

***4.4.1 Pasos inferiores E-1501.1, E-1503.5, E-1505.8, E-1507.5, E-1512.8, E-1513.7,
E-1515.9 Y E-1517.9***

PASOS INFERIORES E-1501.1, E-1503.5, E-1505.8,
E-1507.5, E-1512.8, E-1513.7, E-1515.9 Y E-1517.9

INDICE

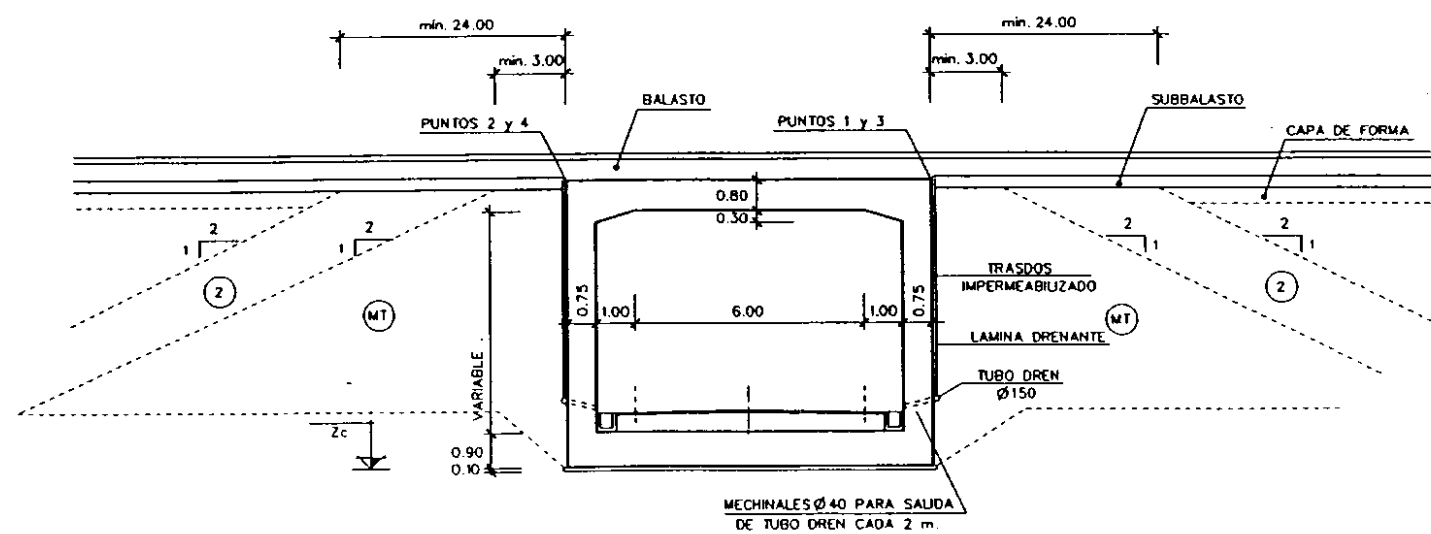
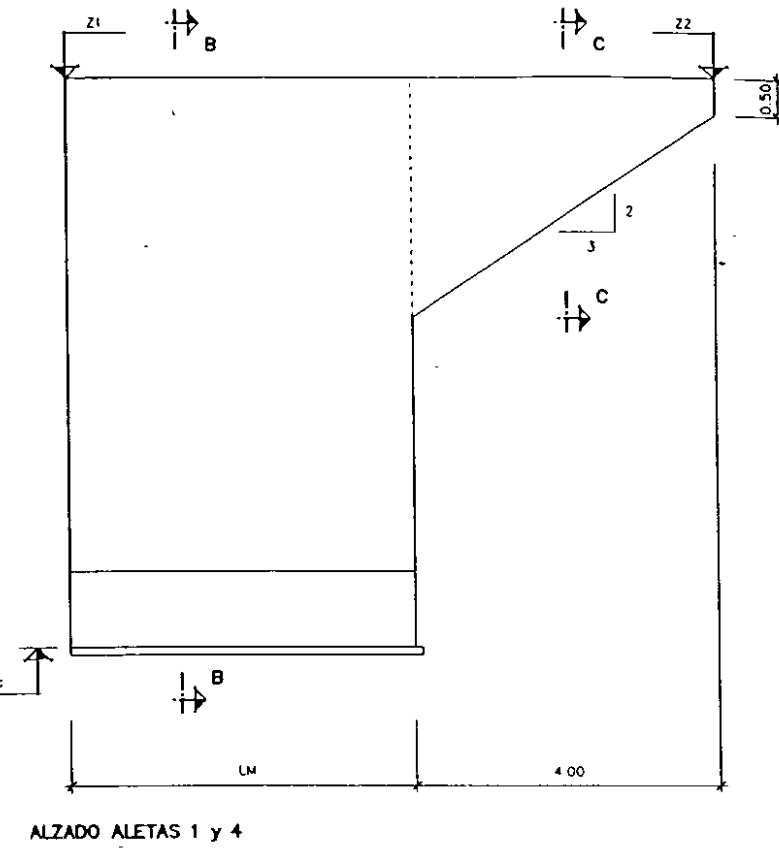
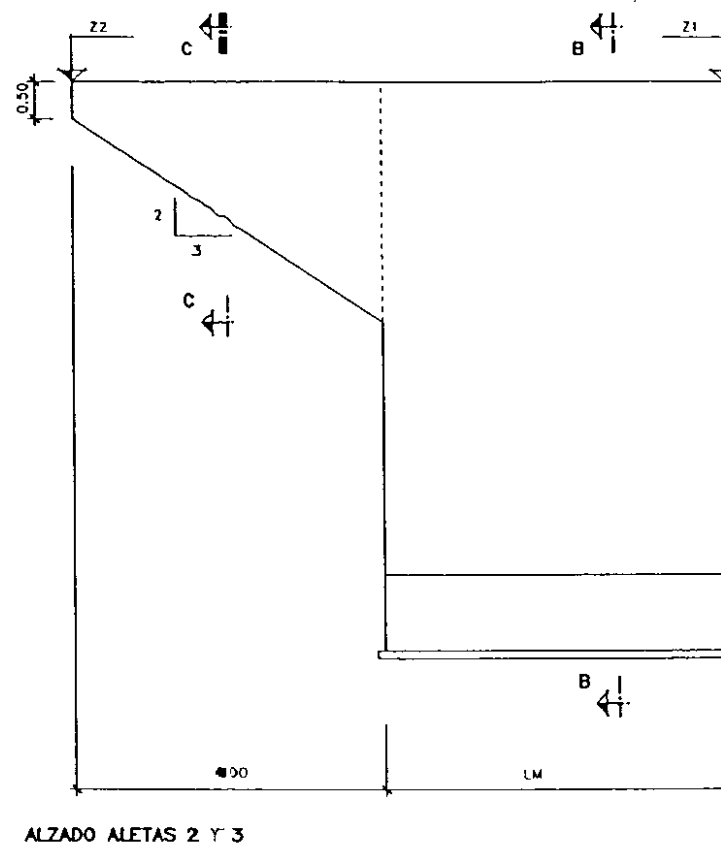
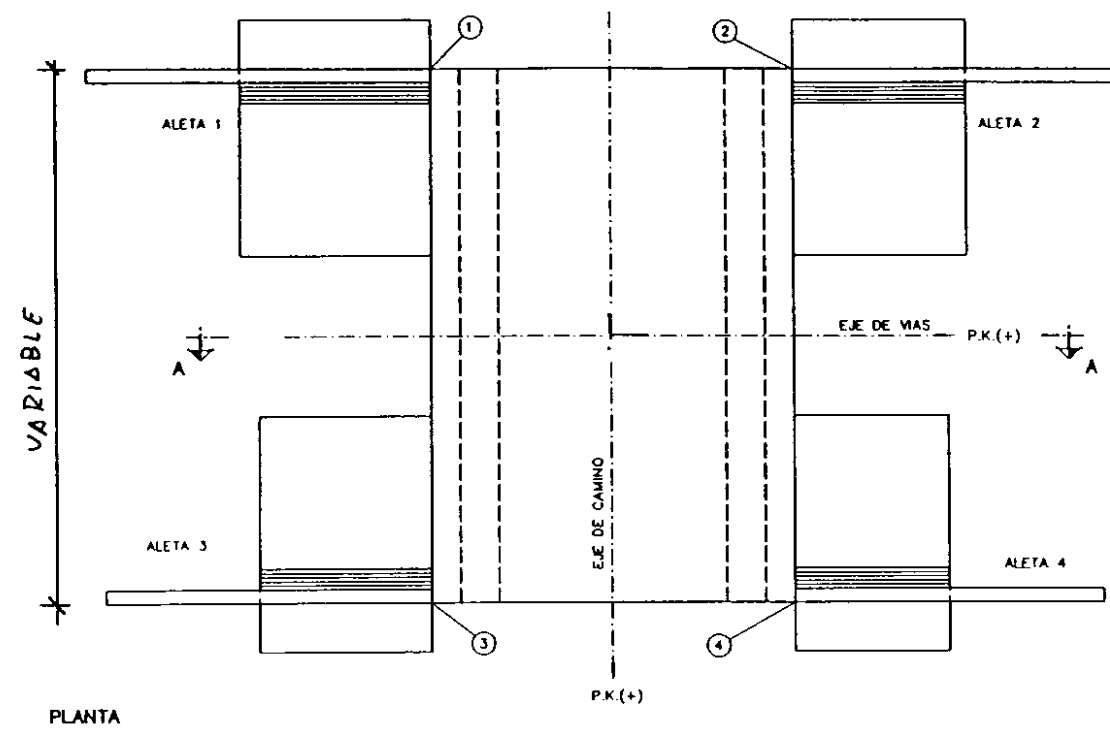
1º DEFINICION GEOMETRICA

2º CALCULOS

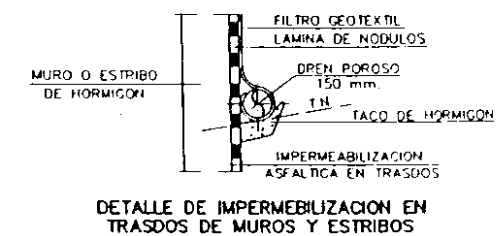
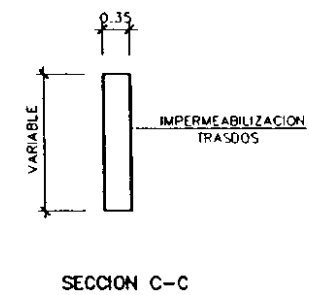
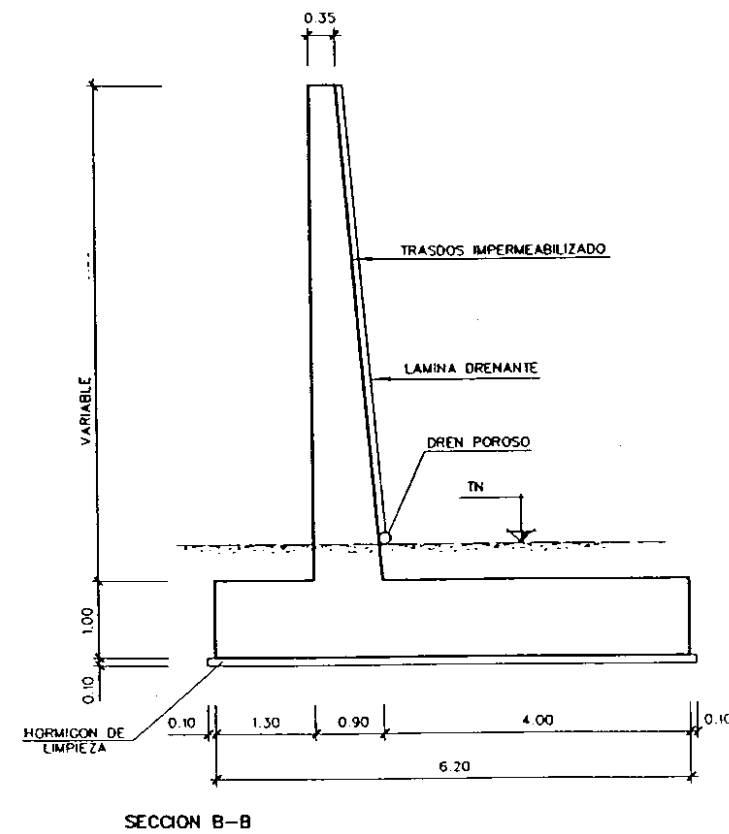
PASOS INFERIORES E-1501.1, E-1503.5, E-1505.8,
E-1507.5, E-1512.8, E-1513.7, E-1515.9 Y E-1517.9

1º DEFINICION GEOMETRICA

DEFINICION GEOMETRICA ESTRUCTURAS E-1501.1, E-1503.5 Y E-1517.9



- (MT) MATERIAL TRATADO CON CEMENTO
- (2) OS3



TABLAS DE DEFINICION GEOMETRICA

E-1501.1

PUNTOS DE REPLANTEO

PUNTO	X	Y	Z
1	665169.074	4611119.219	296.436
2	665178.286	4611116.895	296.436
3	665164.876	4611103.401	296.436
4	665174.058	4611100.964	296.436

REPLANTEO DE ALETAS

ALETA	LM	Z1	Z2	Zc
1	4.00	296.436	296.048	288.877
2	4.00	296.436	296.126	288.877
3	4.00	296.436	296.167	288.959
4	4.00	296.436	296.250	288.959

E-1503.5

PUNTOS DE REPLANTEO

PUNTO	X	Y	Z
1	667450.671	4610298.874	289.889
2	667459.136	4610294.566	289.889
3	667444.321	4610286.396	289.889
4	667452.786	4610282.088	289.889

REPLANTEO DE ALETAS

ALETA	LM	Z1	Z2	Zc
1	5.00	289.889	289.977	282.141
2	4.50	289.889	289.497	282.141
3	4.50	289.889	289.968	282.519
4	4.00	289.889	289.506	282.519

E-1517.9

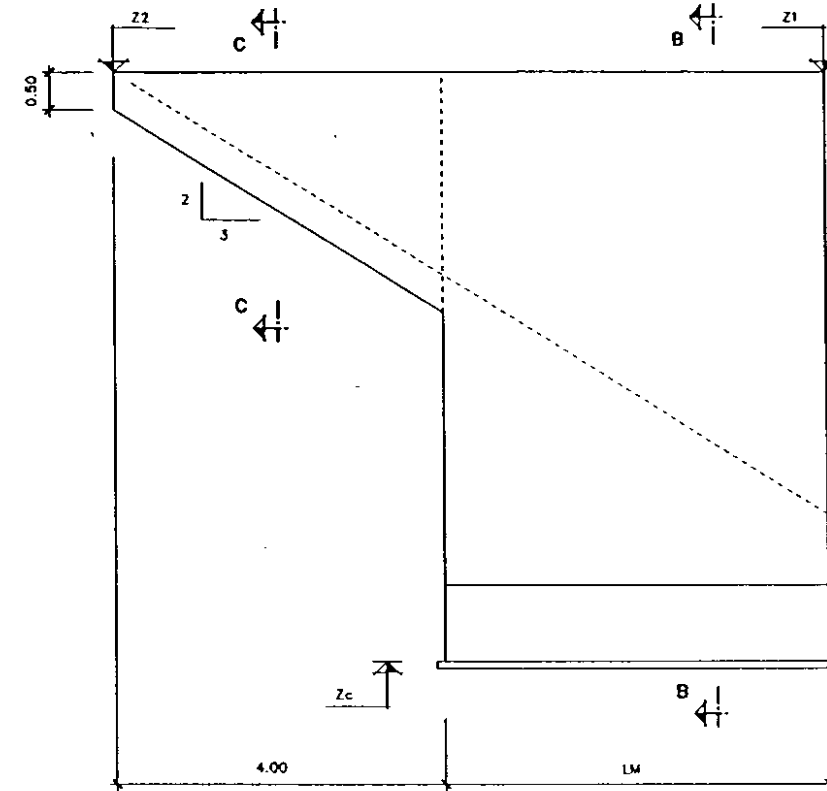
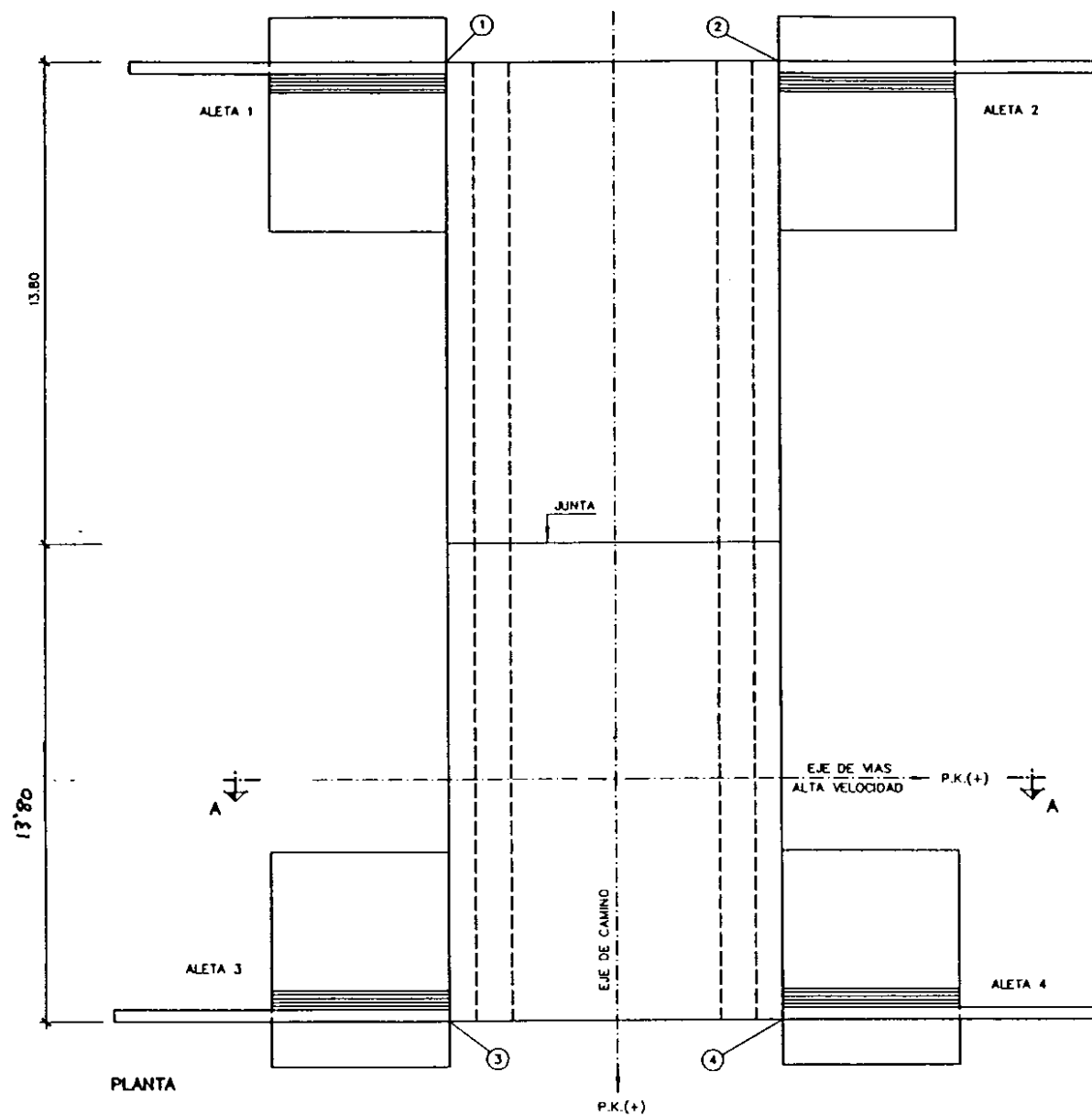
PUNTOS DE REPLANTEO

PUNTO	X	Y	Z
1	681305.638	4606869.211	230.460
2	681313.413	4606863.751	230.460
3	681297.592	4606857.754	230.460
4	681305.367	4606852.294	230.460

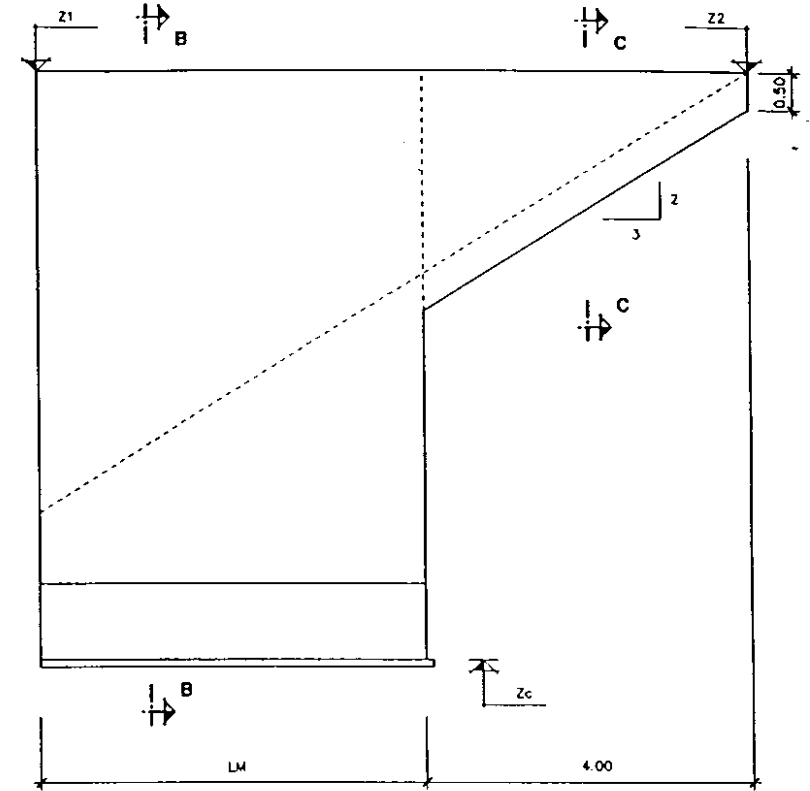
REPLANTEO DE ALETAS

ALETA	LM	Z1	Z2	Zc
1	4.50	230.460	230.200	222.760
2	4.50	230.460	230.253	222.760
3	4.50	230.460	230.200	222.900
4	4.50	230.460	230.253	222.900

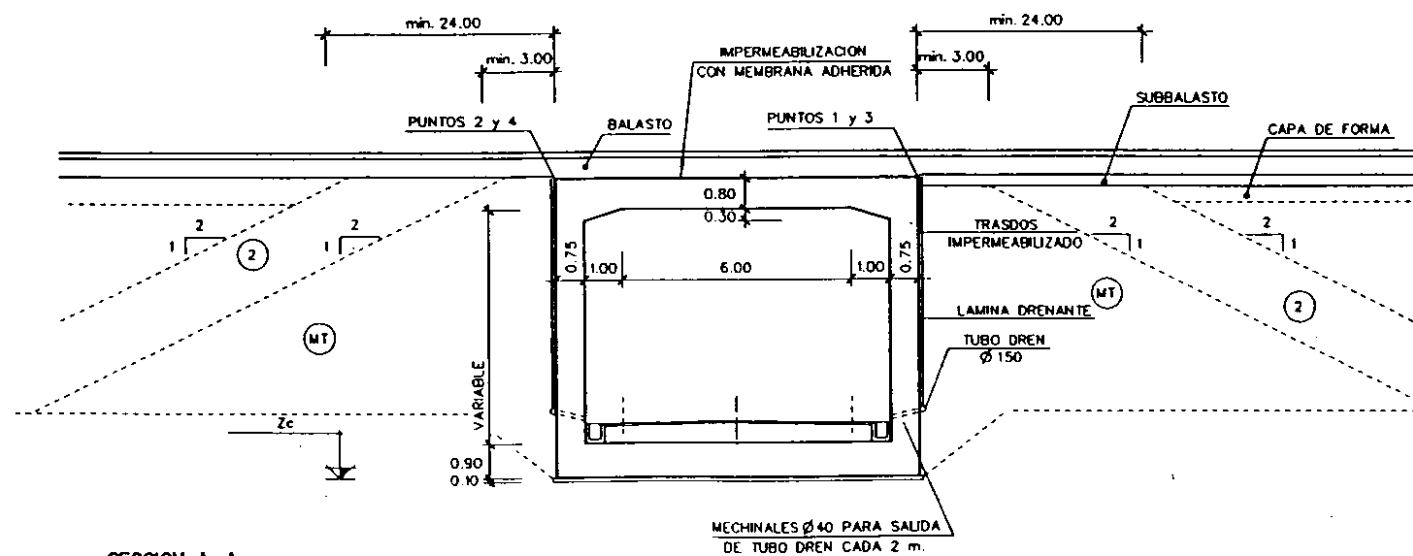
DEFINICION GEOMETRICA ESTRUCTURAS E-1507.5, E-1512.8 Y E-1513.7



ALZADO ALETAS 2 Y 3

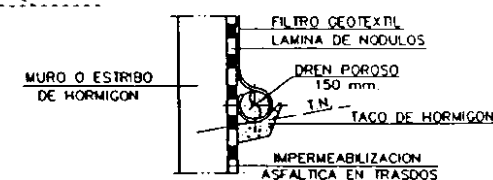


ALZADO ALETAS 1 y 4

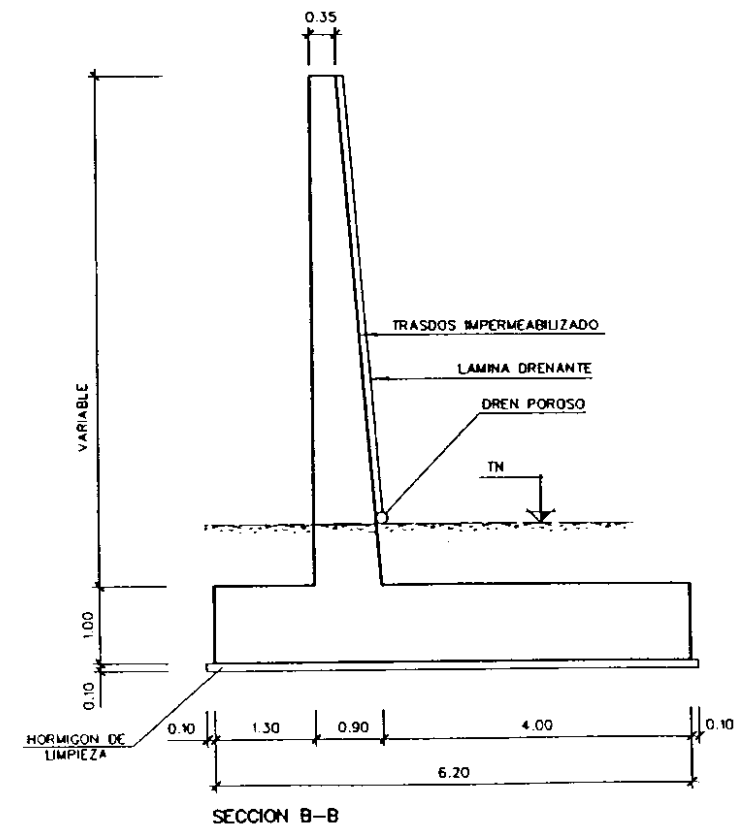


SECCION A-A
ESCALA 1:100

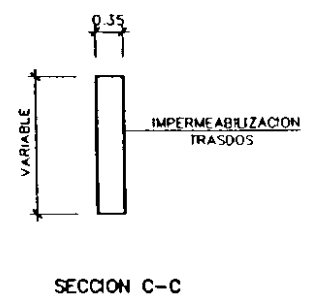
- (MT) MATERIAL TRATADO CON CEMENTO
- (2) Q53



DETALLE DE IMPERMEABILIZACION EN
TRASDOS DE MUROS Y ESTRIBOS



SECCION B-B



SECCION C-C

TABLAS DE DEFINICION GEOMETRICA

E-1507.5

PUNTOS DE REPLANTEO

PUNTO	X	Y	Z
1	671273.309	4609120.523	303.074
2	671282.539	4609118.265	303.074
3	671266.752	4609093.714	303.074
4	671275.980	4609091.456	303.074

REPLANTEO DE ALETAS

ALETA	LM	Z1	Z2	Zc
1	5.00	303.074	302.835	294.906
2	5.50	303.074	302.896	294.906
3	4.50	303.074	302.811	295.499
4	4.50	303.074	302.869	295.499

E-1512.8

PUNTOS DE REPLANTEO

PUNTO	X	Y	Z
1	676466.202	4608089.496	292.244
2	676475.702	4608089.631	292.244
3	676466.599	4608061.905	292.244
4	676476.099	4608062.039	292.244

REPLANTEO DE ALETAS

ALETA	LM	Z1	Z2	Zc
1	5.00	292.244	292.146	284.294
2	5.00	292.244	291.967	284.294
3	5.00	292.244	292.121	284.432
4	5.00	292.244	291.942	284.432

E-1513.7

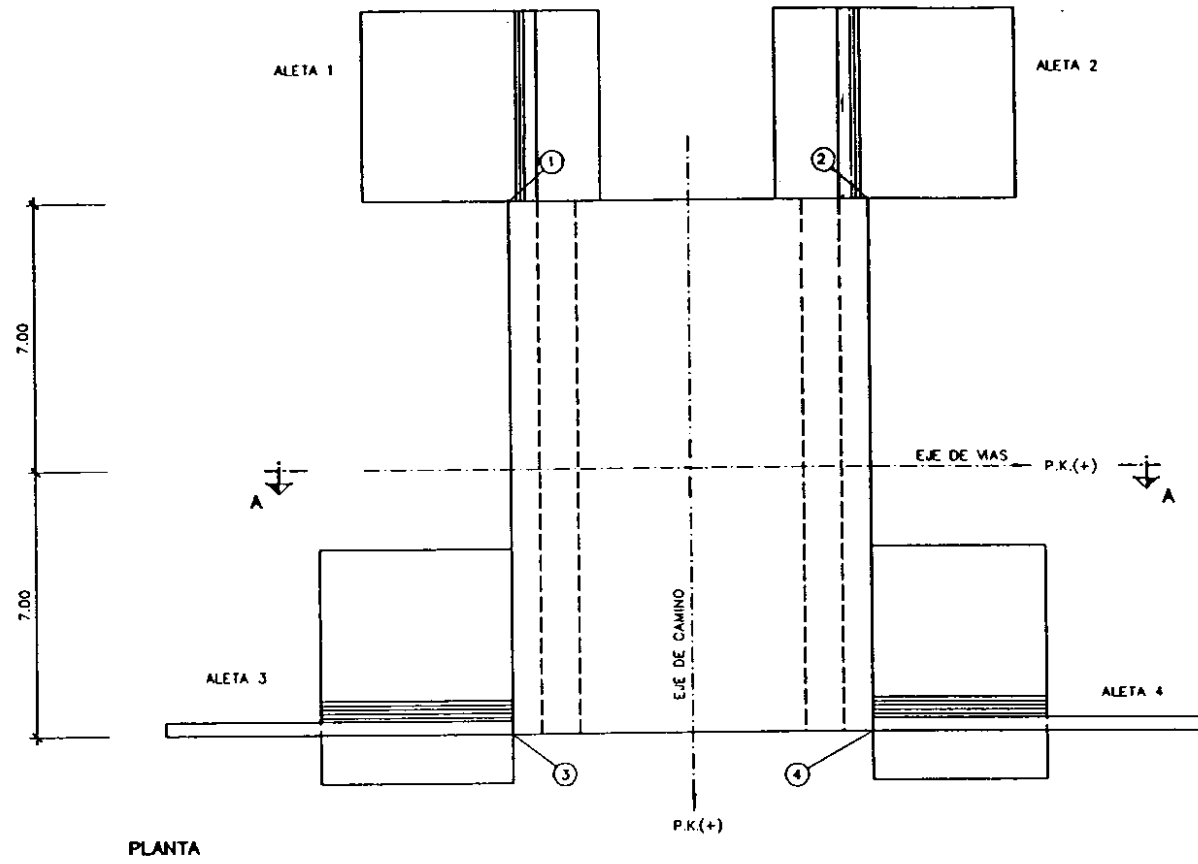
PUNTOS DE REPLANTEO

PUNTO	X	Y	Z
1	677390.994	4608116.596	281.483
2	677400.594	4608116.598	281.483
3	677391.000	4608088.996	281.483
4	677400.600	4608088.998	281.483

REPLANTEO DE ALETAS

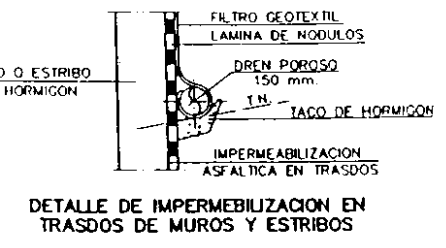
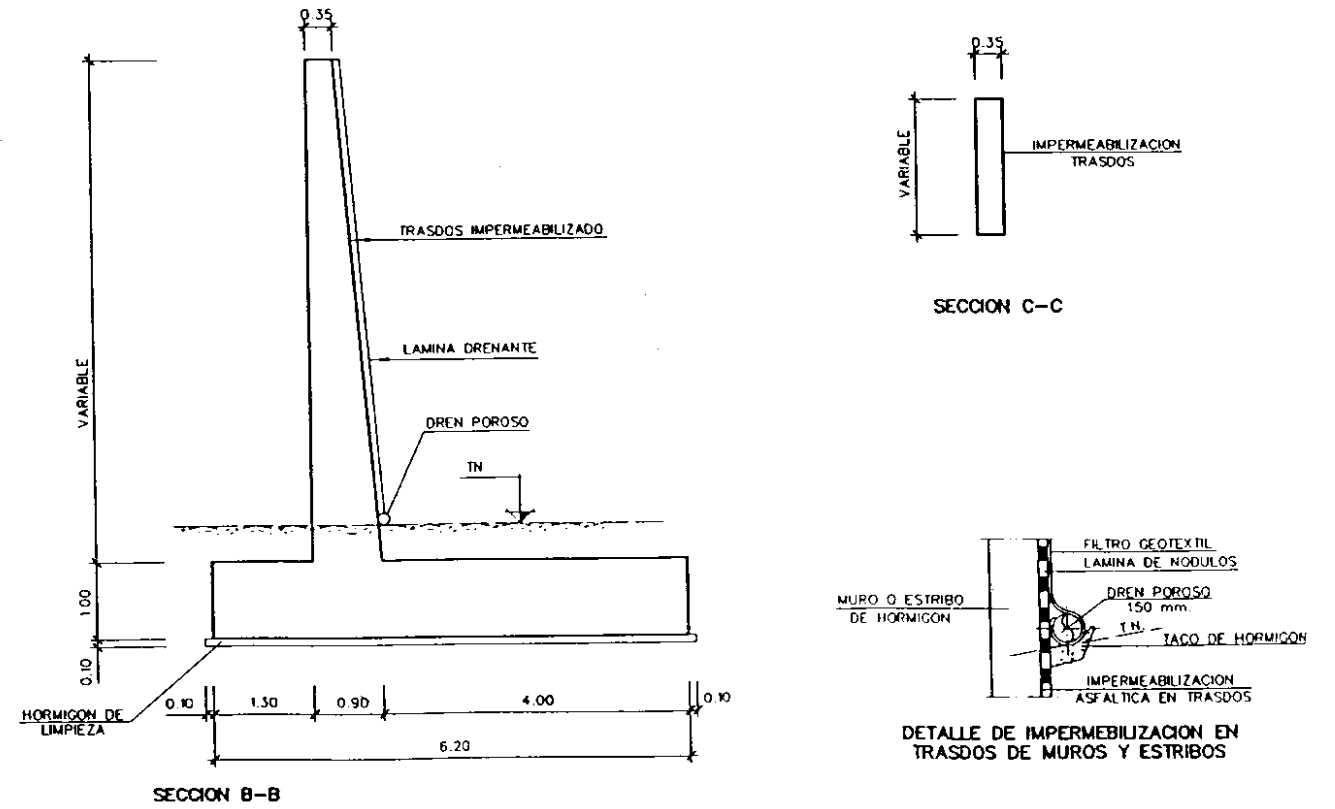
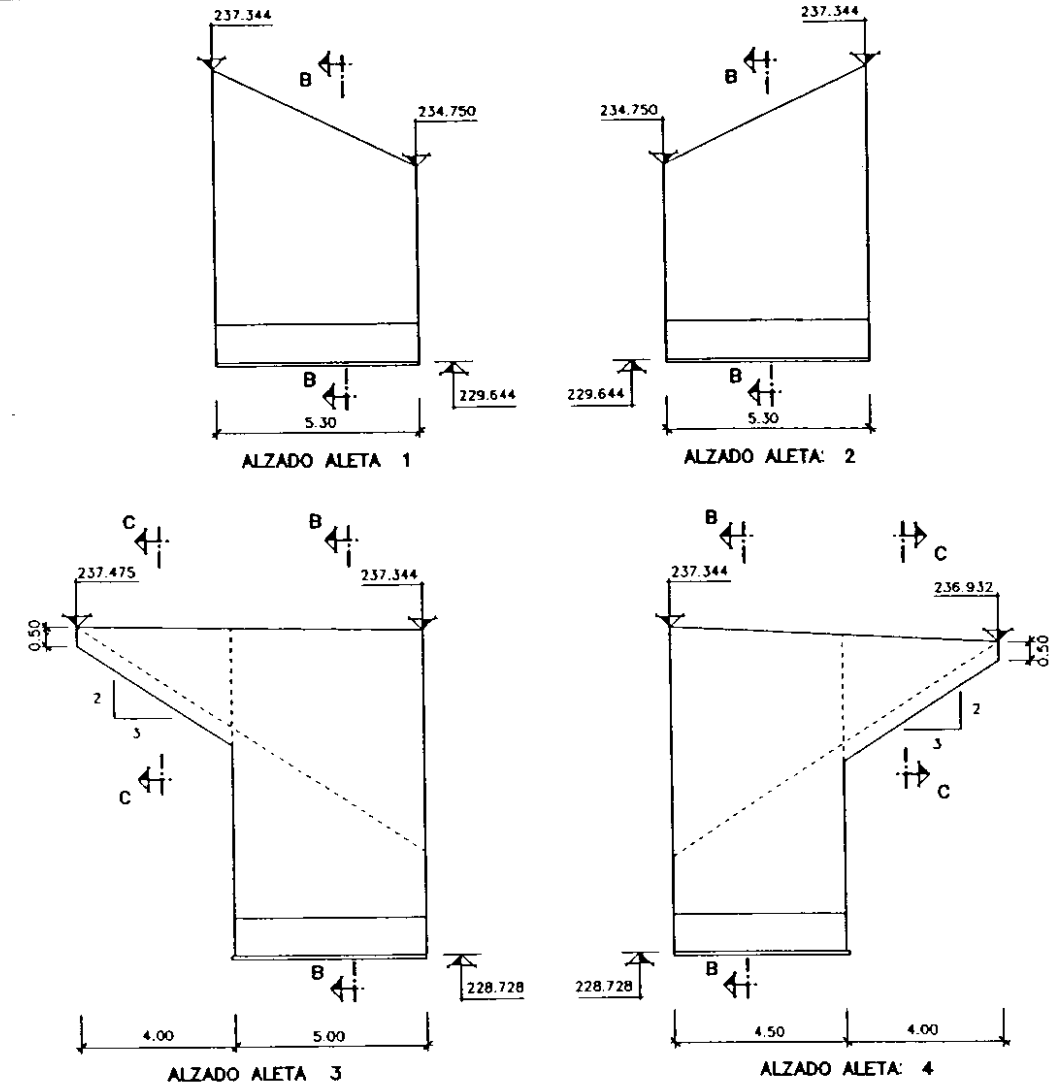
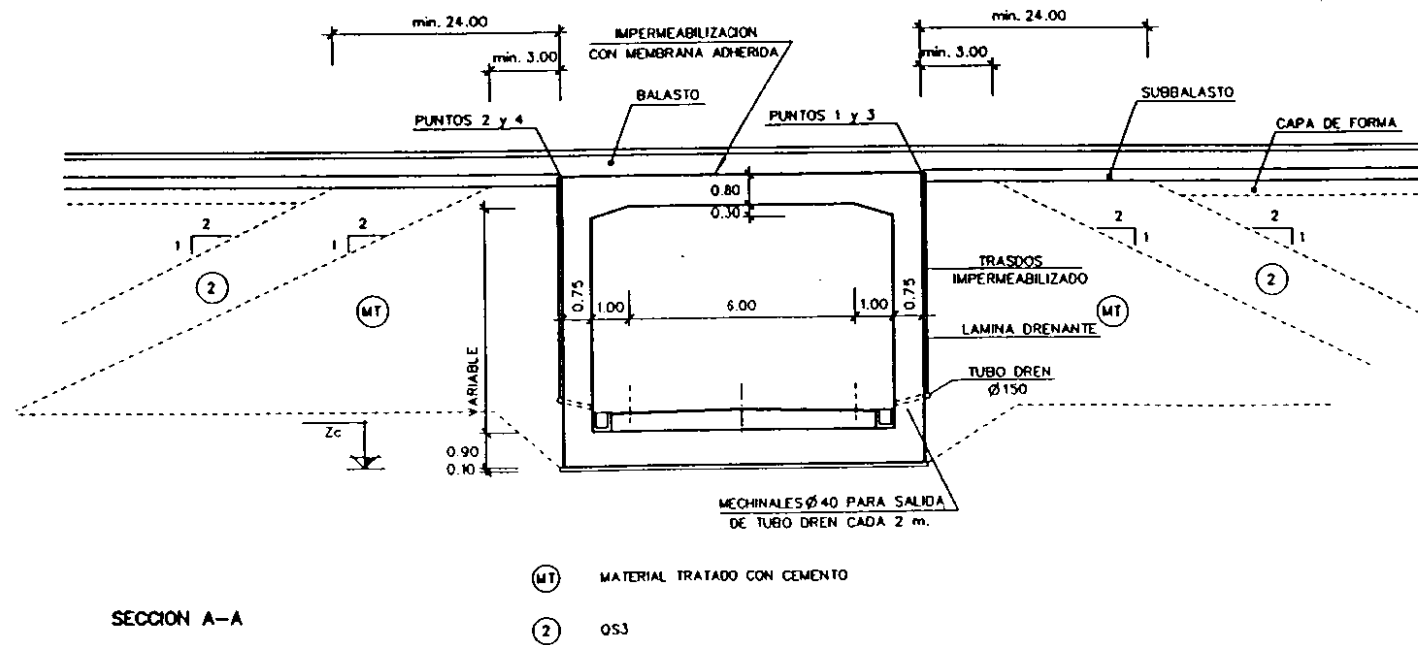
ALETA	LM	Z1	Z2	Zc
1	4.50	281.483	281.554	273.671
2	4.50	281.483	281.129	273.671
3	4.50	281.483	281.530	274.085
4	4.50	281.483	281.104	274.085

DEFINICION GEOMETRICA ESTRUCTURA E-1515.9

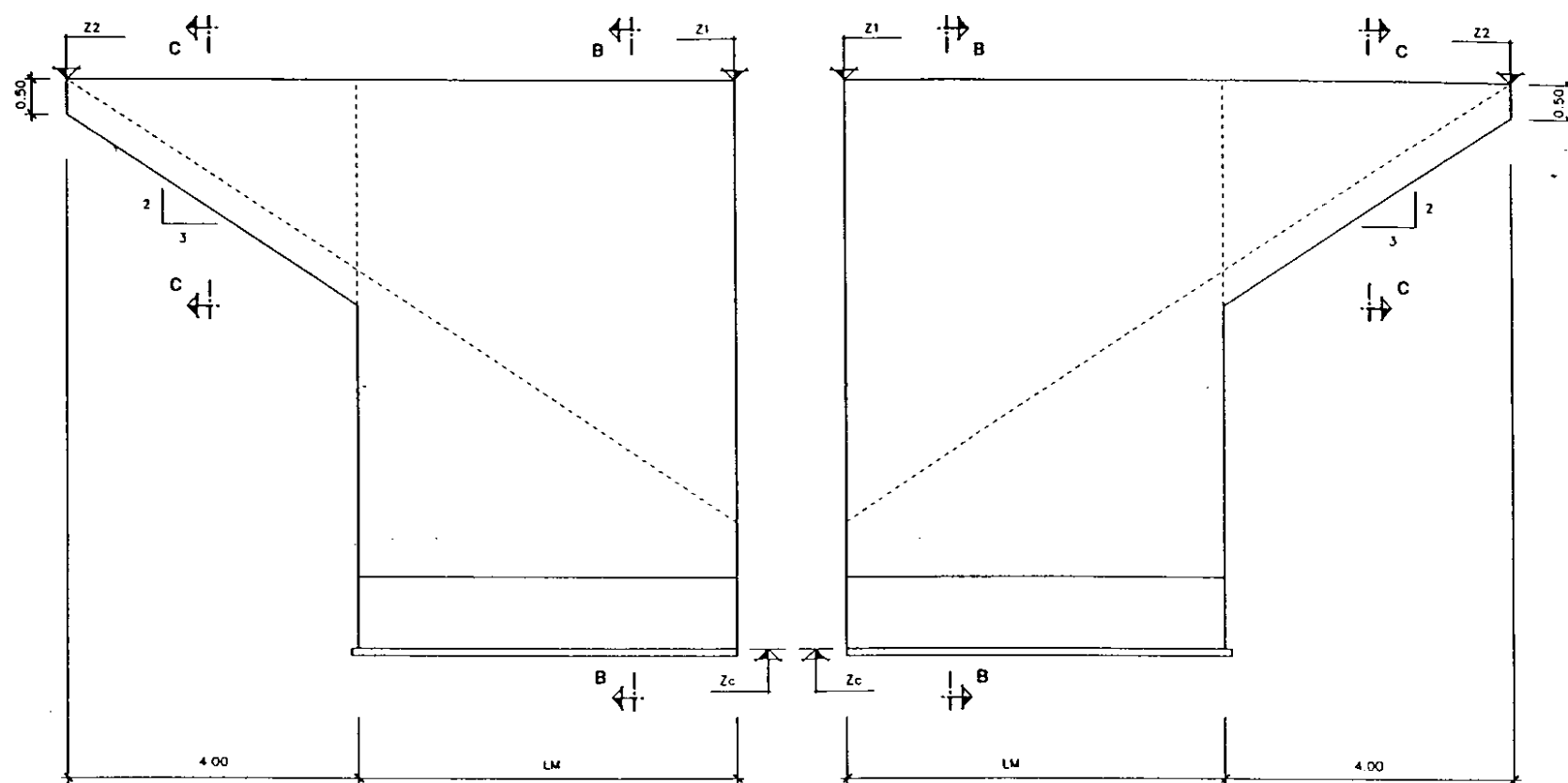
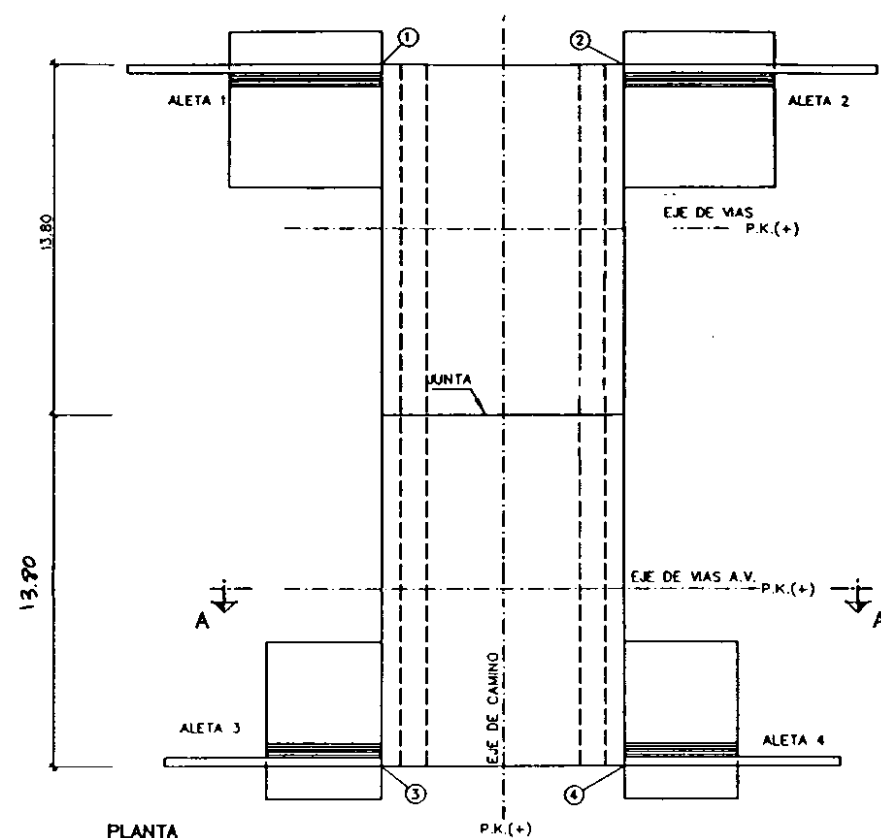


PUNTOS DE REPLANTEO

PUNTO	X	Y	Z
1	679510.749	4607766.615	237.344
2	679519.777	4607763.659	237.344
3	679516.393	4607753.309	237.344
4	679515.421	4607750.353	237.344

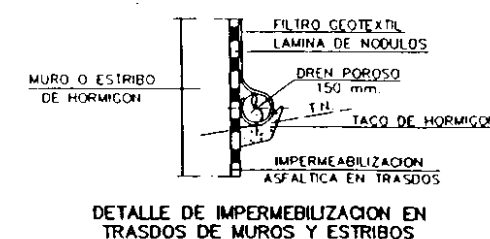
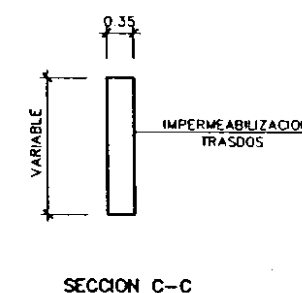
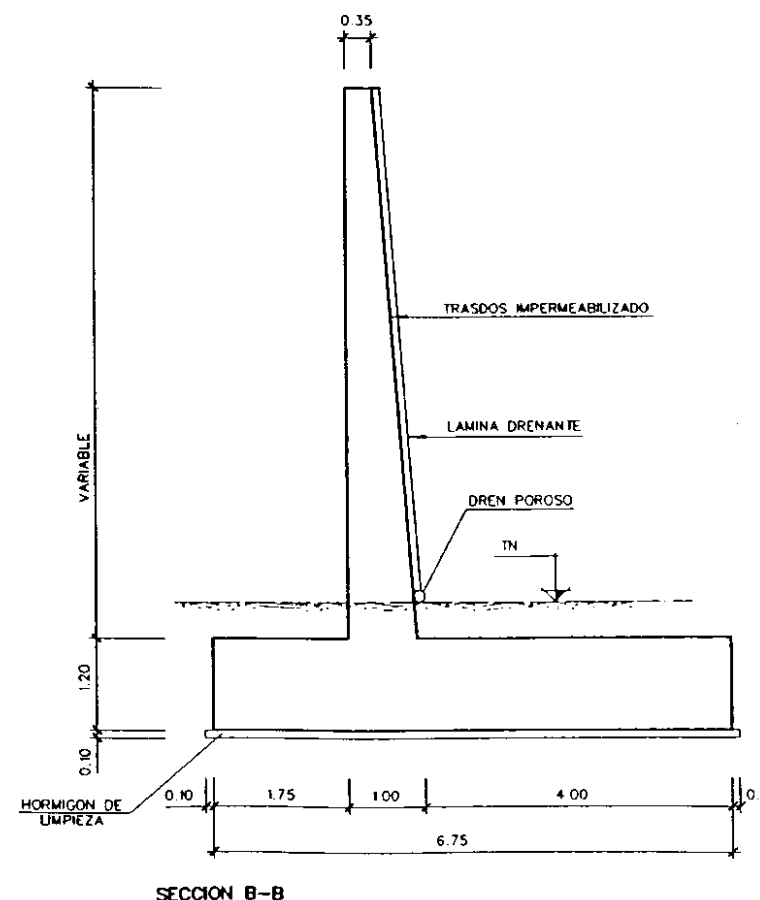
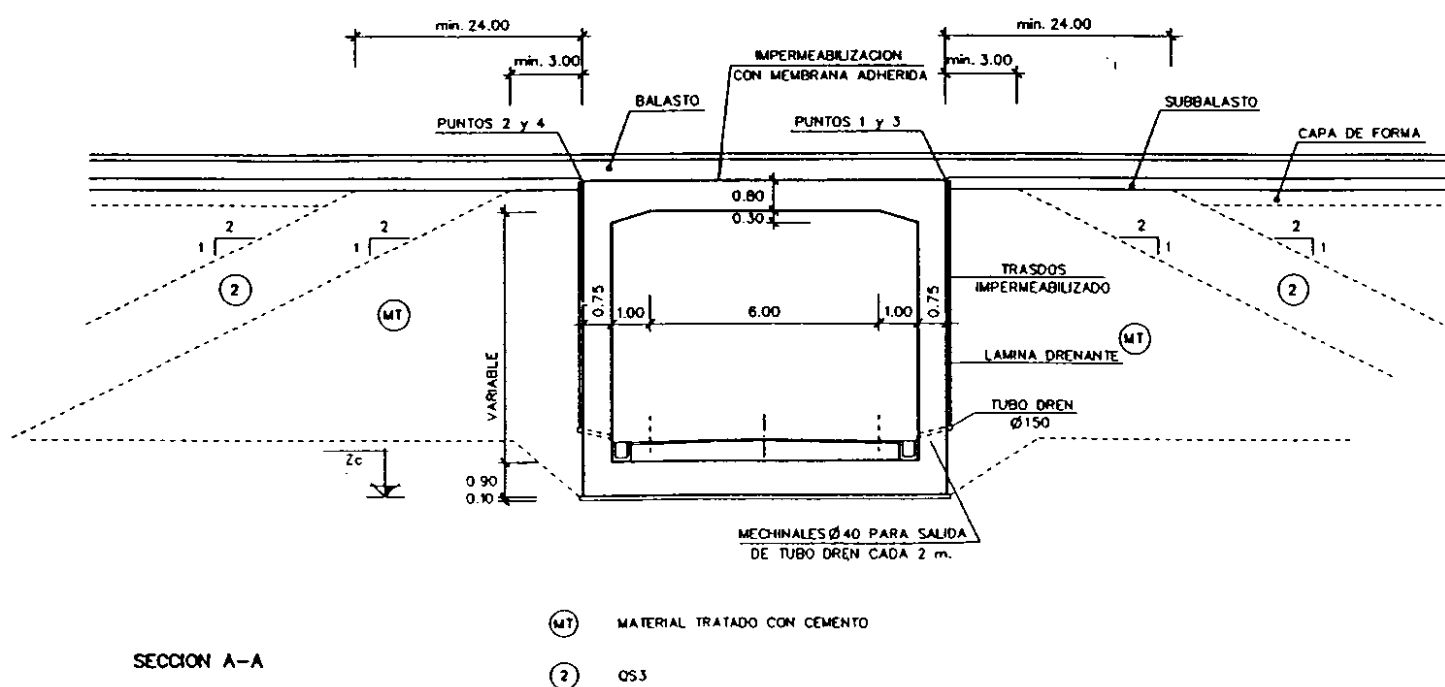


DEFINICION GEOMETRICA ESTRUCTURA E-1505.8



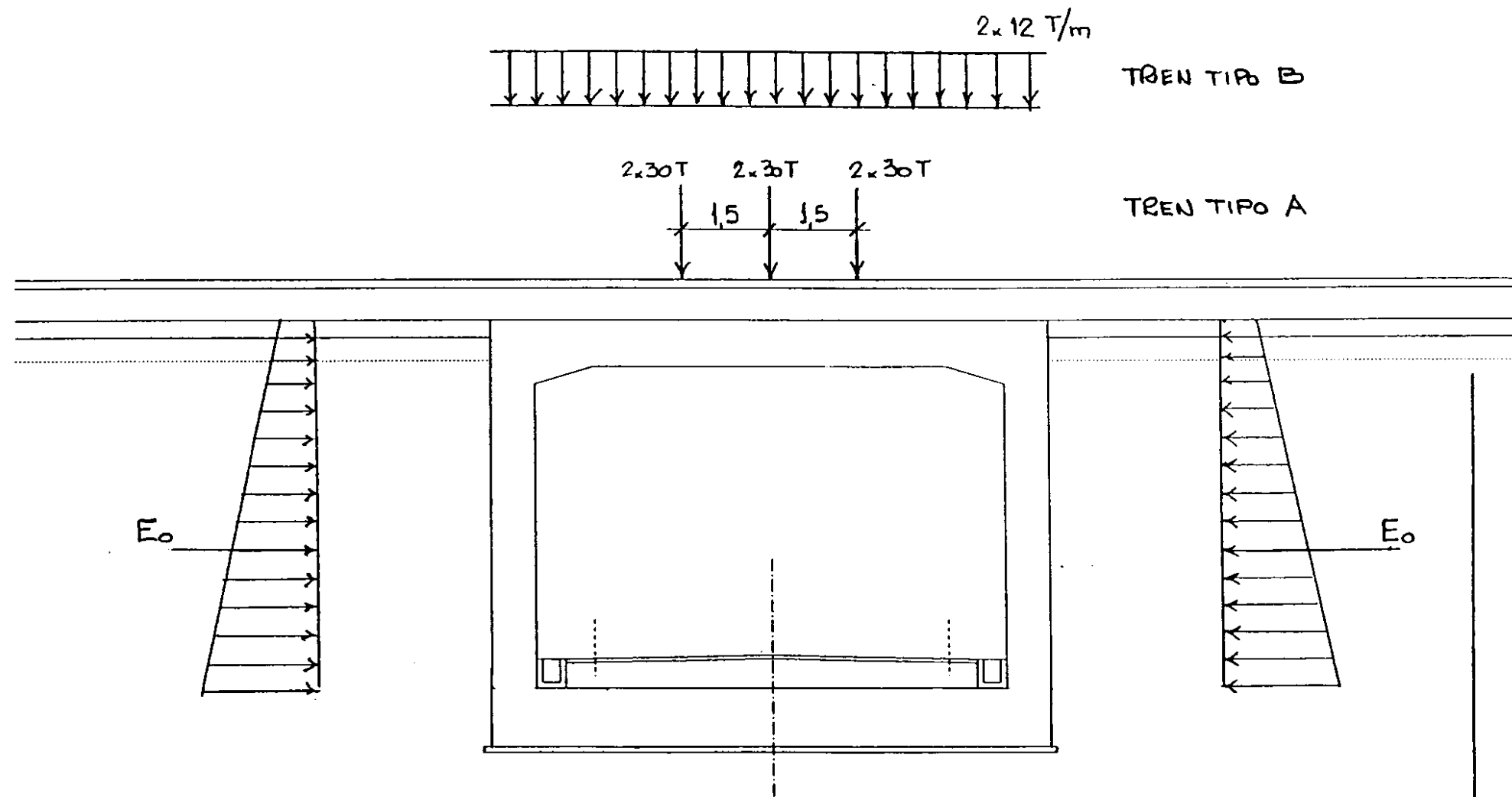
PUNTOS DE REPLANTEO			
PUNTO	X	Y	Z
1	669606.473	4609528.332	298.445
2	669615.701	4609526.075	298.445
3	669599.913	4609501.523	298.445
4	669609.141	4609499.265	298.445

REPLANTEO DE ALETAS				
ALETA	LM	Z1	Z2	Zc
1	6.00	298.445	298.200	289.374
2	6.00	298.445	298.280	289.374
3	4.50	298.445	298.179	290.525
4	4.50	298.445	298.250	290.525



PASOS INFERIORES E-1501.1, E-1503.5, E-1505.8,
E-1507.5, E-1512.8, E-1513.7, E-1515.9 Y E-1517.9

2º CALCULOS



Coef. Impacto

$$V = 200 \text{ km/h}$$

$$T = 0,05 \text{ seg.}$$

$$L = 8,80 \text{ m}$$

$$\mu = \frac{VT}{2L} = 0,57$$

$$I = 65 \frac{\mu}{1 - \mu + \mu^2} = 50$$

$$\phi_0 = 1,50$$

CARGAS PERMANENTES (g)

$$g: \text{Riel + Traviessas: } \frac{0,12 \text{ T/m} + 0,52 \text{ T/m}}{2,4 \text{ m}} = 0,27 \text{ T/m}^2$$

$$\text{Balasto: } 1,2 \text{ m} \times 1,6 \text{ T/m}^3 = \frac{1,92 \text{ T/m}^2}{2,19 \text{ T/m}^2 + \text{Peso Propio Pórtico}}$$

SOBRECARGAS (CARGAS VARIABLES)

. Tren: TREN TIPO A (Q_A)

TREN TIPO B (Q_B)

. Empuje Terreno: (E_0)

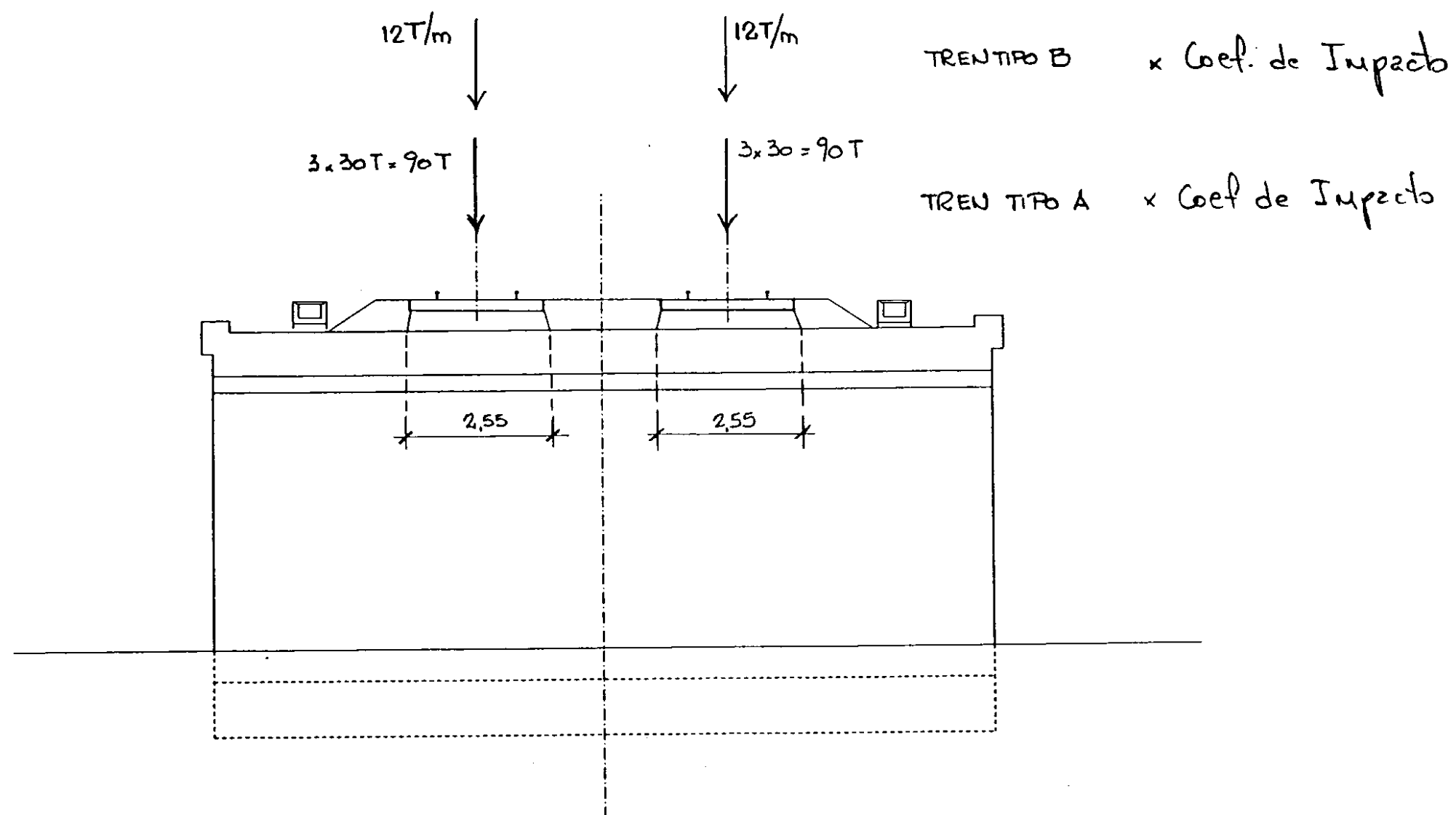
ESTADO LIMITE ULTIMO

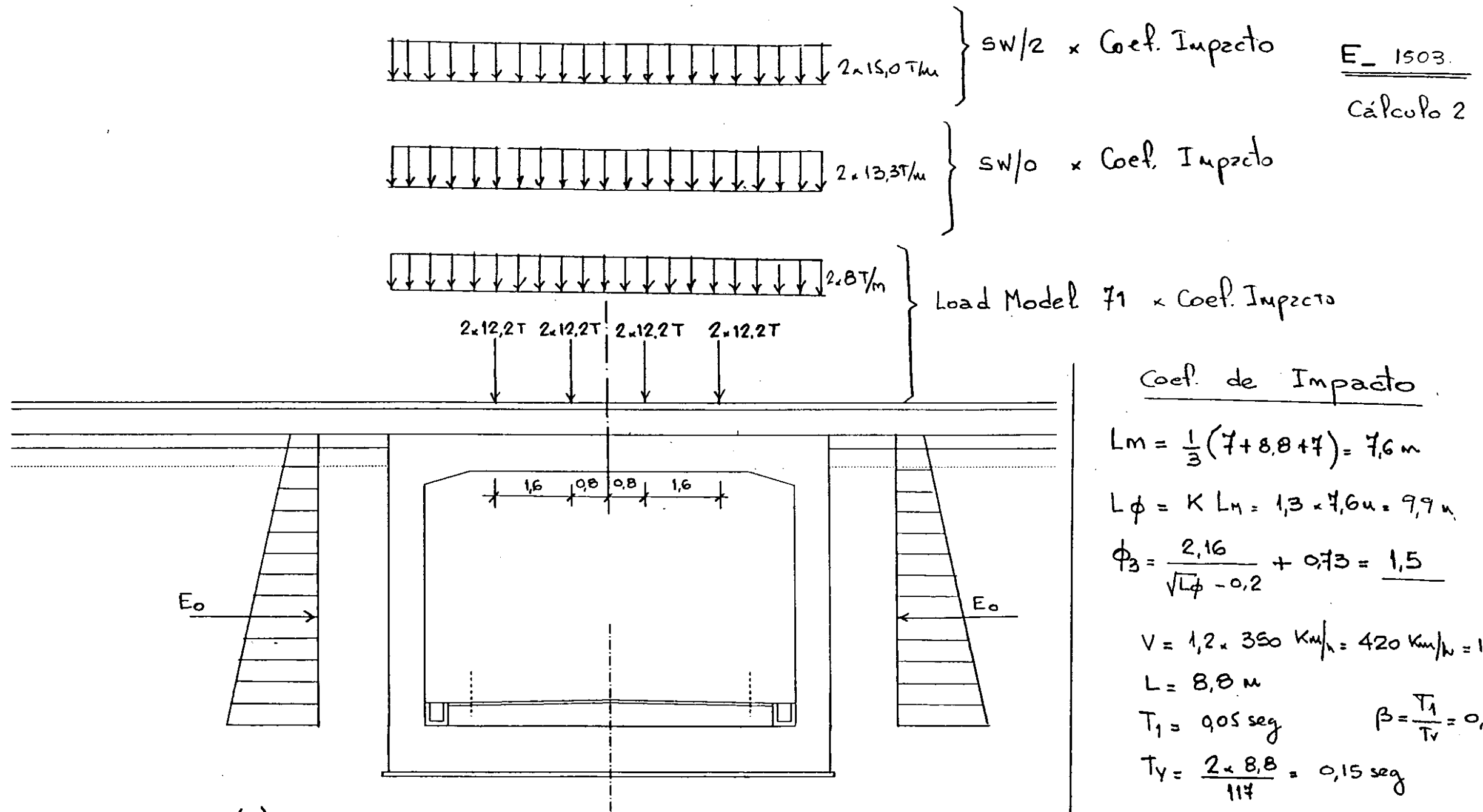
$$S_d = 1,5 [g] + 1,5 \text{ ó } 0,0 [Q_A \text{ ó } Q_B] + 1,5 \text{ ó } 0,0 [E_0]$$

ESTADOS LIMITES DE SERVICIO

$$S_k = 1,0 [g] + 1,0 \text{ ó } 0,0 [Q_A \text{ ó } Q_B] + 1,0 \text{ ó } 0,0 [E_0]$$

E-1503.5
Cálculo 1





CARGAS PERMANENTES (g)

- Peso propio y elementos no estructurales

$$\text{RIEL Y TRAVIESAS} \quad \frac{0,12 \text{ T/m} + 0,52 \text{ T/m}}{2,4 \text{ m}} = 0,27 \text{ T/m}^2$$

$$\text{BALASTO} \quad 1,2 \text{ m} \times 1,6 \text{ T/m}^3 = 1,92 \text{ T/m}^2$$

$$2,19 \text{ T/m}^2 + \text{Peso propio Pórtico}$$

- Empuje del Terreno: (E_o)

SOBRECARGAS (Q)

$$\text{LOAD Model 71} \quad [Q_{LM71}]$$

$$SW/0 \quad [Q_{SW/0}]$$

$$SW/2 \quad [Q_{SW/2}]$$

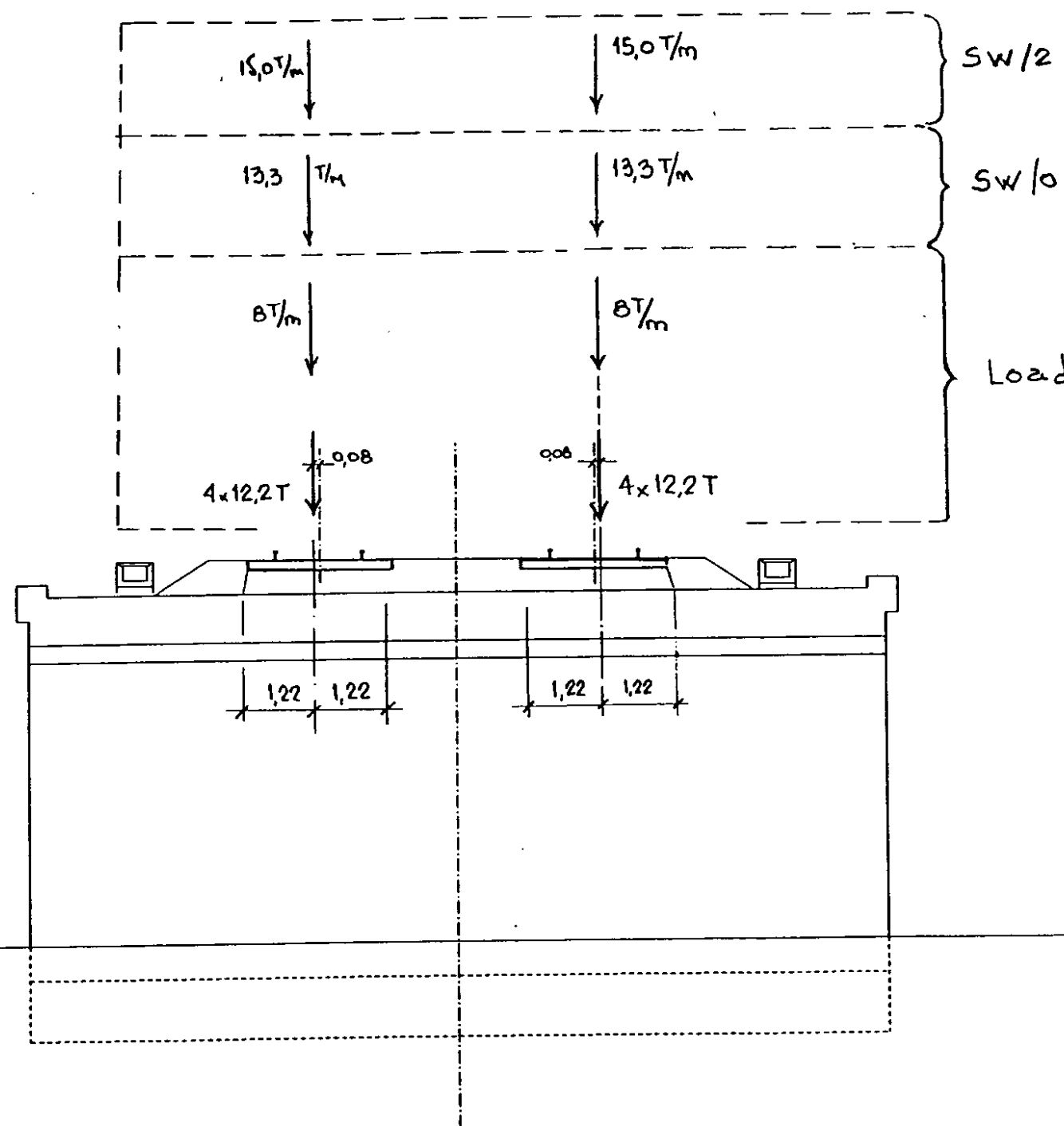
ESTADO LIMITE ÚLTIMO

$$S_d = 1,35 [g] + 1,00 [E_o] + \begin{cases} 1,45 [Q_{LM71}] \\ 1,45 [Q_{SW/0}] \\ 1,20 [Q_{SW/2}] \end{cases}$$

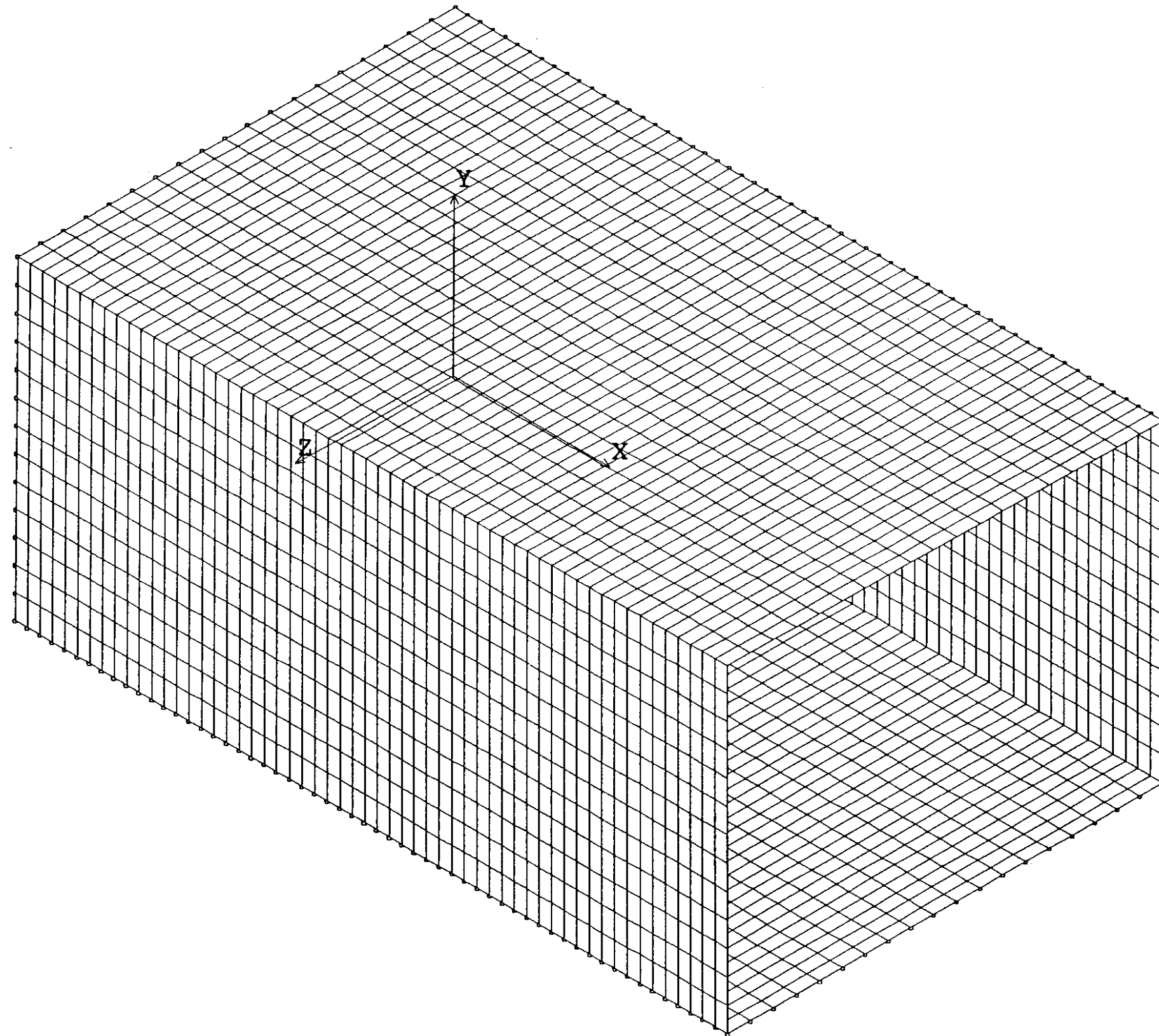
ESTADOS LIMITES DE SERVICIO

$$S_k = 1,00 [g] + 1,00 [E_o] + 1,00 [Q_{LM71}]$$

E = 1503.5
Cálculo 2



$$25.0 T - 8 T/m \cdot 1.6 m = 12.2 T/m$$



```

*****
*****
**
**
** CCCC  OOOO  SSSS  M    M  OOOO  SSSS  /  M    M  **
** C      O  O  S      MM   MM  O  O  S      /  MM   MM  **
** C      O  O  SSSS  M M M M  O  O  SSSS  /  M M M M  **
** C      O  O      S  M  M  M  O  O      S  /  M  M  M  **
** CCCC  OOOO  SSSS  M      M  OOOO  SSSS  /  M      M  **
**
**
**                               VERSION: 2.00
**                               DISTRIBUTED BY:
**      STRUCTURAL RESEARCH AND ANALYSIS CORPORATION
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**      LOS ANGELES, CALIFORNIA 90025
**      TEL. NO. (310) 207-2800
**      COPYRIGHT 1988 S. R. A. C.
**
*****
*****
Problem name:
Date       :                               Time:
Title      :
|
Subtitle   :

```


Element group data

Element group number= 1
 Element name:
 SHELL4T Four node thick shell elements
 Type of Shell element= 2
 EQ. 0; QUAD 2 element
 EQ. 1; QUAD 4 element

Real constant data

Real constant set 1
 Associated with :
 SHELL4T Four node thick shell elements
 Thickness of the plate = .75000
 Temperature Gradient = .00000
 Real constant set 2
 Associated with :
 SHELL4T Four node thick shell elements
 Thickness of the plate = 1.1000
 Temperature Gradient = .00000
 Real constant set 3
 Associated with :
 SHELL4T Four node thick shell elements
 Thickness of the plate = 1.0072
 Temperature Gradient = .00000
 Real constant set 4
 Associated with :
 SHELL4T Four node thick shell elements
 Thickness of the plate = .86908
 Temperature Gradient = .00000
 Real constant set 5
 Associated with :
 SHELL4T Four node thick shell elements
 Thickness of the plate = .80000
 Temperature Gradient = .00000
 Real constant set 6
 Associated with :
 SHELL4T Four node thick shell elements
 Thickness of the plate = .90000
 Temperature Gradient = .00000
 Foundation stiffness = 500.00

Material property data

Material property set 1

	Value	Temp curve no.
EX : X Elastic Modulus	.35000E+07	0
NUXY : Poisson Ratio	.20000	0
DENS : Mass Density	2.5000	0

Nodal input data

NODE BOUNDARY CONDITION CODES NODAL
 POINT COORDINATES
 (0 = FREE ; 1 = FIXED)

	X	Y	Z	XX	YY	ZZ	X	Y	Z
1	1	0	0	0	0	0	.00000	.00000	.00000
2	1	0	0	0	0	0	.00000	.49231	.00000
3	1	0	0	0	0	0	.00000	.98462	.00000
4	1	0	0	0	0	0	.00000	1.4769	.00000
5	1	0	0	0	0	0	.00000	1.9692	.00000
6	1	0	0	0	0	0	.00000	2.4615	.00000
7	1	0	0	0	0	0	.00000	2.9538	.00000
8	1	0	0	0	0	0	.00000	3.4462	.00000
9	1	0	0	0	0	0	.00000	3.9385	.00000
10	1	0	0	0	0	0	.00000	4.4308	.00000
11	1	0	0	0	0	0	.00000	4.9231	.00000
12	1	0	0	0	0	0	.00000	5.4154	.00000
13	1	0	0	0	0	0	.00000	5.9077	.00000
14	1	0	0	0	0	0	.00000	6.4000	.00000
15	1	0	0	0	0	0	.25000	.00000	.00000
16	1	0	0	0	0	0	.25000	.49231	.00000
17	1	0	0	0	0	0	.25000	.98462	.00000
18	1	0	0	0	0	0	.25000	1.4769	.00000
19	1	0	0	0	0	0	.25000	1.9692	.00000
20	1	0	0	0	0	0	.25000	2.4615	.00000
21	1	0	0	0	0	0	.25000	2.9538	.00000
22	1	0	0	0	0	0	.25000	3.4462	.00000
23	1	0	0	0	0	0	.25000	3.9385	.00000
24	1	0	0	0	0	0	.25000	4.4308	.00000
25	1	0	0	0	0	0	.25000	4.9231	.00000
26	1	0	0	0	0	0	.25000	5.4154	.00000
27	1	0	0	0	0	0	.25000	5.9077	.00000
28	1	0	0	0	0	0	.25000	6.4000	.00000
29	1	0	0	0	0	0	.50000	.00000	.00000
30	1	0	0	0	0	0	.50000	.49231	.00000
31	1	0	0	0	0	0	.50000	.98462	.00000
32	1	0	0	0	0	0	.50000	1.4769	.00000
33	1	0	0	0	0	0	.50000	1.9692	.00000
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35	1	0	0	0	0	0	.50000	2.9538	.00000
36	1	0	0	0	0	0	.50000	3.4462	.00000
37	1	0	0	0	0	0	.50000	3.9385	.00000
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40	1	0	0	0	0	0	.50000	5.4154	.00000
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44	1	0	0	0	0	0	.75000	.49231	.00000
45	1	0	0	0	0	0	.75000	.98462	.00000
46	1	0	0	0	0	0	.75000	1.4769	.00000
47	1	0	0	0	0	0	.75000	1.9692	.00000
48	1	0	0	0	0	0	.75000	2.4615	.00000
49	1	0	0	0	0	0	.75000	2.9538	.00000
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53	1	0	0	0	0	0	.75000	4.9231	.00000
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64	1	0	0	0	0	0	1.0000	3.4462	.00000	130	1	0	0	0	0	0	2.2500	1.4769	.00000
65	1	0	0	0	0	0	1.0000	3.9385	.00000	131	1	0	0	0	0	0	2.2500	1.9692	.00000
66	1	0	0	0	0	0	1.0000	4.4308	.00000	132	1	0	0	0	0	0	2.2500	2.4615	.00000
67	1	0	0	0	0	0	1.0000	4.9231	.00000	133	1	0	0	0	0	0	2.2500	2.9538	.00000
68	1	0	0	0	0	0	1.0000	5.4154	.00000	134	1	0	0	0	0	0	2.2500	3.4462	.00000
69	1	0	0	0	0	0	1.0000	5.9077	.00000	135	1	0	0	0	0	0	2.2500	3.9385	.00000
70	1	0	0	0	0	0	1.0000	6.4000	.00000	136	1	0	0	0	0	0	2.2500	4.4308	.00000
71	1	0	0	0	0	0	1.2500	.00000	.00000	137	1	0	0	0	0	0	2.2500	4.9231	.00000
72	1	0	0	0	0	0	1.2500	.49231	.00000	138	1	0	0	0	0	0	2.2500	5.4154	.00000
73	1	0	0	0	0	0	1.2500	.98462	.00000	139	1	0	0	0	0	0	2.2500	5.9077	.00000
74	1	0	0	0	0	0	1.2500	1.4769	.00000	140	1	0	0	0	0	0	2.2500	6.4000	.00000
75	1	0	0	0	0	0	1.2500	1.9692	.00000	141	1	0	0	0	0	0	2.5000	.00000	.00000
76	1	0	0	0	0	0	1.2500	2.4615	.00000	142	1	0	0	0	0	0	2.5000	.49231	.00000
77	1	0	0	0	0	0	1.2500	2.9538	.00000	143	1	0	0	0	0	0	2.5000	.98462	.00000
78	1	0	0	0	0	0	1.2500	3.4462	.00000	144	1	0	0	0	0	0	2.5000	1.4769	.00000
79	1	0	0	0	0	0	1.2500	3.9385	.00000	145	1	0	0	0	0	0	2.5000	1.9692	.00000
80	1	0	0	0	0	0	1.2500	4.4308	.00000	146	1	0	0	0	0	0	2.5000	2.4615	.00000
81	1	0	0	0	0	0	1.2500	4.9231	.00000	147	1	0	0	0	0	0	2.5000	2.9538	.00000
82	1	0	0	0	0	0	1.2500	5.4154	.00000	148	1	0	0	0	0	0	2.5000	3.4462	.00000
83	1	0	0	0	0	0	1.2500	5.9077	.00000	149	1	0	0	0	0	0	2.5000	3.9385	.00000
84	1	0	0	0	0	0	1.2500	6.4000	.00000	150	1	0	0	0	0	0	2.5000	4.4308	.00000
85	1	0	0	0	0	0	1.5000	.00000	.00000	151	1	0	0	0	0	0	2.5000	4.9231	.00000
86	1	0	0	0	0	0	1.5000	.49231	.00000	152	1	0	0	0	0	0	2.5000	5.4154	.00000
87	1	0	0	0	0	0	1.5000	.98462	.00000	153	1	0	0	0	0	0	2.5000	5.9077	.00000
88	1	0	0	0	0	0	1.5000	1.4769	.00000	154	1	0	0	0	0	0	2.5000	6.4000	.00000
89	1	0	0	0	0	0	1.5000	1.9692	.00000	155	1	0	0	0	0	0	2.7500	.00000	.00000
90	1	0	0	0	0	0	1.5000	2.4615	.00000	156	1	0	0	0	0	0	2.7500	.49231	.00000
91	1	0	0	0	0	0	1.5000	2.9538	.00000	157	1	0	0	0	0	0	2.7500	.98462	.00000
92	1	0	0	0	0	0	1.5000	3.4462	.00000	158	1	0	0	0	0	0	2.7500	1.4769	.00000
93	1	0	0	0	0	0	1.5000	3.9385	.00000	159	1	0	0	0	0	0	2.7500	1.9692	.00000
94	1	0	0	0	0	0	1.5000	4.4308	.00000	160	1	0	0	0	0	0	2.7500	2.4615	.00000
95	1	0	0	0	0	0	1.5000	4.9231	.00000	161	1	0	0	0	0	0	2.7500	2.9538	.00000
96	1	0	0	0	0	0	1.5000	5.4154	.00000	162	1	0	0	0	0	0	2.7500	3.4462	.00000
97	1	0	0	0	0	0	1.5000	5.9077	.00000	163	1	0	0	0	0	0	2.7500	3.9385	.00000
98	1	0	0	0	0	0	1.5000	6.4000	.00000	164	1	0	0	0	0	0	2.7500	4.4308	.00000
99	1	0	0	0	0	0	1.7500	.00000	.00000	165	1	0	0	0	0	0	2.7500	4.9231	.00000
100	1	0	0	0	0	0	1.7500	.49231	.00000	166	1	0	0	0	0	0	2.7500	5.4154	.00000
101	1	0	0	0	0	0	1.7500	.98462	.00000	167	1	0	0	0	0	0	2.7500	5.9077	.00000
102	1	0	0	0	0	0	1.7500	1.4769	.00000	168	1	0	0	0	0	0	2.7500	6.4000	.00000
103	1	0	0	0	0	0	1.7500	1.9692	.00000	169	1	0	0	0	0	0	3.0000	.00000	.00000
104	1	0	0	0	0	0	1.7500	2.4615	.00000	170	1	0	0	0	0	0	3.0000	.49231	.00000
105	1	0	0	0	0	0	1.7500	2.9538	.00000	171	1	0	0	0	0	0	3.0000	.98462	.00000
106	1	0	0	0	0	0	1.7500	3.4462	.00000	172	1	0	0	0	0	0	3.0000	1.4769	.00000
107	1	0	0	0	0	0	1.7500	3.9385	.00000	173	1	0	0	0	0	0	3.0000	1.9692	.00000
108	1	0	0	0	0	0	1.7500	4.4308	.00000	174	1	0	0	0	0	0	3.0000	2.4615	.00000
109	1	0	0	0	0	0	1.7500	4.9231	.00000	175	1	0	0	0	0	0	3.0000	2.9538	.00000
110	1	0	0	0	0	0	1.7500	5.4154	.00000	176	1	0	0	0	0	0	3.0000	3.4462	.00000
111	1	0	0	0	0	0	1.7500	5.9077	.00000	177	1	0	0	0	0	0	3.0000	3.9385	.00000
112	1	0	0	0	0	0	1.7500	6.4000	.00000	178	1	0	0	0	0	0	3.0000	4.4308	.00000
113	1	0	0	0	0	0	2.0000	.00000	.00000	179	1	0	0	0	0	0	3.0000	4.9231	.00000
114	1	0	0	0	0	0	2.0000	.49231	.00000	180	1	0	0	0	0	0	3.0000	5.4154	.00000
115	1	0	0	0	0	0	2.0000	.98462	.00000	181	1	0	0	0	0	0	3.0000	5.9077	.00000
116	1	0	0	0	0	0	2.0000	1.4769	.00000	182	1	0	0	0	0	0	3.0000	6.4000	.00000
117	1	0	0	0	0	0	2.0000	1.9692	.00000	183	1	0	0	0	0	0	3.2500	.00000	.00000
118	1	0	0	0	0	0	2.0000	2.4615	.00000	184	1	0	0	0	0	0	3.2500	.49231	.00000
119	1	0	0	0	0	0	2.0000	2.9538	.00000	185	1	0	0	0	0	0	3.2500	.98462	.00000
120	1	0	0	0	0	0	2.0000	3.4462	.00000	186	1	0	0	0	0	0	3.2500	1.4769	.00000
121	1	0	0	0	0	0	2.0000	3.9385	.00000	187	1	0	0	0	0	0	3.2500	1.9692	.00000
122	1	0	0	0	0	0	2.0000	4.4308	.00000	188	1	0	0	0	0	0	3.2500	2.4615	.00000
123	1	0	0	0	0	0	2.0000	4.9231	.00000	189	1	0	0	0	0	0	3.2500	2.9538	.00000
124	1	0	0	0	0	0	2.0000	5.4154	.00000	190	1	0	0	0	0	0	3.2500	3.4462	.00000
125	1	0	0	0	0	0	2.0000	5.9077	.00000	191	1	0	0	0	0	0	3.2500	3.9385	.00000
126	1	0	0	0	0	0	2.0000	6.4000	.00000	192	1	0	0	0	0	0	3.2500	4.4308	.00000

193	1	0	0	0	0	3.2500	4.9231	.00000	259	1	0	0	0	0	4.5000	2.9538	.00000	325	1	0	0	0	0	5.7500	.98462	.00000	391	1	0	0	0	0	6.7500	5.9077	.00000
194	1	0	0	0	0	3.2500	5.4154	.00000	260	1	0	0	0	0	4.5000	3.4462	.00000	326	1	0	0	0	0	5.7500	1.4769	.00000	392	1	0	0	0	0	6.7500	6.4000	.00000
195	1	0	0	0	0	3.2500	5.9077	.00000	261	1	0	0	0	0	4.5000	3.9385	.00000	327	1	0	0	0	0	5.7500	1.9692	.00000	393	1	0	0	0	0	7.0000	.00000	.00000
196	1	0	0	0	0	3.2500	6.4000	.00000	262	1	0	0	0	0	4.5000	4.4308	.00000	328	1	0	0	0	0	5.7500	2.4615	.00000	394	1	0	0	0	0	7.0000	.49231	.00000
197	1	0	0	0	0	3.5000	.00000	.00000	263	1	0	0	0	0	4.5000	4.9231	.00000	329	1	0	0	0	0	5.7500	2.9538	.00000	395	1	0	0	0	0	7.0000	.98462	.00000
198	1	0	0	0	0	3.5000	.49231	.00000	264	1	0	0	0	0	4.5000	5.4154	.00000	330	1	0	0	0	0	5.7500	3.4462	.00000	396	1	0	0	0	0	7.0000	1.4769	.00000
199	1	0	0	0	0	3.5000	.98462	.00000	265	1	0	0	0	0	4.5000	5.9077	.00000	331	1	0	0	0	0	5.7500	3.9385	.00000	397	1	0	0	0	0	7.0000	1.9692	.00000
200	1	0	0	0	0	3.5000	1.4769	.00000	266	1	0	0	0	0	4.5000	6.4000	.00000	332	1	0	0	0	0	5.7500	4.4308	.00000	398	1	0	0	0	0	7.0000	2.4615	.00000
201	1	0	0	0	0	3.5000	1.9692	.00000	267	1	0	0	0	0	4.7500	.00000	.00000	333	1	0	0	0	0	5.7500	4.9231	.00000	399	1	0	0	0	0	7.0000	2.9538	.00000
202	1	0	0	0	0	3.5000	2.4615	.00000	268	1	0	0	0	0	4.7500	.49231	.00000	334	1	0	0	0	0	5.7500	5.4154	.00000	400	1	0	0	0	0	7.0000	3.4462	.00000
203	1	0	0	0	0	3.5000	2.9538	.00000	269	1	0	0	0	0	4.7500	.98462	.00000	335	1	0	0	0	0	5.7500	5.9077	.00000	401	1	0	0	0	0	7.0000	3.9385	.00000
204	1	0	0	0	0	3.5000	3.4462	.00000	270	1	0	0	0	0	4.7500	1.4769	.00000	336	1	0	0	0	0	5.7500	6.4000	.00000	402	1	0	0	0	0	7.0000	4.4308	.00000
205	1	0	0	0	0	3.5000	3.9385	.00000	271	1	0	0	0	0	4.7500	1.9692	.00000	337	1	0	0	0	0	6.0000	.00000	.00000	403	1	0	0	0	0	7.0000	4.9231	.00000
206	1	0	0	0	0	3.5000	4.4308	.00000	272	1	0	0	0	0	4.7500	2.4615	.00000	338	1	0	0	0	0	6.0000	.49231	.00000	404	1	0	0	0	0	7.0000	5.4154	.00000
207	1	0	0	0	0	3.5000	4.9231	.00000	273	1	0	0	0	0	4.7500	2.9538</																			

457	1	0	0	0	0	8.0000	3.9385	.00000	523	1	0	0	0	0	9.2500	1.9692	.00000	589	1	0	0	0	0	10.500	.00000	.00000	655	1	0	0	0	0	11.500	4.9231	.00000
458	1	0	0	0	0	8.0000	4.4308	.00000	524	1	0	0	0	0	9.2500	2.4615	.00000	590	1	0	0	0	0	10.500	.49231	.00000	656	1	0	0	0	0	11.500	5.4154	.00000
459	1	0	0	0	0	8.0000	4.9231	.00000	525	1	0	0	0	0	9.2500	2.9538	.00000	591	1	0	0	0	0	10.500	.98462	.00000	657	1	0	0	0	0	11.500	5.9077	.00000
460	1	0	0	0	0	8.0000	5.4154	.00000	526	1	0	0	0	0	9.2500	3.4462	.00000	592	1	0	0	0	0	10.500	1.4769	.00000	658	1	0	0	0	0	11.500	6.4000	.00000
461	1	0	0	0	0	8.0000	5.9077	.00000	527	1	0	0	0	0	9.2500	3.9385	.00000	593	1	0	0	0	0	10.500	1.9692	.00000	659	1	0	0	0	0	11.750	.00000	.00000
462	1	0	0	0	0	8.0000	6.4000	.00000	528	1	0	0	0	0	9.2500	4.4308	.00000	594	1	0	0	0	0	10.500	2.4615	.00000	660	1	0	0	0	0	11.750	.49231	.00000
463	1	0	0	0	0	8.2500	.00000	.00000	529	1	0	0	0	0	9.2500	4.9231	.00000	595	1	0	0	0	0	10.500	2.9538	.00000	661	1	0	0	0	0	11.750	.98462	.00000
464	1	0	0	0	0	8.2500	.49231	.00000	530	1	0	0	0	0	9.2500	5.4154	.00000	596	1	0	0	0	0	10.500	3.4462	.00000	662	1	0	0	0	0	11.750	1.4769	.00000
465	1	0	0	0	0	8.2500	.98462	.00000	531	1	0	0	0	0	9.2500	5.9077	.00000	597	1	0	0	0	0	10.500	3.9385	.00000	663	1	0	0	0	0	11.750	1.9692	.00000
466	1	0	0	0	0	8.2500	1.4769	.00000	532	1	0	0	0	0	9.2500	6.4000	.00000	598	1	0	0	0	0	10.500	4.4308	.00000	664	1	0	0	0	0	11.750	2.4615	.00000
467	1	0	0	0	0	8.2500	1.9692	.00000	533	1	0	0	0	0	9.5000	.00000	.00000	599	1	0	0	0	0	10.500	4.9231	.00000	665	1	0	0	0	0	11.750	2.9538	.00000
468	1	0	0	0	0	8.2500	2.4615	.00000	534	1	0	0	0	0	9.5000	.49231	.00000	600	1	0	0	0	0	10.500	5.4154	.00000	666	1	0	0	0	0	11.750	3.4462	.00000
469	1	0	0	0	0	8.2500	2.9538	.00000	535	1	0	0	0	0	9.5000	.98462	.00000	601	1	0	0	0	0	10.500	5.9077	.00000	667	1	0	0	0	0	11.750	3.9385	.00000
470	1	0	0	0	0	8.2500	3.4462	.00000	536	1	0	0	0	0	9.5000	1.4769	.00000	602	1	0	0	0	0	10.500	6.4000	.00000	668	1	0	0	0	0	11.750	4.4308	.00000
471	1	0	0	0	0	8.2500	3.9385	.00000	537	1	0	0	0	0	9.5000	1.9692</																			

721	1	0	0	0	0	0	12.750	2.9538	.00000	787	1	0	0	0	0	0	14.000	.98462	.00000	853	0	0	0	0	0	0	.50000	6.4000	1.3816	919	0	0	0	0	0	0	1.2500	6.4000	5.5263
722	1	0	0	0	0	0	12.750	3.4462	.00000	788	1	0	0	0	0	0	14.000	1.4769	.00000	854	0	0	0	0	0	0	.50000	6.4000	1.8421	920	0	0	0	0	0	0	1.2500	6.4000	5.9868
723	1	0	0	0	0	0	12.750	3.9385	.00000	789	1	0	0	0	0	0	14.000	1.9692	.00000	855	0	0	0	0	0	0	.50000	6.4000	2.3026	921	0	0	0	0	0	0	1.2500	6.4000	6.4474
724	1	0	0	0	0	0	12.750	4.4308	.00000	790	1	0	0	0	0	0	14.000	2.4615	.00000	856	0	0	0	0	0	0	.50000	6.4000	2.7632	922	0	0	0	0	0	0	1.2500	6.4000	6.9079
725	1	0	0	0	0	0	12.750	4.9231	.00000	791	1	0	0	0	0	0	14.000	2.9538	.00000	857	0	0	0	0	0	0	.50000	6.4000	3.2237	923	0	0	0	0	0	0	1.2500	6.4000	7.3684
726	1	0	0	0	0	0	12.750	5.4154	.00000	792	1	0	0	0	0	0	14.000	3.4462	.00000	858	0	0	0	0	0	0	.50000	6.4000	3.6842	924	0	0	0	0	0	0	1.2500	6.4000	7.8289
727	1	0	0	0	0	0	12.750	5.9077	.00000	793	1	0	0	0	0	0	14.000	3.9385	.00000	859	0	0	0	0	0	0	.50000	6.4000	4.1447	925	0	0	0	0	0	0	1.2500	6.4000	8.2895
728	1	0	0	0	0	0	12.750	6.4000	.00000	794	1	0	0	0	0	0	14.000	4.4308	.00000	860	0	0	0	0	0	0	.50000	6.4000	4.6053	926	1	0	0	0	0	0	1.2500	6.4000	8.7500
729	1	0	0	0	0	0	13.000	.00000	.00000	795	1	0	0	0	0	0	14.000	4.9231	.00000	861	0	0	0	0	0	0	.50000	6.4000	5.0658	927	0	0	0	0	0	0	1.5000	6.4000	46053
730	1	0	0	0	0	0	13.000	.49231	.00000	796	1	0	0	0	0	0	14.000	5.4154	.00000	862	0	0	0	0	0	0	.50000	6.4000	5.5263	928	0	0	0	0	0	0	1.5000	6.4000	.92105
731	1	0	0	0	0	0	13.000	.98462	.00000	797	1	0	0	0	0	0	14.000	5.9077	.00000	863	0	0	0	0	0	0	.50000	6.4000	5.9868	929	0	0	0	0	0	0	1.5000	6.4000	1.3816
732	1	0	0	0	0	0	13.000	1.4769	.00000	798	1	0	0	0	0	0	14.000	6.4000	.00000	864	0	0	0	0	0	0	.50000	6.4000	6.4474	930	0	0	0	0	0	0	1.5000	6.4000	1.8421
733	1	0	0	0	0	0	13.000	1.9692	.00000	799	1	0	0	0	0	0	14.250	.00000	.00000	865	0	0	0	0	0	0	.50000	6.4000	6.9079	931	0	0	0	0	0	0	1.5000	6.4000	2.3026
734	1	0	0	0	0	0	13.000	2.4615	.00000	800	1	0	0	0	0	0	14.250	.49231	.00000	866	0	0	0	0	0	0	.50000	6.4000	7.3684	932	0	0	0	0	0	0	1.5000	6.4000	2.7632
735	1	0	0	0	0	0	13.000	2.9538	.00000	801	1	0	0	0	0	0	14.250	.98462	.00000	867	0	0	0	0	0	0	.50000	6.4000	7.8289	933	0	0	0	0	0	0	1.5000	6.4000	3.2237
736	1	0	0	0	0	0	13.000	3.4462	.00000	802	1	0	0	0	0	0	14.250	1.4769	.00000	868	0	0	0	0	0	0	.50000	6.4000	8.2895	934	0	0	0	0	0	0	1.5000	6.4000	3.6842
737	1	0	0	0	0	0	13.000	3.9385	.00000	803	1	0	0	0	0	0	14.250	1.9692	.00000	869	1	0	0	0	0	0	.50000	6.4000	8.7500	935	0	0	0	0	0	0	1.5000	6.4000	4.1447
738	1	0	0	0	0	0	13.000	4.4308	.00000	804	1	0	0	0	0	0	14.250	2.4615	.00000	870	0	0	0	0	0	0	.75000	6.4000	.46053	936	0	0	0	0	0	0	1.5000	6.4000	4.6053
739	1	0	0	0	0	0	13.000	4.9231	.00000	805	1	0	0	0	0	0	14.250	2.9538	.00000	871	0	0	0	0	0	0	.75000	6.4000	.92105	937	0	0	0	0	0	0	1.5000	6.4000	5.0658
740	1	0	0	0	0	0	13.000	5.4154	.00000	806	1	0	0	0	0	0	14.250	3.4462	.00000	872	0	0	0	0	0	0	.75000	6.4000	1.3816	938	0	0	0	0	0	0	1.5000	6.4000	5.5263
741	1	0	0	0	0	0	13.000	5.9077	.00000	807	1	0	0	0	0	0	14.250	3.9385	.00000	873	0	0	0	0	0	0	.75000	6.4000	1.8421	939	0	0	0	0	0	0	1.5000	6.4000	5.9868
742	1	0	0	0	0	0	13.000	6.4000	.00000	808	1	0	0	0	0	0	14.250	4.4308	.00000	874	0	0	0	0	0	0	.75000	6.4000	2.3026	940	0	0	0	0	0	0	1.5000	6.4000	6.4474
743	1	0	0	0	0	0	13.250	.00000	.00000	809	1	0	0	0	0	0	14.250	4.9231	.00000	875	0	0	0	0	0	0	.75000	6.4000	2.7632	941	0	0	0	0	0	0	1.5000	6.4000	6.9079
744	1	0	0	0	0	0	13.250	.49231	.00000	810	1	0	0	0	0	0	14.250	5.4154	.00000	876	0	0	0	0	0	0	.75000	6.4000	3.2237	942	0	0	0	0	0	0	1.5000	6.4000	7.3684
745	1	0	0	0	0	0	13.250	.98462	.00000	811	1	0	0	0	0	0	14.250	5.9077	.00000	877	0	0	0	0	0	0	.75000	6.4000	3.6842	943	0	0	0	0	0	0	1.5000	6.4000	7.8289
746	1	0	0	0	0	0	13.250	1.4769	.00000	812	1	0	0	0	0	0	14.250	6.4000	.00000	878	0	0	0	0	0	0	.75000	6.4000	4.1447	944	0	0	0	0	0	0	1.5000	6.4000	8.2895
747	1	0	0	0	0	0	13.250	1.9692	.00000	813	0	0	0	0	0	0	-20130E-07	6.4000	.46053	879	0	0	0	0	0	0	.75000	6.4000	4.6053	945	1	0	0	0	0	0	1.5000	6.4000	8.7500
748	1	0	0	0	0	0	13.250	2.4615	.00000	814	0	0	0	0	0	0	-40260E-07	6.4000	.92105	880	0	0	0	0	0	0	.75000	6.4000	5.0658	946	0	0	0	0	0	0	1.7500	6.4000	46053
749	1	0	0	0	0	0	13.250	2.9538	.00000	815	0	0	0	0	0	0	-60391E-07	6.4000	1.3816	881	0	0	0	0	0	0	.75000	6.4000	5.5263	947	0	0	0	0	0	0	1.7500	6.4000	.92105
750	1	0	0	0	0	0	13.250	3.4462	.00000	816	0	0	0	0	0	0	-80521E-07	6.4000	1.8421	882	0	0	0	0	0	0	.75000	6.4000	5.9868	948	0	0	0	0	0	0	1.7500	6.4000	1.3816
751	1	0	0	0	0	0	13.250	3.9385	.00000	817	0	0	0	0	0	0	-10065E-06	6.4000	2.3026	883	0	0	0	0	0	0	.75000	6.4000	6.4474	949	0	0	0	0	0	0	1.7500	6.4000	1.8421
752	1	0	0	0	0	0	13.250	4.4308	.00000	818	0	0	0	0	0	0	-12078E-06	6.4000	2.7632	884	0	0	0	0	0	0	.75000	6.4000	6.9079	950	0	0	0	0	0	0	1.7500	6.4000	2.3026
753	1	0	0	0	0	0	13.250	4.9231	.00000	819	0	0	0	0	0	0	-14091E-06	6.4000	3.2237	885	0	0	0	0	0	0	.75000	6.4000	7.3684	951	0	0	0	0	0	0	1.7500	6.4000	2.7632
754	1	0	0	0	0	0	13.250	5.4154	.00000	820	0	0	0	0	0	0	-16104E-06	6.4000	3.6842	886	0	0	0	0	0	0	.75000	6.4000	7.8289	952	0	0	0	0	0	0	1.7500	6.4000	3.2237
755	1	0	0	0	0	0	13.250	5.9077	.00000	821	0	0	0	0	0	0	-18117E-06	6.4000	4.1447	887	0	0	0	0	0	0	.75000	6.4000	8.2895	953	0	0	0	0	0	0	1.7500	6.4000	3.6842
756	1	0	0	0	0	0	13.250	6.4000	.00000	822	0	0	0	0	0	0	-20130E-06	6.4000	4.6053	888	1	0	0	0	0	0	.75000	6.4000	8.7500	954	0	0	0	0	0	0	1.7500	6.4000	4.1447
757	1	0	0	0	0	0	13.500	.00000	.00000	823	0	0	0	0	0	0	-22143E-06	6.4000	5.0658	889	0	0	0	0	0	0	1.0000	6.4000	.46053	955	0	0	0	0	0	0	1.7500	6.4000	4.6053
758	1	0	0	0	0	0	13.500	.49231	.00000	824	0	0	0	0	0	0	-24156E-06	6.4000	5.5263	890	0	0	0	0	0	0	1.0000	6.4000	.92105	956	0	0	0	0	0	0	1.7500	6.4000	5.0658
759	1	0	0	0	0	0	13.500	.98462	.00000	825	0	0	0	0	0	0	-26169E-06	6.4000	5.9868	891	0	0	0	0	0	0	1.0000	6.4000	1.3816	957	0	0	0	0	0	0	1.7500	6.4000	5.5263
760	1	0	0	0	0	0	13.500	1.4769	.00000	826	0	0	0	0	0	0	-28182E-06	6.4000	6.4474	892	0	0	0	0	0	0	1.0000	6.4000	1.8421										

985	0	0	0	0	0	2.2500	6.4000	.92105	1051	0	0	0	0	0	3.0000	6.4000	5.0658	1117	0	0	0	0	0	4.0000	6.4000	.46053	1183	0	0	0	0	0	4.7500	6.4000	4.6053
986	0	0	0	0	0	2.2500	6.4000	1.3816	1052	0	0	0	0	0	3.0000	6.4000	5.5263	1118	0	0	0	0	0	4.0000	6.4000	.92105	1184	0	0	0	0	0	4.7500	6.4000	5.0658
987	0	0	0	0	0	2.2500	6.4000	1.8421	1053	0	0	0	0	0	3.0000	6.4000	5.9868	1119	0	0	0	0	0	4.0000	6.4000	1.3816	1185	0	0	0	0	0	4.7500	6.4000	5.5263
988	0	0	0	0	0	2.2500	6.4000	2.3026	1054	0	0	0	0	0	3.0000	6.4000	6.4474	1120	0	0	0	0	0	4.0000	6.4000	1.8421	1186	0	0	0	0	0	4.7500	6.4000	5.9868
989	0	0	0	0	0	2.2500	6.4000	2.7632	1055	0	0	0	0	0	3.0000	6.4000	6.9079	1121	0	0	0	0	0	4.0000	6.4000	2.3026	1187	0	0	0	0	0	4.7500	6.4000	6.4474
990	0	0	0	0	0	2.2500	6.4000	3.2237	1056	0	0	0	0	0	3.0000	6.4000	7.3684	1122	0	0	0	0	0	4.0000	6.4000	2.7632	1188	0	0	0	0	0	4.7500	6.4000	6.9079
991	0	0	0	0	0	2.2500	6.4000	3.6842	1057	0	0	0	0	0	3.0000	6.4000	7.8289	1123	0	0	0	0	0	4.0000	6.4000	3.2237	1189	0	0	0	0	0	4.7500	6.4000	7.3684
992	0	0	0	0	0	2.2500	6.4000	4.1447	1058	0	0	0	0	0	3.0000	6.4000	8.2895	1124	0	0	0	0	0	4.0000	6.4000	3.6842	1190	0	0	0	0	0	4.7500	6.4000	7.8289
993	0	0	0	0	0	2.2500	6.4000	4.6053	1059	1	0	0	0	0	3.0000	6.4000	8.7500	1125	0	0	0	0	0	4.0000	6.4000	4.1447	1191	0	0	0	0	0	4.7500	6.4000	8.2895
994	0	0	0	0	0	2.2500	6.4000	5.0658	1060	0	0	0	0	0	3.2500	6.4000	.46053	1126	0	0	0	0	0	4.0000	6.4000	4.6053	1192	1	0	0	0	0	4.7500	6.4000	8.7500
995	0	0	0	0	0	2.2500	6.4000	5.5263	1061	0	0	0	0	0	3.2500	6.4000	.92105	1127	0	0	0	0	0	4.0000	6.4000	5.0658	1193	0	0	0	0	0	5.0000	6.4000	.46053
996	0	0	0	0	0	2.2500	6.4000	5.9868	1062	0	0	0	0	0	3.2500	6.4000	1.3816	1128	0	0	0	0	0	4.0000	6.4000	5.5263	1194	0	0	0	0	0	5.0000	6.4000	.92105
997	0	0	0	0	0	2.2500	6.4000	6.4474	1063	0	0	0	0	0	3.2500	6.4000	1.8421	1129	0	0	0	0	0	4.0000	6.4000	5.9868	1195	0	0	0	0	0	5.0000	6.4000	1.3816
998	0	0	0	0	0	2.2500	6.4000	6.9079	1064	0	0	0	0	0	3.2500	6.4000	2.3026	1130	0	0	0	0	0	4.0000	6.4000	6.4474	1196	0	0	0	0	0	5.0000	6.4000	1.8421
999	0	0	0	0	0	2.2500	6.4000	7.3684	1065	0	0	0	0	0	3.2500	6.4000	2.7632	1131	0	0	0	0	0	4.0000	6.4000	6.9079	1197	0	0	0	0	0	5.0000	6.4000	2.3026
1000	0	0	0	0	0	2.2500	6.4000	7.8289	1066	0	0	0	0	0	3.2500	6.4000	3.2237	1132	0	0	0	0	0	4.0000	6.4000	7.3684	1198	0	0	0	0	0	5.0000	6.4000	2.7632
1001	0	0	0	0	0	2.2500	6.4000	8.2895	1067	0	0	0	0	0	3.2500	6.4000	3.6842	1133	0	0	0	0	0	4.0000	6.4000	7.8289	1199	0	0	0	0	0	5.0000	6.4000	3.2237
1002	1	0	0	0	0	2.2500	6.4000	8.7500	1068	0	0	0	0	0	3.2500	6.4000	4.1447	1134	0	0	0	0	0	4.0000	6.4000	8.2895	1200	0	0	0	0	0	5.0000	6.4000	3.6842
1003	0	0	0	0	0	2.5000	6.4000	.46053	1069	0	0	0	0	0	3.2500	6.4000	4.6053	1135	1	0	0	0	0	4.0000	6.4000	8.7500	1201	0	0	0	0	0	5.0000	6.4000	4.1447
1004	0	0	0	0	0	2.5000	6.4000	.92105	1070	0	0	0	0	0	3.2500	6.4000	5.0658	1136	0	0	0	0	0	4.2500	6.4000	.46053	1202	0	0	0	0	0	5.0000	6.4000	4.6053
1005	0	0	0	0	0	2.5000	6.4000	1.3816	1071	0	0	0	0	0	3.2500	6.4000	5.5263	1137	0	0	0	0	0	4.2500	6.4000	.92105	1203	0	0	0	0	0	5.0000	6.4000	5.0658
1006	0	0	0	0	0	2.5000	6.4000	1.8421	1072	0	0	0	0	0	3.2500	6.4000	5.9868	1138	0	0	0	0	0	4.2500	6.4000	1.3816	1204	0	0	0	0	0	5.0000	6.4000	5.5263
1007	0	0	0	0	0	2.5000	6.4000	2.3026	1073	0	0	0	0	0	3.2500	6.4000	6.4474	1139	0	0	0	0	0	4.2500	6.4000	1.8421	1205	0	0	0	0	0	5.0000	6.4000	5.9868
1008	0	0	0	0	0	2.5000	6.4000	2.7632	1074	0	0	0	0	0	3.2500	6.4000	6.9079	1140	0	0	0	0	0	4.2500	6.4000	2.3026	1206	0	0	0	0	0	5.0000	6.4000	6.4474
1009	0	0	0	0	0	2.5000	6.4000	3.2237	1075	0	0	0	0	0	3.2500	6.4000	7.3684	1141	0	0	0	0	0	4.2500	6.4000	2.7632	1207	0	0	0	0	0	5.0000	6.4000	6.9079
1010	0	0	0	0	0	2.5000	6.4000	3.6842	1076	0	0	0	0	0	3.2500	6.4000	7.8289	1142	0	0	0	0	0	4.2500	6.4000	3.2237	1208	0	0	0	0	0	5.0000	6.4000	7.3684
1011	0	0	0	0	0	2.5000	6.4000	4.1447	1077	0	0	0	0	0	3.2500	6.4000	8.2895	1143	0	0	0	0	0	4.2500	6.4000	3.6842	1209	0	0	0	0	0	5.0000	6.4000	7.8289
1012	0	0	0	0	0	2.5000	6.4000	4.6053	1078	1	0	0	0	0	3.2500	6.4000	8.7500	1144	0	0	0	0	0	4.2500	6.4000	4.1447	1210	0	0	0	0	0	5.0000	6.4000	8.2895
1013	0	0	0	0	0	2.5000	6.4000	5.0658	1079	0	0	0	0	0	3.5000	6.4000	.46053	1145	0	0	0	0	0	4.2500	6.4000	4.6053	1211	1	0	0	0	0	5.0000	6.4000	8.7500
1014	0	0	0	0	0	2.5000	6.4000	5.5263	1080	0	0	0	0	0	3.5000	6.4000	.92105	1146	0	0	0	0	0	4.2500	6.4000	5.0658	1212	0	0	0	0	0	5.2500	6.4000	.46053
1015	0	0	0	0	0	2.5000	6.4000	5.9868	1081	0	0	0	0	0	3.5000	6.4000	1.3816	1147	0	0	0	0	0	4.2500	6.4000	5.5263	1213	0	0	0	0	0	5.2500	6.4000	.92105
1016	0	0	0	0	0	2.5000	6.4000	6.4474	1082	0	0	0	0	0	3.5000	6.4000	1.8421	1148	0	0	0	0	0	4.2500	6.4000	5.9868	1214	0	0	0	0	0	5.2500	6.4000	1.3816
1017	0	0	0	0	0	2.5000	6.4000	6.9079	1083	0	0	0	0	0	3.5000	6.4000	2.3026	1149	0	0	0	0	0	4.2500	6.4000	6.4474	1215	0	0	0	0	0	5.2500	6.4000	1.8421
1018	0	0	0	0	0	2.5000	6.4000	7.3684	1084	0	0	0	0	0	3.5000	6.4000	2.7632	1150	0	0	0	0	0	4.2500	6.4000	6.9079	1216	0	0	0	0	0	5.2500	6.4000	2.3026
1019	0	0	0	0	0	2.5000	6.4000	7.8289	1085	0	0	0	0	0	3.5000	6.4000	3.2237	1151	0	0	0	0	0	4.2500	6.4000	7.3684	1217	0	0	0	0	0	5.2500	6.4000	2.7632
1020	0	0	0	0	0	2.5000	6.4000	8.2895	1086	0	0	0	0	0	3.5000	6.4000	3.6842	1152	0	0	0	0	0	4.2500	6.4000	7.8289	1218	0	0	0	0	0	5.2500	6.4000	3.2237
1021	1	0	0	0	0	2.5000	6.4000	8.7500	1087	0	0	0	0	0	3.5000	6.4000	4.1447	1153	0	0	0	0	0	4.2500	6.4000	8.2895	1219	0	0	0	0	0	5.2500	6.4000	3.6842
1022	0	0	0	0	0	2.7500	6.4000	.46053	1088	0	0	0	0	0	3.5000	6.4000	4.6053	1154	1	0	0	0	0	4.2500	6.4000	8.7500	1220	0	0	0	0	0	5.2500	6.4000	4.1447
1023	0	0	0	0	0	2.7500	6.4000	.92105	1089	0	0	0	0	0	3.5000	6.4000	5.0658	1155	0	0	0	0	0	4.5000	6.4000	.46053	1221	0	0	0	0	0	5.2500	6.4000	4.6053
1024	0	0	0	0	0	2.7500	6.4000	1.3816	1090	0	0	0	0	0	3.5000	6.4000	5.5263	1156	0	0	0	0	0	4.5000	6.4000	.92105	1222	0	0	0	0	0	5.2500	6.4000	5.0658
1025	0	0	0	0	0	2.7500	6.4000	1.8421	1091	0	0	0	0	0	3.5000	6.4000	5.9868	1157	0	0	0	0	0	4.5000	6.4000	1.3816	1223	0	0	0	0	0	5.2500	6.4000	5.5263
1026	0	0	0	0	0	2.7500	6.4000	2.3026	1092	0	0	0	0	0	3.5000	6.4000	6.4474	1158	0	0	0	0	0	4.5000	6.4000	1.8421	1224	0	0	0	0	0	5.2500	6.4000	5.9868
1027	0	0	0	0	0	2.7500	6.4000	2.7632	1093																										

1249	1	0	0	0	0	5.5000	6.4000	8.7500	1315	0	0	0	0	0	6.5000	6.4000	4.1447	1381	0	0	0	0	0	7.2500	6.4000	8.2895	1447	0	0	0	0	0	8.2500	6.4000	3.6842
1250	0	0	0	0	0	5.7500	6.4000	.46053	1316	0	0	0	0	0	6.5000	6.4000	4.6053	1382	1	0	0	0	0	7.2500	6.4000	8.7500	1448	0	0	0	0	0	8.2500	6.4000	4.1447
1251	0	0	0	0	0	5.7500	6.4000	.92105	1317	0	0	0	0	0	6.5000	6.4000	5.0658	1383	0	0	0	0	0	7.5000	6.4000	.46053	1449	0	0	0	0	0	8.2500	6.4000	4.6053
1252	0	0	0	0	0	5.7500	6.4000	1.3816	1318	0	0	0	0	0	6.5000	6.4000	5.5263	1384	0	0	0	0	0	7.5000	6.4000	.92105	1450	0	0	0	0	0	8.2500	6.4000	5.0658
1253	0	0	0	0	0	5.7500	6.4000	1.8421	1319	0	0	0	0	0	6.5000	6.4000	5.9868	1385	0	0	0	0	0	7.5000	6.4000	1.3816	1451	0	0	0	0	0	8.2500	6.4000	5.5263
1254	0	0	0	0	0	5.7500	6.4000	2.3026	1320	0	0	0	0	0	6.5000	6.4000	6.4474	1386	0	0	0	0	0	7.5000	6.4000	1.8421	1452	0	0	0	0	0	8.2500	6.4000	5.9868
1255	0	0	0	0	0	5.7500	6.4000	2.7632	1321	0	0	0	0	0	6.5000	6.4000	6.9079	1387	0	0	0	0	0	7.5000	6.4000	2.3026	1453	0	0	0	0	0	8.2500	6.4000	6.4474
1256	0	0	0	0	0	5.7500	6.4000	3.2237	1322	0	0	0	0	0	6.5000	6.4000	7.3684	1388	0	0	0	0	0	7.5000	6.4000	2.7632	1454	0	0	0	0	0	8.2500	6.4000	6.9079
1257	0	0	0	0	0	5.7500	6.4000	3.6842	1323	0	0	0	0	0	6.5000	6.4000	7.8289	1389	0	0	0	0	0	7.5000	6.4000	3.2237	1455	0	0	0	0	0	8.2500	6.4000	7.3684
1258	0	0	0	0	0	5.7500	6.4000	4.1447	1324	0	0	0	0	0	6.5000	6.4000	8.2895	1390	0	0	0	0	0	7.5000	6.4000	3.6842	1456	0	0	0	0	0	8.2500	6.4000	7.8289
1259	0	0	0	0	0	5.7500	6.4000	4.6053	1325	1	0	0	0	0	6.5000	6.4000	8.7500	1391	0	0	0	0	0	7.5000	6.4000	4.1447	1457	0	0	0	0	0	8.2500	6.4000	8.2895
1260	0	0	0	0	0	5.7500	6.4000	5.0658	1326	0	0	0	0	0	6.7500	6.4000	.46053	1392	0	0	0	0	0	7.5000	6.4000	4.6053	1458	1	0	0	0	0	8.2500	6.4000	8.7500
1261	0	0	0	0	0	5.7500	6.4000	5.5263	1327	0	0	0	0	0	6.7500	6.4000	.92105	1393	0	0	0	0	0	7.5000	6.4000	5.0658	1459	0	0	0	0	0	8.5000	6.4000	.46053
1262	0	0	0	0	0	5.7500	6.4000	5.9868	1328	0	0	0	0	0	6.7500	6.4000	1.3816	1394	0	0	0	0	0	7.5000	6.4000	5.5263	1460	0	0	0	0	0	8.5000	6.4000	.92105
1263	0	0	0	0	0	5.7500	6.4000	6.4474	1329	0	0	0	0	0	6.7500	6.4000	1.8421	1395	0	0	0	0	0	7.5000	6.4000	5.9868	1461	0	0	0	0	0	8.5000	6.4000	1.3816
1264	0	0	0	0	0	5.7500	6.4000	6.9079	1330	0	0	0	0	0	6.7500	6.4000	2.3026	1396	0	0	0	0	0	7.5000	6.4000	6.4474	1462	0	0	0	0	0	8.5000	6.4000	1.8421
1265	0	0	0	0	0	5.7500	6.4000	7.3684	1331	0	0	0	0	0	6.7500	6.4000	2.7632	1397	0	0	0	0	0	7.5000	6.4000	6.9079	1463	0	0	0	0	0	8.5000	6.4000	2.3026
1266	0	0	0	0	0	5.7500	6.4000	7.8289	1332	0	0	0	0	0	6.7500	6.4000	3.2237	1398	0	0	0	0	0	7.5000	6.4000	7.3684	1464	0	0	0	0	0	8.5000	6.4000	2.7632
1267	0	0	0	0	0	5.7500	6.4000	8.2895	1333	0	0	0	0	0	6.7500	6.4000	3.6842	1399	0	0	0	0	0	7.5000	6.4000	7.8289	1465	0	0	0	0	0	8.5000	6.4000	3.2237
1268	1	0	0	0	0	5.7500	6.4000	8.7500	1334	0	0	0	0	0	6.7500	6.4000	4.1447	1400	0	0	0	0	0	7.5000	6.4000	8.2895	1466	0	0	0	0	0	8.5000	6.4000	3.6842
1269	0	0	0	0	0	6.0000	6.4000	.46053	1335	0	0	0	0	0	6.7500	6.4000	4.6053	1401	1	0	0	0	0	7.5000	6.4000	8.7500	1467	0	0	0	0	0	8.5000	6.4000	4.1447
1270	0	0	0	0	0	6.0000	6.4000	.92105	1336	0	0	0	0	0	6.7500	6.4000	5.0658	1402	0	0	0	0	0	7.7500	6.4000	.46053	1468	0	0	0	0	0	8.5000	6.4000	4.6053
1271	0	0	0	0	0	6.0000	6.4000	1.3816	1337	0	0	0	0	0	6.7500	6.4000	5.5263	1403	0	0	0	0	0	7.7500	6.4000	.92105	1469	0	0	0	0	0	8.5000	6.4000	5.0658
1272	0	0	0	0	0	6.0000	6.4000	1.8421	1338	0	0	0	0	0	6.7500	6.4000	5.9868	1404	0	0	0	0	0	7.7500	6.4000	1.3816	1470	0	0	0	0	0	8.5000	6.4000	5.5263
1273	0	0	0	0	0	6.0000	6.4000	2.3026	1339	0	0	0	0	0	6.7500	6.4000	6.4474	1405	0	0	0	0	0	7.7500	6.4000	1.8421	1471	0	0	0	0	0	8.5000	6.4000	5.9868
1274	0	0	0	0	0	6.0000	6.4000	2.7632	1340	0	0	0	0	0	6.7500	6.4000	6.9079	1406	0	0	0	0	0	7.7500	6.4000	2.3026	1472	0	0	0	0	0	8.5000	6.4000	6.4474
1275	0	0	0	0	0	6.0000	6.4000	3.2237	1341	0	0	0	0	0	6.7500	6.4000	7.3684	1407	0	0	0	0	0	7.7500	6.4000	2.7632	1473	0	0	0	0	0	8.5000	6.4000	6.9079
1276	0	0	0	0	0	6.0000	6.4000	3.6842	1342	0	0	0	0	0	6.7500	6.4000	7.8289	1408	0	0	0	0	0	7.7500	6.4000	3.2237	1474	0	0	0	0	0	8.5000	6.4000	7.3684
1277	0	0	0	0	0	6.0000	6.4000	4.1447	1343	0	0	0	0	0	6.7500	6.4000	8.2895	1409	0	0	0	0	0	7.7500	6.4000	3.6842	1475	0	0	0	0	0	8.5000	6.4000	7.8289
1278	0	0	0	0	0	6.0000	6.4000	4.6053	1344	1	0	0	0	0	6.7500	6.4000	8.7500	1410	0	0	0	0	0	7.7500	6.4000	4.1447	1476	0	0	0	0	0	8.5000	6.4000	8.2895
1279	0	0	0	0	0	6.0000	6.4000	5.0658	1345	0	0	0	0	0	7.0000	6.4000	.46053	1411	0	0	0	0	0	7.7500	6.4000	4.6053	1477	1	0	0	0	0	8.5000	6.4000	8.7500
1280	0	0	0	0	0	6.0000	6.4000	5.5263	1346	0	0	0	0	0	7.0000	6.4000	.92105	1412	0	0	0	0	0	7.7500	6.4000	5.0658	1478	0	0	0	0	0	8.7500	6.4000	.46053
1281	0	0	0	0	0	6.0000	6.4000	5.9868	1347	0	0	0	0	0	7.0000	6.4000	1.3816	1413	0	0	0	0	0	7.7500	6.4000	5.5263	1479	0	0	0	0	0	8.7500	6.4000	.92105
1282	0	0	0	0	0	6.0000	6.4000	6.4474	1348	0	0	0	0	0	7.0000	6.4000	1.8421	1414	0	0	0	0	0	7.7500	6.4000	5.9868	1480	0	0	0	0	0	8.7500	6.4000	1.3816
1283	0	0	0	0	0	6.0000	6.4000	6.9079	1349	0	0	0	0	0	7.0000	6.4000	2.3026	1415	0	0	0	0	0	7.7500	6.4000	6.4474	1481	0	0	0	0	0	8.7500	6.4000	1.8421
1284	0	0	0	0	0	6.0000	6.4000	7.3684	1350	0	0	0	0	0	7.0000	6.4000	2.7632	1416	0	0	0	0	0	7.7500	6.4000	6.9079	1482	0	0	0	0	0	8.7500	6.4000	2.3026
1285	0	0	0	0	0	6.0000	6.4000	7.8289	1351	0	0	0	0	0	7.0000	6.4000	3.2237	1417	0	0	0	0	0	7.7500	6.4000	7.3684	1483	0	0	0	0	0	8.7500	6.4000	2.7632
1286	0	0	0	0	0	6.0000	6.4000	8.2895	1352	0	0	0	0	0	7.0000	6.4000	3.6842	1418	0	0	0	0	0	7.7500	6.4000	7.8289	1484	0	0	0	0	0	8.7500	6.4000	3.2237
1287	1	0	0	0	0	6.0000	6.4000	8.7500	1353	0	0	0	0	0	7.0000	6.4000	4.1447	1419	0	0	0	0	0	7.7500	6.4000	8.2895	1485	0	0	0	0	0	8.7500	6.4000	3.6842
1288	0	0	0	0	0	6.2500	6.4000	.46053	1354	0	0	0	0	0	7.0000	6.4000	4.6053	1420	1	0	0	0	0	7.7500	6.4000	8.7500	1486	0	0	0	0	0	8.7500	6.4000	4.1447
1289	0	0	0	0	0	6.2500	6.4000	.92105	1355	0	0	0	0	0	7.0000	6.4000	5.0658	1421	0	0	0	0	0	8.0000	6.4000	.46053	1487	0	0	0	0	0	8.7500	6.4000	4.6053
1290	0	0	0	0	0	6.2500	6.4000	1.3816	1356	0	0	0	0	0	7.0000	6.4000	5.5263	1422	0	0	0	0	0	8.0000	6.4000	.92105	1488	0	0	0	0	0	8.7500	6.4000	5.0658
1291	0	0	0	0	0	6.2500	6.4000	1.8421	1357	0	0	0	0	0	7.0000	6.4000	5																		

1513	0	0	0	0	0	0	9.0000	6.4000	7.8289	1579	0	0	0	0	0	10.000	6.4000	3.2237	1645	0	0	0	0	0	0	10.750	6.4000	7.3684	1711	0	0	0	0	0	11.750	6.4000	2.7632
1514	0	0	0	0	0	0	9.0000	6.4000	8.2895	1580	0	0	0	0	0	10.000	6.4000	3.6842	1646	0	0	0	0	0	0	10.750	6.4000	7.8289	1712	0	0	0	0	0	11.750	6.4000	3.2237
1515	1	0	0	0	0	0	9.0000	6.4000	8.7500	1581	0	0	0	0	0	10.000	6.4000	4.1447	1647	0	0	0	0	0	0	10.750	6.4000	8.2895	1713	0	0	0	0	0	11.750	6.4000	3.6842
1516	0	0	0	0	0	0	9.2500	6.4000	4.6053	1582	0	0	0	0	0	10.000	6.4000	4.6053	1648	1	0	0	0	0	0	10.750	6.4000	8.7500	1714	0	0	0	0	0	11.750	6.4000	4.1447
1517	0	0	0	0	0	0	9.2500	6.4000	9.2105	1583	0	0	0	0	0	10.000	6.4000	5.0658	1649	0	0	0	0	0	0	11.000	6.4000	4.6053	1715	0	0	0	0	0	11.750	6.4000	4.6053
1518	0	0	0	0	0	0	9.2500	6.4000	1.3816	1584	0	0	0	0	0	10.000	6.4000	5.5263	1650	0	0	0	0	0	0	11.000	6.4000	9.2105	1716	0	0	0	0	0	11.750	6.4000	5.0658
1519	0	0	0	0	0	0	9.2500	6.4000	1.8421	1585	0	0	0	0	0	10.000	6.4000	5.9868	1651	0	0	0	0	0	0	11.000	6.4000	1.3816	1717	0	0	0	0	0	11.750	6.4000	5.5263
1520	0	0	0	0	0	0	9.2500	6.4000	2.3026	1586	0	0	0	0	0	10.000	6.4000	6.4474	1652	0	0	0	0	0	0	11.000	6.4000	1.8421	1718	0	0	0	0	0	11.750	6.4000	5.9868
1521	0	0	0	0	0	0	9.2500	6.4000	2.7632	1587	0	0	0	0	0	10.000	6.4000	6.9079	1653	0	0	0	0	0	0	11.000	6.4000	2.3026	1719	0	0	0	0	0	11.750	6.4000	6.4474
1522	0	0	0	0	0	0	9.2500	6.4000	3.2237	1588	0	0	0	0	0	10.000	6.4000	7.3684	1654	0	0	0	0	0	0	11.000	6.4000	2.7632	1720	0	0	0	0	0	11.750	6.4000	6.9079
1523	0	0	0	0	0	0	9.2500	6.4000	3.6842	1589	0	0	0	0	0	10.000	6.4000	7.8289	1655	0	0	0	0	0	0	11.000	6.4000	3.2237	1721	0	0	0	0	0	11.750	6.4000	7.3684
1524	0	0	0	0	0	0	9.2500	6.4000	4.1447	1590	0	0	0	0	0	10.000	6.4000	8.2895	1656	0	0	0	0	0	0	11.000	6.4000	3.6842	1722	0	0	0	0	0	11.750	6.4000	7.8289
1525	0	0	0	0	0	0	9.2500	6.4000	4.6053	1591	1	0	0	0	0	10.000	6.4000	8.7500	1657	0	0	0	0	0	0	11.000	6.4000	4.1447	1723	0	0	0	0	0	11.750	6.4000	8.2895
1526	0	0	0	0	0	0	9.2500	6.4000	5.0658	1592	0	0	0	0	0	10.250	6.4000	4.6053	1658	0	0	0	0	0	0	11.000	6.4000	4.6053	1724	1	0	0	0	0	11.750	6.4000	8.7500
1527	0	0	0	0	0	0	9.2500	6.4000	5.5263	1593	0	0	0	0	0	10.250	6.4000	9.2105	1659	0	0	0	0	0	0	11.000	6.4000	5.0658	1725	0	0	0	0	0	12.000	6.4000	4.6053
1528	0	0	0	0	0	0	9.2500	6.4000	5.9868	1594	0	0	0	0	0	10.250	6.4000	1.3816	1660	0	0	0	0	0	0	11.000	6.4000	5.5263	1726	0	0	0	0	0	12.000	6.4000	9.2105
1529	0	0	0	0	0	0	9.2500	6.4000	6.4474	1595	0	0	0	0	0	10.250	6.4000	1.8421	1661	0	0	0	0	0	0	11.000	6.4000	5.9868	1727	0	0	0	0	0	12.000	6.4000	1.3816
1530	0	0	0	0	0	0	9.2500	6.4000	6.9079	1596	0	0	0	0	0	10.250	6.4000	2.3026	1662	0	0	0	0	0	0	11.000	6.4000	6.4474	1728	0	0	0	0	0	12.000	6.4000	1.8421
1531	0	0	0	0	0	0	9.2500	6.4000	7.3684	1597	0	0	0	0	0	10.250	6.4000	2.7632	1663	0	0	0	0	0	0	11.000	6.4000	6.9079	1729	0	0	0	0	0	12.000	6.4000	2.3026
1532	0	0	0	0	0	0	9.2500	6.4000	7.8289	1598	0	0	0	0	0	10.250	6.4000	3.2237	1664	0	0	0	0	0	0	11.000	6.4000	7.3684	1730	0	0	0	0	0	12.000	6.4000	2.7632
1533	0	0	0	0	0	0	9.2500	6.4000	8.2895	1599	0	0	0	0	0	10.250	6.4000	3.6842	1665	0	0	0	0	0	0	11.000	6.4000	7.8289	1731	0	0	0	0	0	12.000	6.4000	3.2237
1534	1	0	0	0	0	0	9.2500	6.4000	8.7500	1600	0	0	0	0	0	10.250	6.4000	4.1447	1666	0	0	0	0	0	0	11.000	6.4000	8.2895	1732	0	0	0	0	0	12.000	6.4000	3.6842
1535	0	0	0	0	0	0	9.5000	6.4000	4.6053	1601	0	0	0	0	0	10.250	6.4000	4.6053	1667	1	0	0	0	0	0	11.000	6.4000	8.7500	1733	0	0	0	0	0	12.000	6.4000	4.1447
1536	0	0	0	0	0	0	9.5000	6.4000	9.2105	1602	0	0	0	0	0	10.250	6.4000	5.0658	1668	0	0	0	0	0	0	11.250	6.4000	4.6053	1734	0	0	0	0	0	12.000	6.4000	4.6053
1537	0	0	0	0	0	0	9.5000	6.4000	1.3816	1603	0	0	0	0	0	10.250	6.4000	5.5263	1669	0	0	0	0	0	0	11.250	6.4000	9.2105	1735	0	0	0	0	0	12.000	6.4000	5.0658
1538	0	0	0	0	0	0	9.5000	6.4000	1.8421	1604	0	0	0	0	0	10.250	6.4000	5.9868	1670	0	0	0	0	0	0	11.250	6.4000	1.3816	1736	0	0	0	0	0	12.000	6.4000	5.5263
1539	0	0	0	0	0	0	9.5000	6.4000	2.3026	1605	0	0	0	0	0	10.250	6.4000	6.4474	1671	0	0	0	0	0	0	11.250	6.4000	1.8421	1737	0	0	0	0	0	12.000	6.4000	5.9868
1540	0	0	0	0	0	0	9.5000	6.4000	2.7632	1606	0	0	0	0	0	10.250	6.4000	6.9079	1672	0	0	0	0	0	0	11.250	6.4000	2.3026	1738	0	0	0	0	0	12.000	6.4000	6.4474
1541	0	0	0	0	0	0	9.5000	6.4000	3.2237	1607	0	0	0	0	0	10.250	6.4000	7.3684	1673	0	0	0	0	0	0	11.250	6.4000	2.7632	1739	0	0	0	0	0	12.000	6.4000	6.9079
1542	0	0	0	0	0	0	9.5000	6.4000	3.6842	1608	0	0	0	0	0	10.250	6.4000	7.8289	1674	0	0	0	0	0	0	11.250	6.4000	3.2237	1740	0	0	0	0	0	12.000	6.4000	7.3684
1543	0	0	0	0	0	0	9.5000	6.4000	4.1447	1609	0	0	0	0	0	10.250	6.4000	8.2895	1675	0	0	0	0	0	0	11.250	6.4000	3.6842	1741	0	0	0	0	0	12.000	6.4000	7.8289
1544	0	0	0	0	0	0	9.5000	6.4000	4.6053	1610	1	0	0	0	0	10.250	6.4000	8.7500	1676	0	0	0	0	0	0	11.250	6.4000	4.1447	1742	0	0	0	0	0	12.000	6.4000	8.2895
1545	0	0	0	0	0	0	9.5000	6.4000	5.0658	1611	0	0	0	0	0	10.500	6.4000	4.6053	1677	0	0	0	0	0	0	11.250	6.4000	4.6053	1743	1	0	0	0	0	12.000	6.4000	8.7500
1546	0	0	0	0	0	0	9.5000	6.4000	5.5263	1612	0	0	0	0	0	10.500	6.4000	9.2105	1678	0	0	0	0	0	0	11.250	6.4000	5.0658	1744	0	0	0	0	0	12.250	6.4000	4.6053
1547	0	0	0	0	0	0	9.5000	6.4000	5.9868	1613	0	0	0	0	0	10.500	6.4000	1.3816	1679	0	0	0	0	0	0	11.250	6.4000	5.5263	1745	0	0	0	0	0	12.250	6.4000	9.2105
1548	0	0	0	0	0	0	9.5000	6.4000	6.4474	1614	0	0	0	0	0	10.500	6.4000	1.8421	1680	0	0	0	0	0	0	11.250	6.4000	5.9868	1746	0	0	0	0	0	12.250	6.4000	1.3816
1549	0	0	0	0	0	0	9.5000	6.4000	6.9079	1615	0	0	0	0	0	10.500	6.4000	2.3026	1681	0	0	0	0	0	0	11.250	6.4000	6.4474	1747	0	0	0	0	0	12.250	6.4000	1.8421
1550	0	0	0	0	0	0	9.5000	6.4000	7.3684	1616	0	0	0	0	0	10.500	6.4000	2.7632	1682	0	0	0	0	0	0	11.250	6.4000	6.9079	1748	0	0	0	0	0	12.250	6.4000	2.3026
1551	0	0	0	0	0	0	9.5000	6.4000	7.8289	1617	0	0	0	0	0	10.500	6.4000	3.2237	1683	0	0	0	0	0	0	11.250	6.4000	7.3684	1749	0	0	0	0	0	12.250	6.4000	2.7632
1552	0	0	0	0	0	0	9.5000	6.4000	8.2895	1618	0	0	0	0	0	10.500	6.4000	3.6842	1684	0	0	0	0	0	0	11.250	6.4000	7.8289	1750	0	0	0	0	0	12.250	6.4000	3.2237
1553	1	0	0	0	0	0	9.5000	6.4000	8.7500	1619	0	0	0	0	0	10.500	6.4000	4.1447	16																		

1777	0	0	0	0	0	0	12.500	6.4000	6.9079	1843	0	0	0	0	0	13.500	6.4000	2.3026	1909	0	0	0	0	0	14.250	6.4000	6.4474	1975	1	0	0	0	0	1.0000	1.9692	8.7500
1778	0	0	0	0	0	0	12.500	6.4000	7.3684	1844	0	0	0	0	0	13.500	6.4000	2.7632	1910	0	0	0	0	0	14.250	6.4000	6.9079	1976	1	0	0	0	0	1.0000	1.4769	8.7500
1779	0	0	0	0	0	0	12.500	6.4000	7.8289	1845	0	0	0	0	0	13.500	6.4000	3.2237	1911	0	0	0	0	0	14.250	6.4000	7.3684	1977	1	0	0	0	0	1.0000	.98462	8.7500
1780	0	0	0	0	0	0	12.500	6.4000	8.2895	1846	0	0	0	0	0	13.500	6.4000	3.6842	1912	0	0	0	0	0	14.250	6.4000	7.8289	1978	1	0	0	0	0	1.0000	.49231	8.7500
1781	1	0	0	0	0	0	12.500	6.4000	8.7500	1847	0	0	0	0	0	13.500	6.4000	4.1447	1913	0	0	0	0	0	14.250	6.4000	8.2895	1979	1	0	0	0	0	1.0000	.00000	8.7500
1782	0	0	0	0	0	0	12.750	6.4000	.46053	1848	0	0	0	0	0	13.500	6.4000	4.6053	1914	1	0	0	0	0	14.250	6.4000	8.7500	1980	1	0	0	0	0	1.2500	5.9077	8.7500
1783	0	0	0	0	0	0	12.750	6.4000	.92105	1849	0	0	0	0	0	13.500	6.4000	5.0658	1915	1	0	0	0	0	-.38247E-06	5.9077	8.7500	1981	1	0	0	0	0	1.2500	5.4154	8.7500
1784	0	0	0	0	0	0	12.750	6.4000	1.3816	1850	0	0	0	0	0	13.500	6.4000	5.5263	1916	1	0	0	0	0	-.38247E-06	5.4154	8.7500	1982	1	0	0	0	0	1.2500	4.9231	8.7500
1785	0	0	0	0	0	0	12.750	6.4000	1.8421	1851	0	0	0	0	0	13.500	6.4000	5.9868	1917	1	0	0	0	0	-.38247E-06	4.9231	8.7500	1983	1	0	0	0	0	1.2500	4.4308	8.7500
1786	0	0	0	0	0	0	12.750	6.4000	2.3026	1852	0	0	0	0	0	13.500	6.4000	6.4474	1918	1	0	0	0	0	-.38247E-06	4.4308	8.7500	1984	1	0	0	0	0	1.2500	3.9385	8.7500
1787	0	0	0	0	0	0	12.750	6.4000	2.7632	1853	0	0	0	0	0	13.500	6.4000	6.9079	1919	1	0	0	0	0	-.38247E-06	3.9385	8.7500	1985	1	0	0	0	0	1.2500	3.4462	8.7500
1788	0	0	0	0	0	0	12.750	6.4000	3.2237	1854	0	0	0	0	0	13.500	6.4000	7.3684	1920	1	0	0	0	0	-.38247E-06	3.4462	8.7500	1986	1	0	0	0	0	1.2500	2.9538	8.7500
1789	0	0	0	0	0	0	12.750	6.4000	3.6842	1855	0	0	0	0	0	13.500	6.4000	7.8289	1921	1	0	0	0	0	-.38247E-06	2.9538	8.7500	1987	1	0	0	0	0	1.2500	2.4615	8.7500
1790	0	0	0	0	0	0	12.750	6.4000	4.1447	1856	0	0	0	0	0	13.500	6.4000	8.2895	1922	1	0	0	0	0	-.38247E-06	2.4615	8.7500	1988	1	0	0	0	0	1.2500	1.9692	8.7500
1791	0	0	0	0	0	0	12.750	6.4000	4.6053	1857	1	0	0	0	0	13.500	6.4000	8.7500	1923	1	0	0	0	0	-.38247E-06	1.9692	8.7500	1989	1	0	0	0	0	1.2500	1.4769	8.7500
1792	0	0	0	0	0	0	12.750	6.4000	5.0658	1858	0	0	0	0	0	13.750	6.4000	.46053	1924	1	0	0	0	0	-.38247E-06	1.4769	8.7500	1990	1	0	0	0	0	1.2500	.98462	8.7500
1793	0	0	0	0	0	0	12.750	6.4000	5.5263	1859	0	0	0	0	0	13.750	6.4000	.92105	1925	1	0	0	0	0	-.38247E-06	.98462	8.7500	1991	1	0	0	0	0	1.2500	.49231	8.7500
1794	0	0	0	0	0	0	12.750	6.4000	5.9868	1860	0	0	0	0	0	13.750	6.4000	1.3816	1926	1	0	0	0	0	-.38247E-06	.49231	8.7500	1992	1	0	0	0	0	1.2500	.00000	8.7500
1795	0	0	0	0	0	0	12.750	6.4000	6.4474	1861	0	0	0	0	0	13.750	6.4000	1.8421	1927	1	0	0	0	0	-.38247E-06	.00000	8.7500	1993	1	0	0	0	0	1.5000	5.9077	8.7500
1796	0	0	0	0	0	0	12.750	6.4000	6.9079	1862	0	0	0	0	0	13.750	6.4000	2.3026	1928	1	0	0	0	0	.25000	5.9077	8.7500	1994	1	0	0	0	0	1.5000	5.4154	8.7500
1797	0	0	0	0	0	0	12.750	6.4000	7.3684	1863	0	0	0	0	0	13.750	6.4000	2.7632	1929	1	0	0	0	0	.25000	5.4154	8.7500	1995	1	0	0	0	0	1.5000	4.9231	8.7500
1798	0	0	0	0	0	0	12.750	6.4000	7.8289	1864	0	0	0	0	0	13.750	6.4000	3.2237	1930	1	0	0	0	0	.25000	4.9231	8.7500	1996	1	0	0	0	0	1.5000	4.4308	8.7500
1799	0	0	0	0	0	0	12.750	6.4000	8.2895	1865	0	0	0	0	0	13.750	6.4000	3.6842	1931	1	0	0	0	0	.25000	4.4308	8.7500	1997	1	0	0	0	0	1.5000	3.9385	8.7500
1800	1	0	0	0	0	0	12.750	6.4000	8.7500	1866	0	0	0	0	0	13.750	6.4000	4.1447	1932	1	0	0	0	0	.25000	3.9385	8.7500	1998	1	0	0	0	0	1.5000	3.4462	8.7500
1801	0	0	0	0	0	0	13.000	6.4000	.46053	1867	0	0	0	0	0	13.750	6.4000	4.6053	1933	1	0	0	0	0	.25000	3.4462	8.7500	1999	1	0	0	0	0	1.5000	2.9538	8.7500
1802	0	0	0	0	0	0	13.000	6.4000	.92105	1868	0	0	0	0	0	13.750	6.4000	5.0658	1934	1	0	0	0	0	.25000	2.9538	8.7500	2000	1	0	0	0	0	1.5000	2.4615	8.7500
1803	0	0	0	0	0	0	13.000	6.4000	1.3816	1869	0	0	0	0	0	13.750	6.4000	5.5263	1935	1	0	0	0	0	.25000	2.4615	8.7500	2001	1	0	0	0	0	1.5000	1.9692	8.7500
1804	0	0	0	0	0	0	13.000	6.4000	1.8421	1870	0	0	0	0	0	13.750	6.4000	5.9868	1936	1	0	0	0	0	.25000	1.9692	8.7500	2002	1	0	0	0	0	1.5000	1.4769	8.7500
1805	0	0	0	0	0	0	13.000	6.4000	2.3026	1871	0	0	0	0	0	13.750	6.4000	6.4474	1937	1	0	0	0	0	.25000	1.4769	8.7500	2003	1	0	0	0	0	1.5000	.98462	8.7500
1806	0	0	0	0	0	0	13.000	6.4000	2.7632	1872	0	0	0	0	0	13.750	6.4000	6.9079	1938	1	0	0	0	0	.25000	.98462	8.7500	2004	1	0	0	0	0	1.5000	.49231	8.7500
1807	0	0	0	0	0	0	13.000	6.4000	3.2237	1873	0	0	0	0	0	13.750	6.4000	7.3684	1939	1	0	0	0	0	.25000	.49231	8.7500	2005	1	0	0	0	0	1.5000	.00000	8.7500
1808	0	0	0	0	0	0	13.000	6.4000	3.6842	1874	0	0	0	0	0	13.750	6.4000	7.8289	1940	1	0	0	0	0	.25000	.00000	8.7500	2006	1	0	0	0	0	1.7500	5.9077	8.7500
1809	0	0	0	0	0	0	13.000	6.4000	4.1447	1875	0	0	0	0	0	13.750	6.4000	8.2895	1941	1	0	0	0	0	.50000	5.9077	8.7500	2007	1	0	0	0	0	1.7500	5.4154	8.7500
1810	0	0	0	0	0	0	13.000	6.4000	4.6053	1876	1	0	0	0	0	13.750	6.4000	8.7500	1942	1	0	0	0	0	.50000	5.4154	8.7500	2008	1	0	0	0	0	1.7500	4.9231	8.7500
1811	0	0	0	0	0	0	13.000	6.4000	5.0658	1877	0	0	0	0	0	14.000	6.4000	.46053	1943	1	0	0	0	0	.50000	4.9231	8.7500	2009	1	0	0	0	0	1.7500	4.4308	8.7500
1812	0	0	0	0	0	0	13.000	6.4000	5.5263	1878	0	0	0	0	0	14.000	6.4000	.92105	1944	1	0	0	0	0	.50000	4.4308	8.7500	2010	1	0	0	0	0	1.7500	3.9385	8.7500
1813	0	0	0	0	0	0	13.000	6.4000	5.9868	1879	0	0	0	0	0	14.000	6.4000	1.3816	1945	1	0	0	0	0	.50000	3.9385	8.7500	2011	1	0	0	0	0	1.7500	3.4462	8.7500
1814	0	0	0	0	0	0	13.000	6.4000	6.4474	1880	0	0	0	0	0	14.000	6.4000	1.8421	1946	1	0	0	0	0	.50000	3.4462	8.7500	2012	1	0	0	0	0	1.7500	2.9538	8.7500
1815	0	0	0	0	0	0	13.000	6.4000	6.9079	1881	0	0	0	0	0	14.000	6.4000	2.3026	1947	1	0	0	0	0	.50000	2.9538	8.7500	2013	1	0	0	0	0	1.7500	2.4615	8.7500
1816	0	0	0	0	0	0	13.000	6.4000	7.3684	1882	0	0	0	0	0	14.000	6.4000	2.7632	1948	1	0	0	0	0	.50000	2.4615	8.7500	2014	1	0	0	0	0	1.7500	1.9692	8.7500
1817	0	0	0	0	0	0	13.000	6.4000	7.8289	1883	0	0	0	0	0	14.000	6.4000	3.2237	1949	1	0	0	0	0	.50000	1.9692	8.7500	2015	1	0	0	0	0	1.7500	1.4769	8.7500
1818	0	0	0	0	0	0	13.000	6.4000	8.2895	1884																										

2041	1	0	0	0	0	2.2500	1.4769	8.7500	2107	1	0	0	0	0	3.5000	.98462	8.7500	2173	1	0	0	0	0	4.7500	.49231	8.7500	2239	1	0	0	0	0	6.0000	.00000	8.7500
2042	1	0	0	0	0	2.2500	.98462	8.7500	2108	1	0	0	0	0	3.5000	.49231	8.7500	2174	1	0	0	0	0	4.7500	.00000	8.7500	2240	1	0	0	0	0	6.2500	5.9077	8.7500
2043	1	0	0	0	0	2.2500	.49231	8.7500	2109	1	0	0	0	0	3.5000	.00000	8.7500	2175	1	0	0	0	0	5.0000	5.9077	8.7500	2241	1	0	0	0	0	6.2500	5.4154	8.7500
2044	1	0	0	0	0	2.2500	.00000	8.7500	2110	1	0	0	0	0	3.7500	5.9077	8.7500	2176	1	0	0	0	0	5.0000	5.4154	8.7500	2242	1	0	0	0	0	6.2500	4.9231	8.7500
2045	1	0	0	0	0	2.5000	5.9077	8.7500	2111	1	0	0	0	0	3.7500	5.4154	8.7500	2177	1	0	0	0	0	5.0000	4.9231	8.7500	2243	1	0	0	0	0	6.2500	4.4308	8.7500
2046	1	0	0	0	0	2.5000	5.4154	8.7500	2112	1	0	0	0	0	3.7500	4.9231	8.7500	2178	1	0	0	0	0	5.0000	4.4308	8.7500	2244	1	0	0	0	0	6.2500	3.9385	8.7500
2047	1	0	0	0	0	2.5000	4.9231	8.7500	2113	1	0	0	0	0	3.7500	4.4308	8.7500	2179	1	0	0	0	0	5.0000	3.9385	8.7500	2245	1	0	0	0	0	6.2500	3.4462	8.7500
2048	1	0	0	0	0	2.5000	4.4308	8.7500	2114	1	0	0	0	0	3.7500	3.9385	8.7500	2180	1	0	0	0	0	5.0000	3.4462	8.7500	2246	1	0	0	0	0	6.2500	2.9538	8.7500
2049	1	0	0	0	0	2.5000	3.9385	8.7500	2115	1	0	0	0	0	3.7500	3.4462	8.7500	2181	1	0	0	0	0	5.0000	2.9538	8.7500	2247	1	0	0	0	0	6.2500	2.4615	8.7500
2050	1	0	0	0	0	2.5000	3.4462	8.7500	2116	1	0	0	0	0	3.7500	2.9538	8.7500	2182	1	0	0	0	0	5.0000	2.4615	8.7500	2248	1	0	0	0	0	6.2500	1.9692	8.7500
2051	1	0	0	0	0	2.5000	2.9538	8.7500	2117	1	0	0	0	0	3.7500	2.4615	8.7500	2183	1	0	0	0	0	5.0000	1.9692	8.7500	2249	1	0	0	0	0	6.2500	1.4769	8.7500
2052	1	0	0	0	0	2.5000	2.4615	8.7500	2118	1	0	0	0	0	3.7500	1.9692	8.7500	2184	1	0	0	0	0	5.0000	1.4769	8.7500	2250	1	0	0	0	0	6.2500	.98462	8.7500
2053	1	0	0	0	0	2.5000	1.9692	8.7500	2119	1	0	0	0	0	3.7500	1.4769	8.7500	2185	1	0	0	0	0	5.0000	.98462	8.7500	2251	1	0	0	0	0	6.2500	.49231	8.7500
2054	1	0	0	0	0	2.5000	1.4769	8.7500	2120	1	0	0	0	0	3.7500	.98462	8.7500	2186	1	0	0	0	0	5.0000	.49231	8.7500	2252	1	0	0	0	0	6.2500	.00000	8.7500
2055	1	0	0	0	0	2.5000	.98462	8.7500	2121	1	0	0	0	0	3.7500	.49231	8.7500	2187	1	0	0	0	0	5.0000	.00000	8.7500	2253	1	0	0	0	0	6.5000	5.9077	8.7500
2056	1	0	0	0	0	2.5000	.49231	8.7500	2122	1	0	0	0	0	3.7500	.00000	8.7500	2188	1	0	0	0	0	5.2500	5.9077	8.7500	2254	1	0	0	0	0	6.5000	5.4154	8.7500
2057	1	0	0	0	0	2.5000	.00000	8.7500	2123	1	0	0	0	0	4.0000	5.9077	8.7500	2189	1	0	0	0	0	5.2500	5.4154	8.7500	2255	1	0	0	0	0	6.5000	4.9231	8.7500
2058	1	0	0	0	0	2.7500	5.9077	8.7500	2124	1	0	0	0	0	4.0000	5.4154	8.7500	2190	1	0	0	0	0	5.2500	4.9231	8.7500	2256	1	0	0	0	0	6.5000	4.4308	8.7500
2059	1	0	0	0	0	2.7500	5.4154	8.7500	2125	1	0	0	0	0	4.0000	4.9231	8.7500	2191	1	0	0	0	0	5.2500	4.4308	8.7500	2257	1	0	0	0	0	6.5000	3.9385	8.7500
2060	1	0	0	0	0	2.7500	4.9231	8.7500	2126	1	0	0	0	0	4.0000	4.4308	8.7500	2192	1	0	0	0	0	5.2500	3.9385	8.7500	2258	1	0	0	0	0	6.5000	3.4462	8.7500
2061	1	0	0	0	0	2.7500	4.4308	8.7500	2127	1	0	0	0	0	4.0000	3.9385	8.7500	2193	1	0	0	0	0	5.2500	3.4462	8.7500	2259	1	0	0	0	0	6.5000	2.9538	8.7500
2062	1	0	0	0	0	2.7500	3.9385	8.7500	2128	1	0	0	0	0	4.0000	3.4462	8.7500	2194	1	0	0	0	0	5.2500	2.9538	8.7500	2260	1	0	0	0	0	6.5000	2.4615	8.7500
2063	1	0	0	0	0	2.7500	3.4462	8.7500	2129	1	0	0	0	0	4.0000	2.9538	8.7500	2195	1	0	0	0	0	5.2500	2.4615	8.7500	2261	1	0	0	0	0	6.5000	1.9692	8.7500
2064	1	0	0	0	0	2.7500	2.9538	8.7500	2130	1	0	0	0	0	4.0000	2.4615	8.7500	2196	1	0	0	0	0	5.2500	1.9692	8.7500	2262	1	0	0	0	0	6.5000	1.4769	8.7500
2065	1	0	0	0	0	2.7500	2.4615	8.7500	2131	1	0	0	0	0	4.0000	1.9692	8.7500	2197	1	0	0	0	0	5.2500	1.4769	8.7500	2263	1	0	0	0	0	6.5000	.98462	8.7500
2066	1	0	0	0	0	2.7500	1.9692	8.7500	2132	1	0	0	0	0	4.0000	1.4769	8.7500	2198	1	0	0	0	0	5.2500	.98462	8.7500	2264	1	0	0	0	0	6.5000	.49231	8.7500
2067	1	0	0	0	0	2.7500	1.4769	8.7500	2133	1	0	0	0	0	4.0000	.98462	8.7500	2199	1	0	0	0	0	5.2500	.49231	8.7500	2265	1	0	0	0	0	6.5000	.00000	8.7500
2068	1	0	0	0	0	2.7500	.98462	8.7500	2134	1	0	0	0	0	4.0000	.49231	8.7500	2200	1	0	0	0	0	5.2500	.00000	8.7500	2266	1	0	0	0	0	6.7500	5.9077	8.7500
2069	1	0	0	0	0	2.7500	.49231	8.7500	2135	1	0	0	0	0	4.0000	.00000	8.7500	2201	1	0	0	0	0	5.5000	5.9077	8.7500	2267	1	0	0	0	0	6.7500	5.4154	8.7500
2070	1	0	0	0	0	2.7500	.00000	8.7500	2136	1	0	0	0	0	4.2500	5.9077	8.7500	2202	1	0	0	0	0	5.5000	5.4154	8.7500	2268	1	0	0	0	0	6.7500	4.9231	8.7500
2071	1	0	0	0	0	3.0000	5.9077	8.7500	2137	1	0	0	0	0	4.2500	5.4154	8.7500	2203	1	0	0	0	0	5.5000	4.9231	8.7500	2269	1	0	0	0	0	6.7500	4.4308	8.7500
2072	1	0	0	0	0	3.0000	5.4154	8.7500	2138	1	0	0	0	0	4.2500	4.9231	8.7500	2204	1	0	0	0	0	5.5000	4.4308	8.7500	2270	1	0	0	0	0	6.7500	3.9385	8.7500
2073	1	0	0	0	0	3.0000	4.9231	8.7500	2139	1	0	0	0	0	4.2500	4.4308	8.7500	2205	1	0	0	0	0	5.5000	3.9385	8.7500	2271	1	0	0	0	0	6.7500	3.4462	8.7500
2074	1	0	0	0	0	3.0000	4.4308	8.7500	2140	1	0	0	0	0	4.2500	3.9385	8.7500	2206	1	0	0	0	0	5.5000	3.4462	8.7500	2272	1	0	0	0	0	6.7500	2.9538	8.7500
2075	1	0	0	0	0	3.0000	3.9385	8.7500	2141	1	0	0	0	0	4.2500	3.4462	8.7500	2207	1	0	0	0	0	5.5000	2.9538	8.7500	2273	1	0	0	0	0	6.7500	2.4615	8.7500
2076	1	0	0	0	0	3.0000	3.4462	8.7500	2142	1	0	0	0	0	4.2500	2.9538	8.7500	2208	1	0	0	0	0	5.5000	2.4615	8.7500	2274	1	0	0	0	0	6.7500	1.9692	8.7500
2077	1	0	0	0	0	3.0000	2.9538	8.7500	2143	1	0	0	0	0	4.2500	2.4615	8.7500	2209	1	0	0	0	0	5.5000	1.9692	8.7500	2275	1	0	0	0	0	6.7500	1.4769	8.7500
2078	1	0	0	0	0	3.0000	2.4615	8.7500	2144	1	0	0	0	0	4.2500	1.9692	8.7500	2210	1	0	0	0	0	5.5000	1.4769	8.7500	2276	1	0	0	0	0	6.7500	.98462	8.7500
2079	1	0	0	0	0	3.0000	1.9692	8.7500	2145	1	0	0	0	0	4.2500	1.4769	8.7500	2211	1	0	0	0	0	5.5000	.98462	8.7500	2277	1	0	0	0	0	6.7500	.49231	8.7500
2080	1	0	0	0	0	3.0000	1.4769	8.7500	2146	1	0	0	0	0	4.2500	.98462	8.7500	2212	1	0	0	0	0	5.5000	.49231	8.7500	2278	1	0	0	0	0	6.7500	.00000	8.7500
2081	1	0	0	0	0	3.0000	.98462	8.7500	2147	1	0	0	0	0	4.2500	.49231	8.7500	2213	1	0	0	0	0	5.5000	.00000	8.7500	2279	1	0	0	0	0	7.0000	5.9077	8.7500
2082	1	0	0	0	0	3.0000	.49231	8.7500	2148	1	0	0	0	0	4.2500	.00000	8.7500	2214	1	0	0	0	0	5.7500	5.9077	8.7500	2280	1	0	0	0	0	7.0000	5.4154	8.7500
2083	1	0	0	0	0	3.0000	.00000	8.7500	2149	1	0	0	0	0	4.5000	5.9077	8.7500	2215	1																

2305	1	0	0	0	0	7.5000	5.9077	8.7500	2371	1	0	0	0	0	8.7500	5.4154	8.7500	2437	1	0	0	0	0	10.000	4.9231	8.7500	2503	1	0	0	0	0	11.250	4.4308	8.7500
2306	1	0	0	0	0	7.5000	5.4154	8.7500	2372	1	0	0	0	0	8.7500	4.9231	8.7500	2438	1	0	0	0	0	10.000	4.4308	8.7500	2504	1	0	0	0	0	11.250	3.9385	8.7500
2307	1	0	0	0	0	7.5000	4.9231	8.7500	2373	1	0	0	0	0	8.7500	4.4308	8.7500	2439	1	0	0	0	0	10.000	3.9385	8.7500	2505	1	0	0	0	0	11.250	3.4462	8.7500
2308	1	0	0	0	0	7.5000	4.4308	8.7500	2374	1	0	0	0	0	8.7500	3.9385	8.7500	2440	1	0	0	0	0	10.000	3.4462	8.7500	2506	1	0	0	0	0	11.250	2.9538	8.7500
2309	1	0	0	0	0	7.5000	3.9385	8.7500	2375	1	0	0	0	0	8.7500	3.4462	8.7500	2441	1	0	0	0	0	10.000	2.9538	8.7500	2507	1	0	0	0	0	11.250	2.4615	8.7500
2310	1	0	0	0	0	7.5000	3.4462	8.7500	2376	1	0	0	0	0	8.7500	2.9538	8.7500	2442	1	0	0	0	0	10.000	2.4615	8.7500	2508	1	0	0	0	0	11.250	1.9692	8.7500
2311	1	0	0	0	0	7.5000	2.9538	8.7500	2377	1	0	0	0	0	8.7500	2.4615	8.7500	2443	1	0	0	0	0	10.000	1.9692	8.7500	2509	1	0	0	0	0	11.250	1.4769	8.7500
2312	1	0	0	0	0	7.5000	2.4615	8.7500	2378	1	0	0	0	0	8.7500	1.9692	8.7500	2444	1	0	0	0	0	10.000	1.4769	8.7500	2510	1	0	0	0	0	11.250	.98462	8.7500
2313	1	0	0	0	0	7.5000	1.9692	8.7500	2379	1	0	0	0	0	8.7500	1.4769	8.7500	2445	1	0	0	0	0	10.000	.98462	8.7500	2511	1	0	0	0	0	11.250	.49231	8.7500
2314	1	0	0	0	0	7.5000	1.4769	8.7500	2380	1	0	0	0	0	8.7500	.98462	8.7500	2446	1	0	0	0	0	10.000	.49231	8.7500	2512	1	0	0	0	0	11.250	.00000	8.7500
2315	1	0	0	0	0	7.5000	.98462	8.7500	2381	1	0	0	0	0	8.7500	.49231	8.7500	2447	1	0	0	0	0	10.000	.00000	8.7500	2513	1	0	0	0	0	11.500	5.9077	8.7500
2316	1	0	0	0	0	7.5000	.49231	8.7500	2382	1	0	0	0	0	8.7500	.00000	8.7500	2448	1	0	0	0	0	10.250	5.9077	8.7500	2514	1	0	0	0	0	11.500	5.4154	8.7500
2317	1	0	0	0	0	7.5000	.00000	8.7500	2383	1	0	0	0	0	9.0000	5.9077	8.7500	2449	1	0	0	0	0	10.250	5.4154	8.7500	2515	1	0	0	0	0	11.500	4.9231	8.7500
2318	1	0	0	0	0	7.7500	5.9077	8.7500	2384	1	0	0	0	0	9.0000	5.4154	8.7500	2450	1	0	0	0	0	10.250	4.9231	8.7500	2516	1	0	0	0	0	11.500	4.4308	8.7500
2319	1	0	0	0	0	7.7500	5.4154	8.7500	2385	1	0	0	0	0	9.0000	4.9231	8.7500	2451	1	0	0	0	0	10.250	4.4308	8.7500	2517	1	0	0	0	0	11.500	3.9385	8.7500
2320	1	0	0	0	0	7.7500	4.9231	8.7500	2386	1	0	0	0	0	9.0000	4.4308	8.7500	2452	1	0	0	0	0	10.250	3.9385	8.7500	2518	1	0	0	0	0	11.500	3.4462	8.7500
2321	1	0	0	0	0	7.7500	4.4308	8.7500	2387	1	0	0	0	0	9.0000	3.9385	8.7500	2453	1	0	0	0	0	10.250	3.4462	8.7500	2519	1	0	0	0	0	11.500	2.9538	8.7500
2322	1	0	0	0	0	7.7500	3.9385	8.7500	2388	1	0	0	0	0	9.0000	3.4462	8.7500	2454	1	0	0	0	0	10.250	2.9538	8.7500	2520	1	0	0	0	0	11.500	2.4615	8.7500
2323	1	0	0	0	0	7.7500	3.4462	8.7500	2389	1	0	0	0	0	9.0000	2.9538	8.7500	2455	1	0	0	0	0	10.250	2.4615	8.7500	2521	1	0	0	0	0	11.500	1.9692	8.7500
2324	1	0	0	0	0	7.7500	2.9538	8.7500	2390	1	0	0	0	0	9.0000	2.4615	8.7500	2456	1	0	0	0	0	10.250	1.9692	8.7500	2522	1	0	0	0	0	11.500	1.4769	8.7500
2325	1	0	0	0	0	7.7500	2.4615	8.7500	2391	1	0	0	0	0	9.0000	1.9692	8.7500	2457	1	0	0	0	0	10.250	1.4769	8.7500	2523	1	0	0	0	0	11.500	.98462	8.7500
2326	1	0	0	0	0	7.7500	1.9692	8.7500	2392	1	0	0	0	0	9.0000	1.4769	8.7500	2458	1	0	0	0	0	10.250	.98462	8.7500	2524	1	0	0	0	0	11.500	.49231	8.7500
2327	1	0	0	0	0	7.7500	1.4769	8.7500	2393	1	0	0	0	0	9.0000	.98462	8.7500	2459	1	0	0	0	0	10.250	.49231	8.7500	2525	1	0	0	0	0	11.500	.00000	8.7500
2328	1	0	0	0	0	7.7500	.98462	8.7500	2394	1	0	0	0	0	9.0000	.49231	8.7500	2460	1	0	0	0	0	10.250	.00000	8.7500	2526	1	0	0	0	0	11.750	5.9077	8.7500
2329	1	0	0	0	0	7.7500	.49231	8.7500	2395	1	0	0	0	0	9.0000	.00000	8.7500	2461	1	0	0	0	0	10.500	5.9077	8.7500	2527	1	0	0	0	0	11.750	5.4154	8.7500
2330	1	0	0	0	0	7.7500	.00000	8.7500	2396	1	0	0	0	0	9.2500	5.9077	8.7500	2462	1	0	0	0	0	10.500	5.4154	8.7500	2528	1	0	0	0	0	11.750	4.9231	8.7500
2331	1	0	0	0	0	8.0000	5.9077	8.7500	2397	1	0	0	0	0	9.2500	5.4154	8.7500	2463	1	0	0	0	0	10.500	4.9231	8.7500	2529	1	0	0	0	0	11.750	4.4308	8.7500
2332	1	0	0	0	0	8.0000	5.4154	8.7500	2398	1	0	0	0	0	9.2500	4.9231	8.7500	2464	1	0	0	0	0	10.500	4.4308	8.7500	2530	1	0	0	0	0	11.750	3.9385	8.7500
2333	1	0	0	0	0	8.0000	4.9231	8.7500	2399	1	0	0	0	0	9.2500	4.4308	8.7500	2465	1	0	0	0	0	10.500	3.9385	8.7500	2531	1	0	0	0	0	11.750	3.4462	8.7500
2334	1	0	0	0	0	8.0000	4.4308	8.7500	2400	1	0	0	0	0	9.2500	3.9385	8.7500	2466	1	0	0	0	0	10.500	3.4462	8.7500	2532	1	0	0	0	0	11.750	2.9538	8.7500
2335	1	0	0	0	0	8.0000	3.9385	8.7500	2401	1	0	0	0	0	9.2500	3.4462	8.7500	2467	1	0	0	0	0	10.500	2.9538	8.7500	2533	1	0	0	0	0	11.750	2.4615	8.7500
2336	1	0	0	0	0	8.0000	3.4462	8.7500	2402	1	0	0	0	0	9.2500	2.9538	8.7500	2468	1	0	0	0	0	10.500	2.4615	8.7500	2534	1	0	0	0	0	11.750	1.9692	8.7500
2337	1	0	0	0	0	8.0000	2.9538	8.7500	2403	1	0	0	0	0	9.2500	2.4615	8.7500	2469	1	0	0	0	0	10.500	1.9692	8.7500	2535	1	0	0	0	0	11.750	1.4769	8.7500
2338	1	0	0	0	0	8.0000	2.4615	8.7500	2404	1	0	0	0	0	9.2500	1.9692	8.7500	2470	1	0	0	0	0	10.500	1.4769	8.7500	2536	1	0	0	0	0	11.750	.98462	8.7500
2339	1	0	0	0	0	8.0000	1.9692	8.7500	2405	1	0	0	0	0	9.2500	1.4769	8.7500	2471	1	0	0	0	0	10.500	.98462	8.7500	2537	1	0	0	0	0	11.750	.49231	8.7500
2340	1	0	0	0	0	8.0000	1.4769	8.7500	2406	1	0	0	0	0	9.2500	.98462	8.7500	2472	1	0	0	0	0	10.500	.49231	8.7500	2538	1	0	0	0	0	11.750	.00000	8.7500
2341	1	0	0	0	0	8.0000	.98462	8.7500	2407	1	0	0	0	0	9.2500	.49231	8.7500	2473	1	0	0	0	0	10.500	.00000	8.7500	2539	1	0	0	0	0	12.000	5.9077	8.7500
2342	1	0	0	0	0	8.0000	.49231	8.7500	2408	1	0	0	0	0	9.2500	.00000	8.7500	2474	1	0	0	0	0	10.750	5.9077	8.7500	2540	1	0	0	0	0	12.000	5.4154	8.7500
2343	1	0	0	0	0	8.0000	.00000	8.7500	2409	1	0	0	0	0	9.5000	5.9077	8.7500	2475	1	0	0	0	0	10.750	5.4154	8.7500	2541	1	0	0	0	0	12.000	4.9231	8.7500
2344	1	0	0	0	0	8.2500	5.9077	8.7500	2410	1	0	0	0	0	9.5000	5.4154	8.7500	2476	1	0	0	0	0	10.750	4.9231	8.7500	2542	1	0	0	0	0	12.000	4.4308	8.7500
2345	1	0	0	0	0	8.2500	5.4154	8.7500	2411	1	0	0	0	0	9.5000	4.9231	8.7500	2477	1	0	0	0	0	10.750	4.4308	8.7500	2543	1	0	0	0	0	12.000	3.9385	8.7500
2346	1	0	0	0	0	8.2500	4.9231	8.7500	2412	1	0	0	0	0	9.5000	4.4308	8.7500	2478	1	0	0	0	0	10.750	3.9385	8.7500	2544	1	0	0	0	0	12.000	3.4462	8.7500
2347	1	0	0	0	0	8.2500	4.4308	8.7500	2413	1	0	0	0	0	9.5000	3.9385	8.7500	2479																	

2569	1	0	0	0	0	0	12.500	3.9385	8.7500	2635	1	0	0	0	0	0	13.750	3.4462	8.7500	2701	0	0	0	0	0	0	25000	.00000	6.9079	2767	0	0	0	0	0	0	1.2500	.00000	4.1441
2570	1	0	0	0	0	0	12.500	3.4462	8.7500	2636	1	0	0	0	0	0	13.750	2.9538	8.7500	2702	0	0	0	0	0	0	25000	.00000	7.3684	2768	0	0	0	0	0	0	1.2500	.00000	4.6053
2571	1	0	0	0	0	0	12.500	2.9538	8.7500	2637	1	0	0	0	0	0	13.750	2.4615	8.7500	2703	0	0	0	0	0	0	25000	.00000	7.8289	2769	0	0	0	0	0	0	1.2500	.00000	5.0658
2572	1	0	0	0	0	0	12.500	2.4615	8.7500	2638	1	0	0	0	0	0	13.750	1.9692	8.7500	2704	0	0	0	0	0	0	25000	.00000	8.2895	2770	0	0	0	0	0	0	1.2500	.00000	5.5263
2573	1	0	0	0	0	0	12.500	1.9692	8.7500	2639	1	0	0	0	0	0	13.750	1.4769	8.7500	2705	0	0	0	0	0	0	50000	.00000	4.6053	2771	0	0	0	0	0	0	1.2500	.00000	5.9868
2574	1	0	0	0	0	0	12.500	1.4769	8.7500	2640	1	0	0	0	0	0	13.750	.98462	8.7500	2706	0	0	0	0	0	0	50000	.00000	.92105	2772	0	0	0	0	0	0	1.2500	.00000	6.4474
2575	1	0	0	0	0	0	12.500	.98462	8.7500	2641	1	0	0	0	0	0	13.750	.49231	8.7500	2707	0	0	0	0	0	0	50000	.00000	1.3816	2773	0	0	0	0	0	0	1.2500	.00000	6.9079
2576	1	0	0	0	0	0	12.500	.49231	8.7500	2642	1	0	0	0	0	0	13.750	.00000	8.7500	2708	0	0	0	0	0	0	50000	.00000	1.8421	2774	0	0	0	0	0	0	1.2500	.00000	7.3684
2577	1	0	0	0	0	0	12.500	.00000	8.7500	2643	1	0	0	0	0	0	14.000	5.9077	8.7500	2709	0	0	0	0	0	0	50000	.00000	2.3026	2775	0	0	0	0	0	0	1.2500	.00000	7.8289
2578	1	0	0	0	0	0	12.750	5.9077	8.7500	2644	1	0	0	0	0	0	14.000	5.4154	8.7500	2710	0	0	0	0	0	0	50000	.00000	2.7632	2776	0	0	0	0	0	0	1.2500	.00000	8.2895
2579	1	0	0	0	0	0	12.750	5.4154	8.7500	2645	1	0	0	0	0	0	14.000	4.9231	8.7500	2711	0	0	0	0	0	0	50000	.00000	3.2237	2777	0	0	0	0	0	0	1.5000	.00000	4.6053
2580	1	0	0	0	0	0	12.750	4.9231	8.7500	2646	1	0	0	0	0	0	14.000	4.4308	8.7500	2712	0	0	0	0	0	0	50000	.00000	3.6842	2778	0	0	0	0	0	0	1.5000	.00000	.92105
2581	1	0	0	0	0	0	12.750	4.4308	8.7500	2647	1	0	0	0	0	0	14.000	3.9385	8.7500	2713	0	0	0	0	0	0	50000	.00000	4.1447	2779	0	0	0	0	0	0	1.5000	.00000	1.3816
2582	1	0	0	0</																																			

3361	0	0	0	0	0	9.5000	.00000	4.1447	3427	0	0	0	0	0	10.500	.00000	1.3816	3493	0	0	0	0	0	11.250	.00000	6.9079	3559	0	0	0	0	0	12.250	.00000	4.1447
3362	0	0	0	0	0	9.5000	.00000	4.6053	3428	0	0	0	0	0	10.500	.00000	1.8421	3494	0	0	0	0	0	11.250	.00000	7.3684	3560	0	0	0	0	0	12.250	.00000	4.6053
3363	0	0	0	0	0	9.5000	.00000	5.0658	3429	0	0	0	0	0	10.500	.00000	2.3026	3495	0	0	0	0	0	11.250	.00000	7.8289	3561	0	0	0	0	0	12.250	.00000	5.0658
3364	0	0	0	0	0	9.5000	.00000	5.5263	3430	0	0	0	0	0	10.500	.00000	2.7632	3496	0	0	0	0	0	11.250	.00000	8.2895	3562	0	0	0	0	0	12.250	.00000	5.5263
3365	0	0	0	0	0	9.5000	.00000	5.9868	3431	0	0	0	0	0	10.500	.00000	3.2237	3497	0	0	0	0	0	11.500	.00000	.46053	3563	0	0	0	0	0	12.250	.00000	5.9868
3366	0	0	0	0	0	9.5000	.00000	6.4474	3432	0	0	0	0	0	10.500	.00000	3.6842	3498	0	0	0	0	0	11.500	.00000	.92105	3564	0	0	0	0	0	12.250	.00000	6.4474
3367	0	0	0	0	0	9.5000	.00000	6.9079	3433	0	0	0	0	0	10.500	.00000	4.1447	3499	0	0	0	0	0	11.500	.00000	1.3816	3565	0	0	0	0	0	12.250	.00000	6.9079
3368	0	0	0	0	0	9.5000	.00000	7.3684	3434	0	0	0	0	0	10.500	.00000	4.6053	3500	0	0	0	0	0	11.500	.00000	1.8421	3566	0	0	0	0	0	12.250	.00000	7.3684
3369	0	0	0	0	0	9.5000	.00000	7.8289	3435	0	0	0	0	0	10.500	.00000	5.0658	3501	0	0	0	0	0	11.500	.00000	2.3026	3567	0	0	0	0	0	12.250	.00000	7.8289
3370	0	0	0	0	0	9.5000	.00000	8.2895	3436	0	0	0	0	0	10.500	.00000	5.5263	3502	0	0	0	0	0	11.500	.00000	2.7632	3568	0	0	0	0	0	12.250	.00000	8.2895
3371	0	0	0	0	0	9.7500	.00000	.46053	3437	0	0	0	0	0	10.500	.00000	5.9868	3503	0	0	0	0	0	11.500	.00000	3.2237	3569	0	0	0	0	0	12.500	.00000	.46053
3372	0	0	0	0	0	9.7500	.00000	.92105	3438	0	0	0	0	0	10.500	.00000	6.4474	3504	0	0	0	0	0	11.500	.00000	3.6842	3570	0	0	0	0	0	12.500	.00000	.92105
3373	0	0	0	0	0	9.7500	.00000	1.3816	3439	0	0	0	0	0	10.500	.00000	6.9079	3505	0	0	0	0	0	11.500	.00000	4.1447	3571	0	0	0	0	0	12.500	.00000	1.3816
3374	0	0	0	0	0	9.7500	.00000	1.8421	3440	0	0	0	0	0	10.500	.00000	7.3684	3506	0	0	0	0	0	11.500	.00000	4.6053	3572	0	0	0	0	0	12.500	.00000	1.8421
3375	0	0	0	0	0	9.7500	.00000	2.30																											

3625	0	0	0	0	0	0	13.250	.00000	1.3816
3626	0	0	0	0	0	0	13.250	.00000	1.8421
3627	0	0	0	0	0	0	13.250	.00000	2.3026
3628	0	0	0	0	0	0	13.250	.00000	2.7632
3629	0	0	0	0	0	0	13.250	.00000	3.2237
3630	0	0	0	0	0	0	13.250	.00000	3.6842
3631	0	0	0	0	0	0	13.250	.00000	4.1447
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3684	0	0	0	0	0	0	14.000	.00000	3.6842
3685	0	0	0	0	0	0	14.000	.00000	4.1447
3686	0	0	0	0	0	0	14.000	.00000	4.6053
3687	0	0	0	0	0	0	14.000	.00000	5.0658
3688	0	0	0	0	0	0	14.000	.00000	5.5263
3689	0	0	0	0	0	0	14.000	.00000	5.9868
3690	0	0	0	0	0	0	14.000	.00000	6.4474

3691	0	0	0	0	0	0	14.000	.00000	6.9079
3692	0	0	0	0	0	0	14.000	.00000	7.3684
3693	0	0	0	0	0	0	14.000	.00000	7.8289
3694	0	0	0	0	0	0	14.000	.00000	8.2895
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3706	0	0	0	0	0	0	14.250	.00000	5.5263
3707	0	0	0	0	0	0	14.250	.00000	5.9868
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3711	0	0	0	0	0	0	14.250	.00000	7.8289
3712	0	0	0	0	0	0	14.250	.00000	8.2895

Element input data

ELEM EGRP MP REAL ECS NODE 1 NODE 2 NODE 3
NODE 4 NODE 5 NODE 6
NODE 7 NODE 8 NODE 9 NODE 10
NODE 11 NODE 12
NODE 13 NODE 14 NODE 15 NODE 16
NODE 17 NODE 18

NODE 19 NODE 20

1	1	1	1	-1	1	2	16	15
2	1	1	1	-1	2	3	17	16
3	1	1	1	-1	3	4	18	17
4	1	1	1	-1	4	5	19	18
5	1	1	1	-1	5	6	20	19
6	1	1	1	-1	6	7	21	20
7	1	1	1	-1	7	8	22	21
8	1	1	1	-1	8	9	23	22
9	1	1	1	-1	9	10	24	23
10	1	1	1	-1	10	11	25	24
11	1	1	1	-1	11	12	26	25
12	1	1	1	-1	12	13	27	26
13	1	1	1	-1	13	14	28	27
14	1	1	1	-1	15	16	30	29
15	1	1	1	-1	16	17	31	30
16	1	1	1	-1	17	18	32	31
17	1	1	1	-1	18	19	33	32
18	1	1	1	-1	19	20	34	33
19	1	1	1	-1	20	21	35	34
20	1	1	1	-1	21	22	36	35
21	1	1	1	-1	22	23	37	36
22	1	1	1	-1	23	24	38	37
23	1	1	1	-1	24	25	39	38
24	1	1	1	-1	25	26	40	39
25	1	1	1	-1	26	27	41	40
26	1	1	1	-1	27	28	42	41
27	1	1	1	-1	29	30	44	43
28	1	1	1	-1	30	31	45	44
29	1	1	1	-1	31	32	46	45
30	1	1	1	-1	32	33	47	46
31	1	1	1	-1	33	34	48	47
32	1	1	1	-1	34	35	49	48
33	1	1	1	-1	35	36	50	49
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35	1	1	1	-1	37	38	52	51
36	1	1	1	-1	38	39	53	52
37	1	1	1	-1	39	40	54	53
38	1	1	1	-1	40	41	55	54
39	1	1	1	-1	41	42	56	55
40	1	1	1	-1	43	44	58	57
41	1	1	1	-1	44	45	59	58
42	1	1	1	-1	45	46	60	59
43	1	1	1	-1	46	47	61	60
44	1	1	1	-1	47	48	62	61
45	1	1	1	-1	48	49	63	62
46	1	1	1	-1	49	50	64	63
47	1	1	1	-1	50	51	65	64
48	1	1	1	-1	51	52	66	65
49	1	1	1	-1	52	53	67	66
50	1	1	1	-1	53	54	68	67
51	1	1	1	-1	54	55	69	68
52	1	1	1	-1	55	56	70	69
53	1	1	1	-1	57	58	72	71
54	1	1	1	-1	58	59	73	72
55	1	1	1	-1	59	60	74	73
56	1	1	1	-1	60	61	75	74
57	1	1	1	-1	61	62	76	75

58	1	1	1	-1	62	63	77	76
59	1	1	1	-1	63	64	78	77
60	1	1	1	-1	64	65	79	78
61	1	1	1	-1	65	66	80	79
62	1	1	1	-1	66	67	81	80
63	1	1	1	-1	67	68	82	81
64	1	1	1	-1	68	69	83	82
65	1	1	1	-1	69	70	84	83
66	1	1	1	-1	71	72	86	85
67	1	1	1	-1	72	73	87	86
68	1	1	1	-1	73	74	88	87
69	1	1	1	-1	74	75	89	88
70	1	1	1	-1	75	76	90	89
71	1	1	1	-1	76	77	91	90
72	1	1	1	-1	77	78	92	91
73	1	1	1	-1	78	79	93	92
74	1	1	1	-1	79	80	94	93
75	1	1	1	-1	80	81	95	94
76	1	1	1	-1	81	82	96	95
77	1	1	1	-1	82	83	97	96
78	1	1	1	-1	83	84	98	97
79	1	1	1	-1	85	86	100	99

124	1	1	1	-1	133	134	148	147	190	1	1	1	-1	204	205	219	218	256	1	1	1	-1	275	276	290	289	322	1	1	1	-1	346	347	361	360
125	1	1	1	-1	134	135	149	148	191	1	1	1	-1	205	206	220	219	257	1	1	1	-1	276	277	291	290	323	1	1	1	-1	347	348	362	361
126	1	1	1	-1	135	136	150	149	192	1	1	1	-1	206	207	221	220	258	1	1	1	-1	277	278	292	291	324	1	1	1	-1	348	349	363	362
127	1	1	1	-1	136	137	151	150	193	1	1	1	-1	207	208	222	221	259	1	1	1	-1	278	279	293	292	325	1	1	1	-1	349	350	364	363
128	1	1	1	-1	137	138	152	151	194	1	1	1	-1	208	209	223	222	260	1	1	1	-1	279	280	294	293	326	1	1	1	-1	351	352	366	365
129	1	1	1	-1	138	139	153	152	195	1	1	1	-1	209	210	224	223	261	1	1	1	-1	281	282	296	295	327	1	1	1	-1	352	353	367	366
130	1	1	1	-1	139	140	154	153	196	1	1	1	-1	211	212	226	225	262	1	1	1	-1	282	283	297	296	328	1	1	1	-1	353	354	368	367
131	1	1	1	-1	141	142	156	155	197	1	1	1	-1	212	213	227	226	263	1	1	1	-1	283	284	298	297	329	1	1	1	-1	354	355	369	368
132	1	1	1	-1	142	143	157	156	198	1	1	1	-1	213	214	228	227	264	1	1	1	-1	284	285	299	298	330	1	1	1	-1	355	356	370	369
133	1	1	1	-1	143	144	158	157	199	1	1	1	-1	214	215	229	228	265	1	1	1	-1	285	286	300	299	331	1	1	1	-1	356	357	371	370
134	1	1	1	-1	144	145	159	158	200	1	1	1	-1	215	216	230	229	266	1	1	1	-1	286	287	301	300	332	1	1	1	-1	357	358	372	371
135	1	1	1	-1	145	146	160	159	201	1	1	1	-1	216	217	231	230	267	1	1	1	-1	287	288	302	301	333	1	1	1	-1	358	359	373	372
136	1	1	1	-1	146	147	161	160	202	1	1	1	-1	217	218	232	231	268	1	1	1	-1	288	289	303	302	334	1	1	1	-1	359	360	374	373
137	1	1	1	-1	147	148	162	161	203	1	1	1	-1	218	219	233	232	269	1	1	1	-1	289	290	304	303	335	1	1	1	-1	360	361	375	374
138	1	1	1	-1	148	149	163	162	204	1	1	1	-1	219	220	234	233	270	1	1	1	-1	290	291	305	304	336	1	1	1	-1	361	362	376	375
139	1	1	1	-1	149	150	164	163	205	1	1	1	-1	220	221	235	234	271	1	1	1	-1	291	292	306	305	337	1	1	1	-1	362	363	377	376
140	1	1	1	-1	150	151	165	164	206	1	1	1	-1	221	222	236	235	272	1	1	1	-1	292	293	307	306	338	1	1	1	-1	363	364	378	377
141	1	1	1	-1	151	152	166	165	207	1	1	1	-1	222	223	237	236	273	1	1	1	-1	293	294	308	307	339	1	1	1	-1	365	366	380	379
142	1	1	1	-1	152	153	167	166	208	1	1	1	-1	223	224	238	237	274	1	1	1	-1	295	296	310	309	340	1	1	1	-1	366	367	381	380
143	1	1	1	-1	153	154	168	167	209	1	1	1	-1	225	226	240	239	275	1	1	1	-1	296	297	311	310	341	1	1	1	-1	367	368	382	381
144	1	1	1	-1	155	156	170	169	210	1	1	1	-1	226	227	241	240	276	1	1	1	-1	297	298	312	311	342	1	1	1	-1	368	369	383	382
145	1	1	1	-1	156	157	171	170	211	1	1	1	-1	227	228	242	241	277	1	1	1	-1	298	299	313	312	343	1	1	1	-1	369	370	384	383
146	1	1	1	-1	157	158	172	171	212	1	1	1	-1	228	229	243	242	278	1	1	1	-1	299	300	314	313	344	1	1	1	-1	370	371	385	384
147	1	1	1	-1	158	159	173	172	213	1	1	1	-1	229	230	244	243	279	1	1	1	-1	300	301	315	314	345	1	1	1	-1	371	372	386	385
148	1	1	1	-1	159	160	174	173	214	1	1	1	-1	230	231	245	244	280	1	1	1	-1	301	302	316	315	346	1	1	1	-1	372	373	387	386
149	1	1	1	-1	160	161	175	174	215	1	1	1	-1	231	232	246	245	281	1	1	1	-1	302	303	317	316	347	1	1	1	-1	373	374	388	387
150	1	1	1	-1	161	162	176	175	216	1	1	1	-1	232	233	247	246	282	1	1	1	-1	303	304	318	317	348	1	1	1	-1	374	375	389	388
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155	1	1	1	-1	166	167	181	180	221	1	1	1	-1	237	238	252	251	287	1	1	1	-1	309	310	324	323	353	1	1	1	-1	380	381	395	394
156	1	1	1	-1	167	168	182	181	222	1	1	1	-1	239	240	254	253	288	1	1	1	-1	310	311	325	324	354	1	1	1	-1	381	382	396	395
157	1	1	1	-1	169	170	184	183	223	1	1	1	-1	240	241	255	254	289	1	1	1	-1	311	312	326	325	355	1	1	1	-1	382	383	397	396
158	1	1	1	-1	170	171	185	184	224	1	1	1	-1	241	242	256	255	290	1	1	1	-1	312	313	327	326	356	1	1	1	-1	383	384	398	397
159	1	1	1	-1	171	172	186	185	225	1	1	1	-1	242	243	257	256	291	1	1	1	-1	313	314	328	327	357	1	1	1	-1	384	385	399	398
160	1	1	1	-1	172	173	187	186	226	1	1	1	-1	243	244	258	257	292	1	1	1	-1	314	315	329	328	358	1	1	1	-1	385	386	400	399
161	1	1	1	-1	173	174	188	187	227	1	1	1	-1	244	245	259	258	293	1	1	1	-1	315	316	330	329	359	1	1	1	-1	386	387	401	400
162	1	1	1	-1	174	175	189	188	228	1	1	1	-1	245	246	260	259	294	1	1	1	-1	316	317	331	330	360	1	1	1	-1	387	388	402	401
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1752</																																			

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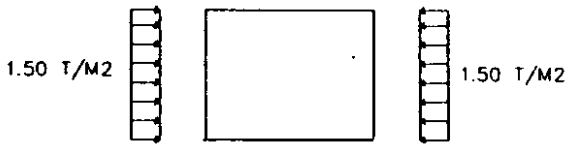
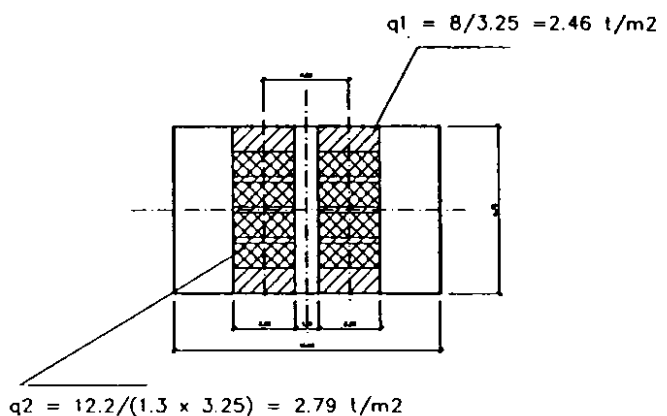
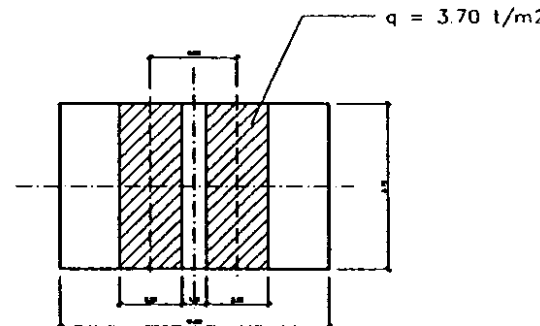
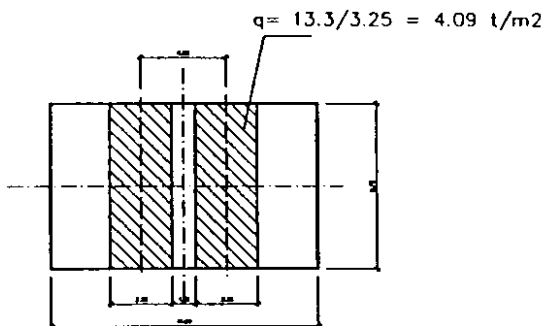
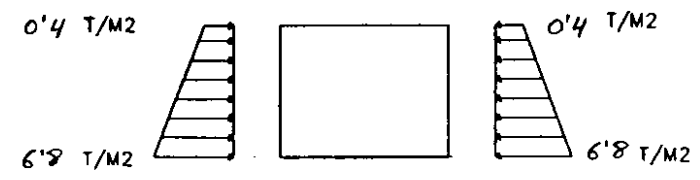
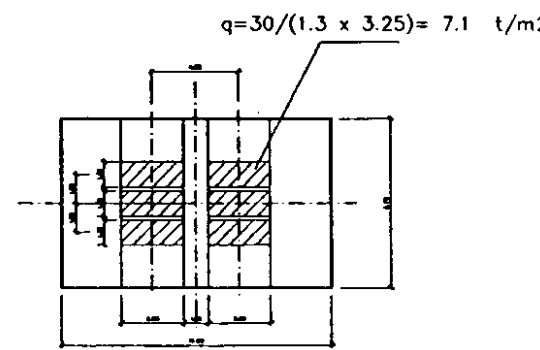
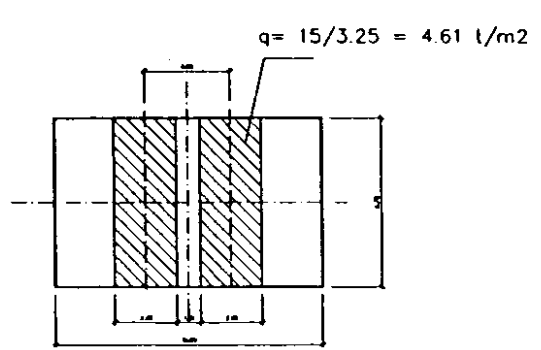
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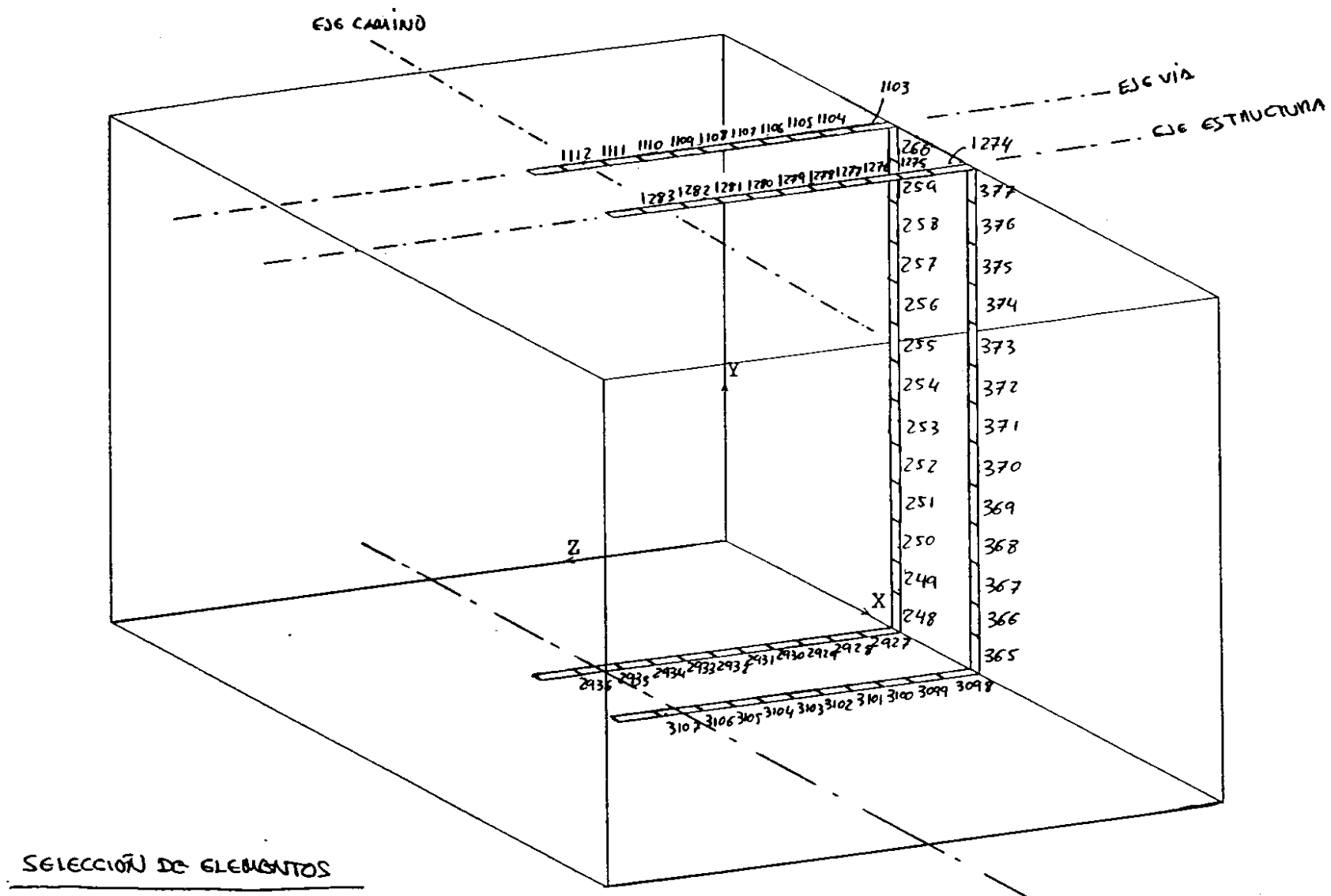
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3301	1	1	6	-1	3365	3366	3384	3383	3367	1	1	6	-1	3427	3428	3446	3445	3433	1	1	6	-1	3490	3491	3509	3508	3499	1	1	6	-1	3552	3553	3571	3570
3302	1	1	6	-1	3366	3367	3385	3384	3368	1	1	6	-1	3428	3429	3447	3446	3434	1	1	6	-1	3491	3492	3510	3509	3500	1	1	6	-1	3553	3554	3572	3571
3303	1	1	6	-1	3367	3368	3386	3385	3369	1	1	6	-1	3429	3430	3448	3447	3435	1	1	6	-1	3492	3493	3511	3510	3501	1	1	6	-1	3554	3555	3573	3572
3304	1	1	6	-1	3368	3369	3387	3386	3370	1	1	6	-1	3430	3431	3449	3448	3436	1	1	6	-1	3493	3494	3512	3511	3502	1	1	6	-1	3555	3556	3574	3573
3305	1	1	6	-1	3369	3370	3388	3387	3371	1	1	6	-1	3431	3432	3450	3449	3437	1	1	6	-1	3494	3495	3513	3512	3503	1	1	6	-1	3556	3557	3575	3574
3306	1	1	6	-1	3370	2421	2434	3388	3372	1	1	6	-1	3432	3433	3451	3450	3438	1	1	6	-1	3495	3496	3514	3513	3504	1	1	6	-1	3557	3558	3576	3575
3307	1	1	6	-1	547	3371	3389	561	3373	1	1	6	-1	3433	3434	3452	3451	3439	1	1	6	-1	3496	2512	2525	3514	3505	1	1	6	-1	3558	3559	3577	3576
3308	1	1	6	-1	3371	3372	3390	3389	3374	1	1	6	-1	3434	3435	3453	3452	3440	1	1	6	-1	645	3497	3515	659	3506	1	1	6	-1	3559	3560	3578	3577
3309	1	1	6	-1	3372	3373	3391	3390	3375	1	1	6	-1	3435	3436	3454	3453	3441	1	1	6	-1	3497	3498	3516	3515	3507	1	1	6	-1	3560	3561	3579	3578
3310	1	1	6	-1	3373	3374	3392	3391	3376	1	1	6	-1	3436	3437	3455	3454	3442	1	1	6	-1	3498	3499	3517	3516	3508	1	1	6	-1	3561	3562	3580	3579
3311	1	1	6	-1	3374	3375	3393	3392	3377	1	1	6	-1	3437	3438	3456	3455	3443	1	1	6	-1	3499	3500	3518	3517	3509	1	1	6	-1	3562	3563	3581	3580
3312	1	1	6	-1	3375	3376	3394	3393	3378	1	1	6	-1	3438	3439	3457	3456	3444	1	1	6	-1	3500	3501	3519	3518	3510	1	1	6	-1	3563	3564	3582	3581
3313	1	1	6	-1	3376	3377	3395	3394	3379	1	1	6	-1	3439	3440	3458	3457	3445	1	1	6	-1	3501	3502	3520	3519	3511	1	1	6	-1	3564	3565	3583	3582
3314	1	1	6	-1	3377	3378	3396	3395	3380	1	1	6	-1	3440	3441	3459	3458	3446	1	1	6	-1	3502	3503	3521	3520	3512	1	1	6	-1	3565	3566	3584	3583
3315	1	1	6	-1	3378	3379	3397	3396	3381	1	1	6	-1	3441	3442	3460	3459	3447	1	1	6	-1	3503	3504	3522	3521	3513	1	1	6	-1	3566	3567	3585	3584
3316	1	1	6	-1	3379	3380	3398	3397	3382	1	1	6	-1	3442	2473	2486	3460	3448	1	1	6	-1	3504	3505	3523	3522	3514	1	1	6	-1	3567	3568	3586	3585
3317	1	1	6	-1	3380	3381	3399	3398	3383	1	1	6	-1	603	3443	3461	617	3449	1	1	6	-1	3505	3506	3524	3523	3515	1	1	6	-1	3568	2564	2577	3586
3318	1	1	6	-1	3381	3382	3400	3399	3384	1	1	6	-1	3443	3444	3462	3461	3450	1	1	6	-1	3506	3507	3525	3524	3516	1	1	6	-1	701	3569	3587	715
3319	1	1	6	-1	3382	3383	3401	3400	3385	1	1	6	-1	3444	3445	3463	3462	3451	1	1	6	-1	3507	3508	3526	3525	3517	1	1	6	-1	3569	3570	3588	3587
3320	1	1	6	-1	3383	3384	3402	3401	3386	1	1	6	-1	3445	3446	3464	3463	3452	1	1	6	-1	3508	3509	3527	3526	3518	1	1	6	-1	3570	3571	3589	3588
3321	1	1	6	-1	3384	3385	3403	3402	3387	1	1	6	-1	3446	3447	3465	3464	3453	1	1	6	-1	3509	3510	3528	3527	3519	1	1	6	-1	3571	3572	3590	3589
3322	1	1	6	-1	3385	3386	3404	3403	3388	1	1	6	-1	3447	3448	3466	3465	3454	1	1	6	-1	3510	3511	3529	3528	3520	1	1	6	-1	3572	3573	3591	3590
3323	1	1	6	-1	3386	3387	3405	3404	3389	1	1	6	-1	3448	3449	3467	3466	3455	1	1	6	-1	3511	3512	3530	3529	3521	1	1	6	-1	3573	3574	3592	3591
3324	1	1	6	-1	3387	3388	3406	3405	3390	1	1	6	-1	3449	3450	3468	3467	3456	1	1	6	-1	3512	3513	3531	3530	3522	1	1	6	-1	3574	3575	3593	3592
3325	1	1	6	-1	3388	2434	2447	3406	3391	1	1	6	-1	3450	3451	3469	3468	3457	1	1	6	-1	3513	3514	3532	3531	3523	1	1	6	-1	3575	3576	3594	3593
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3327	1	1	6	-1	3389	3390	3408	3407	3393	1	1	6	-1	3452	3453	3471	3470	3459	1	1	6	-1	659	3515	3533	673	3525	1	1	6	-1	3577	3578	3596	3595
3328	1	1	6	-1	3390	3391	3409	3408	3394	1	1	6	-1	3453	3454	3472	3471	3460	1	1	6	-1	3515	3516	3534	3533	3526	1	1	6	-1	3578	3579	3597	3596
3329	1	1	6	-1	3391	3392	3410	3409	3395	1	1	6	-1	3454	3455	3473	3472	3461	1	1	6	-1	3516	3517	3535	3534	3527	1	1	6	-1	3579	3580	3598	3597
3330	1	1	6	-1	3392	3393	3411	3410	3396	1	1	6	-1	3455	3456	3474	3473	3462	1	1	6	-1	3517	3518	3536	3535	3528	1	1	6	-1	3580	3581	3599	3598
3331	1	1	6	-1	3393	3394	3412	3411	3397	1	1	6	-1	3456	3457	3475	3474	3463	1	1	6	-1	3518	3519	3537	3536	3529	1	1	6	-1	3581	3582	3600	3599
3332	1	1	6	-1	3394	3395	3413	3412	3398	1	1	6	-1	3457	3458	3476	3475	3464	1	1	6	-1	3519	3520	3538	3537	3530	1	1	6	-1	3582	3583	3601	3600
3333	1	1	6	-1	3395	3396	3414	3413	3399	1	1	6	-1	3458	3459	3477	3476	3465	1	1	6	-1	3520	3521	3539	3538	3531	1	1	6	-1	3583	3584	3602	3601
3334	1	1	6	-1	3396	3397	3415	3414	3400	1	1	6	-1	3459	3460	3478	3477	3466	1	1	6	-1	3521	3522	3540	3539	3532	1	1	6	-1	3584	3585	3603	3602
3335	1	1	6	-1	3397	3398	3416	3415	3401	1	1	6	-1	3460	2486	2499	3478	3467	1	1	6	-1	3522	3523	3541	3540	3533	1	1	6	-1	3585	3586	3604	3603
3																																			

3556	1	1	6	-1	3606	3607	3625	3624
3557	1	1	6	-1	3607	3608	3626	3625
3558	1	1	6	-1	3608	3609	3627	3626
3559	1	1	6	-1	3609	3610	3628	3627
3560	1	1	6	-1	3610	3611	3629	3628
3561	1	1	6	-1	3611	3612	3630	3629
3562	1	1	6	-1	3612	3613	3631	3630
3563	1	1	6	-1	3613	3614	3632	3631
3564	1	1	6	-1	3614	3615	3633	3632
3565	1	1	6	-1	3615	3616	3634	3633
3566	1	1	6	-1	3616	3617	3635	3634
3567	1	1	6	-1	3617	3618	3636	3635
3568	1	1	6	-1	3618	3619	3637	3636
3569	1	1	6	-1	3619	3620	3638	3637
3570	1	1	6	-1	3620	3621	3639	3638
3571	1	1	6	-1	3621	3622	3640	3639
3572	1	1	6	-1	3622	2603	2616	3640
3573	1	1	6	-1	743	3623	3641	757
3574	1	1	6	-1	3623	3624	3642	3641
3575	1	1	6	-1	3624	3625	3643	3642
3576	1	1	6	-1	3625	3626	3644	3643
3577	1	1	6	-1	3626	3627	3645	3644
3578	1	1	6	-1	3627	3628	3646	3645
3579	1	1	6	-1	3628	3629	3647	3646
3580	1	1	6	-1	3629	3630	3648	3647
3581	1	1	6	-1	3630	3631	3649	3648
3582	1	1	6	-1	3631	3632	3650	3649
3583	1	1	6	-1	3632	3633	3651	3650
3584	1	1	6	-1	3633	3634	3652	3651
3585	1	1	6	-1	3634	3635	3653	3652
3586	1	1	6	-1	3635	3636	3654	3653
3587	1	1	6	-1	3636	3637	3655	3654
3588	1	1	6	-1	3637	3638	3656	3655
3589	1	1	6	-1	3638	3639	3657	3656
3590	1	1	6	-1	3639	3640	3658	3657
3591	1	1	6	-1	3640	2616	2629	3658
3592	1	1	6	-1	757	3641	3659	771
3593	1	1	6	-1	3641	3642	3660	3659
3594	1	1	6	-1	3642	3643	3661	3660
3595	1	1	6	-1	3643	3644	3662	3661
3596	1	1	6	-1	3644	3645	3663	3662
3597	1	1	6	-1	3645	3646	3664	3663
3598	1	1	6	-1	3646	3647	3665	3664
3599	1	1	6	-1	3647	3648	3666	3665
3600	1	1	6	-1	3648	3649	3667	3666
3601	1	1	6	-1	3649	3650	3668	3667
3602	1	1	6	-1	3650	3651	3669	3668
3603	1	1	6	-1	3651	3652	3670	3669
3604	1	1	6	-1	3652	3653	3671	3670
3605	1	1	6	-1	3653	3654	3672	3671
3606	1	1	6	-1	3654	3655	3673	3672
3607	1	1	6	-1	3655	3656	3674	3673
3608	1	1	6	-1	3656	3657	3675	3674
3609	1	1	6	-1	3657	3658	3676	3675
3610	1	1	6	-1	3658	2629	2642	3676
3611	1	1	6	-1	771	3659	3677	785
3612	1	1	6	-1	3659	3660	3678	3677
3613	1	1	6	-1	3660	3661	3679	3678
3614	1	1	6	-1	3661	3662	3680	3679
3615	1	1	6	-1	3662	3663	3681	3680
3616	1	1	6	-1	3663	3664	3682	3681
3617	1	1	6	-1	3664	3665	3683	3682
3618	1	1	6	-1	3665	3666	3684	3683
3619	1	1	6	-1	3666	3667	3685	3684
3620	1	1	6	-1	3667	3668	3686	3685

3621	1	1	6	-1	3668	3669	3687	3686
3622	1	1	6	-1	3669	3670	3688	3687
3623	1	1	6	-1	3670	3671	3689	3688
3624	1	1	6	-1	3671	3672	3690	3689
3625	1	1	6	-1	3672	3673	3691	3690
3626	1	1	6	-1	3673	3674	3692	3691
3627	1	1	6	-1	3674	3675	3693	3692
3628	1	1	6	-1	3675	3676	3694	3693
3629	1	1	6	-1	3676	2642	2655	3694
3630	1	1	6	-1	785	3677	3695	799
3631	1	1	6	-1	3677	3678	3696	3695
3632	1	1	6	-1	3678	3679	3697	3696
3633	1	1	6	-1	3679	3680	3698	3697
3634	1	1	6	-1	3680	3681	3699	3698
3635	1	1	6	-1	3681	3682	3700	3699
3636	1	1	6	-1	3682	3683	3701	3700
3637	1	1	6	-1	3683	3684	3702	3701
3638	1	1	6	-1	3684	3685	3703	3702
3639	1	1	6	-1	3685	3686	3704	3703
3640	1	1	6	-1	3686	3687	3705	3704
3641	1	1	6	-1	3687	3688	3706	3705
3642	1	1	6	-1	3688	3689	3707	3706
3643	1	1	6	-1	3689	3690	3708	3707
3644	1	1	6	-1	3690	3691	3709	3708
3645	1	1	6	-1	3691	3692	3710	3709
3646	1	1	6	-1	3692	3693	3711	3710
3647	1	1	6	-1	3693	3694	3712	3711
3648	1	1	6	-1	3694	2655	2668	3712

E-1503.5. HIPOTESIS DE CARGA CONSIDERADAS EN EL MODELO 3D

HIPOTESIS 1: PESO PROPIO (PESO ESPECIFICO 2.5 t/m³)	HIPOTESIS 4: EMPUJE DEL TERRENO DEBIDO A UNA SOBRECARGA DE 3 T/M² 	HIPOTESIS 7: TREN LM-71 
HIPOTESIS 2: CARGA MUERTA (PESO DE BALASTO, TRAVESAS Y CARRILES) q = 2.19 T/m²	HIPOTESIS 5: TREN TIPO B (2 x 12 t/m) 	HIPOTESIS 8: TREN TIPO SW/0 
HIPOTESIS 3: EMPUJE DEL TERRENO 	HIPOTESIS 6: TREN TIPO A 	HIPOTESIS 9: TREN TIPO SW/2 



E-1503.5

RESULTADOS COSMOS. Esfuerzos característicos en hastiales y dintel.**Proyecto : L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV****Estructura: E-1503.5**

Hipotesis----> Elem	PESO PROPIO			CARGA MUERTA			EMPUJE TIERRAS			EMPUJE SC			TREN TIPO B			TREN TIPO A			TREN LM-71			TREN SW/0			TREN SW/2		
	NX	MX	VX	NX	MX	VX	NX	MX	VX	NX	MX	VX	NX	MX	VX	NX	MX	VX	NX	MX	VX	NX	MX	VX	NX	MX	VX
	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)
248	-20.4	14.8	-1.6	-9.3	5.7	0.3	-0.2	4.3	-13.6	-0.1	1.8	-4.5	-8.4	4.8	0.5	-7.6	3.8	1.1	-9.5	5.3	0.8	-9.3	5.3	0.6	-10.4	6.0	0.6
249	-19.5	14.0	-1.6	-9.3	5.8	0.3	-0.2	-1.6	-10.5	-0.1	-0.2	-3.7	-8.6	5.1	0.5	-7.7	4.3	1.1	-9.8	5.7	0.8	-9.5	5.6	0.6	-10.7	6.3	0.6
250	-18.7	13.3	-1.6	-9.3	6.0	0.3	-0.2	-6.1	-7.6	-0.1	-1.8	-3.0	-8.8	5.3	0.5	-7.9	4.8	1.1	-10.0	6.0	0.8	-9.7	5.8	0.6	-11.0	6.6	0.6
251	-17.8	12.5	-1.6	-9.3	6.2	0.3	-0.2	-9.2	-5.0	-0.1	-3.1	-2.3	-9.0	5.5	0.5	-8.1	5.3	1.1	-10.3	6.4	0.8	-10.0	6.1	0.6	-11.3	6.9	0.6
252	-16.9	11.8	-1.6	-9.4	6.4	0.3	-0.2	-11.1	-2.6	-0.1	-4.1	-1.5	-9.3	5.7	0.5	-8.3	5.8	1.1	-10.6	6.7	0.8	-10.3	6.3	0.6	-11.6	7.1	0.7
253	-16.0	11.0	-1.5	-9.4	6.5	0.4	-0.2	-11.9	-0.5	-0.1	-4.7	-0.8	-9.5	6.0	0.6	-8.5	6.3	1.2	-10.8	7.1	0.9	-10.6	6.6	0.6	-11.9	7.4	0.7
254	-15.1	10.3	-1.5	-9.4	6.7	0.4	-0.2	-11.7	1.4	-0.1	-4.9	-0.1	-9.8	6.2	0.6	-8.8	6.9	1.2	-11.2	7.5	0.9	-10.9	6.9	0.7	-12.3	7.7	0.8
255	-14.2	9.5	-1.5	-9.4	6.9	0.4	-0.2	-10.6	3.0	-0.1	-4.7	0.7	-10.2	6.5	0.7	-9.0	7.5	1.3	-11.5	7.9	1.0	-11.3	7.2	0.7	-12.7	8.1	0.8
256	-13.3	8.8	-1.5	-9.4	7.1	0.4	-0.2	-8.8	4.4	-0.1	-4.2	1.4	-10.6	6.8	0.7	-9.3	8.1	1.4	-11.9	8.4	1.1	-11.7	7.5	0.8	-13.2	8.5	0.9
257	-12.4	8.0	-1.5	-9.4	7.3	0.4	-0.2	-6.3	5.5	-0.1	-3.3	2.1	-11.0	7.2	0.8	-9.6	8.8	1.5	-12.4	9.0	1.2	-12.2	8.0	0.9	-13.7	9.0	1.1
258	-11.4	7.3	-1.5	-9.4	7.5	0.4	-0.2	-3.3	6.5	-0.1	-2.1	2.9	-11.5	7.7	1.0	-9.9	9.6	1.6	-13.0	9.6	1.4	-12.7	8.5	1.1	-14.4	9.6	1.2
259	-10.5	6.6	-1.4	-9.4	7.7	0.4	-0.2	0.0	7.1	-0.1	-0.5	3.6	-12.1	8.3	1.1	-10.3	10.5	1.8	-13.6	10.5	1.6	-13.4	9.1	1.3	-15.1	10.3	1.4
260	-9.6	5.8	-1.4	-9.4	7.9	0.4	-0.1	3.6	7.6	-0.1	1.4	4.3	-12.8	8.9	1.2	-10.8	11.5	1.9	-14.3	11.4	1.7	-14.2	9.9	1.4	-16.0	11.2	1.5
365	-20.6	14.8	-1.6	-9.4	5.6	0.3	-0.1	4.3	-13.6	-0.1	1.9	-4.5	-8.5	4.7	0.7	-7.6	3.6	1.3	-9.6	5.1	1.0	-9.4	5.2	0.8	-10.5	5.8	0.9
366	-19.7	14.0	-1.5	-9.4	5.8	0.3	-0.1	-1.6	-10.5	-0.1	-0.2	-3.7	-8.8	5.0	0.7	-7.9	4.2	1.3	-10.0	5.5	1.0	-9.7	5.5	0.7	-10.9	6.2	0.8
367	-18.7	13.3	-1.5	-9.4	6.0	0.4	-0.1	-6.1	-7.6	-0.1	-1.8	-3.0	-9.1	5.2	0.6	-8.2	4.7	1.3	-10.3	6.0	1.0	-10.0	5.8	0.7	-11.3	6.5	0.8
368	-17.8	12.5	-1.5	-9.4	6.2	0.4	-0.1	-9.2	-5.0	-0.1	-3.1	-2.3	-9.4	5.5	0.7	-8.4	5.3	1.3	-10.7	6.4	1.0	-10.3	6.1	0.7	-11.7	6.8	0.8
369	-16.9	11.8	-1.5	-9.4	6.3	0.4	-0.1	-11.1	-2.6	-0.1	-4.1	-1.5	-9.7	5.8	0.7	-8.7	5.9	1.3	-11.0	6.8	1.0	-10.7	6.4	0.8	-12.1	7.2	0.8
370	-16.0	11.0	-1.5	-9.4	6.5	0.4	-0.1	-11.9	-0.5	-0.1	-4.7	-0.8	-10.0	6.1	0.7	-9.0	6.5	1.4	-11.4	7.2	1.1	-11.1	6.7	0.8	-12.5	7.6	0.9
371	-15.1	10.3	-1.5	-9.4	6.7	0.4	-0.1	-11.7	1.4	-0.1	-4.9	-0.1	-10.3	6.4	0.8	-9.3	7.1	1.4	-11.8	7.7	1.1	-11.4	7.1	0.9	-12.9	8.0	1.0
372	-14.2	9.5	-1.5	-9.4	6.9	0.4	-0.1	-10.6	3.0	-0.1	-4.7	0.7	-10.7	6.7	0.8	-9.6	7.8	1.5	-12.2	8.3	1.2	-11.8	7.5	0.9	-13.3	8.4	1.0
373	-13.3	8.8	-1.5	-9.4	7.1	0.4	-0.1	-8.8	4.4	-0.1	-4.2	1.4	-11.1	7.2	0.9	-10.0	8.5	1.6	-12.6	8.9	1.3	-12.2	7.9	1.0	-13.8	8.9	1.1
374	-12.4	8.0	-1.5	-9.4	7.3	0.4	-0.1	-6.3	5.6	-0.1	-3.3	2.1	-11.4	7.7	1.0	-10.4	9.4	1.7	-13.0	9.6	1.4	-12.6	8.5	1.1	-14.2	9.6	1.3
375	-11.5	7.3	-1.5	-9.4	7.5	0.4	-0.1	-3.3	6.5	-0.1	-2.1	2.9	-11.7	8.2	1.1	-10.8	10.3	1.9	-13.5	10.4	1.6	-13.0	9.1	1.2	-14.6	10.3	1.4
376	-10.6	6.5	-1.5	-9.4	7.6	0.4	-0.1	0.0	7.2	-0.1	-0.5	3.6	-12.0	8.9	1.2	-11.2	11.4	2.0	-13.8	11.3	1.7	-13.3	9.8	1.3	-14.9	11.1	1.5
377	-9.7	5.8	-1.5	-9.4	7.8	0.4	-0.1	3.7	7.6	0.0	1.5	4.4	-12.1	9.6	1.2	-11.6	12.6	2.0	-14.1	12.2	1.7	-13.3	10.6	1.3	-15.0	12.0	1.5
1103	1.4	3.5	-8.6	-0.5	5.9	-8.9	-7.7	5.5	-0.1	-4.7	2.5	0.0	-1.1	6.8	-11.8	-1.7	9.8	-10.4	-1.5	9.0	-13.4	-1.2	7.5	-13.0	-1.3	8.4	-14.6
1104	1.4	-0.3	-7.5	-0.5	2.0	-8.0	-7.8	5.5	-0.1	-4.7	2.5	0.0	-1.0	2.2	-9.9	-1.7	5.6	-10.1	-1.4	3.6	-12.0	-1.1	2.4	-10.9	-1.3	2.8	-12.3
1105	1.4	-3.5	-6.4	-0.5	-1.5	-7.0	-7.8	5.5	-0.1	-4.8	2.5	0.0	-1.0	-1.6	-8.6	-1.6	1.5	-10.4	-1.4	-1.1	-11.4	-1.1	-1.7	-9.5	-1.2	-1.9	-10.7
1106	1.4	-6.3	-5.4	-0.6	-4.5	-5.9	-7.9	5.5	-0.1	-4.8	2.5	0.0	-0.9	-4.8	-7.3	-1.6	-2.9	-10.8	-1.3	-5.6	-10.1	-1.0	-5.3	-8.1	-1.2	-6.0	-9.1
1107	1.4	-8.6	-4.5	-0.6	-7.0	-4.9	-8.0	5.5	-0.1	-4.8	2.5	0.0	-0.9	-7.6	-6.0	-1.6	-7.4	-11.1	-1.3	-9.4	-8.2	-1.0	-8.4	-6.6	-1.1	-9.4	-7.4
1108	1.4	-10.5	-3.6	-0.6	-9.1	-4.0	-8.0	5.5	0.0	-4.9	2.5	0.0	-0.9	-9.8	-4.7	-1.6	-11.8	-9.9	-1.3	-12.4	-6.3	-1.0	-10.8	-5.2	-1.1	-12.2	-5.8
1109	1.4	-11.9	-2.7	-0.6	-10.7	-3.0	-8.0	5.5	0.0	-4.9	2.5	0.0	-0.9	-11.4	-3.5	-1.5	-15.4	-7.3	-1.2	-14.6	-4.5	-0.9	-12.7	-3.8	-1.1	-14.3	-4.3
1110	1.4	-13.0	-1.8	-0.6	-11.9	-2.0	-8.1	5.5	0.0	-4.9	2.5	0.0	-0.8	-12.6	-2.3	-1.5	-17.8	-4.8	-1.2	-16.1	-2.8	-0.9	-14.0	-2.5	-1.0	-15.7	-2.9
1111	1.4	-13.6	-0.9	-0.6	-12.6	-1.0	-8.1	5.5	0.0	-4.9	2.5	0.0	-0.8	-13.3	-1.1	-1.5	-19.3	-2.4	-1.2	-16.9	-1.1	-0.9	-14.7	-1.3	-1.0	-16.6	-1.4
1112	1.4	-13.8	0.0	-0.6	-12.8	0.0	-8.1	5.4	0.0	-4.9	2.5	0.0	-0.8	-13.6	0.0	-1.5	-19.8	0.0	-1.2	-17.1	0.0	-0.9	-15.0	0.0	-1.0	-16.9	0.0
1274	1.5	3.4	-8.7	-0.4	5.9	-9.0	-7.8	5.5	-0.1	-4.7	2.5	0.0	-1.0	7.4	-11.2	-1.8	10.7	-11.1	-1.5	9.7	-13.3	-1.1	8.2	-12.4	-1.3	9.2	-13.9
1275	1.4	-0.3	-7.5	-0.5	1.9	-8.0	-7.9	5.5	-0.1	-4.8	2.5	0.0	-1.1	2.8	-9.8	-1.8	6.1	-10.7	-1.5	4.2	-12.1	-1.2	3.1	-10.8	-1.3	3.5	-12.2
1276	1.4	-3.5	-6.4	-0.5	-1.5	-7.0	-7.9	5.5	-0.1	-4.8	2.5	0.0	-1.1	-1.2	-8.6	-1.8	1.6	-10.8	-1.5	-0.9	-11.2	-1.2	-1.4	-9.6	-1.3	-1.5	-10.8
1277	1.4	-6.3	-5.4	-0.5	-4.5	-6.0	-8.0	5.5	-0.1	-4.9	2.5	0.0	-1.1	-4.7	-7.5	-1.8	-3.1	-10.8	-1.5	-5.5	-10.0	-1.2	-5.2	-8.3	-1.3	-5.9	-9.4
1278	1.4	-8.6	-4.5	-0.5	-7.0	-5.0	-8.0	5.5	0.0	-4.9	2.5	0.0	-1.1	-7.7	-6.3	-1.8	-7.8	-10.4	-1.5	-9.5	-8.4	-1.2	-8.5	-6.9	-1.4	-9.6	-7.8
1279	1.4	-10.5	-3.6	-0.6	-9.1	-4.0	-8.0	5.5	0.0	-4.9	2.5	0.0	-1.1	-10.1	-5.0	-1.8	-12.1	-9.1	-1.5	-12.7	-6.6	-1.2	-11.1	-5.5	-1.3	-12.6	-6.2
1280	1.4	-11.9	-2.7	-0.6	-10.7	-3.0	-8.1	5.4	0.0	-4.9	2.5	0.0	-1.1	-11.9	-3.7	-1.8	-15.8	-7.1	-1.5	-15.1	-4.9	-1.2	-13.2	-4.1	-1.3	-14.8	-4.7
1281	1.4	-13.0	-1.8	-0.6	-11.9	-2.0	-8.1	5.4	0.0	-4.9	2.5	0.0	-1.1	-13.2	-2.5	-1.8	-18.4	-4.8	-1.5	-16.8	-3.1	-1.2	-14.6	-2.8	-1.3	-16.5	-3.1
1282	1.4	-13.6	-0.9	-0.6	-12.6	-1.0	-8.1	5.4	0.0	-5.0	2.5	0.0	-1.1	-14.0	-1.2	-1.8	-20.0	-2.4	-1.5	-17.7	-1.5	-1.2	-15.5	-1.4	-1.3	-17.4	-1.5
1283	1.4	-13.8	0.0	-0.6	-12.8	0.0	-8.1	5.4	0.0	-5.0	2.5	0.0	-1.1	-14.2	0.0	-1.8	-20.6	0.0	-1.5	-18.0	0.0	-1.2	-15.7	0.0	-1.3	-17.7	0.0

RESULTADOS COSMOS. Esfuerzos característicos en solera.

Proyecto : L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
 Estructura: E-1503.5

Hipotesis----> Elem	PESO PROPIO			CARGA MUERTA			EMPUJE TIERRAS			EMPUJE SC			TREN TIPO B			TREN TIPO A			TREN LM-71			TREN SW/0			TREN SW/2		
	NX	MX	VX	NX	MX	VX	NX	MX	VX	NX	MX	VX	NX	MX	VX	NX	MX	VX	NX	MX	VX	NX	MX	VX	NX	MX	VX
	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)
2927	-1.7	-10.6	19.8	0.3	-3.5	8.8	-15.2	-7.6	0.2	-4.8	-2.9	0.1	0.5	-2.9	7.8	1.1	-1.9	7.0	0.8	-3.1	8.9	0.6	-3.2	8.6	0.7	-3.6	9.7
2928	-1.7	-2.0	17.5	0.3	0.3	7.8	-15.3	-7.5	0.2	-4.9	-2.9	0.1	0.5	0.5	6.9	1.1	1.2	6.2	0.8	0.8	7.8	0.6	0.5	7.6	0.6	0.6	8.6
2929	-1.8	5.6	15.2	0.2	3.7	6.8	-15.4	-7.5	0.2	-4.9	-2.9	0.1	0.5	3.4	6.0	1.1	3.9	5.4	0.8	4.2	6.8	0.5	3.8	6.6	0.6	4.3	7.4
2930	-1.8	12.2	13.0	0.2	6.6	5.8	-15.6	-7.4	0.2	-5.0	-2.9	0.1	0.5	6.0	5.1	1.1	6.2	4.6	0.7	7.1	5.8	0.5	6.6	5.6	0.6	7.5	6.3
2931	-1.9	17.7	10.7	0.2	9.1	4.8	-15.6	-7.4	0.2	-5.0	-2.8	0.1	0.4	8.2	4.2	1.1	8.1	3.8	0.7	9.6	4.8	0.5	9.0	4.7	0.5	10.2	5.2
2932	-1.9	22.2	8.5	0.2	11.1	3.8	-15.7	-7.3	0.1	-5.0	-2.8	0.1	0.4	9.9	3.4	1.1	9.7	3.0	0.7	11.6	3.8	0.5	11.0	3.7	0.5	12.4	4.2
2933	-1.9	25.7	6.4	0.2	12.7	2.8	-15.8	-7.3	0.1	-5.0	-2.8	0.0	0.4	11.3	2.5	1.0	10.9	2.3	0.7	13.1	2.9	0.5	12.5	2.8	0.5	14.1	3.1
2934	-1.9	28.1	4.2	0.2	13.8	1.9	-15.8	-7.3	0.1	-5.0	-2.8	0.0	0.4	12.3	1.7	1.0	11.8	1.5	0.7	14.2	1.9	0.5	13.6	1.8	0.5	15.3	2.1
2935	-1.9	29.6	2.1	0.2	14.4	0.9	-15.8	-7.2	0.0	-5.1	-2.8	0.0	0.4	12.9	0.8	1.0	12.3	0.7	0.7	14.9	0.9	0.5	14.2	0.9	0.5	16.0	1.0
2936	-1.9	30.1	0.0	0.2	14.7	0.0	-15.9	-7.2	0.0	-5.1	-2.8	0.0	0.4	13.0	0.0	1.0	12.5	0.0	0.7	15.1	0.0	0.5	14.4	0.0	0.5	16.3	0.0
3098	-1.6	-10.6	19.9	0.3	-3.5	8.9	-15.3	-7.6	0.1	-4.9	-2.9	0.1	0.7	-2.7	7.8	1.4	-1.7	7.0	1.1	-2.8	8.9	0.8	-3.0	8.6	0.9	-3.4	9.7
3099	-1.7	-1.9	17.6	0.3	0.4	7.8	-15.4	-7.6	0.2	-4.9	-2.9	0.1	0.7	0.6	6.9	1.3	1.4	6.2	1.0	1.0	7.8	0.8	0.7	7.6	0.9	0.8	8.5
3100	-1.7	5.7	15.3	0.3	3.7	6.8	-15.5	-7.5	0.2	-5.0	-2.9	0.1	0.7	3.6	6.0	1.3	4.0	5.4	1.0	4.3	6.8	0.7	4.0	6.6	0.8	4.5	7.4
3101	-1.8	12.2	13.0	0.3	6.7	5.8	-15.6	-7.4	0.2	-5.0	-2.9	0.1	0.6	6.1	5.1	1.3	6.3	4.6	1.0	7.2	5.8	0.7	6.8	5.6	0.8	7.6	6.3
3102	-1.8	17.7	10.8	0.3	9.1	4.8	-15.7	-7.4	0.2	-5.0	-2.8	0.1	0.6	8.2	4.2	1.3	8.2	3.8	0.9	9.6	4.8	0.7	9.1	4.6	0.7	10.3	5.2
3103	-1.8	22.2	8.6	0.2	11.1	3.8	-15.8	-7.3	0.1	-5.0	-2.8	0.1	0.6	10.0	3.3	1.2	9.8	3.0	0.9	11.6	3.8	0.6	11.0	3.7	0.7	12.4	4.2
3104	-1.9	25.6	6.4	0.2	12.7	2.8	-15.9	-7.3	0.1	-5.1	-2.8	0.0	0.6	11.3	2.5	1.2	11.0	2.3	0.9	13.2	2.8	0.6	12.5	2.8	0.7	14.1	3.1
3105	-1.9	28.1	4.3	0.2	13.8	1.9	-15.9	-7.2	0.1	-5.1	-2.8	0.0	0.5	12.3	1.7	1.2	11.8	1.5	0.9	14.2	1.9	0.6	13.6	1.8	0.7	15.3	2.1
3106	-1.9	29.6	2.1	0.2	14.4	0.9	-16.0	-7.2	0.0	-5.1	-2.8	0.0	0.5	12.9	0.8	1.2	12.4	0.7	0.9	14.9	0.9	0.6	14.2	0.9	0.7	16.0	1.0
3107	-1.9	30.1	0.0	0.2	14.6	0.0	-16.0	-7.2	0.0	-5.1	-2.8	0.0	0.5	13.1	0.0	1.2	12.5	0.0	0.9	15.1	0.0	0.6	14.4	0.0	0.7	16.3	0.0

RESULTADOS COSMOS. Tensiones en cimentación.

Proyecto : L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
 Estructura: E-1503.5

Hipotesis----> Elem	PESO PROPIO	CARGA MUERTA	EMPUJE TIERRAS	EMPUJE SC	TREN TIPO B	TREN TIPO A	TREN LM-71	TREN SW/0	TREN SW/2
	Tensión cim. (T/m²)	Tensión cim. (T/m²)	Tensión cim. (T/m²)	Tensión cim. (T/m²)	Tensión cim. (T/m²)	Tensión cim. (T/m²)	Tensión cim. (T/m²)	Tensión cim. (T/m²)	Tensión cim. (T/m²)
2927	7.4	2.3	0.0	0.0	2.1	1.9	2.4	2.3	2.6
2928	7.4	2.3	0.0	0.0	2.0	1.9	2.5	2.3	2.5
2929	7.3	2.3	0.0	0.0	2.0	1.8	2.5	2.2	2.5
2930	7.2	2.2	0.1	0.0	2.0	1.8	2.6	2.2	2.5
2931	7.1	2.2	0.1	0.0	1.9	1.8	2.7	2.1	2.4
2932	7.1	2.2	0.1	0.0	1.9	1.7	2.7	2.1	2.4
2933	7.0	2.1	0.1	0.0	1.9	1.7	2.7	2.1	2.4
2934	7.0	2.1	0.1	0.0	1.9	1.7	2.8	2.1	2.3
2935	7.0	2.1	0.1	0.0	1.9	1.7	2.8	2.1	2.3
2936	7.0	2.1	0.1	0.0	1.9	1.7	2.8	2.1	2.3
3098	7.4	2.3	0.0	0.0	2.1	1.9	2.4	2.3	2.6
3099	7.4	2.3	0.0	0.0	2.0	1.9	2.5	2.3	2.5
3100	7.3	2.3	0.0	0.0	2.0	1.8	2.6	2.2	2.5
3101	7.2	2.2	0.1	0.0	2.0	1.8	2.6	2.2	2.5
3102	7.1	2.2	0.1	0.0	1.9	1.8	2.7	2.1	2.4
3103	7.1	2.2	0.1	0.0	1.9	1.7	2.7	2.1	2.4
3104	7.0	2.1	0.1	0.0	1.9	1.7	2.8	2.1	2.4
3105	7.0	2.1	0.1	0.0	1.9	1.7	2.8	2.1	2.3
3106	7.0	2.1	0.1	0.0	1.9	1.7	2.8	2.1	2.3
3107	7.0	2.1	0.1	0.0	1.9	1.7	2.8	2.1	2.3

CÁLCULO DE ARMADURAS

Proyecto: L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
Estructura: E-1503.5

Notación: PP= Peso propio
CM= Carga muerta de traviesas, carriles y balasto
E.t= Empuje de tierras

E.sc= Empuje de tierras debido a una sobrecarga de 3 t/m²
Tren A= Tren de cargas tipo A de la norma española.
Tren B= Tren de cargas tipo B de la norma española.

LM-71= Load model 71 del Eurocodigo 1
SW/0= Tren pesado tipo SW/0 del Eurocodigo 1
SW/2= Tren pesado tipo SW/2 del Eurocodigo 1

Envoltorio de M(+) en E.L.U. (Tracciones en cara interior de hastiales y dintel e inferior en solera).

Sección	Situación al.	Elemento	Cálculo	Coeficientes				Nd	Md
				PP+CM	E,t	E,sc	Sobrecarga	T/m	mT/m
Empotramiento inferior de hastial	Eje de vía	248	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	-26.77	-18.42
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	-26.77	-18.42
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-29.84	-24.75
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-29.84	-24.75
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-29.84	-24.75
	Eje de estructura	365	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	-26.89	-18.37
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	-26.89	-18.37
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-30.12	-24.72
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-30.12	-24.72
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-30.12	-24.72
			Combinación pésima. Cálculo 1. Tren A						

Media del hastial	Eje de vía	254	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-22.35	-6.02
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-22.35	-4.47
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-24.76	-9.87
			Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-24.76	-8.58
			Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-24.76	-10.34
	Eje de estructura	371	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-22.34	-6.47
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-22.34	-4.84
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-24.76	-10.29
			Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-24.76	-8.95
			Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-24.76	-10.76
			Combinación pésima. Cálculo 1. Tren B						

Empotramiento superior de hast	Eje de vía	260	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	-17.08	-12.33
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	-17.08	-12.33
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-19.12	-17.33
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-19.12	-17.33
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-19.12	-17.33
	Eje de estructura	377	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	-17.21	-12.27
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	-17.21	-12.27
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-19.22	-17.31
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-19.22	-17.31
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-19.22	-17.31
			Combinación pésima. Cálculo 1. Tren A						

Empotramiento de dintel	Eje de vía	1103	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	0.81	-8.43
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	0.81	-8.43
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-6.82	-14.86
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-6.82	-14.86
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-6.82	-14.86
	Eje de estructura	1274	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	0.93	-8.37
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	0.93	-8.37
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-6.76	-14.83
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-6.76	-14.83
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-6.76	-14.83
			Combinación pésima. Cálculo 1. Tren A						

Centro de dintel	Eje de vía	1112	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	-2.16	84.34
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-0.64	70.41
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-9.57	67.54
			Cálculo 2. SW/0	1.35	1.00	0.00	1.45	-8.96	63.06
			Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-8.82	60.88
	Eje de estructura	1283	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	-2.90	86.13
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-1.23	71.91
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-10.34	69.58
			Cálculo 2. SW/0	1.35	1.00	0.00	1.45	-9.84	64.68
			Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-9.46	62.38
			Combinación pésima. Cálculo 1. Tren A						

Empotramiento solera	Eje de vía	2927	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	-29.62	41.25
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-30.99	43.54
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-27.17	39.96
			Cálculo 2. SW/0	1.35	1.35	1.35	1.45	-27.69	40.28
			Cálculo 2. SW/2	1.35	1.35	1.35	1.20	-27.78	39.82
	Eje de estructura	3098	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	-29.07	40.69
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-30.53	43.07
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-26.62	39.41
			Cálculo 2. SW/0	1.35	1.35	1.35	1.45	-27.20	39.79
			Cálculo 2. SW/2	1.35	1.35	1.35	1.20	-27.32	39.35
			Combinación pésima. Cálculo 1. Tren B						

Centro solera	Eje de vía	2936	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-32.85	-25.23
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-32.85	-25.23
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-29.88	-31.21
			Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-29.88	-31.21
			Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-29.88	-31.21
	Eje de estructura	3107	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-33.08	-25.23
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-33.08	-25.23
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-30.09	-31.20
			Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-30.09	-31.20
			Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-30.09	-31.20
			Combinación pésima. Cálculo 1. Tren A						

Envoltorio de M(+) en E.L.S. (Tracciones en cara interior de hastiales y dintel e inferior en solera).

				Coeficientes				N	M
Sección	Situación al.	Elemento	Cálculo	PP+CM	E.t	E.sc	Sobrecarga	T/m	mT/m
Empotramiento inferior de hastial	Eje de vía	248	Cálculo 1. Tren A	1.00	0.00	0.00	0.00	-29.75	-20.47
			Cálculo 1. Tren B	1.00	0.00	0.00	0.00	-29.75	-20.47
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-29.84	-24.75
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-29.84	-24.75
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-29.84	-24.75
	Eje de estructura	365	Cálculo 1. Tren A	1.00	0.00	0.00	0.00	-29.98	-20.41
			Cálculo 1. Tren B	1.00	0.00	0.00	0.00	-29.98	-20.41
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-30.12	-24.72
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-30.12	-24.72
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-30.12	-24.72
			Combinación pésima. Cálculo 1. Tren A						

Media del hastial	Eje de vía	254	Cálculo 1. Tren A	1.00	1.00	1.00	0.00	-24.68	-10.81
			Cálculo 1. Tren B	1.00	1.00	1.00	0.00	-24.68	-9.78
			Cálculo 2. LM-71	1.00	1.00	1.00	0.00	-24.68	-11.72
			Cálculo 2. SW/0	1.00	1.00	1.00	0.00	-24.68	-10.76
			Cálculo 2. SW/2	1.00	1.00	1.00	0.00	-24.68	-12.07
	Eje de estructura	371	Cálculo 1. Tren A	1.00	1.00	1.00	0.00	-24.69	-11.10
			Cálculo 1. Tren B	1.00	1.00	1.00	0.00	-24.69	-10.02
			Cálculo 2. LM-71	1.00	1.00	1.00	0.00	-24.69	-12.02
			Cálculo 2. SW/0	1.00	1.00	1.00	0.00	-24.69	-11.03
			Cálculo 2. SW/2	1.00	1.00	1.00	0.00	-24.69	-12.37
			Combinación pésima. Cálculo 1. Tren B						

Empotramiento superior de hasti	Eje de via	260	Cálculo 1. Tren A	1.00	0.00	0.00	0.00	-18.98	-13.70
			Cálculo 1. Tren B	1.00	0.00	0.00	0.00	-18.98	-13.70
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-19.12	-17.33
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-19.12	-17.33
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-19.12	-17.33
	Eje de estructura	377	Cálculo 1. Tren A	1.00	0.00	0.00	0.00	-19.12	-13.64
			Cálculo 1. Tren B	1.00	0.00	0.00	0.00	-19.12	-13.64
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-19.22	-17.31
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-19.22	-17.31
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-19.22	-17.31
Combinación pésima. Cálculo 1. Tren A								-19.12	-13.64

CALCULO DE ARMADURAS

Proyecto : L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
Estructura: E-1503.5

Notación: PP= Peso propio
CM= Carga muerta de traviesas, carriles y balasto
E.t= Empuje de tierras

E.sc= Empuje de tierras debido a una sobrecarga de 3 t/m2
Tren A= Tren de cargas tipo A de la norma española.
Tren B= Tren de cargas tipo B de la norma española.

LM-71= Load model 71 del Eurocodigo 1
SW0= Tren pesado tipo SW0 del Eurocodigo 1
SW2= Tren pesado tipo SW2 del Eurocodigo 1

Envoltorio de M(-) en E.L.U. (Tracciones en cara exterior de hastiales y dintel y superior en solera).

Sección	Situación el.	Elemento	Cálculo	Coeficientes				Nd T/m	Md mT/m
				PP+CM	E.t	E.sc	Sobrecarga		
Empotramiento inferior de hastial	Eje de vía	248	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	-62.04	-48.38
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-63.85	-50.74
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-61.26	-47.42
			Cálculo 2. SW0	1.35	1.35	1.35	1.45	-60.64	-47.49
			Cálculo 2. SW2	1.35	1.35	1.35	1.20	-59.29	-46.71
			Cálculo 1. Tren A	1.50	1.50	1.50	1.50	-62.47	-47.92
	Eje de estructura	365	Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-64.31	-50.35
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-61.71	-46.96
			Cálculo 2. SW0	1.35	1.35	1.35	1.45	-61.08	-47.08
			Cálculo 2. SW2	1.35	1.35	1.35	1.20	-59.71	-46.33
			Combinación pésima. Cálculo 1. Tren B						

Media del hastial	Eje de vía	254	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	-56.38	-25.49
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-58.82	-25.49
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-57.46	-11.29
			Cálculo 2. SW0	1.35	1.00	0.00	1.45	-56.83	-11.29
			Cálculo 2. SW2	1.35	1.00	0.00	1.20	-55.25	-11.29
	Eje de estructura	371	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	-57.66	-25.46
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-59.99	-25.46
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-58.80	-11.25
			Cálculo 2. SW0	1.35	1.00	0.00	1.45	-58.06	-11.25
			Cálculo 2. SW2	1.35	1.00	0.00	1.20	-56.38	-11.25
			Combinación pésima. Cálculo 1. Tren A						

Empotramiento superior de hastial	Eje de vía	260	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	-53.06	-54.12
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-57.65	-48.29
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-57.09	-50.09
			Cálculo 2. SW0	1.35	1.35	1.35	1.45	-56.74	-46.86
			Cálculo 2. SW2	1.35	1.35	1.35	1.20	-54.67	-45.41
	Eje de estructura	377	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	-55.09	-56.37
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-56.02	-49.71
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-56.64	-51.92
			Cálculo 2. SW0	1.35	1.35	1.35	1.45	-55.01	-48.37
			Cálculo 2. SW2	1.35	1.35	1.35	1.20	-53.06	-46.83
			Combinación pésima. Cálculo 1. Tren A						

Empotramiento de dintel	Eje de vía	1103	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	-21.08	-48.18
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-19.65	-41.23
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-18.73	-42.91
			Cálculo 2. SW0	1.35	1.35	1.35	1.45	-18.09	-39.67
			Cálculo 2. SW2	1.35	1.35	1.35	1.20	-17.91	-38.58
	Eje de estructura	1274	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	-21.35	-50.09
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-19.56	-42.69
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-18.70	-44.59
			Cálculo 2. SW0	1.35	1.35	1.35	1.45	-17.99	-41.23
			Cálculo 2. SW2	1.35	1.35	1.35	1.20	-17.83	-40.04
			Combinación pésima. Cálculo 1. Tren A						

Centro de dintel	Eje de vía	1112	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-18.74	12.05
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-18.74	12.05
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-16.71	15.90
			Cálculo 2. SW0	1.00	1.35	1.35	0.00	-16.71	15.90
			Cálculo 2. SW2	1.00	1.35	1.35	0.00	-16.71	15.90
	Eje de estructura	1283	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-18.91	12.06
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-18.91	12.06
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-16.87	15.91
			Cálculo 2. SW0	1.00	1.35	1.35	0.00	-16.87	15.91
			Cálculo 2. SW2	1.00	1.35	1.35	0.00	-16.87	15.91
			Combinación pésima. Cálculo 1. Tren A						

Empotramiento solera	Eje de vía	2927	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	-1.28	12.74
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	-1.28	12.74
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-16.60	21.74
			Cálculo 2. SW0	1.00	1.00	0.00	0.00	-16.60	21.74
			Cálculo 2. SW2	1.00	1.00	0.00	0.00	-16.60	21.74
	Eje de estructura	3098	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	-1.15	12.66
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	-1.15	12.66
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-16.56	21.70
			Cálculo 2. SW0	1.00	1.00	0.00	0.00	-16.56	21.70
			Cálculo 2. SW2	1.00	1.00	0.00	0.00	-16.56	21.70
			Combinación pésima. Cálculo 1. Tren A						

Centro solera	Eje de vía	2936	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	-0.14	-95.29
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-1.55	-96.48
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-16.57	-86.03
			Cálculo 2. SW0	1.35	1.00	0.00	1.45	-17.09	-84.53
			Cálculo 2. SW2	1.35	1.00	0.00	1.20	-17.16	-82.43
	Eje de estructura	3107	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	0.17	-95.24
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-1.31	-96.41
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-16.37	-86.00
			Cálculo 2. SW0	1.35	1.00	0.00	1.45	-16.93	-84.52
			Cálculo 2. SW2	1.35	1.00	0.00	1.20	-17.02	-82.40
			Combinación pésima. Cálculo 1. Tren B						

Envoltorio de M(-) en E.L.S. (Tracciones en cara exterior de hastiales y dintel y superior en solera).

Sección	Situación el.	Elemento	Cálculo	Coeficientes				N T/m	M mT/m
				PP+CM	E.t	E.sc	Sobrecarga		
Empotramiento inferior de hastial	Eje de vía	248	Cálculo 1. Tren A	1.00	1.00	1.00	1.00	-41.36	-32.25
			Cálculo 1. Tren B	1.00	1.00	1.00	1.00	-42.57	-33.82
			Cálculo 2. LM-71	1.00	1.00	1.00	1.00	-44.32	-34.54
			Cálculo 2. SW0	1.00	1.00	1.00	1.00	-43.89	-34.59
			Cálculo 2. SW2	1.00	1.00	1.00	1.00	-45.68	-35.60
	Eje de estructura	365	Cálculo 1. Tren A	1.00	1.00	1.00	1.00	-41.64	-31.84
			Cálculo 1. Tren B	1.00	1.00	1.00	1.00	-42.87	-33.57
			Cálculo 2. LM-71	1.00	1.00	1.00	1.00	-44.64	-34.22
			Cálculo 2. SW0	1.00	1.00	1.00	1.00	-44.21	-34.30
			Cálculo 2. SW2	1.00	1.00	1.00	1.00	-45.99	-35.28
			Combinación pésima. Cálculo 2. SW2						

Media del hastial	Eje de vía	254	Cálculo 1. Tren A	1.00	0.00	0.00	1.00	-37.58	-18.99
			Cálculo 1. Tren B	1.00	0.00	0.00	1.00	-39.21	-16.99
			Cálculo 2. LM-71	1.00	1.00	0.00	1.00	-41.36	-5.34
			Cálculo 2. SW0	1.00	1.00	0.00	1.00	-40.93	-5.34
			Cálculo 2. SW2	1.00	1.00	0.00	1.00	-43.01	-5.34
	Eje de estructura	371	Cálculo 1. Tren A	1.00	0.00	0.00	1.00	-38.44	-16.97
			Cálculo 1. Tren B	1.00	0.00	0.00	1.00	-40.00	-16.97
			Cálculo 2. LM-71	1.00	1.00	0.00	1.00	-42.28	-5.31
			Cálculo 2. SW0	1.00	1.00	0.00	1.00	-41.77	-5.31
			Cálculo 2. SW2	1.00	1.00	0.00	1.00	-43.95	-5.31
			Combinación pésima. Cálculo 1. Tren A						

Empotramiento superior de hasti	Eje de via	260	Cálculo 1. Tren A	1.00	1.00	1.00	1.00	-35.37	-36.08
			Cálculo 1. Tren B	1.00	1.00	1.00	1.00	-38.43	-32.19
			Cálculo 2. LM-71	1.00	1.00	1.00	1.00	-40.70	-35.84
			Cálculo 2. SW0	1.00	1.00	1.00	1.00	-40.46	-33.61
			Cálculo 2. SW2	1.00	1.00	1.00	1.00	-43.16	-35.49
	Eje de estructura	377	Cálculo 1. Tren A	1.00	1.00	1.00	1.00	-36.73	-37.58
			Cálculo 1. Tren B	1.00	1.00	1.00	1.00	-37.34	-33.14
			Cálculo 2. LM-71	1.00	1.00	1.00	1.00	-40.39	-37.10
			Cálculo 2. SW0	1.00	1.00	1.00	1.00	-39.26	-34.66
			Cálculo 2. SW2	1.00	1.00	1.00	1.00	-41.80	-36.68
Combinación pesima. Cálculo 1. Tren A								-36.73	-37.58

CÁLCULO DE ARMADURAS

Proyecto: L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
Estructura: E-1503.5

Notación: PP= Peso propio
CM= Carga muerta de traviesas, carriles y balasto
E.t= Empuje de tierras

E.sc= Empuje de tierras debido a una sobrecarga de 3 t/m2
Tren A= Tren de cargas tipo A de la norma española.
Tren B= Tren de cargas tipo B de la norma española.

LM-71= Load model 71 del Eurocodigo 1
SW/0= Tren pesado tipo SW/0 del Eurocodigo 1
SW/2= Tren pesado tipo SW/2 del Eurocodigo 1

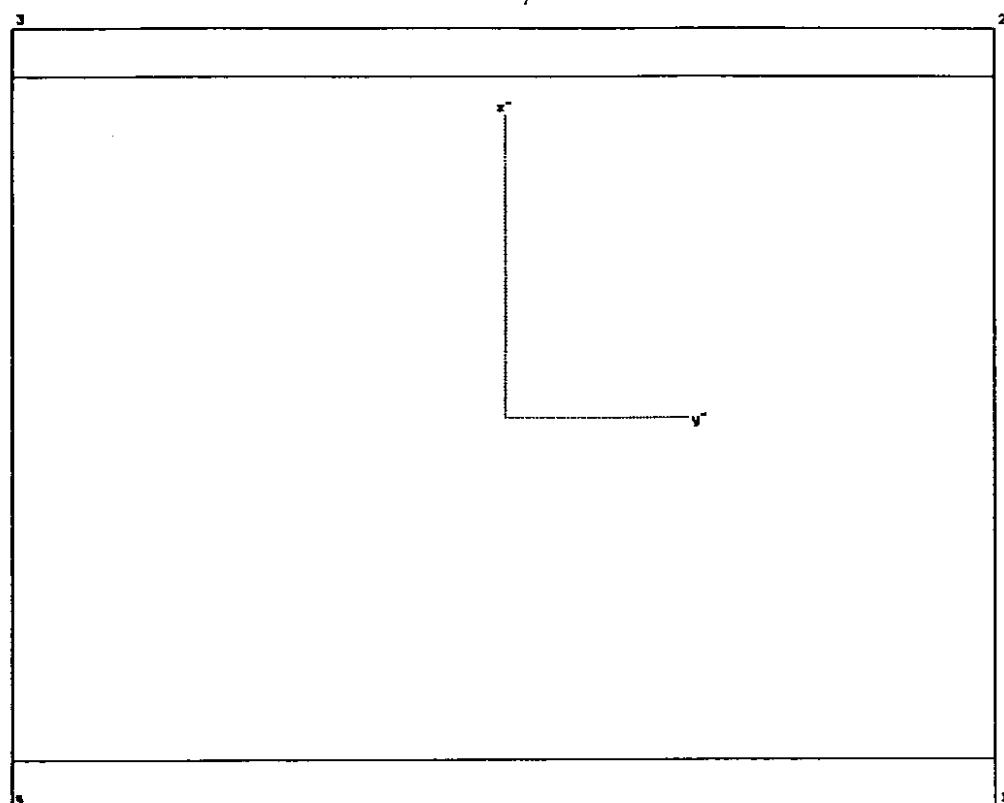
Envolvente de V(+) en E.L.U.

Sección	Situación el.	Elemento	Cálculo	Coeficientes				Vd mT/m
				PP+CM	E.t	E.sc	Sobrecarga	
Empotramiento inferior de hastial	Eje de vía	248	Cálculo 1. Tren A	0.90	0.00	0.00	1.50	1.36
			Cálculo 1. Tren B	0.90	0.00	0.00	1.50	0.01
			Cálculo 2. LM-71	1.00	1.00	0.00	1.45	-13.08
			Cálculo 2. SW/0	1.00	1.00	0.00	1.45	-13.59
			Cálculo 2. SW/2	1.00	1.00	0.00	1.20	-13.68
	Eje de estructura	365	Cálculo 1. Tren A	0.90	0.00	0.00	1.50	1.89
			Cálculo 1. Tren B	0.90	0.00	0.00	1.50	0.46
			Cálculo 2. LM-71	1.00	1.00	0.00	1.45	-12.59
			Cálculo 2. SW/0	1.00	1.00	0.00	1.45	-13.16
			Cálculo 2. SW/2	1.00	1.00	0.00	1.20	-13.27
Combinación pésima. Cálculo 1. Tren A								1.89
Media del hastial	Eje de vía	254	Cálculo 1. Tren A	0.90	1.50	0.00	1.50	3.75
			Cálculo 1. Tren B	0.90	1.50	0.00	1.50	2.38
			Cálculo 2. LM-71	1.00	1.35	0.00	1.45	2.69
			Cálculo 2. SW/0	1.00	1.35	0.00	1.45	2.15
			Cálculo 2. SW/2	1.00	1.35	0.00	1.20	2.05
	Eje de estructura	371	Cálculo 1. Tren A	0.90	1.50	0.00	1.50	4.22
			Cálculo 1. Tren B	0.90	1.50	0.00	1.50	2.75
			Cálculo 2. LM-71	1.00	1.35	0.00	1.45	3.14
			Cálculo 2. SW/0	1.00	1.35	0.00	1.45	2.55
			Cálculo 2. SW/2	1.00	1.35	0.00	1.20	2.42
Combinación pésima. Cálculo 1. Tren A								4.22
Empotramiento superior de hastial	Eje de vía	260	Cálculo 1. Tren A	0.90	1.50	1.50	1.50	21.14
			Cálculo 1. Tren B	0.90	1.50	1.50	1.50	19.88
			Cálculo 2. LM-71	1.00	1.35	1.35	1.45	18.88
			Cálculo 2. SW/0	1.00	1.35	1.35	1.45	17.99
			Cálculo 2. SW/2	1.00	1.35	1.35	1.20	17.79
	Eje de estructura	377	Cálculo 1. Tren A	0.90	1.50	1.50	1.50	21.54
			Cálculo 1. Tren B	0.90	1.50	1.50	1.50	19.60
			Cálculo 2. LM-71	1.00	1.35	1.35	1.45	18.65
			Cálculo 2. SW/0	1.00	1.35	1.35	1.45	17.87
			Cálculo 2. SW/2	1.00	1.35	1.35	1.20	17.68
Combinación pésima. Cálculo 1. Tren A								21.54
Empotramiento de dintel	Eje de vía	1103	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	-15.79
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	-15.79
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-17.63
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-17.63
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-17.63
	Eje de estructura	1274	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	-15.85
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	-15.85
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-17.69
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-17.69
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-17.69
Combinación pésima. Cálculo 1. Tren A								-15.79
Centro de dintel	Eje de vía	1112	Cálculo 1. Tren A	1.50	1.50	0.00	1.50	0.00
			Cálculo 1. Tren B	1.50	1.50	0.00	1.50	0.00
			Cálculo 2. LM-71	1.35	1.35	0.00	1.45	0.00
			Cálculo 2. SW/0	1.35	1.35	0.00	1.45	0.00
			Cálculo 2. SW/2	1.35	1.35	0.00	1.20	0.00
	Eje de estructura	1283	Cálculo 1. Tren A	1.50	1.50	0.00	1.50	0.00
			Cálculo 1. Tren B	1.50	1.50	0.00	1.50	0.00
			Cálculo 2. LM-71	1.35	1.35	0.00	1.45	0.00
			Cálculo 2. SW/0	1.35	1.35	0.00	1.45	0.00
			Cálculo 2. SW/2	1.35	1.35	0.00	1.20	0.00
Combinación pésima. Cálculo 1. Tren A								0.00
Empotramiento solera	Eje de vía	2927	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	59.10
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	80.78
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	58.23
			Cálculo 2. SW/0	1.35	1.35	1.35	1.45	57.66
			Cálculo 2. SW/2	1.35	1.35	1.35	1.20	56.40
	Eje de estructura	3098	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	59.28
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	61.00
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	58.42
			Cálculo 2. SW/0	1.35	1.35	1.35	1.45	57.85
			Cálculo 2. SW/2	1.35	1.35	1.35	1.20	56.59
Combinación pésima. Cálculo 1. Tren B								61.00
Centro solera	Eje de vía	2936	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	0.00
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	0.00
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	0.00
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	0.00
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	0.00
	Eje de estructura	3107	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	0.00
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	0.00
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	0.00
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	0.00
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	0.00
Combinación pésima. Cálculo 1. Tren A								0.00

Envolvente de V(-) en E.L.U.

Sección	Situación el.	Elemento	Cálculo	Coeficientes				Vd mT/m
				PP+CM	E.t	E.sc	Sobrecarga	
Empotramiento inferior de hastial	Eje de vía	248	Cálculo 1. Tren A	1.50	1.50	1.50	0.00	-28.98
			Cálculo 1. Tren B	1.50	1.50	1.50	0.00	-28.96
			Cálculo 2. LM-71	1.35	1.35	1.35	0.00	-26.06
			Cálculo 2. SW/0	1.35	1.35	1.35	0.00	-26.06
			Cálculo 2. SW/2	1.35	1.35	1.35	0.00	-26.06
	Eje de estructura	365	Cálculo 1. Tren A	1.50	1.50	1.50	0.00	-28.95
			Cálculo 1. Tren B	1.50	1.50	1.50	0.00	-28.95
			Cálculo 2. LM-71	1.35	1.35	1.35	0.00	-26.05
			Cálculo 2. SW/0	1.35	1.35	1.35	0.00	-26.05
			Cálculo 2. SW/2	1.35	1.35	1.35	0.00	-26.05
	Combinación pésima. Cálculo 1. Tren A							
Media del hastial	Eje de vía	254	Cálculo 1. Tren A	1.50	0.00	1.50	0.00	-1.82
			Cálculo 1. Tren B	1.50	0.00	1.50	0.00	-1.82
			Cálculo 2. LM-71	1.35	1.00	1.35	0.00	-0.28
			Cálculo 2. SW/0	1.35	1.00	1.35	0.00	-0.28
			Cálculo 2. SW/2	1.35	1.00	1.35	0.00	-0.28
	Eje de estructura	371	Cálculo 1. Tren A	1.50	0.00	1.50	0.00	-1.82
			Cálculo 1. Tren B	1.50	0.00	1.50	0.00	-1.82
			Cálculo 2. LM-71	1.35	1.00	1.35	0.00	-0.27
			Cálculo 2. SW/0	1.35	1.00	1.35	0.00	-0.27
			Cálculo 2. SW/2	1.35	1.00	1.35	0.00	-0.27
	Combinación pésima. Cálculo 1. Tren A							
Empotramiento superior de hastial	Eje de vía	260	Cálculo 1. Tren A	1.50	0.00	0.00	0.00	-1.48
			Cálculo 1. Tren B	1.50	0.00	0.00	0.00	-1.48
			Cálculo 2. LM-71	1.35	1.00	0.00	0.00	6.22
			Cálculo 2. SW/0	1.35	1.00	0.00	0.00	6.22
			Cálculo 2. SW/2	1.35	1.00	0.00	0.00	6.22
	Eje de estructura	377	Cálculo 1. Tren A	1.50	0.00	0.00	0.00	-1.62
			Cálculo 1. Tren B	1.50	0.00	0.00	0.00	-1.62
			Cálculo 2. LM-71	1.35	1.00	0.00	0.00	6.15
			Cálculo 2. SW/0	1.35	1.00	0.00	0.00	6.15
			Cálculo 2. SW/2	1.35	1.00	0.00	0.00	6.15
	Combinación pésima. Cálculo 1. Tren A							
Empotramiento de dintel	Eje de vía	1103	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	-49.82
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-52.85
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-53.05
			Cálculo 2. SW/0	1.35	1.35	1.35	1.45	-52.12
			Cálculo 2. SW/2	1.35	1.35	1.35	1.20	-50.21
	Eje de estructura	1274	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	-51.65
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-51.74
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-52.79
			Cálculo 2. SW/0	1.35	1.35	1.35	1.45	-50.79
			Cálculo 2. SW/2	1.35	1.35	1.35	1.20	-48.99
	Combinación pésima. Cálculo 2. LM-71							
Centro de dintel	Eje de vía	1112	Cálculo 1. Tren A	0.90	0.00	1.50	0.00	0.00
			Cálculo 1. Tren B	0.90	0.00	1.50	0.00	0.00
			Cálculo 2. LM-71	1.00	1.00	1.35	0.00	0.00
			Cálculo 2. SW/0	1.00	1.00	1.35	0.00	0.00
			Cálculo 2. SW/2	1.00	1.00	1.35	0.00	0.00
	Eje de estructura	1283	Cálculo 1. Tren A	0.90	0.00	1.50	0.00	0.00
			Cálculo 1. Tren B	0.90	0.00	1.50	0.00	0.00
			Cálculo 2. LM-71	1.00	1.00	1.35	0.00	0.00
			Cálculo 2. SW/0	1.00	1.00	1.35	0.00	0.00
			Cálculo 2. SW/2	1.00	1.00	1.35	0.00	0.00
	Combinación pésima. Cálculo 1. Tren A							
Empotramiento solera	Eje de vía	2927	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	25.73
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	25.73
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	28.77
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	28.77
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	28.77
	Eje de estructura	3098	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	25.88
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	25.88
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	28.90
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	28.90
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	28.90
	Combinación pésima. Cálculo 1. Tren A							
Centro solera	Eje de vía	2936	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	0.00
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	0.00
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	0.00
			Cálculo 2. SW/0	1.35	1.35	1.35	1.45	0.00
			Cálculo 2. SW/2	1.35	1.35	1.35	1.20	0.00
	Eje de estructura	3107	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	0.00
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	0.00
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	0.00
			Cálculo 2. SW/0	1.35	1.35	1.35	1.45	0.00
			Cálculo 2. SW/2	1.35	1.35	1.35	1.20	0.00
	Combinación pésima. Cálculo 1. Tren B							

Mstb. 1 : 7.0



Sección : "DINTEL" Armadura : "B1"
Tipo : tipo viga/ Rectángulo Unidades : [cm]
Material : "H250"

Ancho = 100.00 cm Canto = 80.00 cm

Características mecánicas de la sección:
Area : Ax= 0.800000 [m2]
Momentos de inercia : Iy= 0.042667 [m4] Iz= 0.066667 [m4]
Inercia a torsión : Ix= 0.087559 [m4]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.400000 [m]

I: R=dist.borde [m] W=I/R [m3] W/Ax [m]
izq. Iz -0.500 -0.133333 0.167
dch. Iz 0.500 0.133333 -0.167
abajo Iy -0.400 -0.106667 0.133
arriba Iy 0.400 0.106667 -0.133

Armadura: "B1"

Nº	Nom.mat	Cod.dim.	Area [cm2]	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]
1	AEH500	(2)	0.00	-50.00	5.00	50.00	5.00
2	AEH500	(2)	0.00	-50.00	75.00	50.00	75.00

Programa F A G U S - 2 V.1.32
GINPROSA Ingenieros Consultores

Seite 5
26.06.98

Total: 0.00 Cuantía de armadura: 0.000 [o/o]

Cód. dimensionamiento: (0) = As constante
Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada
Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero"AEH500"/Hormigón"H250")
Cortante Area mín.cercos Ancho alma ideal Canto útil Incl.bielas

Vz	0.00 [cm2/m]	100.00 [cm]	76.00 [cm]	0.00
Vy	0.00 [cm2/m]	80.00 [cm]	96.00 [cm]	0.00

Características del material:

Nom.Mat.	Módulo E [kp/cm2]	0.85*fcd,fyd [kp/cm2]	eps-fc [o/oo]	fct [kp/cm2]	fcv [kp/cm2]	fcw,mín [kp/cm2]
"H250"	300000.0	-141.600	-2.000	0.0	6.460	250.000
"AEH500"	2.10E+06	4434.700				

Legenda:

fcd,fyd resistencia de cálculo del hormigón,acero
eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)
fct resistencia de cálculo a tracción del hormigón
fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Dimensionamiento : Viga "DINTEL"/"B1"

Esfuerzos (Rotura)	Unidades : [cm]
M Vy Vz Mx My Mz Alpha	
-2.900	86.130 45.0

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	27.37	27.37
2 "AEH500"	-50.0	75.0	50.0	75.0	0.00	-	0.00

Cuantía arm. 0.34 [o/o] Suma 27.37

146. DINTEL

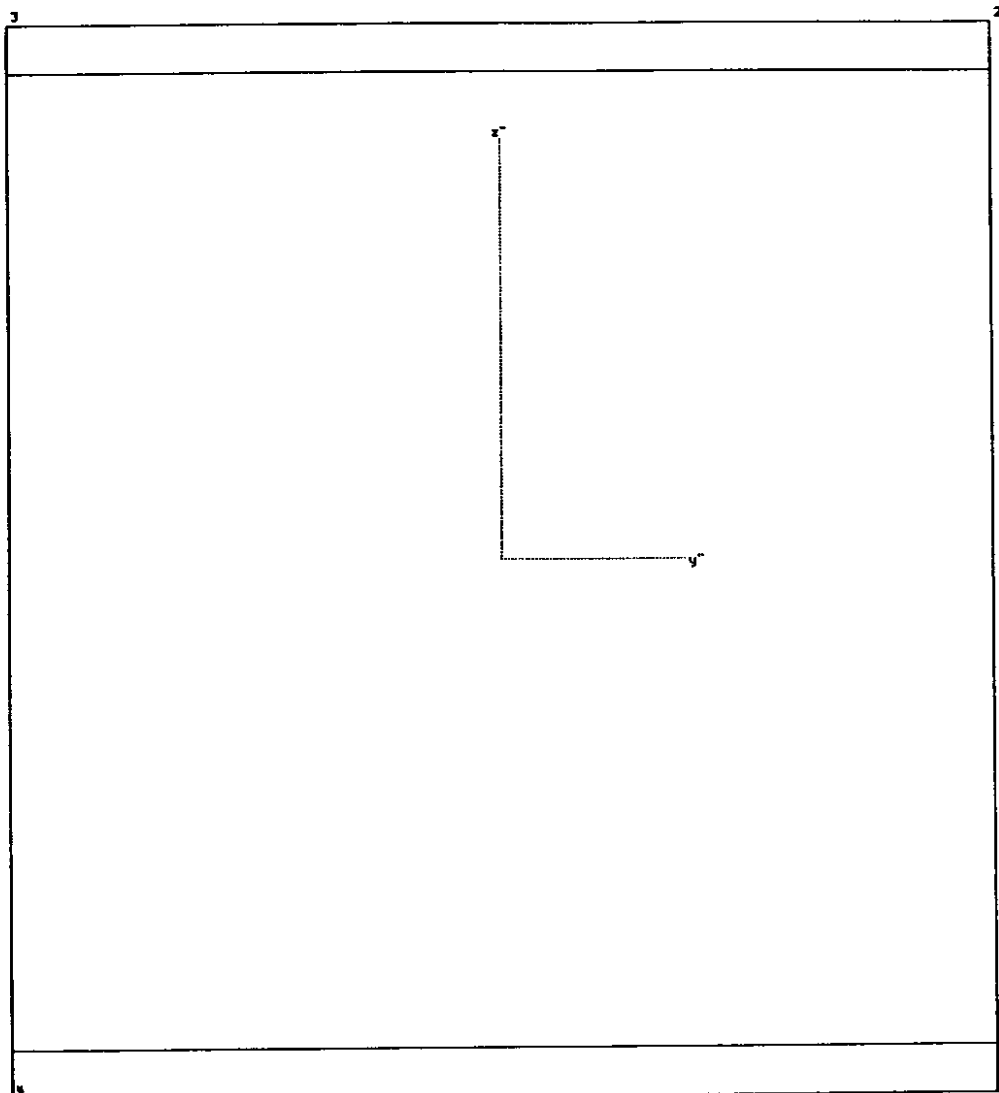
Deformaciones y tensiones extremas (Rotura):

1	Coordenadas	Eps	Estado-II
	y [cm] z [cm]	[o/oo]	[kp/cm2]

Hormigón-Min	-50.00	80.00	-2.085	-141.600	"H250"
Armadura-Min	-50.00	75.00	-1.279	-2686.273	"AEH500"
Hormigón-Max	50.00	0.00	10.806	0.000	"H250"
Armadura-Max	50.00	5.00	10.000	4434.700	"AEH500"

Fibra neutra	zn	67.06 cm	yn	-0.00 cm	Angulo	0.0
Ancho zona comprim.		12.94 cm	Zona comprimida/Canto útil			0.17

Mstb. 1 : 7.0



abajo ly -0.550 -0.201666 0.183
arriba ly 0.550 0.201666 -0.183

Armadura: "B1"

Nº	Nom.mat	Cod.dim.	Area [cm²]	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]
1	AEH500	(2)	0.00	-50.00	5.00	50.00	5.00
2	AEH500	(2)	0.00	-50.00	105.00	50.00	105.00

Total: 0.00 Cuantía de armadura: 0.000 [o/o]

Cód. dimensionamiento: (0) = As constante
Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada
Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero"AEH500"/Hormigón"H250")
Cortante Area mín.cercos Ancho alma ideal Canto útil Incl.bielas

Vz	0.00 [cm²/m]	100.00 [cm]	106.00 [cm]	0.00
Vy	0.00 [cm²/m]	110.00 [cm]	96.00 [cm]	0.00

Características del material:

Nom.Mat.	Módulo E	0.85*fcd,fyd	eps-fc	fct	fcv	fcw,min
[kp/cm²]	[kp/cm²]	[o/oo]	[kp/cm²]	[kp/cm²]	[kp/cm²]	[kp/cm²]
"H250"	300000.0	-141.600	-2.000	0.0	6.460	250.000
"AEH500"	2.10E+06	4434.700				

Leyenda:

fcd,fyd resistencia de cálculo del hormigón,acero
eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)
fct resistencia de cálculo a tracción del hormigón
fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Dimensionamiento : Viga "CARTELA"/"B1"

Esfuerzos (Rotura)							Unidades : [tm]	
N	Vy	Vz	Mx	My	Mz	Alpha		
-21.350				-50.090		45.0		

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm²]	[cm²]	[cm²]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	-	0.00
2 "AEH500"	-50.0	105.0	50.0	105.0	0.00	8.68	8.68

Cuantía arm. 0.08 [o/o] Suma 8.68

SUP. DINTEL

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas		Eps	Estado-II
	y [cm]	z [cm]	[o/oo]	[kp/cm²]

Hormigón-Min	50.00	0.00	-1.041	-109.018	"H250"
Armadura-Min	50.00	5.00	-0.515	-1081.248	"AEH500"
Hormigón-Max	-50.00	110.00	10.526	0.000	"H250"
Armadura-Max	-50.00	105.00	10.000	4434.700	"AEH500"

Fibra neutra	zn	9.90 cm	yn	0.00 cm	Angulo	0.0
Ancho zona comprim.		9.90 cm	Zona comprimida/Canto útil			0.09

Sección : "CARTELA" Armadura : "B1"
Tipo : tipo viga/ Rectángulo Unidades : [cm]
Material : "H250"

Ancho = 100.00 cm Canto = 110.00 cm

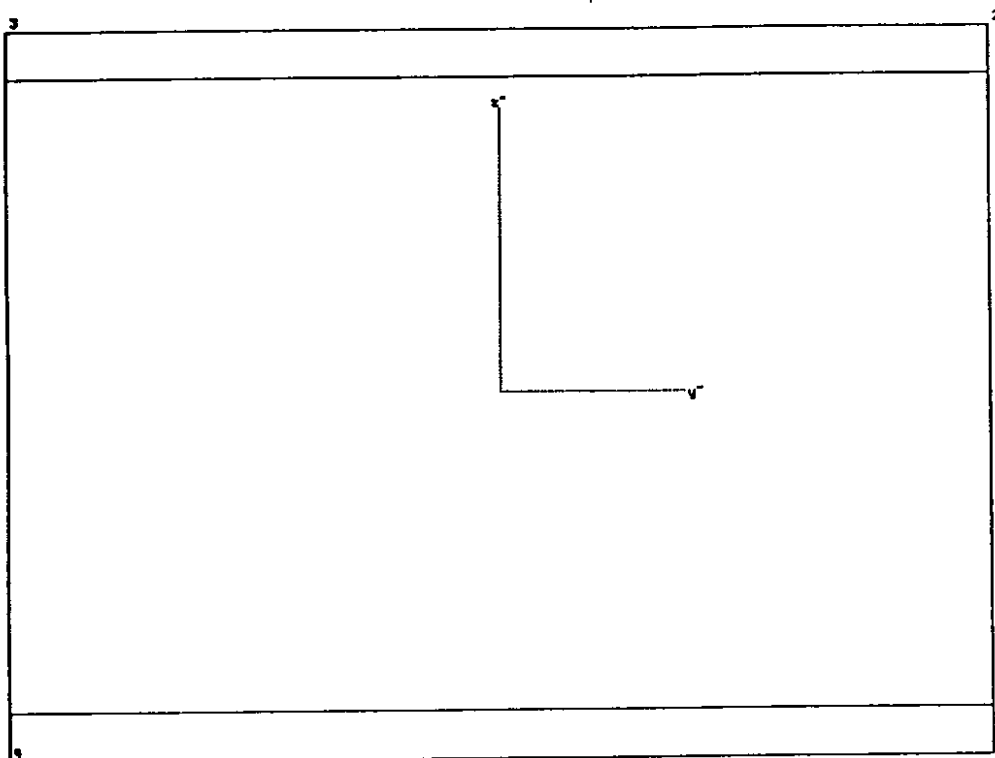
Características mecánicas de la sección:

Area : Ax= 1.100 [m²]
Momentos de inercia : Iy= 0.110917 [m⁴] Iz= 0.091667 [m⁴]
Inercia a torsión : Ix= 0.168506 [m⁴]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.550000 [m]

I: R=dist.borde [m] W=I/R [m³] W/Ax [m]
izq. Iz -0.500 -0.183333 0.167
dch. Iz 0.500 0.183333 -0.167

Matb. 1 : 7.0



Sección : "HASTIAL" Armadura : "B1"
Tipo : tipo viga/ Rectángulo Unidades : [cm]
Material : "H250"

Ancho = 100.00 cm Canto = 75.00 cm

Características mecánicas de la sección:
Area : Ax= 0.750000 [m2]
Momentos de inercia : Iy= 0.035156 [m4] Iz= 0.062500 [m4]
Inercia a torsión : Ix= 0.075915 [m4]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.375000 [m]

	I: R=dist.borde [m]	W=1/R [m3]	W/Ax [m]
izq. Iz	-0.500	-0.125000	0.167
dch. Iz	0.500	0.125000	-0.167
abajo Iy	-0.375	-0.093750	0.125
arriba Iy	0.375	0.093750	-0.125

Armadura: "B1"

Nº	Nom.mat	Cod.dim.	Area [cm2]	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]
1	AEH500	(2)	0.00	-50.00	5.00	50.00	5.00
2	AEH500	(2)	0.00	-50.00	70.00	50.00	70.00

Total: 0.00 Cuantía de armadura: 0.000 [o/o]

Cód. dimensionamiento: (0) = As constante
Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada
Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero"AEH500"/Hormigón"H250")
Cortante Area mín.cercos Ancho alma ideal Canto útil Incl.bielas

Vz	0.00 [cm2/m]	100.00 [cm]	71.00 [cm]	0.00
Vy	0.00 [cm2/m]	75.00 [cm]	96.00 [cm]	0.00

Características del material:
Nom.Mat. Módulo E 0.85*fcd,fyd eps-fc fct fcv fcm,mín
[N/mm2] [N/mm2] [o/oo] [N/mm2] [N/mm2] [N/mm2]
"H250" 30000.0 -14.160 -2.000 0.0 0.646000 25.000
"AEH500" 210000.0 443.470

Leyenda:
fcd,fyd resistencia de cálculo del hormigón,acero
eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)
fct resistencia de cálculo a tracción del hormigón
fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Dimensionamiento : Viga "HASTIAL"/"B1"

Esfuerzos (Rotura)							Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	Alpha	
-63.850				-50.740		45.0	

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	-	0.00
2 "AEH500"	-50.0	70.0	50.0	70.0	0.00	10.16	10.16

Cuantía arm. 0.14 [o/o] Suma 10.16

EXT. HASTIAL
BOSF

Deformaciones y tensiones extremas (Rotura):
1 Coordenadas Eps Estado-II
y [cm] z [cm] [o/oo] [kp/cm2]

Hormigón-Min	50.00	0.00	-1.988	-141.595	"H250"
Armadura-Min	50.00	5.00	-1.132	-2376.497	"AEH500"
Hormigón-Max	-50.00	75.00	10.856	0.000	"H250"
Armadura-Max	-50.00	70.00	10.000	4434.700	"AEH500"

Fibra neutra	zn	11.61 cm	yn	0.00 cm	Angulo	0.0
Ancho zona comprim.		11.61 cm	Zona comprimida/Canto útil			0.17

Dimensionamiento : Viga "HASTIAL"/"B1"

Esfuerzos (Rotura)							Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	Alpha	
-56.380				-25.490		45.0	

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	-	0.00
2 "AEH500"	-50.0	70.0	50.0	70.0	0.00	2.06	2.06

Cuantía arm. 0.03 [o/o] Suma 2.06

EXT. HASTIAL
MEDIO

Deformaciones y tensiones extremas (Rotura):
1 Coordenadas Eps Estado-II
y [cm] z [cm] [o/oo] [kp/cm2]

Hormigón-Min	50.00	0.00	-1.409	-129.232	"H250"
Armadura-Min	50.00	5.00	-0.594	-1247.408	"AEH500"
Hormigón-Max	-50.00	75.00	10.815	0.000	"H250"
Armadura-Max	-50.00	70.00	10.000	4434.700	"AEH500"

Fibra neutra	zn	8.64 cm	yn	0.00 cm	Angulo	0.0
Ancho zona comprim.		8.64 cm	Zona comprimida/Canto útil			0.12

Dimensionamiento : Viga "HASTIAL"/"B1"

Esfuerzos (Rotura)							Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	Alpha	
-55.090				-56.370		45.0	

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	-	0.00
2 "AEH500"	-50.0	70.0	50.0	70.0	0.00	13.14	13.14

Cuantía arm. 0.18 [o/o] Suma 13.14

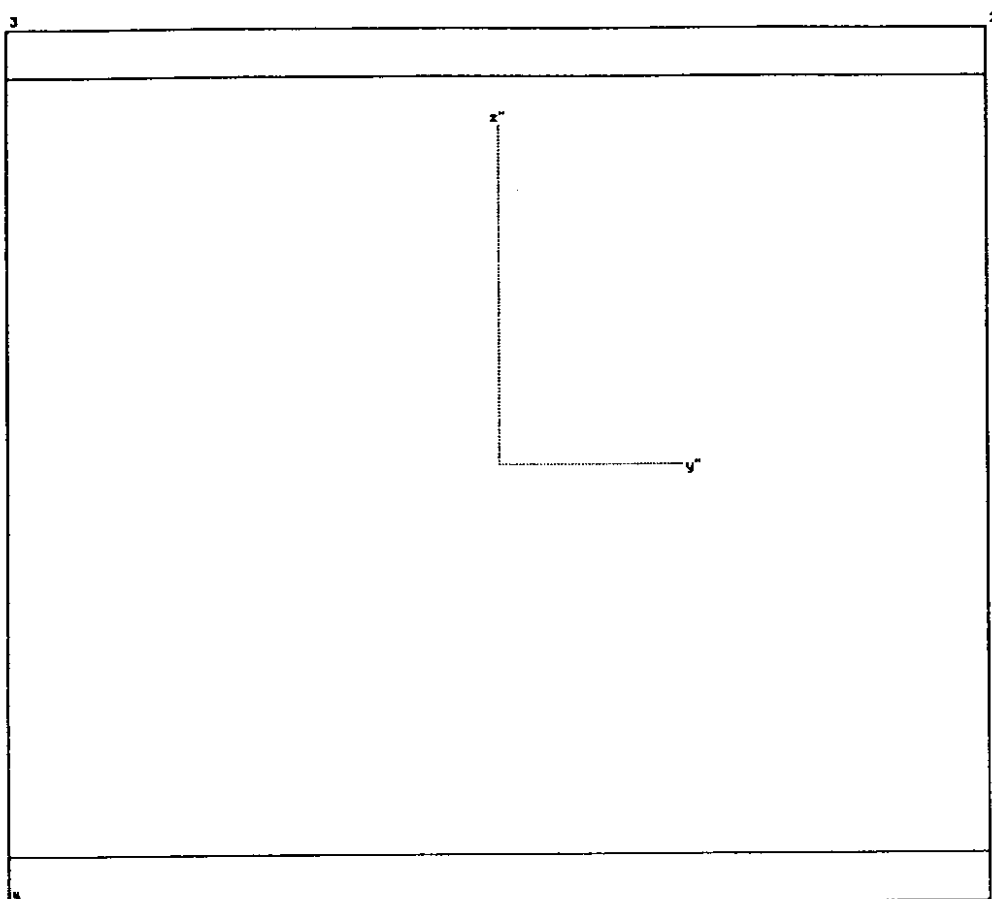
EXT. HASTIAL
SUP.

Deformaciones y tensiones extremas (Rotura):
1 Coordenadas Eps Estado-II
y [cm] z [cm] [o/oo] [kp/cm2]

Hormigón-Min	50.00	0.00	-2.047	-141.600	"H250"
Armadura-Min	50.00	5.00	-1.186	-2491.125	"AEH500"
Hormigón-Max	-50.00	75.00	10.860	0.000	"H250"
Armadura-Max	-50.00	70.00	10.000	4434.700	"AEH500"

Fibra neutra	zn	11.89 cm	yn	0.00 cm	Angulo	0.0
Ancho zona comprim.		11.89 cm	Zona comprimida/Canto útil			0.17

Mstb. 1 : 7.0



Sección : "SOLERA" Armadura : "B1"
Tipo : tipo viga/ Rectángulo Unidades : [cm]
Material : "H250"

Ancho = 100.00 cm Canto = 90.00 cm

Características mecánicas de la sección:

Area : Ax= 0.900000 [m2]
Momentos de inercia : Iy= 0.060750 [m4] Iz= 0.075000 [m4]
Inercia a torsión : Ix= 0.112680 [m4]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.450000 [m]

I: R=dist.borde [m] W=I/R [m3] W/Ax [m]
izq. Iz -0.500 -0.150000 0.167
dch. Iz 0.500 0.150000 -0.167
abajo Iy -0.450 -0.135000 0.150
arriba Iy 0.450 0.135000 -0.150

Dimensionamiento : Viga "SOLERA"/"B1"

Esfuerzos (Rotura)
M Vy Vz Mx My Mz Alpha
-30.990 43.540 45.0

Armadura y1 z1 y2 z2 dado dimens. As-nuevo
Longitudinal: [cm] [cm] [cm] [cm] [cm2] [cm2] [cm2]
1 "AEH500" -50.0 5.0 50.0 5.0 0.00 8.47 8.47
2 "AEH500" -50.0 85.0 50.0 85.0 0.00 - 0.00
Cuantía arm. 0.09 [o/o] Suma 8.48

INF. SOLERA

Deformaciones y tensiones extremas (Rotura):

1 Coordenadas Eps Estado-II
y [cm] z [cm] [o/oo] [kp/cm2]
Hormigón-Min -50.00 90.00 -1.279 -123.177 "H250"
Armadura-Min -50.00 85.00 -0.615 -1291.802 "AEH500"
Hormigón-Max 50.00 0.00 10.663 0.000 "H250"
Armadura-Max 50.00 5.00 10.000 4434.700 "AEH500"

Fibra neutra zn 80.36 cm yn -0.00 cm Angulo 0.0
Ancho zona comprim. 9.64 cm Zona comprimida/Canto útil 0.11

Dimensionamiento : Viga "SOLERA"/"B1"

Esfuerzos (Rotura)
M Vy Vz Mx My Mz Alpha
-1.550 -96.480 45.0

Armadura y1 z1 y2 z2 dado dimens. As-nuevo
Longitudinal: [cm] [cm] [cm] [cm] [cm2] [cm2] [cm2]
1 "AEH500" -50.0 5.0 50.0 5.0 0.00 - 0.00
2 "AEH500" -50.0 85.0 50.0 85.0 0.00 27.00 27.00
Cuantía arm. 0.30 [o/o] Suma 27.00

SUP. SOLERA

Armadura: "B1"

Nº	Nom.mat	Cod.dim.	Area [cm2]	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]
1	AEH500	(2)	0.00	-50.00	5.00	50.00	5.00
2	AEH500	(2)	0.00	-50.00	85.00	50.00	85.00
Total:			0.00	Cuantía de armadura: 0.000 [o/o]			

Cód. dimensionamiento: (0) = As constante
Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada
Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero"AEH500"/Hormigón"H250")

Cortante	Area mfn.cercos	Ancho alma ideal	Canto útil	Incl.bielas
Vz	0.00 [cm2/m]	100.00 [cm]	86.00 [cm]	0.00
Vy	0.00 [cm2/m]	90.00 [cm]	96.00 [cm]	0.00

Características del material:

Nom.Mat.	Módulo E	0.85*fcd,fyd	eps-fc	fct	fcv	fcw,mín
[kp/cm2]	[kp/cm2]	[o/oo]	[kp/cm2]	[kp/cm2]	[kp/cm2]	[kp/cm2]
"H250"	300000.0	-141.600	-2.000	0.0	6.460	250.000
"AEH500"	2.10E+06	4434.700				

Leyenda:

fcd,fyd resistencia de cálculo del hormigón,acero
eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)
fct resistencia de cálculo a tracción del hormigón
fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Deformaciones y tensiones extremas (Rotura):

1 Coordenadas Eps Estado-II
y [cm] z [cm] [o/oo] [kp/cm2]
Hormigón-Min 50.00 0.00 -1.863 -140.936 "H250"
Armadura-Min 50.00 5.00 -1.165 -2446.983 "AEH500"
Hormigón-Max -50.00 90.00 10.698 0.000 "H250"
Armadura-Max -50.00 85.00 10.000 4434.700 "AEH500"

Fibra neutra zn 13.35 cm yn 0.00 cm Angulo 0.0
Ancho zona comprim. 13.35 cm Zona comprimida/Canto útil 0.16

PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA TT1

Obra : L.A.V. MADRID - ZARAGOZA. Subtramo XV. E-1503.5. DINTEL.
Fecha: 26/6/1998
Hora : 18:26

CALCULO A CORTANTE DE SECCIONES RECTANGULARES

1. Datos

- Materiales:

fck [kp/cm²] = 250
fyk [kp/cm²] = 5100
GammaC = 1.50
GammaS = 1.15

- Tipo de Elemento Estructural:

Tipo: viga
En el cálculo no se considera la armadura comprimida

- Sección

b [cm] = 100.0
h [cm] = 110.0
r [cm] = 5.0

2. Dimensionamiento con cercos a 90°

Vd [Mp] = 53.05

Vcu [Mp] = 67.78
Vu1 [Mp] = 525.00

A90_est [cm²/m] = 0.00

PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA TT1

Obra : L.A.V. MADRID - ZARAGOZA. Subtramo XV. E-1503.5. HASTIALES
Fecha: 26/6/1998
Hora : 18:25

CALCULO A CORTANTE DE SECCIONES RECTANGULARES

1. Datos

- Materiales:

fck [kp/cm²] = 250
fyk [kp/cm²] = 5100
GammaC = 1.50
GammaS = 1.15

- Tipo de Elemento Estructural:

Tipo: viga
En el cálculo no se considera la armadura comprimida

- Sección

b [cm] = 100.0
h [cm] = 75.0
r [cm] = 5.0

2. Dimensionamiento con cercos a 90°

Vd [Mp] = 28.96

Vcu [Mp] = 45.18
Vu1 [Mp] = 350.00

A90_est [cm²/m] = 0.00

PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA TT1

Obra : L.A.V. MADRID - ZARAGOZA. Subtramo XV. E-1503.5. SOLERA.
Fecha: 26/6/1998
Hora : 18:26

CALCULO A CORTANTE DE SECCIONES RECTANGULARES

1. Datos

- Materiales:

fck [kp/cm²] = 250
fyk [kp/cm²] = 5100
GammaC = 1.50
GammaS = 1.15

- Tipo de Elemento Estructural:

Tipo: viga
En el cálculo no se considera la armadura comprimida

- Sección

b [cm] = 100.0
h [cm] = 90.0
r [cm] = 5.0

2. Dimensionamiento con cercos a 90°

Vd [Mp] = 61.00

Vcu [Mp] = 54.87
Vu1 [Mp] = 425.00

A90_est [cm²/m] = 1.91

COMPROBACION DEL ESTADO LIMITE DE FISURACION DEBIDO A TENSIONES NORMALES	
Proyecto :	L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
Estructura:	E-1503.5

DATOS

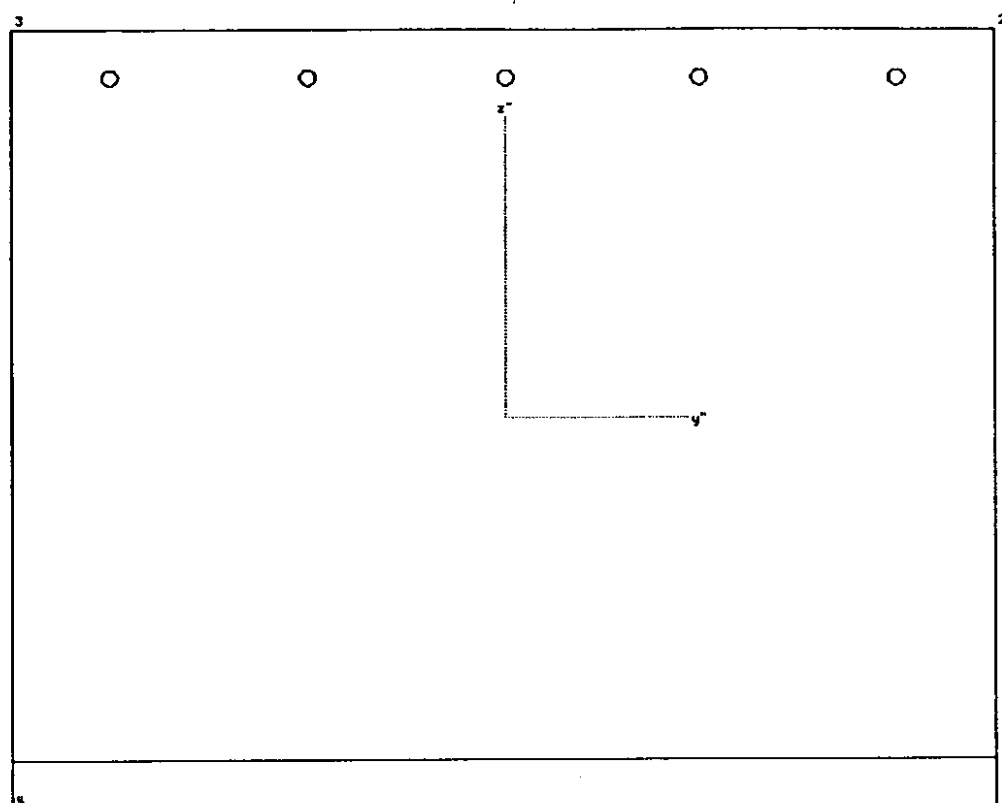
	Dintel (vano)	Dintel (empotramiento)	Hastial	Solera (vano)	Solera (empotramiento)
Axil de servicio (T) :	-1.93	-14.23	-36.73	-1.03	-20.47
Momento de servicio (mT) :	57.42	-33.39	-37.58	-64.32	30.10
Ambiente	II	II	II	II	II
Recubrimiento armaduras de tracción (cm) (c) :	3.750	3.500	3.500	3.750	3.500
Diámetro de la barra traccionada más gruesa (mm) (Φ) :	25.000	20.000	20.000	25.000	20.000
Distancia mínima entre barras (m) (s) :	0.150	0.200	0.200	0.150	0.200
Deformación fibra traccionada max (o/oo) (ϵ_1) :	1.276	0.849	1.300	1.251	0.884
Deformación fibra traccionada min (o/oo) (ϵ_2) :	0.000	0.000	0.000	0.000	0.000
Ac eficaz (m ²) :	0.238	0.195	0.195	0.238	0.195
Armadura traccionada (cm ²)(As) :	32.733	15.700	15.700	32.733	15.700
Tensión en armadura al fisurarse la sección (Kp/cm ²)(σ_{sr}) :	1257.110	3450.800	2430.960	1395.770	2857.410
Tensión de servicio armadura en hipótesis de sección fisurada (Kp/cm ²)(σ_s) :	2480.340	1687.250	2503.310	2449.480	1733.910
Módulo elasticidad acero (Es) (T/m ²) :	21000000.000	21000000.000	21000000.000	21000000.000	21000000.000
Fck (Kp/cm ²) :	250.000	250.000	250.000	250.000	250.000
Inercia sección (m ⁴) :	0.043	0.111	0.035	0.061	0.061
Distancia cdg seccion a fibra traccionada (m) :	0.400	0.550	0.375	0.450	0.450

RESULTADOS

	1	2	3	4	5
Wk max (mm) =	0.200	0.200	0.200	0.200	0.200
Corrección Wk max por recubrimiento (mm) =	0.300	0.300	0.300	0.300	0.300
Corrección separación barras (m) =	0.150	0.200	0.200	0.150	0.200
K1 (se supone barras corrugadas) =	0.400	0.400	0.400	0.400	0.400
K2 =	0.125	0.125	0.125	0.125	0.125
K3 (se supone no carga noval) =	0.500	0.500	0.500	0.500	0.500
fctm (T/m ²) =	269.858	269.858	269.858	269.858	269.858
Momento de fisuración (mT) =	28.785	54.421	25.299	36.431	36.431
S m (mm) =	195.695	234.204	234.204	195.695	234.204
ϵ_{sm} =	0.00103	0.00032	0.00063	0.00098	0.00033

Wk (mm) =	0.300	0.128	0.251	0.300	0.131
	Vale	Vale	Vale	Vale	Vale

Mstb. 1 : 7.0



Sección : "FISUDINT" Armadura : "B1"
Tipo : tipo viga/ Rectángulo Unidades : [cm]
Material : "H250"

Ancho = 100.00 cm Canto = 80.00 cm

Características mecánicas de la sección:
Area : Ax= 0.800000 [m2]
Momentos de inercia : Iy= 0.042667 [m4] Iz= 0.066667 [m4]
Inercia a torsión : Ix= 0.087559 [m4]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.400000 [m]

	I: R=dist.borde [m]	W=I/R [m3]	W/Ax [m]
izq. Iz	-0.500	-0.133333	0.167
dch. Iz	0.500	0.133333	-0.167
abajo Iy	-0.400	-0.106667	0.133
arriba Iy	0.400	0.106667	-0.133

Armadura: "B1"

Nº	Nom.mat	Cod.dim.	Area [cm2]	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]
1	AEH500	(2)	32.73	-50.00	5.00	50.00	5.00
2	AEH500	(2)	10.05	-40.00	75.00	40.00	75.00

Total: 42.79 Cuantía de armadura: 0.535 [o/o]

Cód. dimensionamiento: (0) = As constante
Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada
Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero "AEH500"/Hormigón "H250")
Cortante Area mín.cercos Ancho alma ideal Canto útil Incl.bielas

Vz	0.00 [cm2/m]	100.00 [cm]	76.00 [cm]	0.00
Vy	0.00 [cm2/m]	80.00 [cm]	96.00 [cm]	0.00

Características del material:

Nom.Mat.	Módulo E [kp/cm2]	0.85*fcd, fyd [kp/cm2]	eps-fc [o/oo]	fct [kp/cm2]	fcv [kp/cm2]	fcw,mín [kp/cm2]
"H250"	300000.0	-141.600	-2.000	0.0	6.460	250.000
"AEH500"	2.10E+06	4434.700				

Leyenda:
fcd, fyd resistencia de cálculo del hormigón, acero
eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)
fct resistencia de cálculo a tracción del hormigón
fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Comprobación de las tensiones en el estado II: Viga "FISUDINT"/"B1"

Esfuerzos (E.L.S.) Unidades : [tm]

N	Vy	Vz	Mx	My	Mz
-1.930				57.420	

Deformaciones y tensiones extremas:

3	Coordenadas y [cm]	Eps [o/oo]	Estado-II [kp/cm2]	Estado-I [kp/cm2]
Hormigón-Min	-50.00 80.00	-0.325	-97.511	-54.073 "H250"
Armadura-Min	-40.00 75.00	-0.224	-471.103	"AEH500"
Hormigón-Max	50.00 0.00	1.286	0.000	53.590 "H250"
Armadura-Max	50.00 5.00	1.185	2489.541	"AEH500"

Fibra neutra zn 63.86 cm yn -0.00 cm Angulo 0.0
Ancho zona comprim. 16.14 cm Zona comprimida/Canto útil 0.22

Esfuerzos : Rigideces secantes: Deformaciones:

M =	-1.930 [t]	EAX=	4015.977 [t]	4.805805E+04
My=	57.420 [tm]	Ely=	28509.8 [tm2]	2.014043E-03 [1/m]
Mz=	0.000 [tm]	*Elz=	47200.5 [tm2]	-3.078173E-13 [1/m]

(*) Rigidez tangencial !

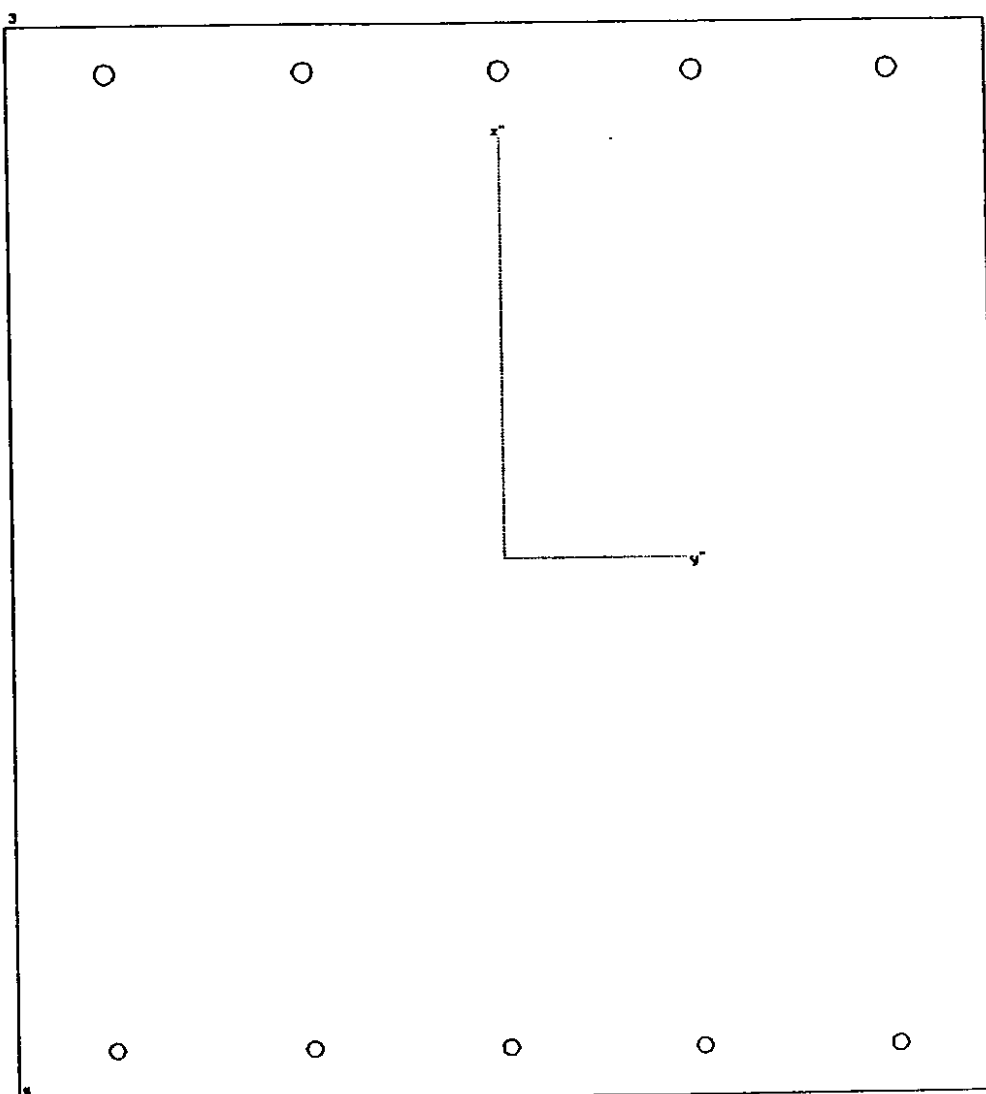
Deformaciones y tensiones en vertices de la sección:

Coordenadas y [cm]	z [cm]	Eps [o/oo]	Est. I [kp/cm2]	Est. II [kp/cm2]	Dist.Fuerz.Compr. [t]	[cm]
50.00	0.00	1.286	53.590	0.000	-78.684	34.62
50.00	80.00	-0.325	-54.073	-97.511		
-50.00	80.00	-0.325	-54.073	-97.511		
-50.00	0.00	1.286	53.590	0.000		

Deformaciones y tensiones de la armadura pasiva (Estado II):

Nº	Coordenadas y [cm]	z [cm]	Eps [o/oo]	Sigma-s [kp/cm2]
1	-50.000 5.000	1.185	2489.54	
	50.000 5.000	1.185	2489.54	
2	-40.000 75.000	-0.224	-471.10	
	40.000 75.000	-0.224	-471.10	

Mstb. 1 : 7.0



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Comprobación de las tensiones en el estado II: Viga "FISUDINT"/"B1"

Esfuerzos (E.L.S.)						Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	
						28.785

Deformaciones y tensiones extremas:

3	Coordenadas		Eps	Estado-II	Estado-I	
	y [cm]	z [cm]				
Normigón-Min	-50.00	80.00	-0.163	-48.769	-26.986	"H250"
Armadura-Min	-40.00	75.00	-0.112	-234.506		"AEH500"
Normigón-Max	50.00	0.00	0.652	0.000	26.986	"H250"
Armadura-Max	50.00	5.00	0.601	1261.768		"AEH500"

Fibra neutra	zn	64.03 cm	yn	-0.00 cm	Angulo	0.0
Ancho zona comprim.		15.97 cm	Zona comprimida/Canto útil			0.21

Esfuerzos		Rigideces secantes:		Deformaciones:	
N =	0.000 [t]	*EAX=	568976.3 [t]	2.445863E-04	
My=	28.785 [tm]	EIy=	28279.6 [tm2]	1.017873E-03 [1/m]	
Mz=	0.000 [tm]	*EIz=	46781.3 [tm2]	-1.558560E-13 [1/m]	
(*) Rigidez tangencial I					

Deformaciones y tensiones en vertices de la sección:

y [cm]	Coordenadas		Eps	Est. I	Est. II	Dist.Fuerz.Compr.	
	z [cm]						
50.00	0.00	0.652	26.986	0.000	-38.944	34.68	
50.00	80.00	-0.163	-26.986	-48.769			
-50.00	80.00	-0.163	-26.986	-48.769			
-50.00	0.00	0.652	26.986	0.000			

Deformaciones y tensiones de la armadura pasiva (Estado II):

N°	Coordenadas		Eps	Sigma-s	
	y [cm]	z [cm]			
1	-50.000	5.000	0.601	1261.77	
	50.000	5.000	0.601	1261.77	
2	-40.000	75.000	-0.112	-234.51	
	40.000	75.000	-0.112	-234.51	

Parámetros globales de cálculo :

Norma : EH-1991
Inclinación estándar bielas comprimidas hormigón .. : 45.00 [Grados]
Coeficiente de fluencia phi : 0.00
Factor minoración de la resistencia de la sección : 1.00
Def. máxima en compresión centrada del hormigón .. : -2.00 [o/oo]
Deformación máxima en flexión en vigas : -3.50 [o/oo]
Def. máxima en tracción del acero en vigas : 10.00 [o/oo]
Modo de análisis / Inclinación del eje neutro : flexión esviada
Cuantía mínima de armadura long. para pilas : 0.40 [o/o]
Cuantía máxima de armadura long. : 8.00 [o/o]
Modo de pretensado : adherente
NO se usaron coef. de homogeneización para calcular las caract. mecánicas

Modelo para dimensionamiento a cortante:

Usar un canto útil constante en los cálculos a cortante
Cálculo separado para la arm. longitudinal adicional debida a cortante

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abajo Iy	-0.550	-0.201666	0.183
arriba Iy	0.550	0.201666	-0.183

Armadura: "B1"

N°	Nom.mat	Cod.dim.	Area	y1	z1	y2	z2
			[cm2]	[cm]	[cm]	[cm]	[cm]
1	AEH500	(2)	10.05	-40.00	5.00	40.00	5.00
2	AEH500	(2)	15.71	-40.00	105.00	40.00	105.00
Total:			25.76	Cuantía de armadura: 0.234 [o/o]			

Cód. dimensionamiento: (0) = As constante
Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada
Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero"AEH500"/Hormigón"H250")

Cortante	Area mín.cercos	Ancho alma ideal	Canto útil	Incl.bielas
Vz	0.00 [cm2/m]	100.00 [cm]	106.00 [cm]	0.00
Vy	0.00 [cm2/m]	110.00 [cm]	96.00 [cm]	0.00

Características del material:

Nom.Mat.	Módulo E	0.85*fcd,fyd	eps-fc	fct	fcv	fcw,mín
	[kp/cm2]	[kp/cm2]	[o/oo]	[kp/cm2]	[kp/cm2]	[kp/cm2]
"H250"	300000.0	-141.600	-2.000	0.0	6.460	250.000
"AEH500"	2.10E+06	4434.700				

Legenda:

fcd,fyd resistencia de cálculo del hormigón,acero
eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)
fct resistencia de cálculo a tracción del hormigón
fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Sección : "FISUCART"
Tipo : tipo viga/ Rectángulo
Material : "H250"

Ancho = 100.00 cm Canto = 110.00 cm

Características mecánicas de la sección:
Area : Ax= 1.100 [m2]
Momentos de inercia : Iy= 0.110917 [m4] Iz= 0.091667 [m4]
Inercia a torsión : Ix= 0.168506 [m4]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.550000 [m]

I:	R=dist.borde [m]	W=I/R [m3]	W/Ax [m]
izq.	Iz -0.500	-0.183333	0.167
dch.	Iz 0.500	0.183333	-0.167

Comprobación de las tensiones en el estado II: Viga "FISUCART"/"B1"

Esfuerzos (E.L.S.)						Unidades : [tm]	
N	Vy	Vz	Mx	My	Mz		
-14.230				-33.390			

Deformaciones y tensiones extremas:

3	Coordenadas		Eps	Estado-II	Estado-I	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	
Hormigón-Min	50.00	0.00	-0.153	-45.849	-17.851	"H250"
Armadura-Min	40.00	5.00	-0.107	-225.311		"AEH500"
Hormigón-Max	-50.00	110.00	0.849	0.000	15.263	"H250"
Armadura-Max	-40.00	105.00	0.803	1687.254		"AEH500"

Fibra neutra	zn	16.78 cm	yn	0.00 cm	Angulo	0.0
Ancho zona comprim.		16.78 cm	Zona comprimida/Canto útil			0.16

Esfuerzos		: Rigideces secantes:		Deformaciones:	
N =	-14.230 [t]	EAX=	40881.2 [t]		3.480815E-04
My=	-33.390 [tm]	Ely=	36662.3 [tm2]		-9.107453E-04 [1/m]
Mz=	0.000 [tm]	EIz=	44836.7 [tm2]		6.218143E-16 [1/m]

(*) Rigidez tangencial !

Deformaciones y tensiones en vertices de la sección:

Coordenadas		Eps	Est. I	Est. II	Dist.Fuerz.Compr.	
y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	[t]	[cm]
50.00	0.00	-0.153	-17.851	-45.849	-38.468	49.41
50.00	110.00	0.849	15.263	0.000		
-50.00	110.00	0.849	15.263	0.000		
-50.00	0.00	-0.153	-17.851	-45.849		

Deformaciones y tensiones de la armadura pasiva (Estado II):

Nº	Coordenadas		Eps	Sigma-s
	y [cm]	z [cm]	[o/oo]	[kp/cm2]
1	-40.000	5.000	-0.107	-225.31
	40.000	5.000	-0.107	-225.31
2	-40.000	105.000	0.803	1687.25
	40.000	105.000	0.803	1687.25

Comprobación de las tensiones en el estado II: Viga "FISUCART"/"B1"

Esfuerzos (E.L.S.)						Unidades : [tm]	
N	Vy	Vz	Mx	My	Mz		
				-54.421			

Deformaciones y tensiones extremas:

3	Coordenadas		Eps	Estado-II	Estado-I	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	
Hormigón-Min	50.00	0.00	-0.247	-74.142	-26.986	"H250"
Armadura-Min	40.00	5.00	-0.157	-329.955		"AEH500"
Hormigón-Max	-50.00	110.00	1.733	0.000	26.986	"H250"
Armadura-Max	-40.00	105.00	1.643	3450.804		"AEH500"

Fibra neutra	zn	13.73 cm	yn	0.00 cm	Angulo	0.0
Ancho zona comprim.		13.73 cm	Zona comprimida/Canto útil			0.13

Esfuerzos		: Rigideces secantes:		Deformaciones:	
N =	0.000 [t]	*EAX=	465914.5 [t]		7.430593E-04
My=	-54.421 [tm]	Ely=	30227.8 [tm2]		-1.800361E-03 [1/m]
Mz=	0.000 [tm]	EIz=	37203.3 [tm2]		2.326760E-15 [1/m]

(*) Rigidez tangencial !

Deformaciones y tensiones en vertices de la sección:

Coordenadas		Eps	Est. I	Est. II	Dist.Fuerz.Compr.	
y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	[t]	[cm]
50.00	0.00	-0.247	-26.986	-74.142	-50.888	50.42
50.00	110.00	1.733	26.986	0.000		
-50.00	110.00	1.733	26.986	0.000		
-50.00	0.00	-0.247	-26.986	-74.142		

Deformaciones y tensiones de la armadura pasiva (Estado II):

Nº	Coordenadas		Eps	Sigma-s
	y [cm]	z [cm]	[o/oo]	[kp/cm2]
1	-40.000	5.000	-0.157	-329.95
	40.000	5.000	-0.157	-329.95
2	-40.000	105.000	1.643	3450.80
	40.000	105.000	1.643	3450.80

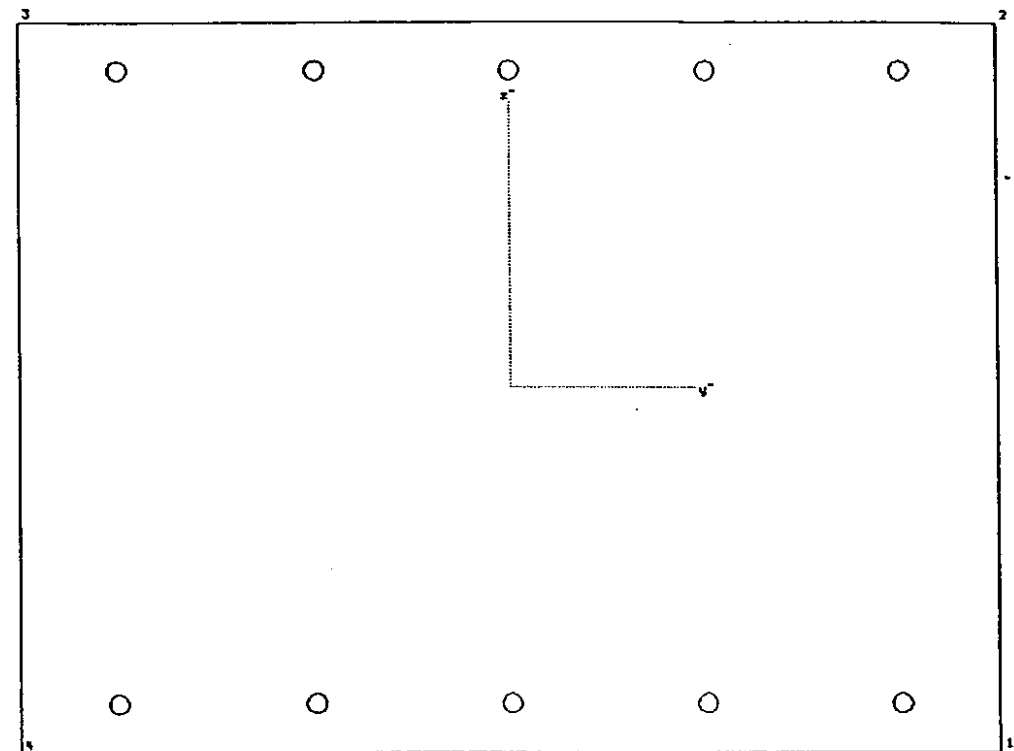
Parámetros globales de cálculo :

Norma EH-1991
Inclinación estándar bielas comprimidas hormigón .. 45.00 [Grados]
Coeficiente de fluencia phi 0.00
Factor minoración de la resistencia de la sección : 1.00
Def. máxima en compresión centrada del hormigón ... -2.00 [o/oo]
Deformación máxima en flexión en vigas -3.50 [o/oo]
Def. máxima en tracción del acero en vigas 10.00 [o/oo]
Modo de análisis / Inclinación del eje neutro flexión esviada
Cuantía mínima de armadura long. para pilas 0.40 [o/o]
Cuantía máxima de armadura lo.g. 8.00 [o/o]
Modo de pretensado adherente
NO se usaron coef. de homogeneización para calcular las caract. mecánicas

Modelo para dimensionamiento a cortante:

Usar un canto útil constante en los cálculos a cortante
Cálculo separado para la arm. longitudinal adicional debida a cortante

Mstb. 1 : 7.0



Sección : "FISUHAST" Armadura : "B1"
Tipo : tipo viga/ Rectángulo Unidades : [cm]
Material : "H250"

Ancho = 100.00 cm Canto = 75.00 cm

Características mecánicas de la sección:

Area : Ax= 0.750000 [m2]
Momentos de inercia : Iy= 0.035156 [m4] Iz= 0.062500 [m4]
Inercia a torsión : Ix= 0.075915 [m4]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.375000 [m]

	I:	R=dist.borde [m]	W=1/R [m3]	W/Ax [m]
izq. Iz	-0.500		-0.125000	0.167
dch. Iz	0.500		0.125000	-0.167
abajo Iy	-0.375		-0.093750	0.125
arriba Iy	0.375		0.093750	-0.125

Armadura: "B1"

Nº	Nom.mat	Cod.dim.	Area [cm2]	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]
1	AEH500	(2)	15.71	-40.00	5.00	40.00	5.00
2	AEH500	(2)	15.71	-40.00	70.00	40.00	70.00

Total: 31.42 Cuantía de armadura: 0.419 [o/o]

Cód. dimensionamiento: (0) = As constante
Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada
Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero"AEH500"/Hormigón"H250")				
Cortante	Area mín.cercos	Ancho alma ideal	Canto útil	Incl.bielas
Vz	0.00 [cm2/m]	100.00 [cm]	71.00 [cm]	0.00
Vy	0.00 [cm2/m]	75.00 [cm]	96.00 [cm]	0.00

Características del material:						
Nom.Mat.	Módulo E	0.85*fcd,fyd	eps-fc	fct	fcv	fcw,mín
	[kp/cm2]	[kp/cm2]	[o/oo]	[kp/cm2]	[kp/cm2]	[kp/cm2]
"H250"	300000.0	-141.600	-2.000	0.0	6.460	250.000
"AEH500"	2.10E+06	4434.700				

Leyenda:
fcd,fyd resistencia de cálculo del hormigón,acero
eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)
fct resistencia de cálculo a tracción del hormigón
fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Comprobación de las tensiones en el estado II: Viga "FISUHAST"/"B1"

Esfuerzos (E.L.S.)					
N	Vy	Vz	Mx	My	Mz
-36.730				-37.580	

Deformaciones y tensiones extremas:					
3	Coordenadas	Eps	Estado-II	Estado-I	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]
Hormigón-Min	50.00	0.00	-0.315	-94.556	-44.983 "H250"
Armadura-Min	40.00	5.00	-0.208	-435.808	"AEH500"
Hormigón-Max	-50.00	75.00	1.300	0.000	35.188 "H250"
Armadura-Max	-40.00	70.00	1.192	2503.313	"AEH500"

Fibra neutra	zn	14.64 cm	yn	0.00 cm	Angulo	0.0
Ancho zona comprim.		14.64 cm	Zona comprimida/Canto útil			0.21

Esfuerzos		Rigideces secantes:		Deformaciones:	
N =	-36.730 [t]	EAx=	74614.6 [t]		4.922630E-04
My=	-37.580 [tm]	Ely=	17453.1 [tm2]		-2.153202E-03 [1/m]
Mz=	0.000 [tm]	EIz=	40113.8 [tm2]		5.062660E-15 [1/m]
(*) Rigidez tangencial !					

Deformaciones y tensiones en vertices de la sección:						
	Coordenadas	Eps	Est. I	Est. II	Dist.Fuerz.Compr.	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	[t]
	50.00	0.00	-0.315	-44.983	-94.556	-69.206 32.62
	50.00	75.00	1.300	35.188	0.000	
	-50.00	75.00	1.300	35.188	0.000	
	-50.00	0.00	-0.315	-44.983	-94.556	

Deformaciones y tensiones de la armadura pasiva (Estado II):				
Nº	Coordenadas	Eps	Sigma-s	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]
1	-40.000	5.000	-0.208	-435.81
	40.000	5.000	-0.208	-435.81
2	-40.000	70.000	1.192	2503.31
	40.000	70.000	1.192	2503.31

Comprobación de las tensiones en el estado II: Viga "FISUHAST"/"B1"

Esfuerzos (E.L.S.)					
N	Vy	Vz	Mx	My	Mz
				-25.299	

Deformaciones y tensiones extremas:					
3	Coordenadas	Eps	Estado-II	Estado-I	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]
Hormigón-Min	50.00	0.00	-0.212	-63.567	-26.986 "H250"
Armadura-Min	40.00	5.00	-0.114	-239.543	"AEH500"
Hormigón-Max	-50.00	75.00	1.255	0.000	26.986 "H250"
Armadura-Max	-40.00	70.00	1.158	2430.965	"AEH500"

Fibra neutra	zn	10.83 cm	yn	0.00 cm	Angulo	0.0
Ancho zona comprim.		10.83 cm	Zona comprimida/Canto útil			0.15

Esfuerzos		Rigideces secantes:		Deformaciones:	
N =	0.000 [t]	EAx=	390887.0 [t]		5.217671E-04
My=	-25.299 [tm]	Ely=	12931.3 [tm2]		-1.956416E-03 [1/m]
Mz=	0.000 [tm]	EIz=	30594.7 [tm2]		1.646196E-16 [1/m]
(*) Rigidez tangencial !					

Deformaciones y tensiones en vertices de la sección:						
	Coordenadas	Eps	Est. I	Est. II	Dist.Fuerz.Compr.	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	[t]
	50.00	0.00	-0.212	-26.986	-63.567	-34.423 33.89
	50.00	75.00	1.255	26.986	0.000	
	-50.00	75.00	1.255	26.986	0.000	
	-50.00	0.00	-0.212	-26.986	-63.567	

Deformaciones y tensiones de la armadura pasiva (Estado II):				
Nº	Coordenadas	Eps	Sigma-s	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]
1	-40.000	5.000	-0.114	-239.54
	40.000	5.000	-0.114	-239.54
2	-40.000	70.000	1.158	2430.96
	40.000	70.000	1.158	2430.96

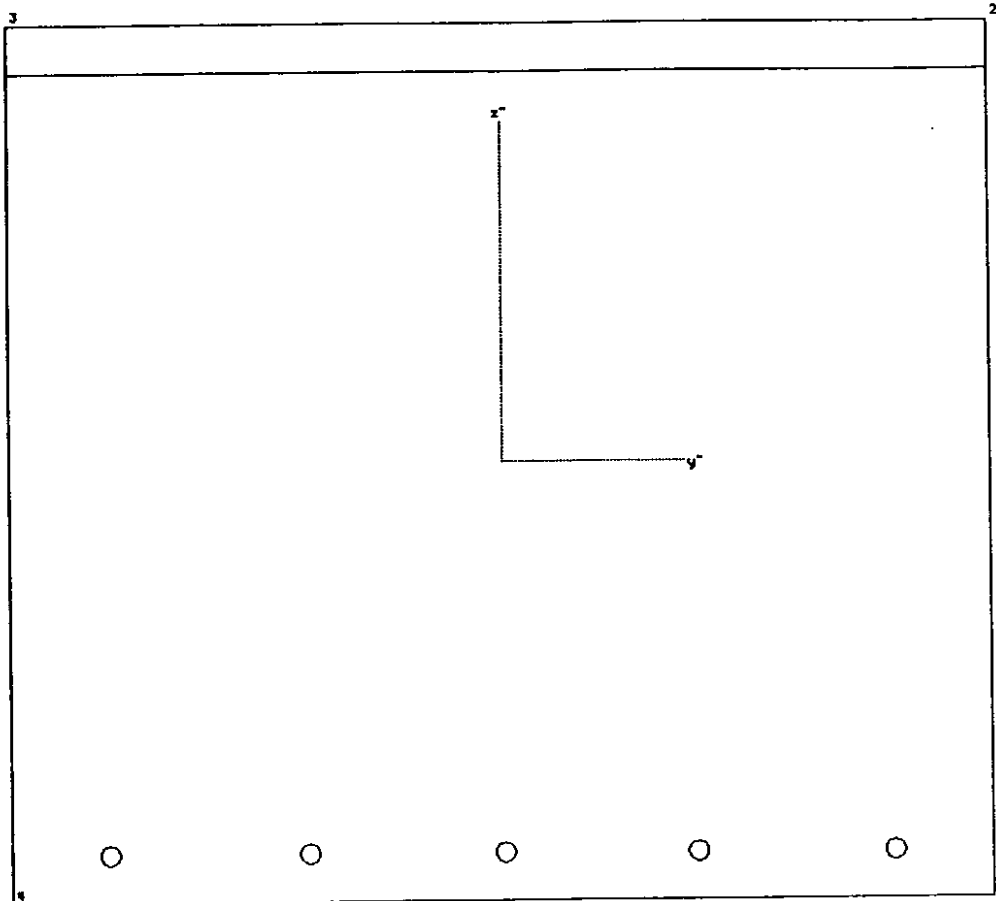
Parámetros globales de cálculo :

Norma: EH-1991
Inclinación estándar bielas comprimidas hormigón ..: 45.00 [Grados]
Coeficiente de fluencia phi: 0.00
Factor minoración de la resistencia de la sección : 1.00
Def. máxima en compresión centrada del hormigón ...: -2.00 [o/oo]
Deformación máxima en flexión en vigas: -3.50 [o/oo]
Def. máxima en tracción del acero en vigas: 10.00 [o/oo]
Modo de análisis / Inclinación del eje neutro: flexión esviada
Cuantía mínima de armadura long. para pilas: 0.40 [o/o]
Cuantía máxima de armadura long.: 8.00 [o/o]
Modo de pretensado: adherente
NO se usaron coef. de homogeneización para calcular las caract. mecánicas

Modelo para dimensionamiento a cortante:

Usar un canto útil constante en los cálculos a cortante
Cálculo separado para la arm. longitudinal adicional debida a cortante

Mstb. 1 : 7.0



Sección : "FISUSOLE" Armadura : "B1"
Tipo : tipo viga/ Rectángulo Unidades : [cm]
Material : "H350"

Ancho = 100.00 cm Canto = 90.00 cm

Características mecánicas de la sección:

Area : Ax= 0.900000 [m2]
Momentos de inercia : Iy= 0.060750 [m4] Iz= 0.075000 [m4]
Inercia a torsión : Ix= 0.112680 [m4]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.450000 [m]

I: R=dist.borde [m] W=I/R [m3] W/Ax [m]
Izq. Iz -0.500 -0.150000 0.167
dch. Iz 0.500 0.150000 -0.167
abajo Iy -0.450 -0.135000 0.150
arriba Iy 0.450 0.135000 -0.150

Armadura: "B1"

Nº	Nom.mat	Cod.dim.	Area [cm2]	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]
1	AEH500	(2)	15.71	-40.00	5.00	40.00	5.00
2	AEH500	(2)	32.73	-50.00	85.00	50.00	85.00
Total:			48.44	Cuantía de armadura: 0.538 [o/o]			

Cód. dimensionamiento: (0) = As constante

Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada

Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero"AEH500"/Hormigón"H350")

Cortante Area mín.cercos Ancho alma ideal Canto útil Incl.bielas

Vz	0.00 [cm2/m]	100.00 [cm]	86.00 [cm]	0.00
Vy	0.00 [cm2/m]	90.00 [cm]	96.00 [cm]	0.00

Características del material:

Nom.Mat.	Módulo E [kp/cm2]	0.85*fcd,fyd [kp/cm2]	eps-fc [o/oo]	fct [kp/cm2]	fcv [kp/cm2]	fcw,mín [kp/cm2]
"H350"	350000.0	-198.300	-2.000	0.0	7.640	350.000
"AEH500"	2.10E+06	4434.700				

Leyenda:

fcd,fyd resistencia de cálculo del hormigón,acero

eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)

fct resistencia de cálculo a tracción del hormigón

fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Comprobación de las tensiones en el estado II: Viga "FISUSOLE"/"B1"

Esfuerzos (E.L.S.)						Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	
-1.030				-64.320		

Deformaciones y tensiones extremas:

3	Coordenadas y [cm]	z [cm]	Eps [o/oo]	Estado-II [kp/cm2]	Estado-I [kp/cm2]	
Hormigón-Min	50.00	0.00	-0.269	-94.238	-47.759	"H350"
Armadura-Min	40.00	5.00	-0.185	-388.081		"AEH500"
Hormigón-Max	-50.00	90.00	1.251	0.000	47.530	"H350"
Armadura-Max	-50.00	85.00	1.166	2449.481		"AEH500"

Fibra neutra zn 15.94 cm yn 0.00 cm Angulo 0.0
Ancho zona comprim. 15.94 cm Zona comprimida/Canto útil 0.19

Esfuerzos	Rigideces secantes:	Deformaciones:
N = -1.030 [t]	EAx= 2098.574 [t]	4.908095E-04
My= -64.320 [tm]	Ely= 38081.1 [tm2]	-1.689025E-03 [1/m]
Mz= 0.000 [tm]	*Eiz= 53982.9 [tm2]	8.750396E-16 [1/m]
(*) Rigidez tangencial !		

Deformaciones y tensiones en vertices de la sección:

Coordenadas y [cm]	z [cm]	Eps [o/oo]	Est. I [kp/cm2]	Est. II [kp/cm2]	Dist.Fuerz.Compr. [t]	[cm]
50.00	0.00	-0.269	-47.759	-94.238	-75.114	39.69
50.00	90.00	1.251	47.530	0.000		
-50.00	90.00	1.251	47.530	0.000		
-50.00	0.00	-0.269	-47.759	-94.238		

Deformaciones y tensiones de la armadura pasiva (Estado II):

Nº	Coordenadas y [cm]	z [cm]	Eps [o/oo]	Sigma-s [kp/cm2]
1	-40.000	5.000	-0.185	-388.08
	40.000	5.000	-0.185	-388.08
2	-50.000	85.000	1.166	2449.48
	50.000	85.000	1.166	2449.48

Comprobación de las tensiones en el estado II: Viga "FISUSOLE"/"B1"

Esfuerzos (E.L.S.)						Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	
						-36.431

Deformaciones y tensiones extremas:

3	Coordenadas		Eps	Estado-II	Estado-I	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	
Hormigón-Min	50.00	0.00	-0.152	-53.315	-26.986	"H350"
Armadura-Min	40.00	5.00	-0.104	-218.970		"AEH500"
Hormigón-Max	-50.00	90.00	0.713	0.000	26.986	"H350"
Armadura-Max	-50.00	85.00	0.665	1395.769		"AEH500"

Fibra neutra	zn	15.85 cm	yn	0.00 cm	Angulo	0.0
Ancho zona comprim.		15.85 cm	Zona comprimida/Canto útil			0.19

Esfuerzos		: Rigideces secantes:		Deformaciones:	
N =	0.000 [t]	*EAX=	656426.9 [t]	2.801902E-04	
My=	-36.431 [tm]	Ely=	37903.4 [tm2]	-9.611545E-04 [1/m]	
Mz=	0.000 [tm]	*EIZ=	53712.6 [tm2]	1.084552E-15 [1/m]	
(*) Rigidez tangencial !					

Deformaciones y tensiones en vertices de la sección:

Coordenadas		Eps	Est. I	Est. II	Dist.Fuerz.Compr.	
y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	[t]	[cm]
50.00	0.00	-0.152	-26.986	-53.315	-42.249	39.72
50.00	90.00	0.713	26.986	0.000		
-50.00	90.00	0.713	26.986	0.000		
-50.00	0.00	-0.152	-26.986	-53.315		

Deformaciones y tensiones de la armadura pasiva (Estado II):

Nº	Coordenadas		Eps	Sigma-s
	y [cm]	z [cm]	[o/oo]	[kp/cm2]
1	-40.000	5.000	-0.104	-218.97
	40.000	5.000	-0.104	-218.97
2	-50.000	85.000	0.665	1395.77
	50.000	85.000	0.665	1395.77

Comprobación de las tensiones en el estado II: Viga "FISUSOLE"/"B1"

Esfuerzos (E.L.S.)						Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	
						-20.470 30.100

Deformaciones y tensiones extremas:

3	Coordenadas		Eps	Estado-II	Estado-I	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	
Hormigón-Min	-50.00	90.00	-0.164	-57.406	-24.571	"H350"
Armadura-Min	-50.00	85.00	-0.106	-222.182		"AEH500"
Hormigón-Max	50.00	0.00	0.884	0.000	20.022	"H350"
Armadura-Max	40.00	5.00	0.826	1733.907		"AEH500"

Fibra neutra	zn	75.91 cm	yn	-0.00 cm	Angulo	0.0
Ancho zona comprim.		14.09 cm	Zona comprimida/Canto útil			0.17

Esfuerzos		: Rigideces secantes:		Deformaciones:	
N =	-20.470 [t]	EAX=	56871.4 [t]	3.599346E-04	
My=	30.100 [tm]	Ely=	25851.6 [tm2]	1.164338E-03 [1/m]	
Mz=	0.000 [tm]	*EIZ=	48574.0 [tm2]	-3.175379E-14 [1/m]	
(*) Rigidez tangencial !					

Deformaciones y tensiones en vertices de la sección:

Coordenadas		Eps	Est. I	Est. II	Dist.Fuerz.Compr.	
y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	[t]	[cm]
50.00	0.00	0.884	20.022	0.000	-40.433	40.30
50.00	90.00	-0.164	-24.571	-57.406		
-50.00	90.00	-0.164	-24.571	-57.406		
-50.00	0.00	0.884	20.022	0.000		

Deformaciones y tensiones de la armadura pasiva (Estado II):

Nº	Coordenadas		Eps	Sigma-s
	y [cm]	z [cm]	[o/oo]	[kp/cm2]
1	-40.000	5.000	0.826	1733.91
	40.000	5.000	0.826	1733.91
2	-50.000	85.000	-0.106	-222.18
	50.000	85.000	-0.106	-222.18

Comprobación de las tensiones en el estado II: Viga "FISUSOLE"/"B1"

Esfuerzos (E.L.S.)						Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	
						36.431

Deformaciones y tensiones extremas:

3	Coordenadas		Eps	Estado-II	Estado-I	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	
Hormigón-Min	-50.00	90.00	-0.198	-69.436	-26.986	"H350"
Armadura-Min	-50.00	85.00	-0.107	-224.024		"AEH500"
Hormigón-Max	50.00	0.00	1.452	0.000	26.986	"H350"
Armadura-Max	40.00	5.00	1.361	2857.412		"AEH500"

Fibra neutra	zn	79.18 cm	yn	-0.00 cm	Angulo	0.0
Ancho zona comprim.		10.82 cm	Zona comprimida/Canto útil			0.13

Esfuerzos		: Rigideces secantes:		Deformaciones:	
N =	0.000 [t]	*EAX=	480289.6 [t]	6.269972E-04	
My=	36.431 [tm]	Ely=	19862.2 [tm2]	1.834188E-03 [1/m]	
Mz=	0.000 [tm]	*EIZ=	39034.5 [tm2]	-3.809661E-14 [1/m]	
(*) Rigidez tangencial !					

Deformaciones y tensiones en vertices de la sección:

Coordenadas		Eps	Est. I	Est. II	Dist.Fuerz.Compr.	
y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	[t]	[cm]
50.00	0.00	1.452	26.986	0.000	-37.551	41.39
50.00	90.00	-0.198	-26.986	-69.436		
-50.00	90.00	-0.198	-26.986	-69.436		
-50.00	0.00	1.452	26.986	0.000		

Deformaciones y tensiones de la armadura pasiva (Estado II):

Nº	Coordenadas		Eps	Sigma-s
	y [cm]	z [cm]	[o/oo]	[kp/cm2]
1	-40.000	5.000	1.361	2857.41
	40.000	5.000	1.361	2857.41
2	-50.000	85.000	-0.107	-224.02
	50.000	85.000	-0.107	-224.02

Parámetros globales de cálculo :

Norma: EH-1991
Inclinación estándar bielas comprimidas hormigón ..: 45.00 [Grados]
Coeficiente de fluencia phi: 0.00
Factor minoración de la resistencia de la sección : 1.00
Def. máxima en compresión centrada del hormigón ...: -2.00 [o/oo]
Deformación máxima en flexión en vigas: -3.50 [o/oo]
Def. máxima en tracción del acero en vigas: 10.00 [o/oo]
Modo de análisis / Inclinación del eje neutro: flexión esviada
Cuantía mínima de armadura long. para pilas: 0.40 [o/o]
Cuantía máxima de armadura long.: 8.00 [o/o]
Modo de pretensado: adherente
NO se usaron coef. de homogeneización para calcular las caract. mecánicas

Modelo para dimensionamiento a cortante:

Usar un canto útil constante en los cálculos a cortante
Cálculo separado para la arm. longitudinal adicional debida a cortante

CALCULO DE MUROS.

NOMBRE PROYECTO : L.A.V. MADRID - ZARAGOZA. Subtramo XV.
 NOMBRE OBRA : Aletas de marcos sin cobertura.

DATOS

GEOMETRIA DE CALCULO DEL MURO

C. Canto del muro en coronación (m) :	0.350
ST. Sobreespesor muro en trasdós (m) :	0.550
SI. Sobreespesor muro en intradós (m) :	0.000
P. Puntera zapata (m) :	1.300
T. Talón zapata (m) :	4.000
H. Altura muro (m) :	7.300
H _z . Canto zapata (m) :	1.000
Anchura total cimentación (m) :	6.200
Angulo trasdós muro (°) :	85.691

DEFINICION TERRENO

	X	Y
0. Coordenadas base trasdós (m) :	0.000	0.000
1. Coordenadas coronación trasdós (m) :	-0.550	7.300
2. Coordenadas fin tramo 1 terreno (m) :	3.650	7.300
3. Coordenadas fin tramo 2 terreno (m) :	7.300	7.300
4. Coordenadas fin tramo 3 terreno (m) :	10.950	7.300

COEFICIENTES DE SEGURIDAD

Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
γ _o (coeficiente combinación variables) :	1.00

Estado Límite Último	
Favorable	Desfavorable

Acciones permanentes (G)

Peso propio, cargas muertas :	0.90	1.50
-------------------------------	------	------

Acciones permanentes de valor no constante (G*)

Tierras (peso propio y empujes) :	0.00	1.50
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Acciones variables (Q)

Sobrecargas :	0.00	1.50
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CARACTERISTICAS DEL TERRENO

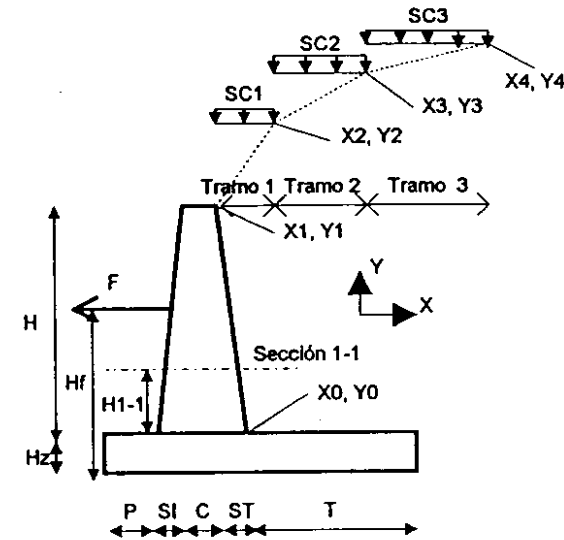
γ. Peso específico (T/m³) :	2.00
δ. Angulo rozamiento interno (°) :	30.000
δ _{mt} . Angulo rozamiento muro-tierras (°) :	0.000
δ _{tt} . Angulo rozamiento tierras-tierras (°) :	0.000
μ. Coeficiente rozamiento zapata-tierras :	0.580
Tensión admisible cimentación (T/m²) :	20.000

ARMADO

H1-1. Dist. sección 1 a sup. zapata (m) :	1.700
Recubrimiento alzado (m) :	0.050
Recubrimiento cimentación (m) :	0.050

Cuantías mínimas

Vertical muros (1/3 mín cara)(o/oo) :	0.900
Horizontal muros (1/3 mín. cara)(o/oo) :	1.600
Cortante o montaje alzado (cm²/m²) :	4.500
Transversal zapata (sup+inf)(o/oo) :	1.447
Longitudinal zapata (sup+inf)(o/oo) :	1.447
Cortante zapata (cm²/m²) :	0.000
Perimetral zapata (en canto)(cm²/m) :	7.235



CARGAS (sin mayorar)

Acciones permanentes (G)

Peso propio barrera coronación (T/m) :	0.750
--	-------

Acciones permanentes de valor no constante (G*)

Fg. Carga horizontal sobre muro (T/m) :	1.321
---	-------

H _{fg} . Posición Fg a inferior zapata (m) :	6.710
---	-------

Acciones variables (Q)

SC1. Sobrecarga en tramo 1 (T/m) :	3.000
------------------------------------	-------

SC2. Sobrecarga en tramo 2 (T/m) :	3.000
------------------------------------	-------

SC3. Sobrecarga en tramo 3 (T/m) :	3.000
------------------------------------	-------

Fq. Carga horizontal sobre muro (T/m) :	1.606
---	-------

H _{fq} . Posición Fq a inferior zapata (m) :	7.221
---	-------

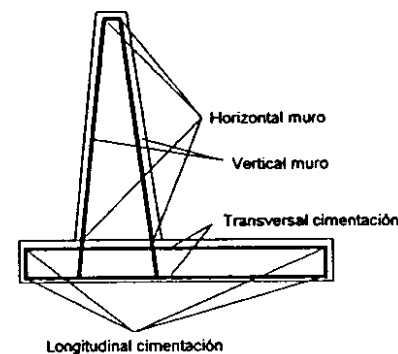
CARACTERISTICAS MATERIALES

Peso específico hormigón (T/m³) :	2.500
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Hormigón alzado (T/m²) :	H - 250
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Hormigón cimentación (T/m²) :	H - 250
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Acero (T/P) :	AEH - 500
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RESUMEN ACCIONES SOBRE EL MURO

		F. vertical (T / m)	X (m)	F. Horizontal (T / m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 (ΣP _i , i=1..3)	8.603	1.583	---	---
	Sobre sección base muro (ΣP _i , i=1..3)	12.156	1.623	---	---
	Total peso propio (ΣP _i , i=1..6)	27.656	2.451	---	---
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E1 _t)	0.855	1.931	11.348	4.567
	Sobre sección base muro (E1 _t)	1.453	2.017	19.284	3.433
	Total tierras (E2 _t + ΣT)	62.415	4.060	22.910	2.767
	Verticales sobre talón (ΣT _i , i=1..3)	58.400	4.200	---	---
	Verticales sobre talón (cortante) (ΣT _i , i=1..3)	44.530	4.675	---	---
Fuerza Fg	Sobre sección 1	---	---	---	6.710
	Sobre sección base muro	---	---	1.321	6.710
	Total Fg	---	---	1.321	6.710
Acciones variables (Q)					
Sobrecargas sobre terreno	Sección 1 (E1 _{sc})	0.458	1.861	6.079	5.500
	Base muro (E1 _{sc})	0.597	1.925	7.925	4.650
	Inf. cimentación (E2 _{sc} + ΣS)	23.550	4.808	8.281	4.150
	Verticales sobre talón (ΣS _i , i=1..3)	21.900	5.025	---	---
	Verticales sobre talón (cortante) (ΣS _i , i=1..3)	9.150	4.675	---	---
Fuerza Fq	Sobre sección 1	---	---	---	1.606
	Sobre sección base muro	---	---	1.606	7.221
	Total Fq	---	---	1.606	7.221

COMPROBACIONES

SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	16.041	---
Acciones permanentes de valor no constante (G*)		
Tierras	36.201	22.910
Fuerza Fg	---	1.321
Acciones variables (Q)		
Sobrecargas sobre terreno	---	---
Fuerza Fq	---	1.606

TOTAL 52.241 25.836

Csd= 2.022 Vale

SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	67.779	---
Acciones permanentes de valor no constante (G*)		
Tierras	253.377	63.384
Fuerza Fg	---	8.861
Acciones variables (Q)		
Sobrecargas sobre terreno	---	---
Fuerza Fq	---	11.595

TOTAL 321.166 83.839

Csv= 3.831 Vale

TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	27.656	17.956
Acciones permanentes de valor no constante (G*)		
Tierras	62.415	3.493
Fuerza Fg	0.000	8.861
Acciones variables (Q)		
Sobrecargas sobre terreno	23.550	-5.854
Fuerza Fq	0.000	11.595

TOTAL 113.621 36.050

D (m) = 6.20

σ puntera (T / m²) = 23.95

σ talón (T / m²) = 12.70

σ med (T / m²) = 18.33

σ cob (T / m²) = 20

Vale

ARMADO

Secciones

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	0.90	1.00	0.90
	1-1	1.00	0.77	1.00	0.77
PUNTERA	2-2 f	1.00	1.00	1.00	1.00
	2-2 c	1.00	1.00	1.00	1.00
TALON	3-3 f	1.00	1.00	1.00	1.00
	3-3 c	1.00	1.00	1.00	1.00

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	14.016	140.723	45.203
	0-0 (-)	10.941	1.390	0.000
	1-1 (+)	9.713	76.501	30.531
	1-1 (-)	7.743	0.794	0.000
PUNTERA	2-2 f (+)	0.000	31.791	---
	2-2 f (-)	0.000	4.013	---
	2-2 c (+)	---	---	25.622
	2-2 c (-)	---	---	3.260
TALON	3-3 f (+)	-0.830	-16.742	---
	3-3 f (-)	-30.378	-100.723	---
	3-3 c (+)	---	---	0.811
	3-3 c (-)	---	---	-20.533

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm2/m	Minima cm2/m	Control cálculo	Adoptada cm2/m
ALZADO	Vert. trasdós	0-0 (+)	38.919	5.400	Vale	38.919
		0-0 (-)	0.000	2.700	Vale	
		1-1 (+)	24.238	4.632	Vale	
		1-1 (-)	0.000	2.316	Vale	
	Vert. intradós	0-0 (+)	0.000	2.700	Vale	2.700
		0-0 (-)	0.000	2.700	Vale	
		1-1 (+)	0.000	2.316	Vale	
		1-1 (-)	0.000	2.316	Vale	
	Hor. trasdós (*)	---	7.784	9.600	Vale	9.600
	Hor. intradós (*)	---	0.000	4.800	Vale	4.800
	Cortante	0-0 (+)	0.000	4.500	Vale	4.500 (cm²/m²)
		0-0 (-)	0.000	4.500	Vale	
		1-1 (+)	0.000	4.500	Vale	
		1-1 (-)	0.000	4.500	Vale	
PUNTERA	Trans. inferior	2-2 f (+)	7.642	7.235	Vale	7.642
		2-2 f (-)	0.954	7.235	Vale	
	Long. inf. (*)	---	1.528	7.235	Vale	7.235
		---	---	---	---	
	Trans. superior	2-2 f (+)	0.000	7.235	Vale	31.782
		2-2 f (-)	0.000	7.235	Vale	
	Long. sup. (*)	---	0.000	7.235	Vale	7.235
		---	---	---	---	
TALON	Cortante	2-2 c (+)	0.000	0.000	Vale	0.000 (cm²/m²)
		2-2 c (-)	0.000	0.000	Vale	
	Trans. inferior	3-3 f (+)	0.000	7.235	Vale	7.642
		3-3 f (-)	0.000	7.235	Vale	
	Long. inf. (*)	---	0.000	7.235	Vale	7.235
		---	---	---	---	
	Trans. superior	3-3 f (+)	4.187	7.235	Vale	31.782
		3-3 f (-)	31.782	7.235	Vale	
ZAPATA	Long. sup. (*)	---	6.356	7.235	Vale	7.235
		---	---	---	---	
	Cortante	3-3 c (+)	0.000	0.000	Vale	0.000 (cm²/m²)
		3-3 c (-)	0.000	0.000	Vale	
ZAPATA	Perimetral	---	0.000	7.235	Vale	7.235
		---	---	---	---	

(*) Calculada como el 20% de la armadura perpendicular a ella

CALCULO DE MUROS.

NOMBRE PROYECTO : L.A.V. MADRID - ZARAGOZA, Subtramo XV.
 NOMBRE OBRA : Aletas 1 y 2 E-1505.8

DATOS

GEOMETRIA DE CALCULO DEL MURO

C. Canto del muro en coronación (m) :	0.350
ST. Sobreepesor muro en trasdós (m) :	0.650
SI. Sobreepesor muro en intradós (m) :	0.000
P. Puntera zapata (m) :	1.750
T. Talón zapata (m) :	4.000
H. Altura muro (m) :	7.870
H _z . Canto zapata (m) :	1.200
Anchura total cimentación (m) :	6.750
Angulo trasdós muro (°) :	85.279

DEFINICION TERRENO

	X	Y
0. Coordenadas base trasdós (m) :	0.000	0.000
1. Coordenadas coronación trasdós (m) :	-0.650	7.870
2. Coordenadas fin tramo 1 terreno (m) :	3.935	7.870
3. Coordenadas fin tramo 2 terreno (m) :	7.870	7.870
4. Coordenadas fin tramo 3 terreno (m) :	11.805	7.870

COEFICIENTES DE SEGURIDAD

Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
γ _o (coeficiente combinación variables) :	1.00

Estado Límite Ultimo	
Favorable	Desfavorable

Acciones permanentes (G)	
Peso propio, cargas muertas :	0.90
Acciones permanentes de valor no constante (G*)	
Terreno (peso propio y empujes) :	0.00
Acciones variables (Q)	
Sobrecargas :	0.00

CARACTERISTICAS DEL TERRENO

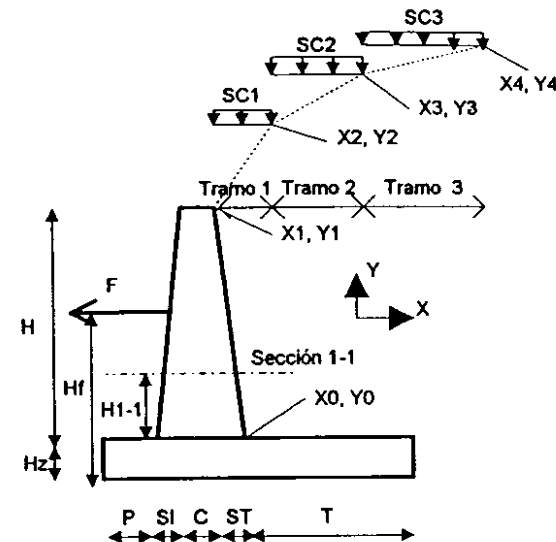
γ. Peso específico (T/m³) :	2.00
φ. Angulo rozamiento interno (°) :	30.000
δ _{ml} . Angulo rozamiento muro-tierras (°) :	0.000
φ _{lt} . Angulo rozamiento tierras-tierras (°) :	0.000
μ. Coeficiente rozamiento zapata-tierras :	0.580
Tensión admisible cimentación (T/m²) :	20.000

ARMADO

H1-1. Dist. sección 1 a sup. zapata (m) :	1.750
Recubrimiento alzado (m) :	0.050
Recubrimiento cimentación (m) :	0.050

Cuantías mínimas

Vertical muros (1/3 mín cara)(o/oo) :	0.900
Horizontal muros (1/3 mín. cara)(o/oo) :	1.600
Cortante o montaje alzado (cm²/m²) :	4.500
Transversal zapata (sup+inf)(o/oo) :	1.447
Longitudinal zapata (sup+inf)(o/oo) :	1.447
Cortante zapata (cm²/m²) :	0.000
Perimetral zapata (en canto)(cm²/m) :	8.682

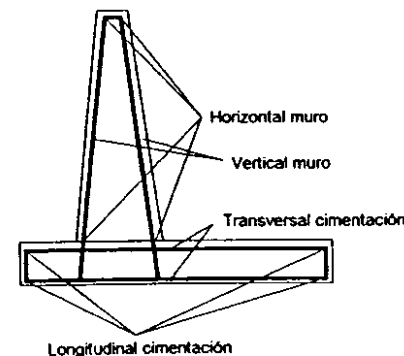


CARGAS (sin mayorar)

Acciones permanentes (G)	
Peso propio barrera coronación (T/m) :	0.750
Acciones permanentes de valor no constante (G*)	
Fg. Carga horizontal sobre muro (T/m) :	0.880
Hfg. Posición Fg a inferior zapata (m) :	7.480
Acciones variables (Q)	
SC1. Sobrecarga en tramo 1 (T/m) :	3.000
SC2. Sobrecarga en tramo 2 (T/m) :	3.000
SC3. Sobrecarga en tramo 3 (T/m) :	3.000
Fq. Carga horizontal sobre muro (T/m) :	1.071
Hfq. Posición Fq a inferior zapata (m) :	7.991

CARACTERISTICAS MATERIALES

Peso específico hormigón (T/m³) :	2.500
Hormigón alzado (T/m²) :	H - 250
Hormigón cimentación (T/m²) :	H - 250
Acero (T/°) :	AEH - 500



RESUMEN ACCIONES SOBRE EL MURO

		F. vertical (T / m)	X (m)	F. Horizontal (T / m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 (ΣP _i , i=1..3)	9.972	2.058	---	---
	Sobre sección base muro (ΣP _i , i=1..3)	14.031	2.103	---	---
	Total peso propio (ΣP _i , i=1..6)	34.281	2.855	---	---
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E1t)	1.128	2.437	13.662	4.990
	Sobre sección base muro (E1t)	1.866	2.533	22.593	3.823
	Total tierras (E2t + ΣT)	68.076	4.583	27.346	3.023
	Verticales sobre talón (ΣT _i)	62.960	4.750	---	---
	Verticales sobre talón (cortante) (ΣT _i)	44.859	5.325	---	---
Fuerza Fg	Sobre sección 1	---	---	0.880	7.480
	Sobre sección base muro	---	---	0.880	7.480
	Total Fg	---	---	0.880	7.480
Acciones variables (Q)					
Sobrecargas sobre terreno	Sección 1 (E1sc)	0.553	2.353	6.697	6.010
	Base muro (E1sc)	0.711	2.425	8.612	5.135
	Inf. cimentación (E2sc + ΣS)	25.560	5.466	9.045	4.535
	Verticales sobre talón (ΣS _i , i=1..3)	23.610	5.718	---	---
	Verticales sobre talón (cortante) (ΣS _i)	8.550	5.325	---	---
Fuerza Fq	Sobre sección 1	---	---	1.071	7.991
	Sobre sección base muro	---	---	1.071	7.991
	Total Fq	---	---	1.071	7.991

COMPROBACIONES**SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)**

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	19.883	—
Acciones permanentes de valor no constante (G*)		
Tierras	39.484	27.346
Fuerza Fg	—	0.880
Acciones variables (Q)		
Sobrecargas sobre terreno	—	—
Fuerza Fq	—	1.071

TOTAL 69.367 29.296

Csd= 2.026 Vale

SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	97.857	—
Acciones permanentes de valor no constante (G*)		
Tierras	312.019	82.675
Fuerza Fg	—	6.585
Acciones variables (Q)		
Sobrecargas sobre terreno	—	—
Fuerza Fq	—	8.554

TOTAL 409.876 97.814

Csv= 4.190 Vale

TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	34.281	17.840
Acciones permanentes de valor no constante (G*)		
Tierras	68.076	0.410
Fuerza Fg	0.000	6.585
Acciones variables (Q)		
Sobrecargas sobre terreno	25.560	-12.436
Fuerza Fq	0.000	8.554

TOTAL 127.916 20.954

D (m) = 6.75

σ puntera (T / m²) = 21.71

σ talón (T / m²) = 16.19

σ med (T / m²) = 18.95

σ cob (T / m²) = 19.92

Vale

ARMADO**Secciones**

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	1.00	1.00	1.00
	1-1	1.00	0.86	1.00	0.86
PUNTERA	2-2 f	1.00	1.20	1.00	1.20
	2-2 c	1.00	1.20	1.00	1.20
TALON	3-3 f	1.00	1.20	1.00	1.20
	3-3 c	1.00	1.20	1.00	1.20

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	16.493	159.803	49.733
	0-0 (-)	12.628	1.850	0.000
	1-1 (+)	11.497	87.111	33.465
	1-1 (-)	8.975	1.073	0.000
PUNTERA	2-2 f (+)	0.000	49.255	—
	2-2 f (-)	0.000	6.477	—
	2-2 c (+)	—	—	32.130
	2-2 c (-)	—	—	4.250
TALON	3-3 f (+)	-1.206	-6.255	—
	3-3 f (-)	-33.693	-116.835	—
	3-3 c (+)	—	—	5.567
	3-3 c (-)	—	—	-22.458

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm²/m	Minima cm²/m	Control cálculo	Adoptada cm²/m
ALZADO	Vert. trasdós	0-0 (+)	38.976	6.000	Vale	39.0
		0-0 (-)	0.000	3.000	Vale	
		1-1 (+)	24.429	5.133	Vale	
		1-1 (-)	0.000	2.566	Vale	
	Vert. intradós	0-0 (+)	0.000	3.000	Vale	3.0
		0-0 (-)	0.000	3.000	Vale	
		1-1 (+)	0.000	2.566	Vale	
		1-1 (-)	0.000	2.566	Vale	
	Hor. trasdós (*)	—	7.795	10.667	Vale	10.7
	Hor. intradós (*)	—	0.000	5.333	Vale	5.3
	Cortante	0-0 (+)	0.000	4.500	Vale	4.6 (cm²/m²)
		0-0 (-)	0.000	4.500	Vale	
		1-1 (+)	0.000	4.500	Vale	
		1-1 (-)	0.000	4.500	Vale	
PUNTERA	Trans. inferior	2-2 f (+)	9.788	8.682	Vale	9.8
		2-2 f (-)	1.272	8.682	Vale	
	Long. inf. (*)	—	1.958	8.682	Vale	8.7
	Trans. superior	2-2 f (+)	0.000	8.682	Vale	31.3
		2-2 f (-)	0.000	8.682	Vale	
	Long. sup. (*)	—	0.000	8.682	Vale	8.7
	Cortante	2-2 c (+)	0.000	0.000	Vale	0.0 (cm²/m²)
		2-2 c (-)	0.000	0.000	Vale	
TALON	Trans. inferior	3-3 f (+)	0.000	8.682	Vale	9.8
		3-3 f (-)	0.000	8.682	Vale	
	Long. inf. (*)	—	0.000	8.682	Vale	8.7
	Trans. superior	3-3 f (+)	1.501	8.682	Vale	31.3
		3-3 f (-)	31.269	8.682	Vale	
	Long. sup. (*)	—	6.254	8.682	Vale	8.7
	Cortante	3-3 c (+)	0.000	0.000	Vale	0.0 (cm²/m²)
		3-3 c (-)	0.000	0.000	Vale	
ZAPATA	Perimetral	—	0.000	8.682	Vale	8.7

(*) Calculada como el 20% de la armadura perpendicular a ella

CALCULO DE MUROS.

NOMBRE PROYECTO : L.A.V. MADRID - ZARAGOZA. Subtramo XV.
NOMBRE OBRA : Aléas 3 y 4 E-1505.8

DATOS

GEOMETRIA DE CALCULO DEL MURO

C. Canto del muro en coronación (m) :	0.350
ST. Sobreespesor muro en trasdós (m) :	0.650
Sl. Sobreespesor muro en intradós (m) :	0.000
P. Puntera zapata (m) :	1.750
T. Talón zapata (m) :	4.000
H. Altura muro (m) :	6.700
Hx. Canto zapata (m) :	1.200
Anchura total cimentación (m) :	6.750
Angulo trasdós muro (°) :	84.459

DEFINICION TERRENO

	X	Y
0. Coordenadas base trasdós (m) :	0.000	0.000
1. Coordenadas coronación trasdós (m) :	-0.650	6.700
2. Coordenadas fin tramo 1 terreno (m) :	3.350	6.700
3. Coordenadas fin tramo 2 terreno (m) :	6.700	6.700
4. Coordenadas fin tramo 3 terreno (m) :	10.050	6.700

COEFICIENTES DE SEGURIDAD

Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
Ψ_0 (coeficiente combinación variables) :	1.00

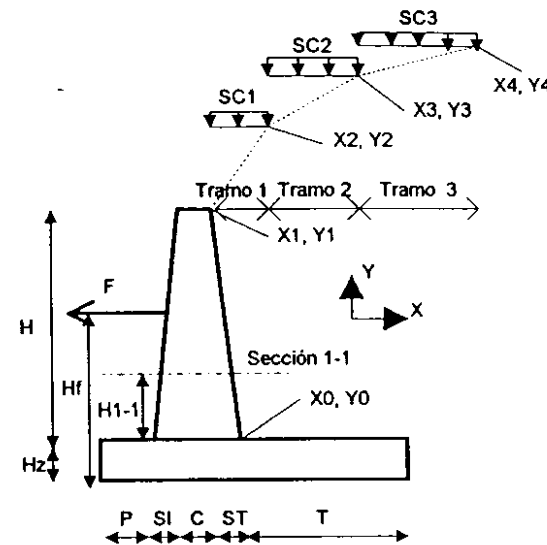
	Estado Límite Último	
	Favorable	Desfavorable
Acciones permanentes (G)		
Peso propio, cargas muertas :	0.90	1.50
Acciones permanentes de valor no constante (G*)		
Terreno (peso propio y empujes) :	0.00	1.50
Acciones variables (Q)		
Sobrecargas :	0.00	1.50

CARACTERISTICAS DEL TERRENO

γ . Peso específico (T/m³) :	2.00
ϕ . Angulo rozamiento interno (°) :	30.000
δ_{mt} . Angulo rozamiento muro-tierras (°) :	0.000
ϕ_{tt} . Angulo rozamiento tierras-tierras (°) :	0.000
μ . Coeficiente rozamiento zapata-tierras :	0.580
Tensión admisible cimentación (T/m²) :	20.000

ARMADO

H1-1. Dist. sección 1 a sup. zapata (m) :	1.750
Recubrimiento alzado (m) :	0.050
Recubrimiento cimentación (m) :	0.050
Cuantías mínimas	
Vertical muros (1/3 mín. cara)(o/oo) :	0.900
Horizontal muros (1/3 mín. cara)(o/oo) :	1.600
Cortante o montaje alzado (cm²/m²) :	4.500
Transversal zapata (sup+inf)(o/oo) :	1.447
Longitudinal zapata (sup+inf)(o/oo) :	1.447
Cortante zapata (cm²/m²) :	0.000
Perimetral zapata (en canto)(cm²/m) :	8.682

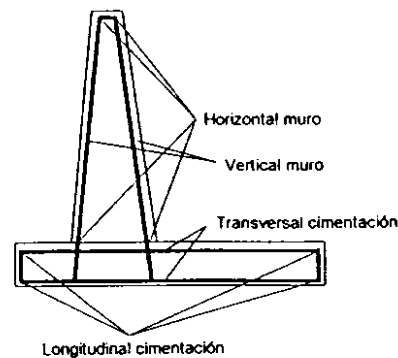


CARGAS (sin mayorar)

Acciones permanentes (G)	
Peso propio barrera coronación (T/m) :	0.750
Acciones permanentes de valor no constante (G*)	
Fg. Carga horizontal sobre muro (T/m) :	1.174
Hfg. Posición Fg a inferior zapata (m) :	6.310
Acciones variables (Q)	
SC1. Sobrecarga en tramo 1 (T/m) :	3.000
SC2. Sobrecarga en tramo 2 (T/m) :	3.000
SC3. Sobrecarga en tramo 3 (T/m) :	3.000
Fq. Carga horizontal sobre muro (T/m) :	1.427
Hfq. Posición Fq a inferior zapata (m) :	6.821

CARACTERISTICAS MATERIALES

Peso específico hormigón (T/m³) :	2.500
Hormigón alzado (T/m³) :	H - 250
Hormigón cimentación (T/m³) :	H - 250
Acero (T/°) :	AEH - 500



RESUMEN ACCIONES SOBRE EL MURO

		F. vertical (T / m)	X (m)	F. Horizontal (T / m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 ($\Sigma P_i, i=1..3$)	8.053	2.049	---	---
	Sobre sección base muro ($\Sigma P_i, i=1..3$)	12.056	2.102	---	---
	Total peso propio ($\Sigma P_i, i=1..6$)	32.306	2.900	---	---
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E1t)	0.881	2.420	9.077	4.600
	Sobre sección base muro (E1t)	1.613	2.533	16.630	3.433
	Total tierras (E2t + ΣT)	57.955	4.583	20.786	2.633
	Verticales sobre talón ($\Sigma T^* i$)	53.600	4.750	---	---
	Verticales sobre talón (cortante) ($\Sigma T^* i$)	38.190	5.325	---	---
Fuerza Fg	Sobre sección 1	---	---	1.174	6.310
	Sobre sección base muro	---	---	1.174	6.310
	Total Fg	---	---	1.174	6.310
Acciones variables (Q)					
Sobrecargas sobre terreno	Sección 1 (E1sc)	0.534	2.340	5.501	5.425
	Base muro (E1sc)	0.722	2.425	7.446	4.550
	Inf. cimentación (E2sc + ΣS)	22.050	5.160	7.893	3.950
	Verticales sobre talón ($\Sigma S^* i, i=1..3$)	20.100	5.425	---	---
	Verticales sobre talón (cortante) ($\Sigma S^* i$)	8.550	5.325	---	---
Fuerza Fq	Sobre sección 1	---	---	1.427	6.821
	Sobre sección base muro	---	---	1.427	6.821
	Total Fq	---	---	1.427	6.821

COMPROBACIONES**SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)**

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	18.738	—
Acciones permanentes de valor no constante (G*)		
Tierras	33.614	20.786
Fuerza Fg	—	1.174
Acciones variables (Q)		
Sobrecargas sobre terreno	—	—
Fuerza Fq	—	1.427
TOTAL	62.352	23.387
Csd=	2.239	Vale

SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	93.684	—
Acciones permanentes de valor no constante (G*)		
Tierras	265.633	54.736
Fuerza Fg	—	7.407
Acciones variables (Q)		
Sobrecargas sobre terreno	—	—
Fuerza Fq	—	9.736
TOTAL	359.317	71.878
Csv=	4.999	Vale

TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	32.306	15.349
Acciones permanentes de valor no constante (G*)		
Tierras	57.955	-15.299
Fuerza Fg	0.000	7.407
Acciones variables (Q)		
Sobrecargas sobre terreno	22.050	-8.174
Fuerza Fq	0.000	9.736
TOTAL	112.311	9.019
D (m) =	6.75	
σ puntera (T / m²) =	17.83	
σ talón (T / m²) =	16.45	
σ_{med} (T / m²) =	16.64	
σ_{cob} (T / m²) =	17.04	
Vale		

ARMADO**Secciones**

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	1.00	1.00	1.00
	1-1	1.00	0.83	1.00	0.83
PUNTERA	2-2 f	1.00	1.20	1.00	1.20
	2-2 c	1.00	1.20	1.00	1.20
TALON	3-3 f	1.00	1.20	1.00	1.20
	3-3 c	1.00	1.20	1.00	1.20

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	14.354	114.890	40.015
	0-0 (-)	10.851	1.608	0.000
	1-1 (+)	9.369	57.460	25.769
	1-1 (-)	7.247	0.844	0.000
PUNTERA	2-2 f (+)	0.000	39.539	—
	2-2 f (-)	0.000	5.569	—
	2-2 c (+)	—	—	25.767
	2-2 c (-)	—	—	3.654
TALON	3-3 f (+)	-1.573	-9.544	—
	3-3 f (-)	-27.748	-76.775	—
	3-3 c (+)	—	—	0.866
	3-3 c (-)	—	—	-14.018

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm2/m	Minima cm2/m	Control cálculo	Adoptada cm2/m
ALZADO	Vert. trasdós	0-0 (+)	27.081	6.000	Vale	27.1
		0-0 (-)	0.000	3.000	Vale	
		1-1 (+)	16.151	4.981	Vale	16.2
		1-1 (-)	0.000	2.491	Vale	
	Vert. intrados	0-0 (+)	0.000	3.000	Vale	3.0
		0-0 (-)	0.000	3.000	Vale	
		1-1 (+)	0.000	2.491	Vale	
		1-1 (-)	0.000	2.491	Vale	
	Hor. trasdós (*)	—	5.416	10.667	Vale	10.7
	Hor. intrados (*)	—	0.000	5.333	Vale	5.3
	Cortante	0-0 (+)	0.000	4.500	Vale	4.6
		0-0 (-)	0.000	4.500	Vale	(cm²/m²)
		1-1 (+)	0.000	4.500	Vale	
		1-1 (-)	0.000	4.500	Vale	
PUNTERA	Trans. inferior	2-2 f (+)	7.836	8.682	Vale	8.7
		2-2 f (-)	1.094	8.682	Vale	
	Long. inf. (*)	—	1.567	8.682	Vale	8.7
	Trans. superior	2-2 f (+)	0.000	8.682	Vale	21.6
		2-2 f (-)	0.000	8.682	Vale	
	Long. sup. (*)	—	0.000	8.682	Vale	8.7
	Cortante	2-2 c (+)	0.000	0.000	Vale	0.0
		2-2 c (-)	0.000	0.000	Vale	(cm²/m²)
TALON	Trans. inferior	3-3 f (+)	0.000	8.682	Vale	8.7
		3-3 f (-)	0.000	8.682	Vale	
	Long. inf. (*)	—	0.000	8.682	Vale	8.7
	Trans. superior	3-3 f (+)	2.231	8.682	Vale	21.6
		3-3 f (-)	21.633	8.682	Vale	
	Long. sup. (*)	—	4.327	8.682	Vale	8.7
	Cortante	3-3 c (+)	0.000	0.000	Vale	0.0
		3-3 c (-)	0.000	0.000	Vale	(cm²/m²)
ZAPATA	Perimetral	—	0.000	8.682	Vale	8.7

(*) Calculada como el 20% de la armadura perpendicular a ella

NOMBRE PROYECTO : L.A.V. MADRID - ZARAGOZA. Subtramo XV.DESIGNACION ALETA: Aleta para marcos sin cobertura de 4 m.

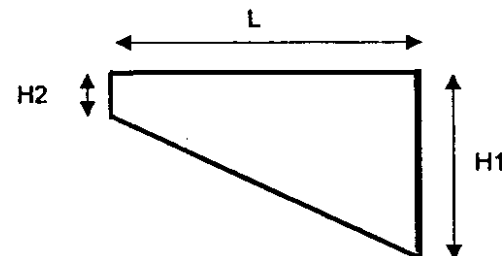
HOJA DE CALCULO DE ALETAS

DATOS REQUERIDOS:

DIMENSIONES(en metros)

H1= 3.17
H2= 0.5
L= 4

Espesor= 0.35
Recubrim.= 0.05



CARACTERISTICAS DE TERRENO

Peso tierras(T/m3) $\gamma = 2$
Angulo rozamiento interno ($^\circ$) $\phi = 30$
Ang. rozamiento tierras muro ($^\circ$) $\delta = 0$

COEFICIENTES DE SEGURIDAD

Mayoracion de cargas $\gamma_f = 1.5$
Minoracion acero $g_s = 1.15$
Minoracion hormigon $g_c = 1.5$

CARACTERISTICAS DE LOS MATERIALES

Peso especifico hgon(T/m3) $\gamma_h = 2.5$
Resistencia acero (T/m2) $F_y = 51000$
Resistencia hormigon (T/m2) $F_{ck} = 2500$

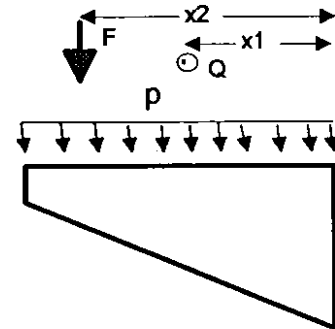
CARGAS (valores sin mayorar)

Cargas verticales

Sobrecarga vertical (t/m) $p = 0.75$
Carga vertical (t.) $F = 0.00$
Situacion x2 (m) $x_2 = 0$

Cargas horizontales

Carga horizontal (t.) $Q = 0$
Posicion x1 (m) $x_1 = 0$
Sobrecarga sobre terreno (ton/m2) $q = 3$



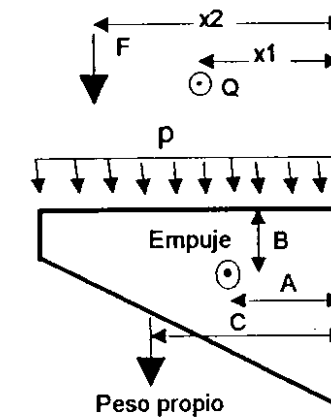
CUANTIAS MINIMAS

LONGITUDINAL SUPERIOR 0.400 o/oo
LONGITUDINAL INFERIOR 0.400 o/oo
CORTANTE 2.778 CM2/M
HORIZONTAL MUROS ALETA 0.900 o/oo
VERTICAL MUROS ALETA 1.600 o/oo
CORTANTE MUROS 0.000 CM2/M

NOMBRE PROYECTO : L.A.V. MADRID - ZARAGOZA. Subtramo XVDESIGNACION ALETA: Aleta para marcos sin cobertura de 4 m.

HOJA DE CALCULO DE ALETAS

CARGAS DE PESO PROPIO Y EMPUJES DE TIERRAS SOBRE ESTRIBO(ton/m. sin mayorar)



COEFICIENTES EMPUJE ACTIVO ALETA

Coef. empuje activo $\lambda_h = 0.333$
Coef. empuje activo $\lambda_v = 0.000$

PESO PROPIO

	Peso	Dist.emp.	Dist. vert.
Peso aux. 1	1.750	2.000	0.250
Peso aux. 2	4.673	1.333	1.390
Peso propio	6.423	1.515	1.079

EMPUJE DE TIERRAS

HORIZONTAL	Empuje.	Dist.emp.	Dist. vert.
Auxiliar	0.111	3.000	-
Auxiliar	0.704	2.000	-
Auxiliar	4.466	1.000	-
Auxiliar	1.000	2.667	-
Auxiliar	6.340	1.333	-
Empuje hor.	12.622	1.373	1.293

VERTICAL

	Empuje.	Dist.emp.
Empuje aux.1	0.000	3.000
Empuje aux.2	0.000	2.000
Empuje aux.3	0.000	1.000
Empuje aux.4	0.000	2.667
Empuje aux.5	0.000	1.333
Empuje vert.	0.000	0.000

NOMBRE PROYECTO : L.A.V. MADRID - ZARAGOZA. Subtramo XV.DESIGNACION ALETA: Aleta para marcos sin cobertura de 4 m.**HOJA DE CALCULO DE ALETAS****CALCULOS****ESFUERZOS DE DISEÑO**

(Para cargas verticales, momentos positivos implica tracciones en cara superior)

Acciones	Verticales	Horizontales
M peso propio	9.730	0.000
M empuje hor.	0.000	17.328
M empuje vert.	0.000	0.000
M sobrec.vert.	6.000	0.000
M carga vert.	0.000	0.000
M carga hor.	0.000	0.000
Md (mt)	23.595	25.993
V peso propio	6.423	0.000
V empuje hor.	0.000	12.622
V empuje vert.	0.000	0.000
V sobrec.vert.	3.000	0.000
V carga vert.	0.000	0.000
V carga hor.	0.000	0.000
Vd (mt)	14.134	18.933

NOMBRE PROYECTO : L.A.V. MADRID - ZARAGOZA. Subtramo XV.DESIGNACION ALETA: Aleta para marcos sin cobertura de 4 m.**HOJA DE CALCULO DE ALETAS****CALCULO DE SECCIONES**

Fcd	1666.67
0,85*Fcd	1416.67
Fcv	64.55
Es	21000000
Fyd	44347.83
FYAD	42000.00

Acciones	Verticales	Horizontales
Md(m.t)	23.595	25.993
Md max/Md med	1.000	1.570
Md a usar calculo	23.595	40.817
Canto seccion	3.170	0.350
Canto util	3.120	0.300
ancho seccion	0.350	3.170
Ancho calculo	0.350	3.139
Def acero	0.010	0.010
Tension acero	44348	44348
X	0.015	0.032
As (cm.2)	1.709	32.427
Prof. fibra neutra	0.218	0.050
Def. hormigon	0.001	0.002
Comentarios	VALE	VALE

Vd	14.134	18.933	
Vd compuesto			23.626
Vu1			470.913
Vsu			0.000
Vcu			60.795
Vu2			60.795
Comentarios			
As (cm.2)			0.000

ARMADO

	Calculo	Minima	total
Long. superior	1.709	4.438	4.438
Long inferior	0.000	4.438	4.438
Cortante	0.000	11.111	11.111
Horizontal trasdos	32.427	6.657	32.427
Vertical trasdos	0.000	11.200	11.200
Horizontal intrados	0.000	3.329	3.329
Vertical intrados	0.000	11.200	11.200
Cortante transversal			NO

TOTAL ENVOLVENTE ARMADURA

Long. superior	4.438 cm²
Long inferior	4.438 cm²
Horizontal trasdos	10.229 cm²/m
Horizontal intrados	1.050 cm²/m
Estribos	8.378 cm²/m

4.4.2 Pasos inferiores ED1-06, EVN1.0.9, E-1512.0, EVN3-2.5, EVN3-4.7 Y EVN3.4.7.2

PASOS INFERIORES ED1-0.6, EVN1-0.9, E-1512.0,
EVN3-2.5, EVN3-4.7.1 Y EVN3-4.7.2

INDICE

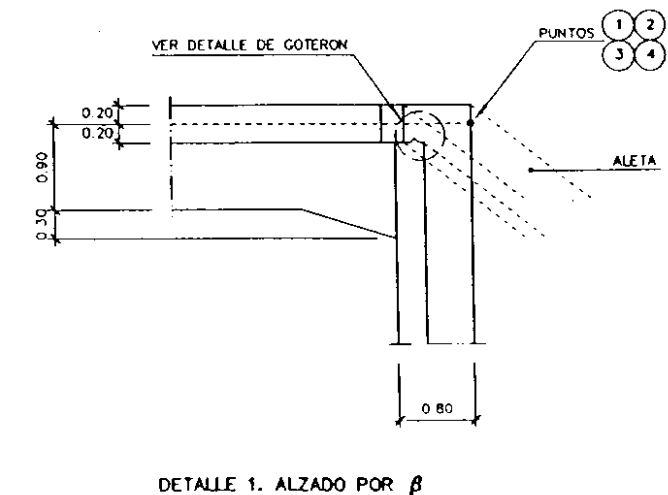
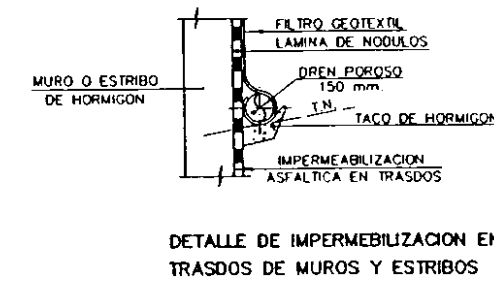
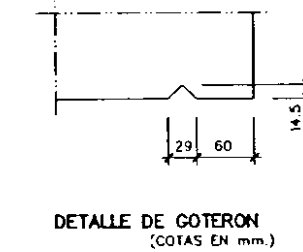
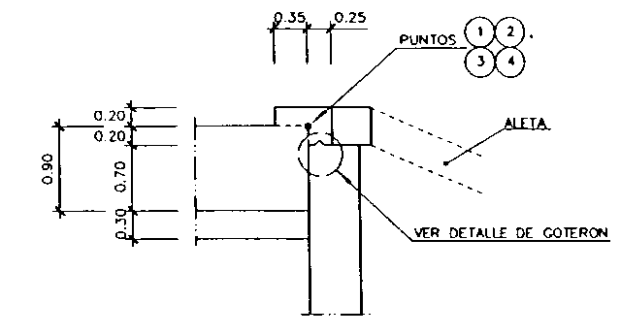
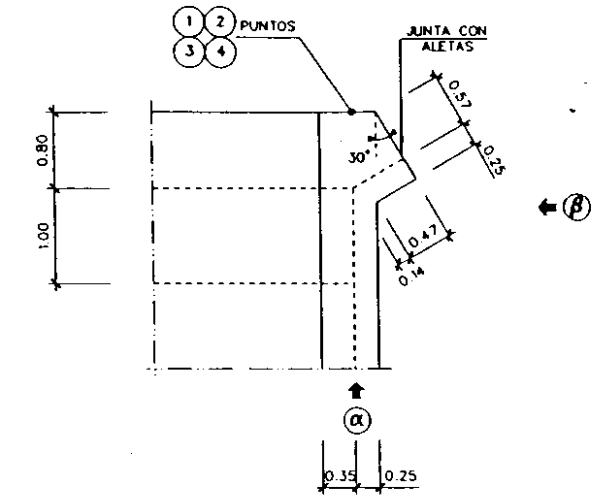
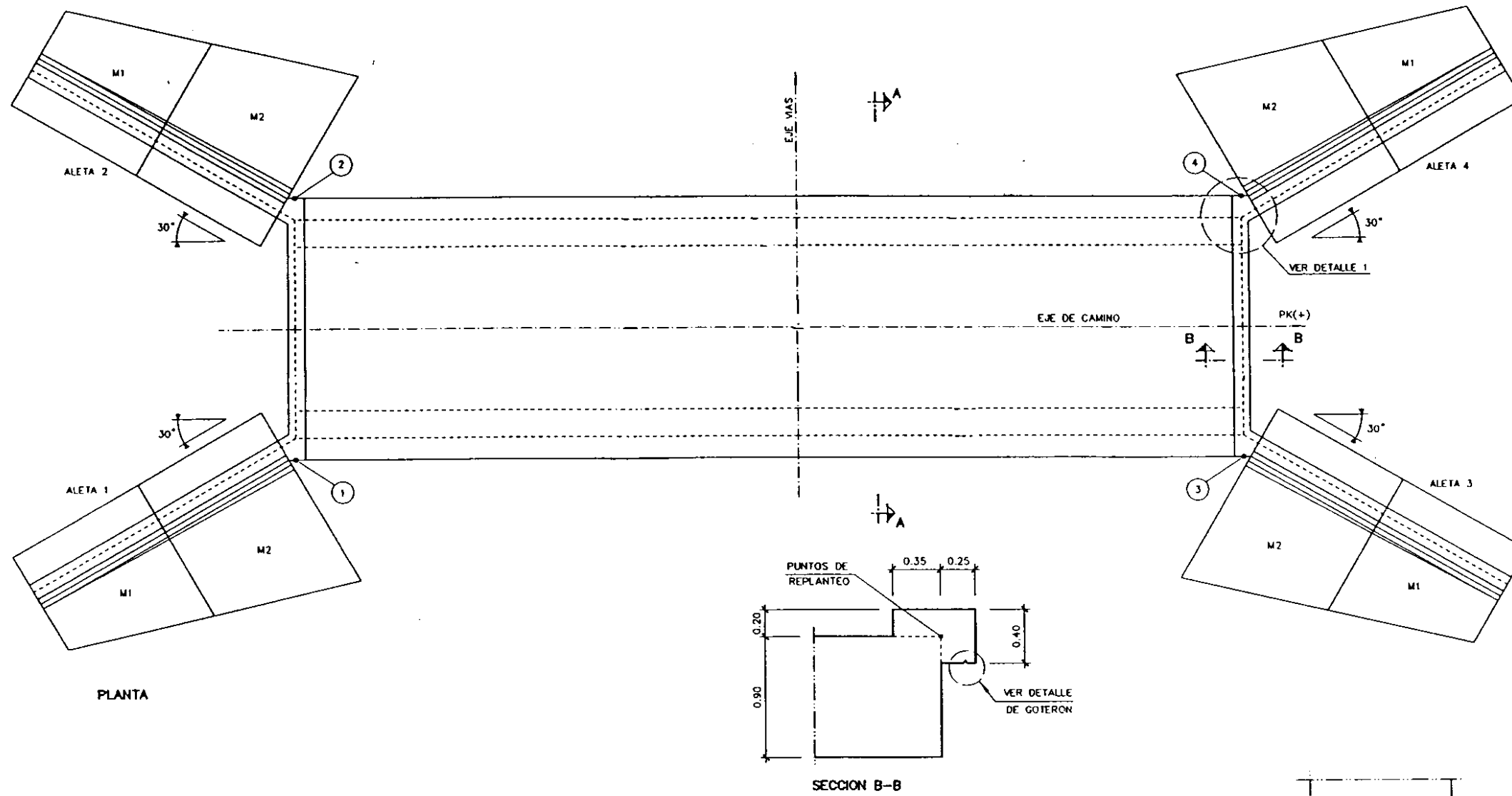
1º DEFINICION GEOMETRICA

2º CALCULOS

PASOS INFERIORES ED1-0.6, EVN1-0.9, E-1512.0,
EVN3-2.5, EVN3-4.7.1 Y EVN3-4.7.2

1º DEFINICION GEOMETRICA

DEFINICION GEOMETRICA ESTRUCTURAS ED1-0.6, EVN1-0.9, E-1512.0, EVN3-4.7.1 Y EVN3-4.7.2



SECCION A-A

- (MT) MATERIAL TRATADO CON CEMENTO
- (2) OS3
- (1) NUCLEO DE RELLENO

TABLAS DE DEFINICION GEOMETRICA

ED1-0.6

PUNTOS DE REPLANTEO

PUNTO	X	Y	Z
1	665152.189	4611055.783	297.736
2	665161.169	4611052.198	297.794
3	665148.277	4611041.043	298.498
4	665157.258	4611037.458	298.557

EVN3-4.7.1

PUNTOS DE REPLANTEO

PUNTO	X	Y	Z
1	682301.059	4607413.065	208.752
2	682304.294	4607422.104	208.752
3	682324.126	4607404.810	209.162
4	682327.361	4607413.849	209.162

EVN1-0.9

PUNTOS DE REPLANTEO

PUNTO	X	Y	Z
1	667512.601	4610386.663	288.382
2	667520.037	4610380.590	288.382
3	667500.584	4610371.947	288.534
4	667508.019	4610365.874	288.534

EVN3-4.7.2

PUNTOS DE REPLANTEO

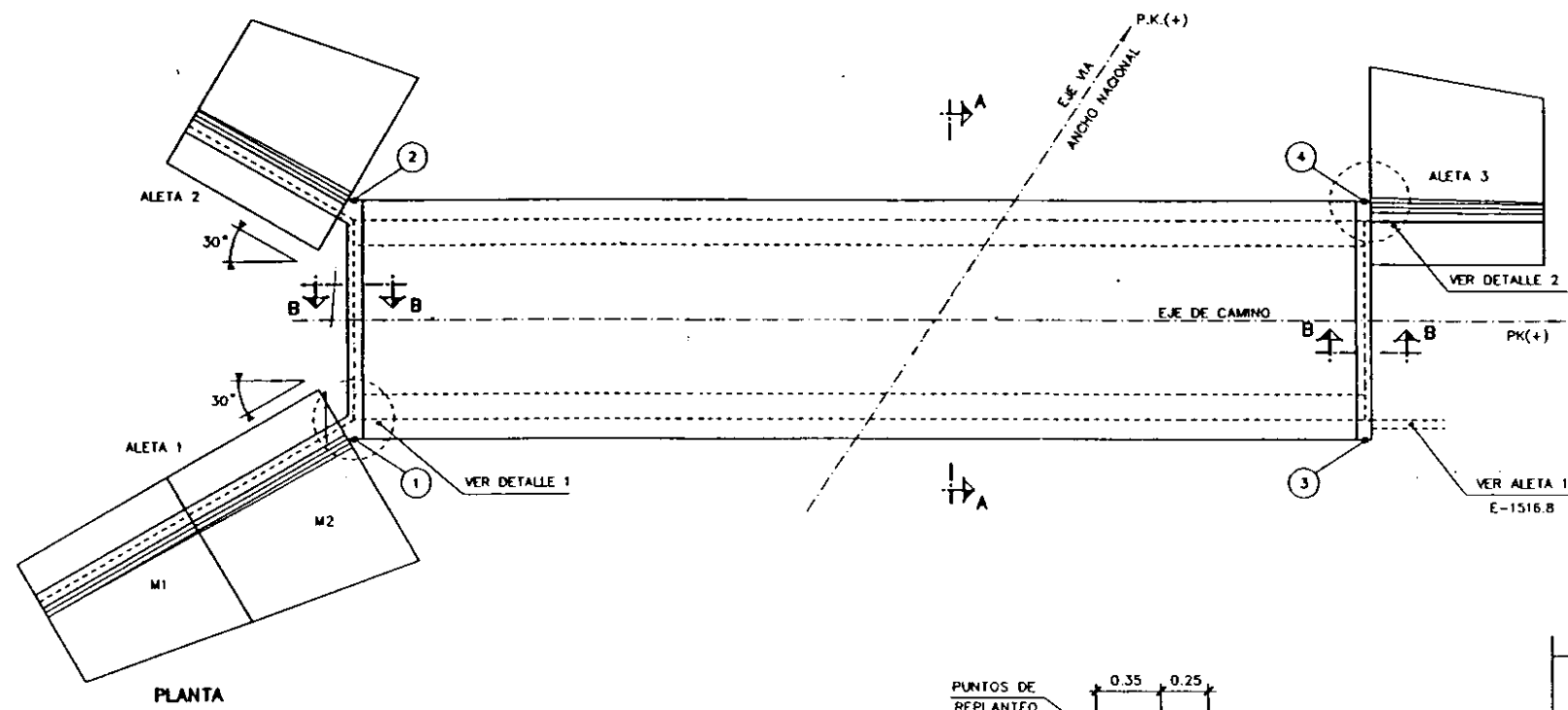
PUNTO	X	Y	Z
1	682354.428	4607379.580	209.905
2	682362.616	4607384.592	209.905
3	682365.080	4607362.182	210.246
4	682373.268	4607367.194	210.246

E-1512.0

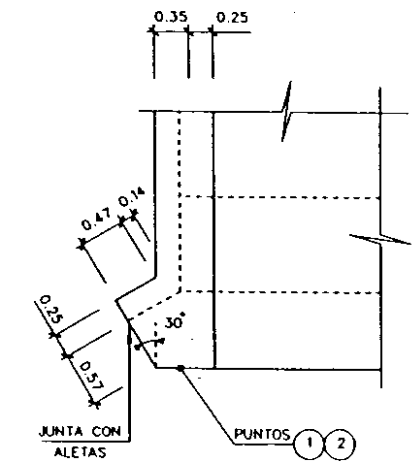
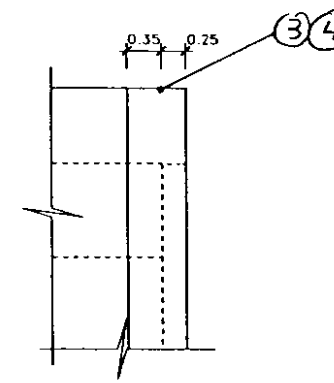
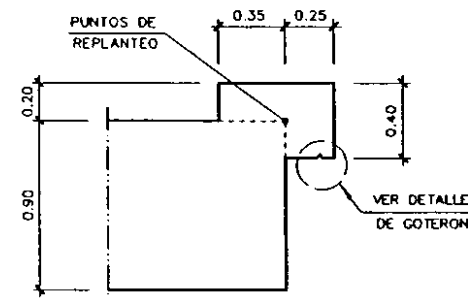
PUNTOS DE REPLANTEO

PUNTO	X	Y	Z
1	675636.084	4608138.812	291.300
2	675645.636	4608137.846	291.300
3	675631.084	4608089.364	293.098
4	675640.636	4608088.398	293.098

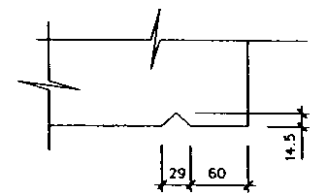
DEFINICION GEOMETRICA ESTRUCTURA EVN3-2.5



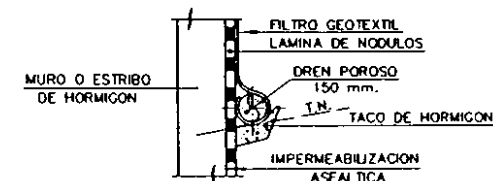
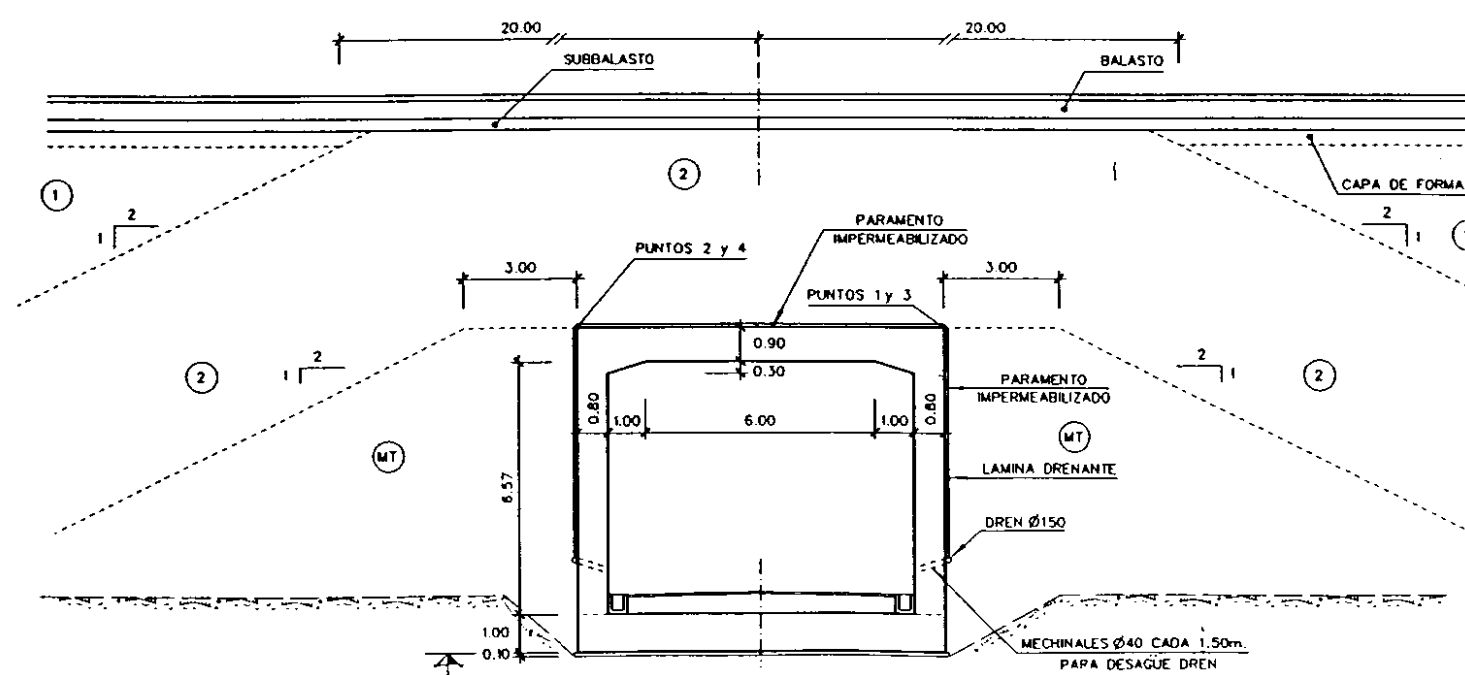
PUNTO	X	Y	Z
1	680334.883	4607480.785	228.740
2	680344.416	4607481.924	228.740
3	680339.722	4607440.273	229.160
4	680349.254	4607441.412	229.160



DETALLE 1



DETALLE DE GUTTER (COTAS EN mm.)

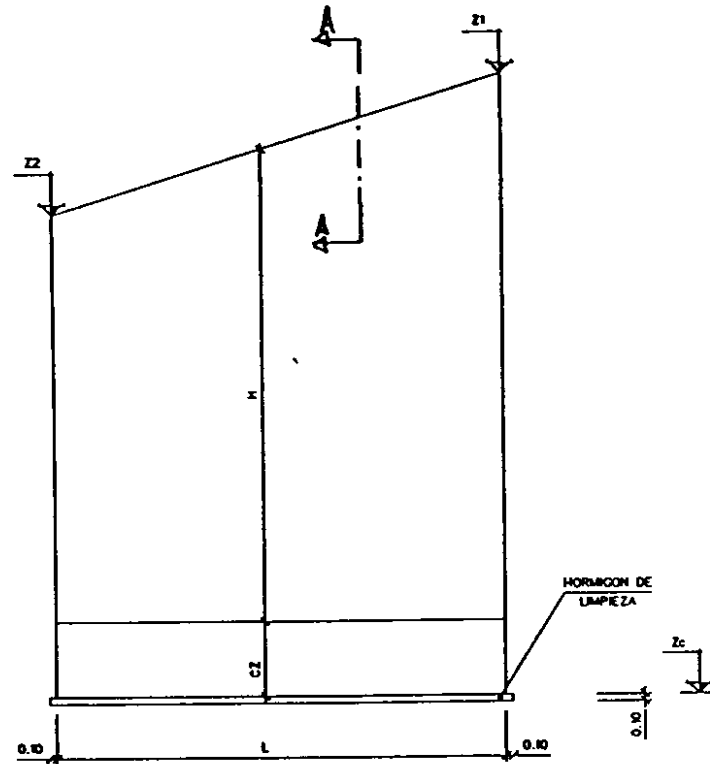


DETALLE DE IMPERMEABILIZACION

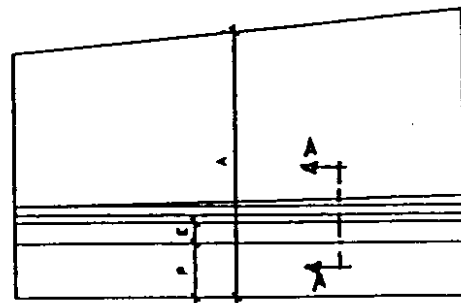
SECCION A-A

- (MT) MATERIAL TRATADO CON CEMENTO
- (2) Q53
- (1) NUCLEO DE RELLENO

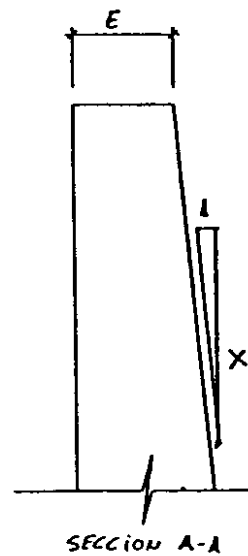
DEFINICION GEOMETRICA ALETAS



ALZADO TIPO DE MURO



PLANTA TIPO DE MURO



SECCION A-A

ED1-0.6

DEFINICION GEOMETRICA

	Aleta 1. M1	Aleta 1. M2	Aleta 2. M1	Aleta 2. M2	Aleta 3. M1	Aleta 3. M2	Aleta 4. M1	Aleta 4. M2
Z1	296.043	297.936	296.322	297.994	296.999	298.698	297.053	298.757
Z2	294.150	296.043	294.650	296.322	295.300	296.999	295.350	297.053
ZC	290.156	290.156	290.214	290.214	290.918	290.918	290.977	290.977
H	De 4.79 a 2.89	De 6.68 a 4.79	De 5.01 a 3.34	De 6.68 a 5.01	De 4.98 a 3.28	De 6.68 a 4.98	De 4.98 a 3.27	De 6.68 a 4.98
CZ	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
L	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
A	De 4.00 a 5.60	De 5.60 a 7.20	De 4.00 a 5.60	De 5.60 a 7.20	De 4.00 a 5.60	De 5.60 a 7.20	De 4.00 a 5.60	De 4.00 a 5.60
P	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
E	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
X	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0

EVN1-0.9

DEFINICION GEOMETRICA

	Aletas 1 y 2. M1	Aletas 1 y 2. M2	Aletas 3 y 4. M1	Aletas 3 y 4. M2
Z1	286.417	288.582	286.569	288.734
Z2	284.252	286.417	284.404	286.569
ZC	280.812	280.812	280.964	280.964
H	De 4.50 a 2.34	De 6.67 a 4.50	De 4.50 a 2.34	De 6.67 a 4.50
CZ	1.10	1.10	1.10	1.10
L	5.00	5.00	5.00	5.00
A	De 4.00 a 5.60	De 5.60 a 7.20	De 4.00 a 5.60	De 4.00 a 5.60
P	1.50	1.50	1.50	1.50
E	0.30	0.30	0.30	0.30
X	12.0	12.0	12.0	12.0

E-1512.0

DEFINICION GEOMETRICA

	Aletas 1 y 2. M1	Aletas 1 y 2. M2	Aletas 3 y 4. M1	Aletas 3 y 4. M2
Z1	289.100	291.500	290.899	293.298
Z2	286.700	289.100	288.500	290.899
ZC	281.700	281.700	284.338	284.338
H	De 6.30 a 3.90	De 8.70 a 6.30	De 5.46 a 3.06	De 7.86 a 5.46
CZ	1.10	1.10	1.10	1.10
L	5.25	5.25	5.25	5.25
A	De 5.60 a 4.00	De 7.20 a 5.60	De 5.60 a 4.00	De 7.20 a 5.60
P	1.50	1.50	1.50	1.50
E	0.30	0.30	0.30	0.30
X	12.0	12.0	12.0	12.0

EVN3-2.5

DEFINICION GEOMETRICA

	Aleta 1. M1	Aleta 1. M2	Aleta 2	Aleta 3
Z1	227.195	228.940	228.940	229.360
Z2	225.450	227.195	222.650	226.230
ZC	220.170	220.170	220.170	220.590
H	De 5.93 a 4.18	De 7.67 a 5.93	De 7.67 a 1.38	De 7.67 a 4.54
CZ	1.10	1.10	1.10	1.10
L	7.00	7.00	7.00	7.00
A	De 6.75 a 5.50	De 8.00 a 6.75	De 8.00 a 6.75	De 8.00 a 6.75
P	1.75	1.75	1.75	1.75
E	0.30	0.30	0.30	0.30
X	12.0	12.0	12.0	12.0

EVN3-4.7.1

DEFINICION GEOMETRICA

	Aletas 1 y 2. M1	Aletas 1 y 2. M2	Aletas 3 y 4. M1	Aletas 3 y 4. M2
Z1	206.612	208.952	207.031	209.362
Z2	204.271	206.612	204.700	207.031
ZC	200.182	200.182	200.592	200.592
H	De 5.33 a 2.99	De 7.67 a 5.33	De 5.34 a 3.01	De 7.67 a 5.34
CZ	1.10	1.10	1.10	1.10
L	5.25	5.25	5.25	5.25
A	De 5.60 a 4.00	De 7.20 a 5.60	De 5.60 a 4.00	De 7.20 a 5.60
P	1.50	1.50	1.50	1.50
E	0.30	0.30	0.30	0.30
X	12.0	12.0	12.0	12.0

EVN3-4.7.2

DEFINICION GEOMETRICA

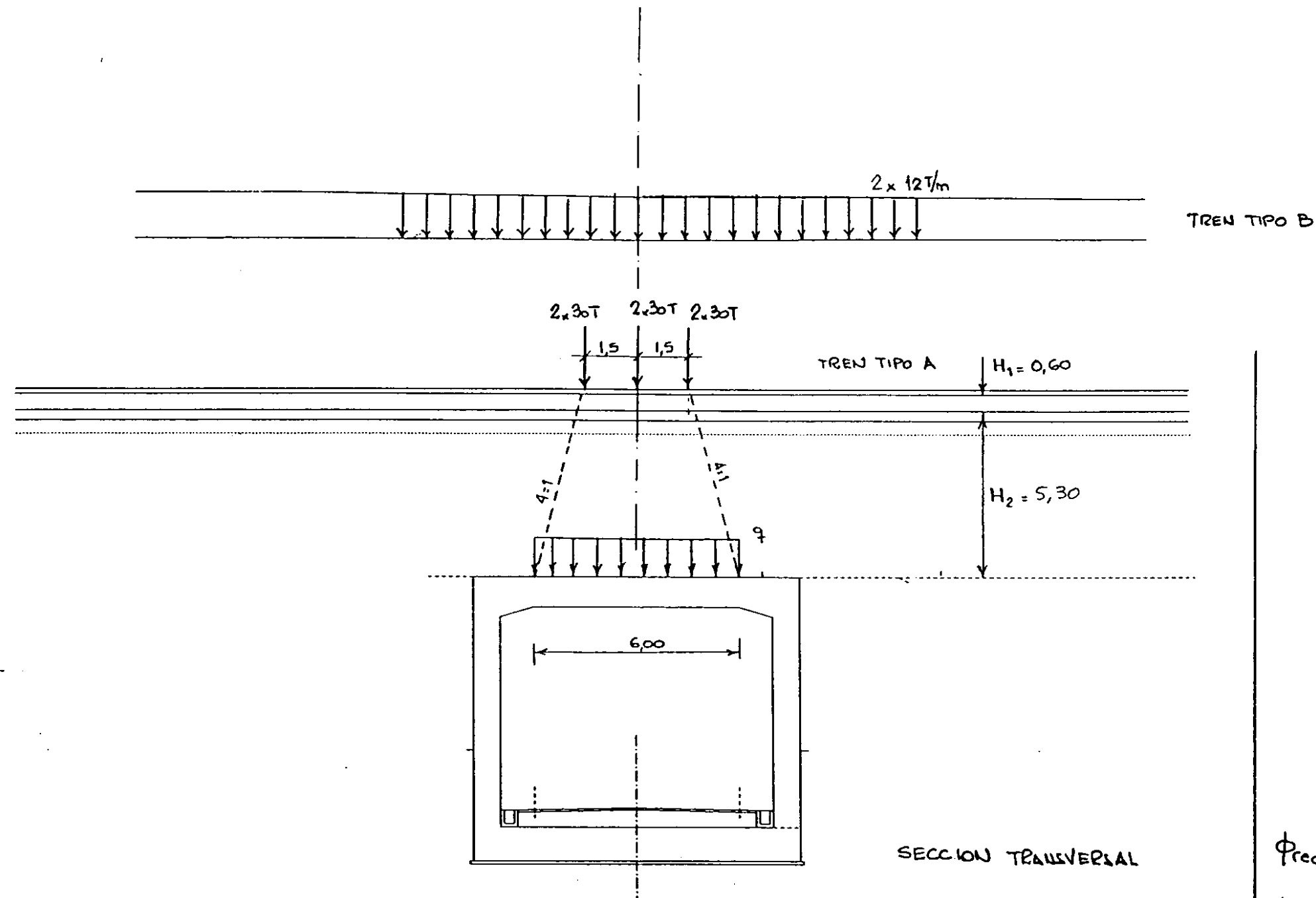
	Aletas 1 y 2. M1	Aletas 1 y 2. M2	Aletas 3 y 4. M1	Aletas 3 y 4. M2
Z1	207.940	210.105	207.954	210.446
Z2	205.776	207.940	205.463	207.954
ZC	201.335	201.335	201.676	201.676
H	De 5.51 a 3.34	De 7.67 a 5.51	De 5.18 a 2.69	De 7.67 a 5.18
CZ	1.10	1.10	1.10	1.10
L	5.25	5.25	5.25	5.25
A	De 5.60 a 4.00	De 7.20 a 5.60	De 5.60 a 4.00	De 7.20 a 5.60
P	1.50	1.50	1.50	1.50
E	0.30	0.30	0.30	0.30
X	12.0	12.0	12.0	12.0

PASOS INFERIORES ED1-0.6, EVN1-0.9, E-1512.0,
EVN3-2.5, EVN3-4.7.1 Y EVN3-4.7.2

2º CALCULOS

E. 1512.0

Cálculo 1



Coef. Impacto

$$V = 200 \text{ km/h}$$

$$T = 0.05 \text{ seg.}$$

$$L = 8.80 \text{ m}$$

$$\mu = \frac{VT}{2L} = 0.57$$

$$I = 65 \frac{\mu}{1 - \mu + \mu^2} = 50$$

$$\phi_0 = 1.50$$

$$\phi_{red} = \phi_0 - \frac{h - 1.0}{10.0} \text{ Para } h = 6 \text{ m}$$

$$\phi_{red} = 1.50 - \frac{6 - 1}{10} = 1.00$$

CARGA PERMANENTE

$$g: \text{Riel + Traveses} = \frac{0.12 \text{ T/m} + 0.52 \text{ T/m}}{2.4 \text{ m}} = 0.27 \text{ T/m}^2$$

$$\text{Baldasto} = 0.60 \text{ m} \cdot 1.6 \text{ T/m}^3 = 0.96 \text{ T/m}^2$$

$$\text{Relleno} = 5.30 \text{ m} \cdot 2.0 \text{ T/m}^3 = 10.60 \text{ T/m}^2$$

$$g = 11.83 \text{ T/m}^2 + \text{PESO PROPIO MARCO}$$

SOBRECARGA DE TREN

$$q_A = \frac{2 \times 90 \text{ T}}{9.0 \text{ m} \times 6.0 \text{ m}} = 3.33 \text{ T/m}^2$$

$$q_B = \frac{2 \times 12 \text{ T/m}}{9.0 \text{ m}} = 2.67 \text{ T/m}^2$$

$$S_d = 1.5 g + 1.5 q$$

ESTADO LÍMITE ULTIMO

$$S_k = 1.0 g + 1.0 q$$

ESTADOS LÍMITES DE SERVICIO

$$3 \times 30T = 90T$$



$$12T/m$$



$$3 \times 30T = 90T$$



$$12T/m$$

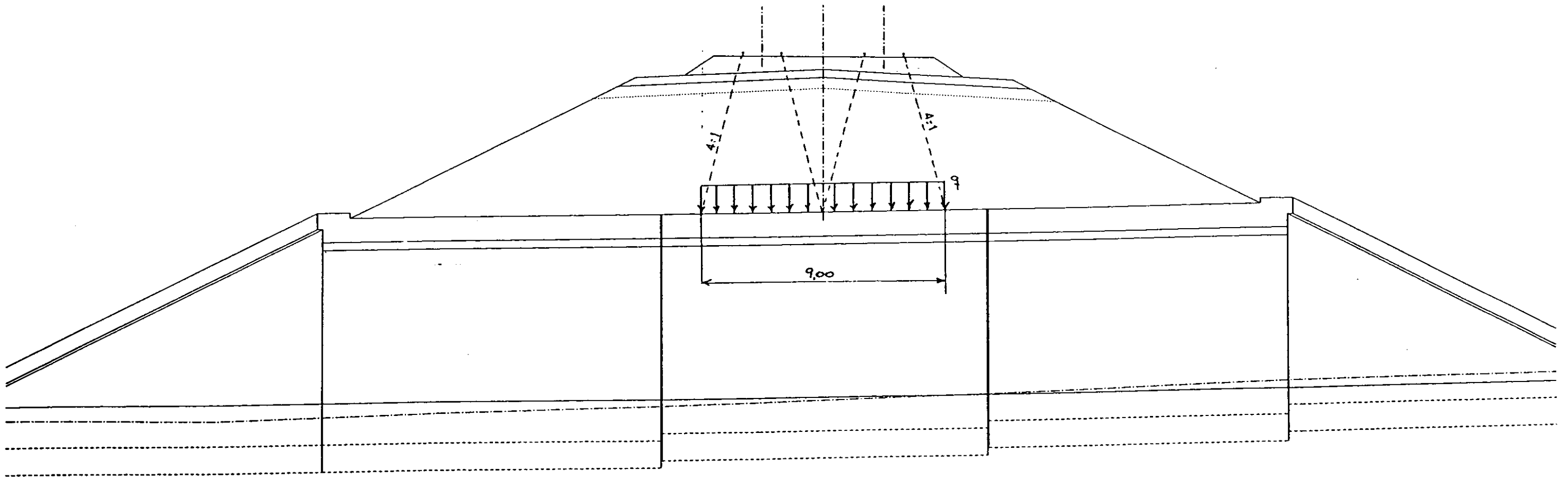


TREN TIPO A

TREN TIPO B

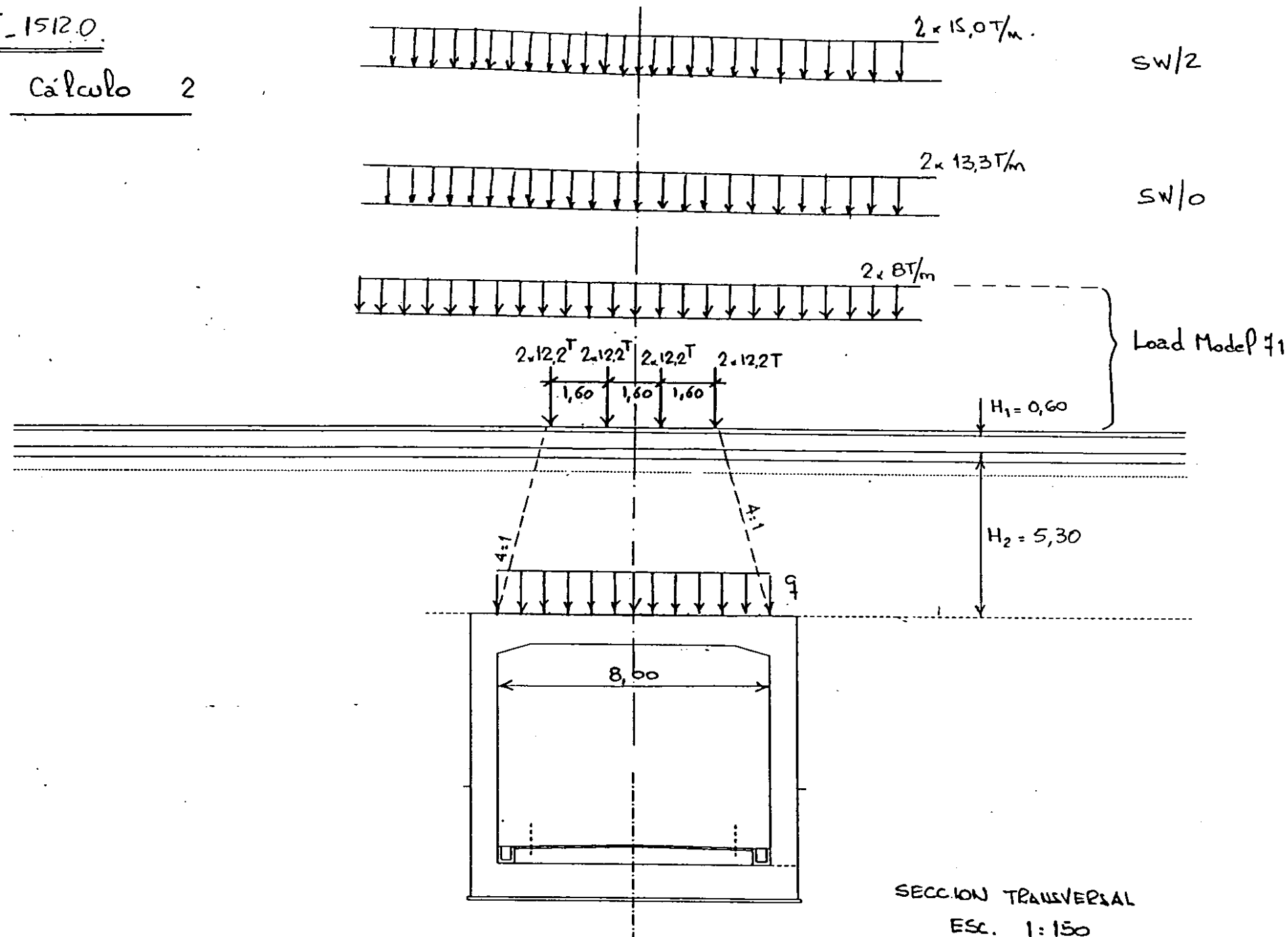
E-1512.0

Cálculo 1



E-1512.0

Cálculo 2



CARGA PERMANENTE

$$g: \text{Riel + Traveses} = \frac{0,12 \text{ T/m} + 0,52 \text{ T/m}}{2,4 \text{ m}} = 0,27 \text{ T/m}^2$$

$$\text{Baldasto} = 0,60 \text{ m} \cdot 1,6 \text{ T/m}^3 = 0,96 \text{ T/m}^2$$

$$\text{Relleno} = 5,30 \text{ m} \cdot 2,0 \text{ T/m}^3 = 10,60 \text{ T/m}^2$$

$$g = 11,83 \text{ T/m}^2 + \text{PESO PROPIO MARCO}$$

SOBRECARGA TREN

$$q_{LM71} = \frac{8 \times 12,2 \text{ T}}{8 \text{ m} \times 9 \text{ m}} + \frac{2 \times 8 \text{ T/m}}{9 \text{ m}} = 3,13 \text{ T/m}^2$$

$$q_{SW/0} = \frac{2 \times 13,3 \text{ T/m}}{9 \text{ m}} = 2,95 \text{ T/m}^2$$

$$q_{SW/2} = \frac{2 \times 15,0 \text{ T/m}}{9 \text{ m}} = 3,33 \text{ T/m}^2$$

Coef. de Impacto

$$L_m = \frac{1}{3}(7 + 8,8 + 7) = 7,6 \text{ m}$$

$$L_\phi = K L_m = 1,3 \times 7,6 \text{ m} = 9,9 \text{ m}$$

$$\phi_3 = \frac{2,16}{\sqrt{L_\phi} - 0,2} + 0,73 = 1,5$$

$$V = 1,2 \times 350 \text{ km/h} = 420 \text{ km/h} = 117 \text{ m/s}$$

$$L = 8,8 \text{ m}$$

$$T_1 = 0,05 \text{ seg} \quad \beta = \frac{T_1}{T_v} = 0,33$$

$$T_v = \frac{2 \times 8,8}{117} = 0,15 \text{ seg}$$

$$\frac{f_{din}}{f_{est.}} = \frac{1 + \beta}{1 - \beta^2} = 1,5$$

$$\therefore \text{Adoptando } \phi_0 = 1,50$$

$$\phi_{red} = \phi_0 - \frac{h-1}{10} \quad \text{Para } h = 6 \text{ m}$$

$$\phi_{red} = 1,50 - \frac{6-1}{10} = 1,00$$

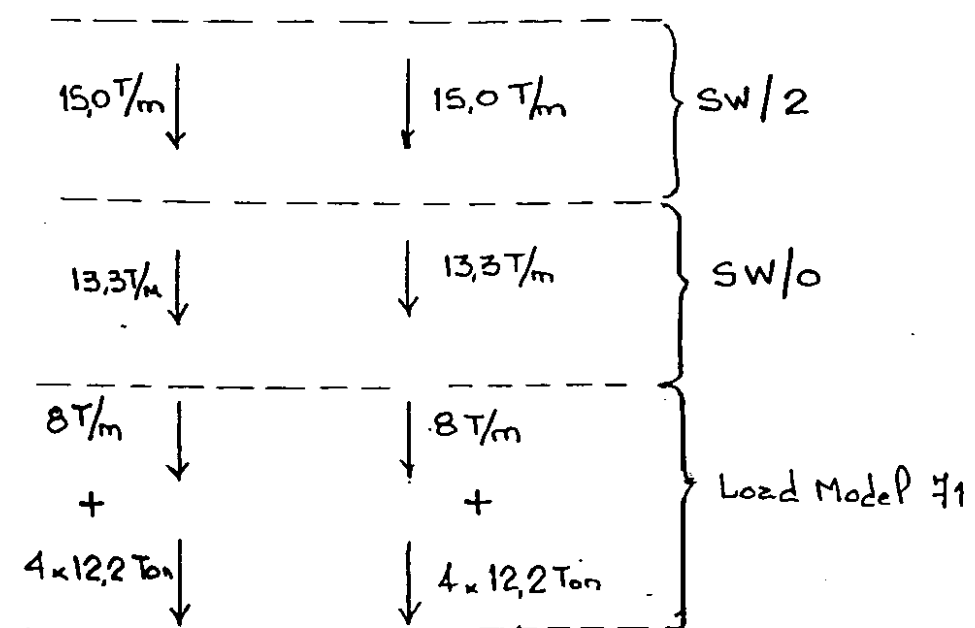
ESTADO LÍMITE ÚLTIMO

$$S_d = 1,35 g + 1,45 q_{LM71}$$

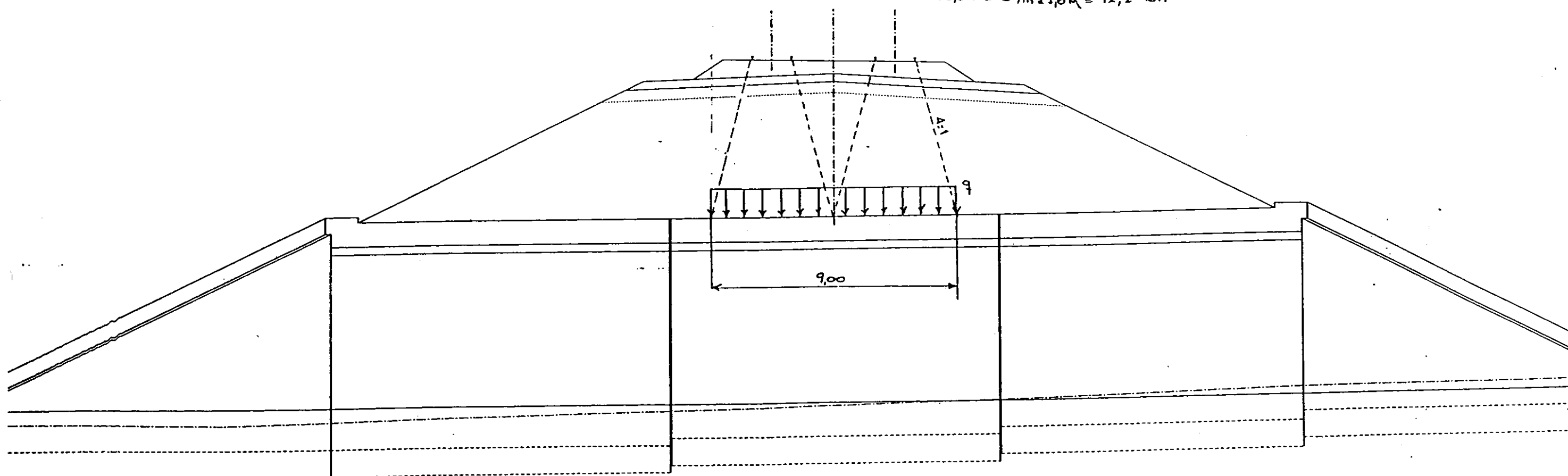
$$S_d = 1,35 g + 1,45 q_{SW/0}$$

$$S_d = 1,35 g + 1,20 q_{SW/2}$$

E-1512.0
Cálculo 2



$$25,0 \text{ T} - 8 \text{ T/m} \times 1,6 \text{ m} = 12,2 \text{ Ton}$$



IBM

Ordenador Personal

PROGRAMA ARCO

CALCULO DE ARCOS,PASOS INFERIORES Y GALERIAS ENTERRADAS

(C) Copyright J.Diaz del Valle, 1988

P R O Y E C T O : L.A.V. MADRID - ZARAGOZA. Subtramo XV.

Referencia : E-1512.0

Fecha : 07-01-1998

L.A.V. MADRID - ZARAGOZA. Subtramo XV. E-1512.0

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

=====

NUMERO DE SEGMENTOS = 40
SALTO = 1

TIPO DE GEOMETRIA :

TIPO 0 : POLIGONAL ARBITRARIA DADA POR COORDENADAS
TIPO 1 : ARCO CIRCULAR DEFINIDO POR : f,a
TIPO 2 : PARABOLA CON $y'(0)=0$, DEFINIDA POR : f,a
TIPO 3 : PARABOLA CON $y'(0)=0$, DEFINIDA POR : a,c,b
TIPO 4 : PARABOLA CON $y'(0)<0$ DEFINIDA POR : f,a,c,b
TIPO 5 : CUBICA CON $y'(0)=0$ DEFINIDA POR : f,a,c,b
TIPO 6 : PORTICO CIRCULAR DEFINIDO POR : f,a,H,B
TIPO 7 : CURVA GENERAL DEFINIDA POR PUNTOS DE PASO
TIPO 8 : GEOMETRIA ANTERIOR ALMACENADA EN FICHERO DE DATOS

2a = CUERDA , f = FLECHA , (c,b) = COORDENADAS DE UN PUNTO

TIPO = 9

CUERDA 2a = 8.400 m
ALTURA H = 7.450 m

TIPO DE CONDICIONES DE APOYO :

TIPO 0 : TRIARTICULADO (EN APOYOS Y CLAVE)
TIPO 1 : BIARTICULADO (EN APOYOS)
TIPO 2 : EMPOTRADO EN EXTREMOS
TIPO 3 : EMPOTRADO EN EXTREMOS CON ROTULA EN CLAVE
TIPO 4 : EMPOTRADO ELASTICAMENTE
TIPO 5 : ATIRANTADO EN EXTREMOS

TIPO = 2

PESO ESPECIFICO DEL HORMIGON = 2.50 t/m³
RESISTENCIA CARACTERISTICA DEL HORMIGON f_{ck} = 250 Kp/cm²
COEFICIENTE DE MINORACION DE f_{ck} γ_c = 1.50
LIMITE ELASTICO CARACTERISTICO DEL ACERO f_{yk} = 5100 Kp/cm²
COEFICIENTE DE MINORACION DE f_{yk} γ_s = 1.15
RECUBRIMIENTO DE LAS ARMADURAS c = 5 cm

ALTURA DE TIERRAS DESDE LA BASE = 14.00 m
PESO ESPECIFICO DE LAS TIERRAS = 2.00 t/m³
COEFICIENTE EMPUJE TIERRAS = 0.50
SOBRECARGA q = 3.33 t/m²

CARGAS CONCENTRADAS EN LOS MUJOS : NINGUNA

COEFICIENTE DE MAYORACION DE LAS CARGAS %f = 1.50

GALIBO GX = 8.00 m

GALIBO GY = 6.00 m

EXISTE LOSA DE CIMENTACION :

SOBRECARGA DE LA LOSA DE CIMENTACION Q = 0.40 t/m²

CANTO DE LA LOSA DE CIMENTACION t = 1.00 m

COEFICIENTE DE BALASTO DEL TERRENO K = 500 t/m³

E S F U E R Z O S E N E L A R C O

=====

SEC	X (m)	Y (m)	AXIL (t/m)	CORTANTE (t/m)	FLECTOR (txm/m)	ESPESOR (m)
1	4.200	0.000	141.139	-63.529	-116.832	0.800
2	4.200	0.562	140.297	-57.712	-84.424	0.800
3	4.200	1.123	138.612	-46.392	-58.373	0.800
4	4.200	1.685	136.928	-35.546	-38.413	0.800
5	4.200	2.246	135.243	-25.173	-24.277	0.800
6	4.200	2.808	133.558	-15.272	-15.701	0.800
7	4.200	3.369	131.874	-5.845	-12.419	0.800
8	4.200	3.931	130.189	3.109	-14.165	0.800
9	4.200	4.492	128.505	11.591	-20.674	0.800
10	4.200	5.054	126.820	19.599	-31.679	0.800
11	4.200	5.615	125.135	27.134	-46.916	0.800
12	4.200	6.177	123.451	34.197	-66.119	0.800
13	4.200	6.738	121.766	40.786	-89.022	0.800
14	4.200	7.300	59.406	-114.192	-115.360	1.200
15	4.092	7.312	62.066	-111.247	-103.311	1.177
16	3.985	7.323	61.843	-108.076	-91.605	1.154
17	3.877	7.335	61.621	-104.918	-80.242	1.131
18	3.769	7.346	61.400	-101.773	-69.219	1.108
19	3.662	7.358	61.180	-98.641	-58.535	1.085
20	3.554	7.369	60.961	-95.522	-48.189	1.062
21	3.446	7.381	60.744	-92.416	-38.180	1.038
22	3.338	7.392	60.528	-89.323	-28.505	1.015
23	3.231	7.404	60.313	-86.244	-19.164	0.992
24	3.123	7.415	60.099	-83.177	-10.156	0.969
25	3.015	7.427	59.887	-80.123	-1.478	0.946
26	2.908	7.438	59.675	-77.083	6.871	0.923
27	2.800	7.450	51.237	-79.969	14.892	0.900
28	2.600	7.450	51.294	-75.654	30.023	0.900
29	2.400	7.450	51.294	-70.050	44.033	0.900
30	2.200	7.450	51.294	-64.446	56.922	0.900
31	2.000	7.450	51.294	-58.842	68.690	0.900

32	1.800	7.450	51.294	-53.238	79.338	0.900
33	1.600	7.450	51.294	-47.634	88.865	0.900
34	1.400	7.450	51.294	-42.030	97.271	0.900
35	1.200	7.450	51.294	-36.426	104.556	0.900
36	1.000	7.450	51.294	-30.822	110.720	0.900
37	0.800	7.450	51.294	-25.218	115.764	0.900
38	0.600	7.450	51.294	-19.614	119.687	0.900
39	0.400	7.450	51.294	-14.010	122.489	0.900
40	0.200	7.450	51.294	-8.406	124.170	0.900
41	0.000	7.450	51.294	-2.802	124.730	0.900

R = 0.14114E+03 M = -.11683E+03 H = -.63529E+02 V = 0.44963E-02m

LONGITUD DEL SEMIARCO = 11.508 LONGITUD DE TRANSPORTE = 8.552

LOSA DE CIMENTACION SOBRE TERRENO ELASTICO

=====

X (m)	W (mm)	GIRO (1000xrad)	FLECTOR (txm/m)	CORTANTE (t/m)	REACCION (t/m ²)
4.200	78.678	-1.324	116.832	141.139	39.339
3.780	78.088	-1.472	60.631	126.505	39.044
3.360	77.454	-1.531	10.550	111.999	38.727
2.940	76.813	-1.511	-33.467	97.629	38.406
2.520	76.195	-1.422	-71.477	83.390	38.097
2.100	75.627	-1.274	-103.533	69.277	37.813
1.680	75.131	-1.078	-129.686	55.276	37.566
1.260	74.727	-0.842	-149.978	41.370	37.364
0.840	74.428	-0.578	-164.446	27.537	37.214
0.420	74.245	-0.294	-173.117	13.756	37.122
-0.000	74.183	-0.000	-176.005	-0.000	37.091

A R M A D U R A S E N E L A R C O

=====

SEC	X (m)	Y (m)	Ainterior (cm ² /m)	Aexterior (cm ² /m)	Acortante (cm ² /m)
1	4.200	0.000	0.000	25.117	5.332
2	4.200	0.562	0.000	13.499	3.280
3	4.200	1.123	0.000	3.791	0.000
4	4.200	1.685	0.000	0.000	0.000
5	4.200	2.246	0.000	0.000	0.000
6	4.200	2.808	0.000	0.000	0.000
7	4.200	3.369	0.000	0.000	0.000
8	4.200	3.931	0.000	0.000	0.000
9	4.200	4.492	0.000	0.000	0.000
10	4.200	5.054	0.000	0.000	0.000
11	4.200	5.615	0.000	1.081	0.000

			JMT	EXT	Cte.
12	4.200	6.177	0.000	8.307	0.000
13	4.200	6.738	0.000	17.178	0.000
14	4.200	7.300	0.000	18.138	9.193
15	4.092	7.312	0.000	15.607	9.039
16	3.985	7.323	0.000	13.397	8.825
17	3.877	7.335	0.000	11.180	8.605
18	3.769	7.346	0.000	8.955	8.379
19	3.662	7.358	0.000	6.721	8.146
20	3.554	7.369	0.000	4.476	7.906
21	3.446	7.381	0.000	2.221	7.657
22	3.338	7.392	0.000	0.000	7.401
23	3.231	7.404	0.000	0.000	7.136
24	3.123	7.415	0.000	0.000	6.861
25	3.015	7.427	0.000	0.000	6.576
26	2.908	7.438	0.000	0.000	6.280
27	2.800	7.450	0.000	0.000	7.812
28	2.600	7.450	2.500	0.000	6.470
29	2.400	7.450	6.692	0.000	4.725
30	2.200	7.450	10.599	0.000	2.981
31	2.000	7.450	14.212	0.000	1.237
32	1.800	7.450	17.520	0.000	0.000
33	1.600	7.450	20.514	0.000	0.000
34	1.400	7.450	23.184	0.000	0.000
35	1.200	7.450	25.521	0.000	0.000
36	1.000	7.450	27.514	0.000	0.000
37	0.800	7.450	29.157	0.000	0.000
38	0.600	7.450	30.442	0.000	0.000
39	0.400	7.450	31.364	0.000	0.000
40	0.200	7.450	31.918	0.000	0.000
41	0.000	7.450	32.104	0.000	0.000

ARMADURAS EN LA LOSA

SEC	X (m)	Y (m)	Ainferior (cm ² /m)	Asuperior (cm ² /m)	Acortante (cm ² /m)
1	4.200	-0.500	31.029	0.000	22.227
2	3.780	-0.500	15.779	0.000	18.152
3	3.360	-0.500	2.689	0.000	14.112
4	2.940	-0.500	0.000	8.630	10.110
5	2.520	-0.500	0.000	18.670	6.145
6	2.100	-0.500	0.000	27.357	2.215
7	1.680	-0.500	0.000	34.619	0.000
8	1.260	-0.500	0.000	40.375	0.000
9	0.840	-0.500	0.000	44.549	0.000
10	0.420	-0.500	0.000	47.080	0.000
11	0.000	-0.500	0.000	47.929	0.000

PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA F1

Obra : L.A.V. MADRID - ZARAGOZA. Subtramo XV.
E-1512.0. CENTRO DINTEL.
Fecha: 1/7/1998
Hora : 12:46

COMPROBACION DEL ESTADO LIMITE DE FISURACION DEBIDO
A SOLICITACIONES NORMALES

1. Datos

- Materiales

f_{ck} [kp/cm²] = 250
 f_{yk} [kp/cm²] = 5100

- Sección

b [cm] = 100.0
 h [cm] = 90.0
 ϕ [mm] = 25.0
 c [cm] = 3.5
 n° de capas = 1
 n° de diámetros capa 1 = 10

- Solicitación de servicio

M_k [m·Mp] = 83.15

2. Resultados

ABERTURA DE FISURA CARACTERISTICA

w_k [mm]	S_m [cm]	ϵ_{sm} ·1.E-3	σ_{sr} [kp/cm ²]	σ_s [kp/cm ²]
0.23	15.0	0.91	1050	2165

ABERTURA DE FISURA MAXIMA ADMITIDA

AMBIENTE I (interior)	0.560 [mm]
AMBIENTE II (exterior no agresivo)	0.280 [mm]
AMBIENTE III (agresivo)	0.140 [mm]

El número de capas consideradas en el cálculo es 1

PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA F1

Obra : L.A.V. MADRID - ZARAGOZA. Subtramo XV.
E-1512.0. CENTRO SOLERA.
Fecha: 1/7/1998
Hora : 12:53

COMPROBACION DEL ESTADO LIMITE DE FISURACION DEBIDO
A SOLICITACIONES NORMALES

1. Datos

- Materiales

f_{ck} [kp/cm²] = 250
 f_{yk} [kp/cm²] = 5100

- Sección

b [cm] = 100.0
 h [cm] = 100.0
 ϕ [mm] = 25.0
 c [cm] = 3.5
 n° de capas = 1
 n° de diámetros capa 1 = 10

- Solicitación de servicio

M_k [m·Mp] = 117.34

2. Resultados

ABERTURA DE FISURA CARACTERISTICA

w_k [mm]	S_m [cm]	ϵ_{sm} ·1.E-3	σ_{sr} [kp/cm ²]	σ_s [kp/cm ²]
0.28	15.0	1.18	1147	2723

ABERTURA DE FISURA MAXIMA ADMITIDA

AMBIENTE I (interior)	0.560 [mm]
AMBIENTE II (exterior no agresivo)	0.280 [mm]
AMBIENTE III (agresivo)	0.140 [mm]

El número de capas consideradas en el cálculo es 1

CALCULO DE MUROS.

NOMBRE PROYECTO : L.A.V. MADRID - ZARAGOZA. Subtramo XV.
 NOMBRE OBRA : Aletas marcos con cobertura. Altura máxima.

DATOS

GEOMETRIA DE CALCULO DEL MURO

C. Canto del muro en coronación (m) :	0.300
ST. Sobreepesor muro en trasdós (m) :	0.625
SI. Sobreepesor muro en intradós (m) :	0.000
P. Puntera zapata (m) :	1.500
T. Talón zapata (m) :	4.575
H. Altura muro (m) :	7.500
H _z . Canto zapata (m) :	1.100
Anchura total cimentación (m) :	7.000
Angulo trasdós muro (°) :	85.236

DEFINICION TERRENO

	X	Y
0. Coordenadas base trasdós (m) :	0.000	0.000
1. Coordenadas coronación trasdós (m) :	-0.625	7.500
2. Coordenadas fin tramo 1 terreno (m) :	4.825	8.863
3. Coordenadas fin tramo 2 terreno (m) :	9.825	8.863
4. Coordenadas fin tramo 3 terreno (m) :	14.825	8.863

COEFICIENTES DE SEGURIDAD

Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
γ _o (coeficiente combinación variables) :	1.00

	Estado Límite Último	
	Favorable	Desfavorable

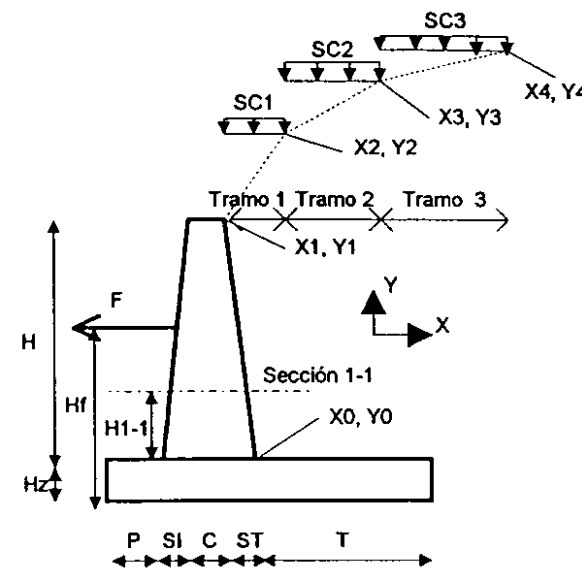
Acciones permanentes (G)		
Peso propio, cargas muertas :	0.90	1.50
Acciones permanentes de valor no constante (G*)		
Terreno (peso propio y empujes) :	0.00	1.50
Acciones variables (Q)		
Sobrecargas :	0.00	1.50

CARACTERISTICAS DEL TERRENO

γ. Peso específico (T/m³) :	2.00
φ. Angulo rozamiento interno (°) :	30.000
δ _{mt} . Angulo rozamiento muro-tierras (°) :	0.000
δ _{tt} . Angulo rozamiento tierras-tierras (°) :	0.000
μ. Coeficiente rozamiento zapata-tierras :	0.580
Tensión admisible cimentación (T/m²) :	20.000

ARMADO

H1-1. Dist. sección 1 a sup. zapata (m) :	1.500
Recubrimiento alzado (m) :	0.050
Recubrimiento cimentación (m) :	0.050
Cuantías mínimas	
Vertical muros (1/3 mín. cara)(o/o) :	0.900
Horizontal muros (1/3 mín. cara)(o/o) :	1.600
Cortante o montaje alzado (cm²/m²) :	4.500
Transversal zapata (sup+inf)(o/o) :	1.447
Longitudinal zapata (sup+inf)(o/o) :	1.447
Cortante zapata (cm²/m²) :	0.000
Perimetral zapata (en canto)(cm²/m) :	7.959

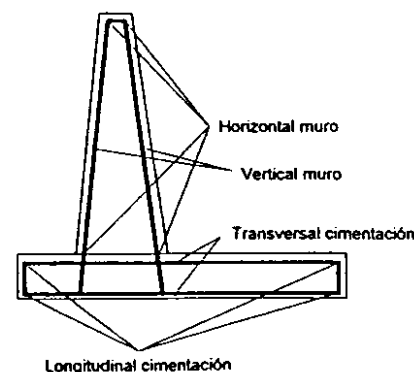


CARGAS (sin mayorar)

Acciones permanentes (G)	
Peso propio barrera coronación (T/m) :	0.000
Acciones permanentes de valor no constante (G*)	
Fg. Carga horizontal sobre muro (T/m) :	0.000
Hfg. Posición Fg a inferior zapata (m) :	0.000
Acciones variables (Q)	
SC1. Sobrecarga en tramo 1 (T/m) :	0.000
SC2. Sobrecarga en tramo 2 (T/m) :	3.000
SC3. Sobrecarga en tramo 3 (T/m) :	3.000
Fq. Carga horizontal sobre muro (T/m) :	0.000
Hfq. Posición Fq a inferior zapata (m) :	0.000

CARACTERISTICAS MATERIALES

Peso específico hormigón (T/m³) :	2.500
Hormigón alzado (T/m³) :	H - 250
Hormigón cimentación (T/m³) :	H - 250
Acero (T/P) :	AEH - 500



RESUMEN ACCIONES SOBRE EL MURO

		F. vertical (T / m)	X (m)	F. Horizontal (T / m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 (ΣP _i , i=1..3)	8.250	1.794	---	---
	Sobre sección base muro (ΣP _i , i=1..3)	11.484	1.833	---	---
	Total peso propio (ΣP _i , i=1..6)	30.734	2.877	---	---
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E1i)	1.296	2.133	15.550	4.600
	Sobre sección base muro (E1i)	2.025	2.217	24.297	3.600
	Total tierras (E2i + ΣT _i)	80.073	4.613	32.942	3.300
	Verticales sobre talón (ΣT _i ij)	75.287	4.765	---	---
	Verticales sobre talón (cortante) (ΣT _i ij)	58.934	5.268	---	---
Fuerza Fg	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fg	---	---	0.000	0.000
Acciones variables (Q)					
Sobrecargas sobre terreno	Sección 1 (E1'sc)	0.115	2.050	1.380	5.600
	Base muro (E1'sc)	0.144	2.113	1.726	4.850
	Inf. cimentación (E2'sc + ES)	0.000	0.000	9.450	4.950
	Verticales sobre talón (ΣS _i i, i=1..3)	0.000	0.000	---	---
	Verticales sobre talón (cortante) (ΣS _i i)	0.000	0.000	---	---
Fuerza Fq	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fq	---	---	0.000	0.000

COMPROBACIONES

SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	17.826	—
Acciones permanentes de valor no constante (G*)		
Tierras	46.442	32.942
Fuerza Fg	—	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	9.450
Fuerza Fq	—	0.000
TOTAL	64.268	42.393

Csd= 1.516 Vale

SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	88.424	—
Acciones permanentes de valor no constante (G*)		
Tierras	369.389	108.710
Fuerza Fg	—	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	46.779
Fuerza Fq	—	0.000
TOTAL	457.812	155.489

Csv= 2.944 Vale

TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	30.734	19.146
Acciones permanentes de valor no constante (G*)		
Tierras	80.073	19.575
Fuerza Fg	0.000	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	46.779
Fuerza Fq	0.000	0.000
TOTAL	110.807	85.500

D (m) = 7.00
 σ puntera (T / m²) = 26.30
 σ talón (T / m²) = 5.36
 σ med (T / m²) = 15.83
 σ cob (T / m²) = 20
 Vale

ARMADO

Secciones

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	0.93	1.00	0.93
	1-1	1.00	0.80	1.00	0.80
PUNTERA	2-2 f	1.00	1.10	1.00	1.10
	2-2 c	1.00	1.10	1.00	1.10
TALON	3-3 f	1.00	1.10	1.00	1.10
	3-3 c	1.00	1.10	1.00	1.10

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	13.589	101.357	39.034
	0-0 (-)	10.336	1.340	0.000
	1-1 (+)	9.541	53.171	25.396
	1-1 (-)	7.425	0.787	0.000
PUNTERA	2-2 f (+)	0.000	44.140	—
	2-2 f (-)	0.000	4.374	—
	2-2 c (+)	—	—	32.308
	2-2 c (-)	—	—	3.210
TALON	3-3 f (+)	0.000	5.810	—
	3-3 f (-)	-33.348	-160.487	—
	3-3 c (+)	—	—	2.521
	3-3 c (-)	—	—	-47.731

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm²/m	Minima cm²/m	Control cálculo	Adoptada cm²/m
ALZADO	Vert. trasdós	0-0 (+)	26.013	5.550	Vale	26.013
		0-0 (-)	0.000	2.775	Vale	
		1-1 (+)	15.488	4.800	Vale	
		1-1 (-)	0.000	2.400	Vale	
	Vert. intrados	0-0 (+)	0.000	2.775	Vale	2.775
		0-0 (-)	0.000	2.775	Vale	
		1-1 (+)	0.000	2.400	Vale	
		1-1 (-)	0.000	2.400	Vale	
	Hor. trasdós (*)	—	5.203	9.867	Vale	9.867
	Hor. intrados (*)	—	0.000	4.933	Vale	4.933
	Cortante	0-0 (+)	0.000	4.500	Vale	4.500 (cm²/m²)
		0-0 (-)	0.000	4.500	Vale	
		1-1 (+)	0.000	4.500	Vale	
		1-1 (-)	0.000	4.500	Vale	
PUNTERA	Trans. inferior	2-2 f (+)	9.617	7.959	Vale	9.617
		2-2 f (-)	0.941	7.959	Vale	
	Long. inf. (*)	—	1.923	7.959	Vale	7.959
	Trans. superior	2-2 f (+)	0.000	7.959	Vale	43.965
		2-2 f (-)	0.000	7.959	Vale	
	Long. sup. (*)	—	0.000	7.959	Vale	8.793
	Cortante	2-2 c (+)	0.000	0.000	Vale	0.000 (cm²/m²)
		2-2 c (-)	0.000	0.000	Vale	
TALON	Trans. inferior	3-3 f (+)	1.250	7.959	Vale	9.617
		3-3 f (-)	0.000	7.959	Vale	
	Long. inf. (*)	—	0.250	7.959	Vale	7.959
	Trans. superior	3-3 f (+)	0.000	7.959	Vale	43.965
		3-3 f (-)	43.965	7.959	Vale	
	Long. sup. (*)	—	8.793	7.959	Vale	8.793
	Cortante	3-3 c (+)	0.000	0.000	Vale	0.000 (cm²/m²)
		3-3 c (-)	0.000	0.000	Vale	
ZAPATA	Perimetral	—	0.000	7.959	Vale	7.959

(*) Calculada como el 20% de la armadura perpendicular a ella

CALCULO DE MUROS.

NOMBRE PROYECTO : L.A.V. MADRID - ZARAGOZA. Subtramo XV.
 NOMBRE OBRA : Aletas marcos con cobertura. Altura media.

DATOS

GEOMETRIA DE CALCULO DEL MURO

C. Canto del muro en coronación (m) :	0.300
ST. Sobreepesor muro en trasdós (m) :	0.500
SI. Sobreepesor muro en intradós (m) :	0.000
P. Puntera zapata (m) :	1.500
T. Talón zapata (m) :	3.300
H. Altura muro (m) :	6.000
H _z . Canto zapata (m) :	1.100
Anchura total cimentación (m) :	5.600
Angulo trasdós muro (°) :	85.236

DEFINICION TERRENO

	X	Y
0. Coordenadas base trasdós (m) :	0.000	0.000
1. Coordenadas coronación trasdós (m) :	-0.500	6.000
2. Coordenadas fin tramo 1 terreno (m) :	3.550	7.013
3. Coordenadas fin tramo 2 terreno (m) :	7.550	8.013
4. Coordenadas fin tramo 3 terreno (m) :	11.550	9.013

COEFICIENTES DE SEGURIDAD

Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
γ _o (coeficiente combinación variables) :	1.00

Estado Límite Último	
Favorable	Desfavorable

Acciones permanentes (G)

Peso propio, cargas muertas :	0.90	1.50
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Acciones permanentes de valor no constante (G*)

Terrano (peso propio y empujes) :	0.00	1.50
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Acciones variables (Q)

Sobrecargas :	0.00	1.50
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CARACTERISTICAS DEL TERRENO

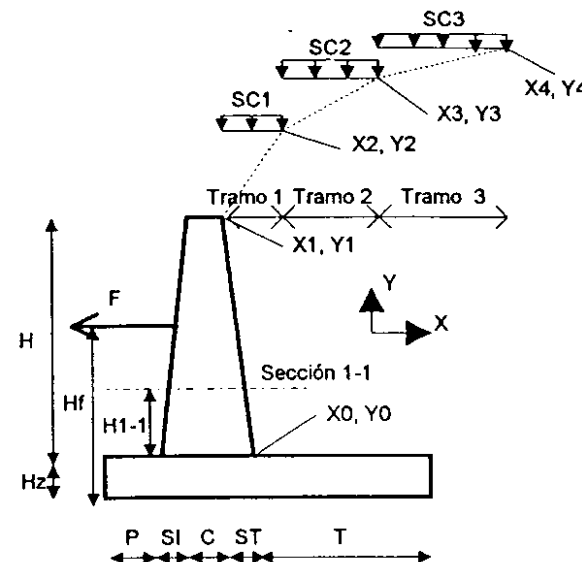
γ. Peso específico (T/m³) :	2.00
φ. Angulo rozamiento interno (°) :	30.000
δ _{mt} . Angulo rozamiento muro-terras (°) :	0.000
φ _{tt} . Angulo rozamiento tierras-terras (°) :	0.000
μ. Coeficiente rozamiento zapata-terras :	0.580
Tensión admisible cimentación (T/m²) :	20.000

ARMADO

H1-1. Dist. sección 1 a sup. zapata (m) :	0.000
Recubrimiento alzado (m) :	0.050
Recubrimiento cimentación (m) :	0.050

Cuantías mínimas

Vertical muros (1/3 min cara)(o/oo) :	0.900
Horizontal muros (1/3 min. cara)(o/oo) :	1.600
Cortante o montaje alzado (cm²/m²) :	4.500
Transversal zapata (sup+inf)(o/oo) :	1.447
Longitudinal zapata (sup+inf)(o/oo) :	1.447
Cortante zapata (cm²/m²) :	0.000
Perimetral zapata (en canto)(cm²/m) :	7.959



CARGAS (sin mayorar)

Acciones permanentes (G)

Peso propio barrera coronación (T/m) :	0.000
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Acciones permanentes de valor no constante (G*)

Fg. Carga horizontal sobre muro (T/m) :	0.000
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Hfg. Posición Fg a inferior zapata (m) :	0.000
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Acciones variables (Q)

SC1. Sobrecarga en tramo 1 (T/m) :	0.000
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SC2. Sobrecarga en tramo 2 (T/m) :	0.000
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SC3. Sobrecarga en tramo 3 (T/m) :	0.000
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Fq. Carga horizontal sobre muro (T/m) :	0.000
---	-------

Hfq. Posición Fq a inferior zapata (m) :	0.000
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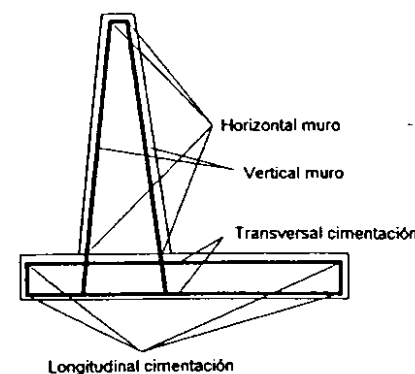
CARACTERISTICAS MATERIALES

Peso específico hormigón (T/m³) :	2.500
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Hormigón alzado (T/m³) :	H - 250
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Hormigón cimentación (T/m³) :	H - 250
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Acero (T/P) :	AEH - 500
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RESUMEN ACCIONES SOBRE EL MURO

		F. vertical (T / m)	X (m)	F. Horizontal (T / m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 (ΣP _i , i=1..3)	8.250	1.794	---	---
	Sobre sección base muro (ΣP _i , i=1..3)	8.250	1.794	---	---
	Total peso propio (ΣP _i , i=1..6)	23.650	2.449	---	---
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E1t)	1.309	2.133	15.706	3.100
	Sobre sección base muro (E1t)	1.309	2.133	15.706	3.100
	Total tierras (E2t + ΣT _i)	46.210	3.862	25.600	2.683
	Verticales sobre talón (ΣT _i)	43.148	3.985	---	---
	Verticales sobre talón (cortante) (ΣT* _i)	30.009	4.491	---	---
Fuerza Fg	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fg	---	---	0.000	0.000
Acciones variables (Q)					
Sobrecargas sobre terreno	Sección 1 (E1'sc)	0.000	2.050	0.000	4.100
	Base muro (E1'sc)	0.000	2.050	0.000	4.100
	Inf. cimentación (E2'sc + ΣS)	0.000	0.000	0.000	4.025
	Verticales sobre talón (ΣS _i , i=1..3)	0.000	0.000	---	---
	Verticales sobre talón (cortante) (ΣS* _i)	0.000	0.000	---	---
Fuerza Fq	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fq	---	---	0.000	0.000

COMPROBACIONES**SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)**

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	13.717	---
Acciones permanentes de valor no constante (G*)		
Tierras	26.802	25.600
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	---	0.000
TOTAL	40.619	25.600

Csd= 1.583 Vale

SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	57.920	---
Acciones permanentes de valor no constante (G*)		
Tierras	178.463	68.694
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	---	0.000
TOTAL	236.383	68.694

Csv= 3.441 Vale

TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	23.650	8.300
Acciones permanentes de valor no constante (G*)		
Tierras	46.210	19.619
Fuerza Fg	0.000	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	0.000	0.000
TOTAL	69.860	27.919

D (m) = 5.60
 σ puntera (T / m²) = 17.82
 σ talón (T / m²) = 7.13
 σ med (T / m²) = 12.48
 σ cob (T / m²) = 14.55
 Vale

ARMADO**Secciones**

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	0.80	1.00	0.80
	1-1	1.00	0.80	1.00	0.80
PUNTERA	2-2 f	1.00	1.10	1.00	1.10
	2-2 c	1.00	1.10	1.00	1.10
TALON	3-3 f	1.00	1.10	1.00	1.10
	3-3 c	1.00	1.10	1.00	1.10

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	9.388	47.447	23.559
	0-0 (-)	7.425	0.787	0.000
	1-1 (+)	9.388	47.447	23.559
	1-1 (-)	7.425	0.787	0.000
PUNTERA	2-2 f (+)	0.000	27.628	---
	2-2 f (-)	0.000	3.254	---
	2-2 c (+)	---	---	20.675
	2-2 c (-)	---	---	2.444
TALON	3-3 f (+)	0.000	4.665	---
	3-3 f (-)	-19.468	-61.138	---
	3-3 c (+)	---	---	1.766
	3-3 c (-)	---	---	-23.683

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm2/m	Minima cm2/m	Control cálculo	Adoptada cm2/m
ALZADO	Vert. trasdós	0-0 (+)	13.655	4.800	Vale	13.655
		0-0 (-)	0.000	2.400	Vale	
		1-1 (+)	13.655	4.800	Vale	
		1-1 (-)	0.000	2.400	Vale	
	Vert. intradós	0-0 (+)	0.000	2.400	Vale	2.400
		0-0 (-)	0.000	2.400	Vale	
		1-1 (+)	0.000	2.400	Vale	
		1-1 (-)	0.000	2.400	Vale	
	Hor. trasdós (*)	---	2.731	8.533	Vale	8.533
		---	0.000	4.267	Vale	
	Cortante	0-0 (+)	0.000	4.500	Vale	4.500 (cm²/m²)
		0-0 (-)	0.000	4.500	Vale	
		1-1 (+)	0.000	4.500	Vale	
		1-1 (-)	0.000	4.500	Vale	
PUNTERA	Trans. inferior	2-2 f (+)	5.987	7.959	Vale	7.959
		2-2 f (-)	0.699	7.959	Vale	
	Long. inf. (*)	---	1.197	7.959	Vale	7.959
		---	---	---	---	
	Trans. superior	2-2 f (+)	0.000	7.959	Vale	17.787
		2-2 f (-)	0.000	7.959	Vale	
	Long. sup. (*)	---	0.000	7.959	Vale	7.959
		---	---	---	---	
TALON	Cortante	2-2 c (+)	0.000	0.000	Vale	0.000 (cm²/m²)
		2-2 c (-)	0.000	0.000	Vale	
	Trans. inferior	3-3 f (+)	1.003	7.959	Vale	7.959
		3-3 f (-)	0.000	7.959	Vale	
	Long. inf. (*)	---	0.201	7.959	Vale	7.959
		---	---	---	---	
	Trans. superior	3-3 f (+)	0.000	7.959	Vale	17.787
		3-3 f (-)	17.787	7.959	Vale	
ZAPATA	Long. sup. (*)	---	3.557	7.959	Vale	7.959
		---	---	---	---	
	Cortante	3-3 c (+)	0.000	0.000	Vale	0.000 (cm²/m²)
		3-3 c (-)	0.000	0.000	Vale	

(*) Calculada como el 20% de la armadura perpendicular a ella

CALCULO DE MUROS.

NOMBRE PROYECTO :	L.A.V. MADRID - ZARAGOZA. Subtramo XV.
NOMBRE OBRA :	Aletas marcos con cobertura. Altura mínima.

DATOS

GEOMETRIA DE CALCULO DEL MURO

C. Canto del muro en coronación (m) :	0.300
ST. Sobreespesor muro en trasdós (m) :	0.333
SI. Sobreespesor muro en intradós (m) :	0.000
P. Puntera zapata (m) :	1.500
T. Talón zapata (m) :	1.867
H. Altura muro (m) :	4.000
H _z . Canto zapata (m) :	1.100
Anchura total cimentación (m) :	4.000
Angulo trasdós (°) :	85.236

DEFINICION TERRENO

	X	Y
0. Coordenadas base trasdós (m) :	0.000	0.000
1. Coordenadas coronación trasdós (m) :	-0.333	4.000
2. Coordenadas fin tramo 1 terreno (m) :	3.667	5.000
3. Coordenadas fin tramo 2 terreno (m) :	6.333	5.667
4. Coordenadas fin tramo 3 terreno (m) :	9.000	6.333

COEFICIENTES DE SEGURIDAD

Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
γ _o (coeficiente combinación variables) :	1.00

Estado Límite Último	
Favorable	Desfavorable

Acciones permanentes (G)	
Peso propio, cargas muertas :	0.90
Acciones permanentes de valor no constante (G*)	
Terreno (peso propio y empujes) :	0.00
Acciones variables (Q)	
Sobrecargas :	0.00

CARACTERISTICAS DEL TERRENO

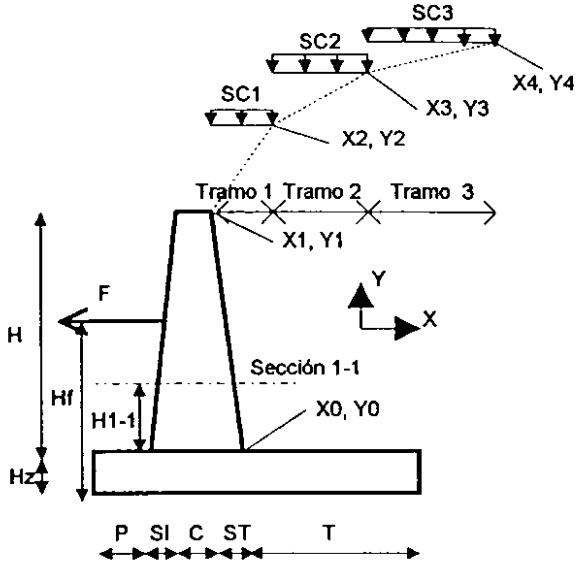
γ. Peso específico (T/m³) :	2.00
φ. Angulo rozamiento interno (°) :	30.000
δ _{ml} . Angulo rozamiento muro-tierras (°) :	0.000
φ _{tl} . Angulo rozamiento tierras-tierras (°) :	0.000
μ. Coeficiente rozamiento zapata-tierras :	0.580
Tensión admisible cimentación (T/m²) :	20.000

ARMADO

H1-1. Dist. sección 1 a sup. zapata (m) :	0.000
Recubrimiento alzado (m) :	0.050
Recubrimiento cimentación (m) :	0.050

Cuantías mínimas

Vertical muros (1/3 mín. cara)(o/o) :	0.900
Horizontal muros (1/3 mín. cara)(o/o) :	1.600
Cortante o montaje alzado (cm²/m²) :	4.500
Transversal zapata (sup+inf)(o/o) :	1.447
Longitudinal zapata (sup+inf)(o/o) :	1.447
Cortante zapata (cm²/m²) :	0.000
Perimetral zapata (en canto)(cm²/m) :	7.959

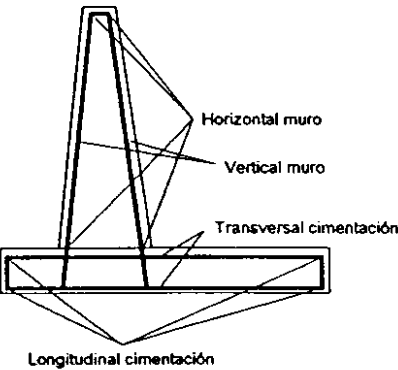


CARGAS (sin mayorar)

Acciones permanentes (G)	
Peso propio barrera coronación (T/m) :	0.000
Acciones permanentes de valor no constante (G*)	
Fg. Carga horizontal sobre muro (T/m) :	0.000
Hf _g . Posición Fg a inferior zapata (m) :	0.000
Acciones variables (Q)	
SC1. Sobrecarga en tramo 1 (T/m) :	0.000
SC2. Sobrecarga en tramo 2 (T/m) :	0.000
SC3. Sobrecarga en tramo 3 (T/m) :	0.000
Fq. Carga horizontal sobre muro (T/m) :	0.000
Hf _q . Posición Fq a inferior zapata (m) :	0.000

CARACTERISTICAS MATERIALES

Peso específico hormigón (T/m³) :	2.500
Hormigón alzado (T/m³) :	H - 250
Hormigón cimentación (T/m³) :	H - 250
Acero (T/m) :	AEH - 500



RESUMEN ACCIONES SOBRE EL MURO

		F.vertical (T / m)	X (m)	F. Horizontal (T / m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 (ΣP _i , i=1..3)	4.667	1.743	---	---
	Sobre sección base muro (ΣP _i , i=1..3)	4.667	1.743	---	---
	Total peso propio (ΣP _i , i=1..6)	15.667	1.924	---	---
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E1't)	0.578	2.022	6.931	2.433
	Sobre sección base muro (E1t)	0.578	2.022	6.931	2.433
	Total tierras (E2t + ΣT)	17.477	3.001	12.622	1.883
	Verticales sobre talón (ΣT ⁺ ij)	16.116	3.083	---	---
	Verticales sobre talón (cortante) (ΣT ⁺ ij)	11.759	3.338	---	---
Fuerza Fg	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fg	---	---	0.000	0.000
Acciones variables (Q)					
Sobrecargas sobre terreno	Sección 1 (E1'sc)	0.000	1.967	0.000	3.100
	Base muro (E1sc)	0.000	1.967	0.000	3.100
	Inf. cimentación (E2sc + ΣS)	0.000	0.000	0.000	2.625
	Verticales sobre talón (ΣS ⁺ i, i=1..3)	0.000	0.000	---	---
	Verticales sobre talón (cortante) (ΣS ⁺ i)	0.000	0.000	---	---
Fuerza Fq	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fq	---	---	0.000	0.000

COMPROBACIONES

SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	9.087	---
Acciones permanentes de valor no constante (G*)		
Tierras	10.136	12.622
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	---	0.000
TOTAL	19.223	12.622

Csd= 1.523 Vale

SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	30.135	---
Acciones permanentes de valor no constante (G*)		
Tierras	52.445	23.771
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	---	0.000
TOTAL	82.580	23.771

Csv= 3.474 Vale

TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	15.667	1.198
Acciones permanentes de valor no constante (G*)		
Tierras	17.477	6.280
Fuerza Fg	0.000	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	0.000	0.000
TOTAL	33.143	7.478

D (m) = 4.00
 σ puntera (T / m²) = 11.09
 σ talón (T / m²) = 5.48
 σ med (T / m²) = 8.29

σ cob (T / m²) = 9.34
 Vale

ARMADO

Secciones

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	0.63	1.00	0.63
	1-1	1.00	0.63	1.00	0.63
PUNTERA	2-2 f	1.00	1.10	1.00	1.10
	2-2 c	1.00	1.10	1.00	1.10
TALON	3-3 f	1.00	1.10	1.00	1.10
	3-3 c	1.00	1.10	1.00	1.10

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	5.066	13.993	10.397
	0-0 (-)	4.200	0.308	0.000
	1-1 (+)	5.066	13.993	10.397
	1-1 (-)	4.200	0.308	0.000
PUNTERA	2-2 f (+)	0.000	14.491	---
	2-2 f (-)	0.000	1.713	---
	2-2 c (+)	---	---	11.198
	2-2 c (-)	---	---	1.322
TALON	3-3 f (+)	0.000	2.494	---
	3-3 f (-)	-7.437	-15.733	---
	3-3 c (+)	---	---	1.747
	3-3 c (-)	---	---	-10.947

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm2/m	Minima cm2/m	Control cálculo	Adoptada cm2/m
ALZADO	Vert. trasdós	0-0 (+)	4.886	3.800	Vale	4.886
		0-0 (-)	0.000	1.900	Vale	
		1-1 (+)	4.886	3.800	Vale	
		1-1 (-)	0.000	1.900	Vale	
	Vert. intrados	0-0 (+)	0.000	1.900	Vale	1.900
		0-0 (-)	0.000	1.900	Vale	
		1-1 (+)	0.000	1.900	Vale	
		1-1 (-)	0.000	1.900	Vale	
	Hor. trasdós (*)	---	0.977	6.756	Vale	6.756
	Hor. intrados (*)	---	0.000	3.378	Vale	3.378
	Cortante	0-0 (+)	0.000	4.500	Vale	4.500 (cm²/m²)
		0-0 (-)	0.000	4.500	Vale	
		1-1 (+)	0.000	4.500	Vale	
		1-1 (-)	0.000	4.500	Vale	
PUNTERA	Trans. inferior	2-2 f (+)	3.126	7.959	Vale	7.959
		2-2 f (-)	0.368	7.959	Vale	
	Long. inf. (*)	---	0.625	7.959	Vale	7.959
		---	0.000	7.959	Vale	
	Trans. superior	2-2 f (+)	0.000	7.959	Vale	7.959
		2-2 f (-)	0.000	7.959	Vale	
	Long. sup. (*)	---	0.000	7.959	Vale	7.959
		---	0.000	0.000	Vale	
TALON	Trans. inferior	2-2 c (+)	0.000	0.000	Vale	0.000 (cm²/m²)
		2-2 c (-)	0.000	0.000	Vale	
	Trans. inferior	3-3 f (+)	0.536	7.959	Vale	7.959
		3-3 f (-)	0.000	7.959	Vale	
	Long. inf. (*)	---	0.107	7.959	Vale	7.959
		---	0.000	7.959	Vale	
	Trans. superior	3-3 f (+)	0.000	7.959	Vale	7.959
		3-3 f (-)	5.073	7.959	Vale	
ZAPATA	Long. sup. (*)	---	1.015	7.959	Vale	7.959
		---	0.000	0.000	Vale	
	Cortante	3-3 c (+)	0.000	0.000	Vale	0.000 (cm²/m²)
		3-3 c (-)	0.000	0.000	Vale	
ZAPATA	Perimetral	---	0.000	7.959	Vale	7.959
		---	0.000	7.959	Vale	

(*) Calculada como el 20% de la armadura perpendicular a ella

CALCULO DE SECUENCIA DE MUROS . Resultados.

PROYECTO :	L.A.V. MADRID - ZARAGOZA. Subtramo XV
OBRA :	EVN3-2.5. Aletas.

	Sección 1	Sección 2	Sección 3	Sección 4	Sección 5	Sección 6	Sección 7	Sección 8	Sección 9	Sección 10	Sección 11	Sección 12	Sección 13	Sección 14	Sección 15	Sección 16
GEOMETRIA SECCION																
C. Canto del muro en coronación (m) :	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300
ST. Sobreepesor muro en trasdós (m) :	0.642	0.621	0.601	0.580	0.560	0.539	0.518	0.508	0.498	0.477	0.457	0.436	0.416	0.395	0.375	0.354
Sl. Sobreepesor muro en intradós (m) :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
P. Puntera zapata (m) :	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750
T. Talón zapata (m) :	5.308	5.150	4.992	4.834	4.676	4.518	4.360	4.281	4.202	4.044	3.886	3.728	3.570	3.412	3.254	3.096
H. Altura muro (m) :	7.700	7.454	7.207	6.961	6.714	6.468	6.221	6.098	5.975	5.729	5.482	5.236	4.989	4.743	4.496	4.250
H _z . Canto zapata (m) :	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100
H1-1. Dist. sección 1 a sup. zapata (m) :	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750
Cota cimentación :	-1.100	-1.100	-1.100	-1.100	-1.100	-1.100	-1.100	-1.100	-1.100	-1.100	-1.100	-1.100	-1.100	-1.100	-1.100	-1.100
TERRENO																
X0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X1																
X2	4.669	4.931	5.193	5.454	5.716	5.978	6.240	6.371	6.502	6.764	7.026	7.288	7.550	7.812	8.074	8.335
X3	9.979	10.482	10.986	11.489	11.992	12.495	12.999	13.250	13.502	14.005	14.509	15.012	15.515	16.019	16.522	17.025
X4	24.479	24.982	25.486	25.989	26.492	26.995	27.499	27.750	28.002	28.505	29.009	29.512	30.015	30.519	31.022	31.525
Y0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Y1																
Y2	10.084	9.946	9.808	9.670	9.532	9.394	9.256	9.187	9.118	8.980	8.842	8.704	8.566	8.428	8.290	8.152
Y3	12.469	12.439	12.410	12.380	12.350	12.321	12.291	12.276	12.261	12.232	12.202	12.172	12.143	12.113	12.083	12.054
Y4	12.469	12.439	12.410	12.380	12.350	12.321	12.291	12.276	12.261	12.232	12.202	12.172	12.143	12.113	12.083	12.054
Vale terreno	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
COMPROBACIONES																
Coeficiente seguridad deslizamiento :	1.622	1.582	1.552	1.529	1.514	1.507	1.506	1.508	1.512	1.526	1.549	1.560	1.557	1.561	1.575	1.588
	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Coeficiente seguridad al vuelco :	3.576	3.530	3.502	3.491	3.496	3.518	3.556	3.581	3.612	3.687	3.786	4.000	4.046	4.116	4.211	4.311
	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Tensión máxima (T/m ²) :	23.256	22.665	21.972	21.191	20.332	19.404	18.417	17.904	17.379	16.299	15.184	13.747	12.931	12.082	11.209	10.376
Tensión media (T/m ²) :	18.875	18.325	17.764	17.193	16.615	16.029	15.437	15.139	14.840	14.238	13.632	13.044	12.472	11.899	11.323	10.754
Tensión cobaricentrica (T/m ²) :	20	20	19	19	18	17	16	16	16	15	14	13	13	12	11	11
	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
ARMADO																
1. Inferior transversal cimentación (cm ² /m) :	11.617	11.222	10.779	10.295	9.777	9.229	8.659	8.366	8.070	7.959	7.959	7.959	7.959	7.959	7.959	7.959
2. Superior transversal cimentación (cm ² /m) :	39.041	36.658	34.144	31.558	28.949	26.358	23.818	22.575	21.354	18.989	16.737	14.271	12.750	11.286	9.894	8.643
3. Inferior longitudinal cimentación (cm ² /m) :	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959
4. Superior longitudinal cimentación (cm ² /m) :	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959
5. Perimetral cimentación (cm ² /m) :	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959
6a. Espera 6b (cm ² /m) :	16.889	15.255	13.670	12.191	10.791	9.504	8.293	7.717	7.181	6.160	5.209	4.369	3.602	3.296	3.173	3.050
6b. Vertical trasdós con solape (cm ² /m) :	16.889	15.255	13.670	12.191	10.791	9.504	8.293	7.717	7.181	6.160	5.209	4.369	3.602	3.296	3.173	3.050
7. Vertical trasdós sin solape (cm ² /m) :	14.848	14.147	13.413	12.699	11.979	11.292	10.597	10.247	9.924	9.263	8.587	7.963	7.333	6.301	5.228	4.245
8a. Espera 8b (cm ² /m) :	2.825	2.763	2.702	2.640	2.579	2.517	2.455	2.425	2.394	2.332	2.271	2.209	2.147	2.086	2.024	1.963
8b. Vertical intradós (cm ² /m) :	2.825	2.763	2.702	2.640	2.579	2.517	2.455	2.425	2.394	2.332	2.271	2.209	2.147	2.086	2.024	1.963
9. Horquilla coronación (cm ² /m) :	5.650	5.650	5.650	5.650	5.650	5.650	5.650	5.650	5.650	5.650	5.650	5.650	5.650	5.650	5.650	5.650
10. Horizontal trasdós (cm ² /m) :	10.044	9.825	9.606	9.387	9.168	8.949	8.730	8.621	8.511	8.292	8.073	7.854	7.635	7.416	7.197	6.978
11. Horizontal intradós (cm ² /m) :	5.022	4.913	4.803	4.694	4.584	4.475	4.365	4.310	4.256	4.146	4.037	3.927	3.817	3.708	3.598	3.489
12. Montaje muro y cortante (cm ² /m ²) :	4.500	4.500	4.500	4.500	4.500	4.500	4.500	4.500	4.500	4.500	4.500	4.500	4.500	4.500	4.500	4.500
13. Horquillas horizontales bordes (cm ² /m) :	10.044	9.825	9.606	9.387	9.168	8.949	8.730	8.621	8.511	8.292	8.073	7.854	7.635	7.416	7.197	6.978

4.4.3 Pasos inferiores EVN2-03, EVN2-1.0 Y E-1516.8

PASOS INFERIORES EVN2-0.3, EVN2-1.0 Y E-1516.8

INDICE

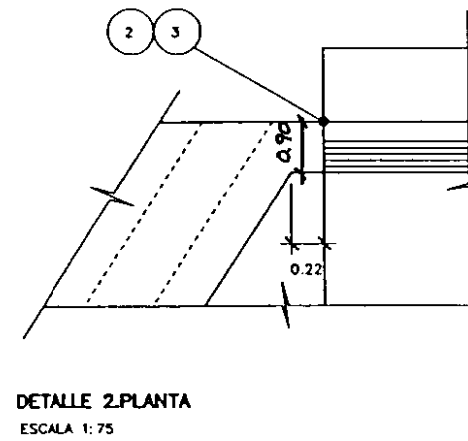
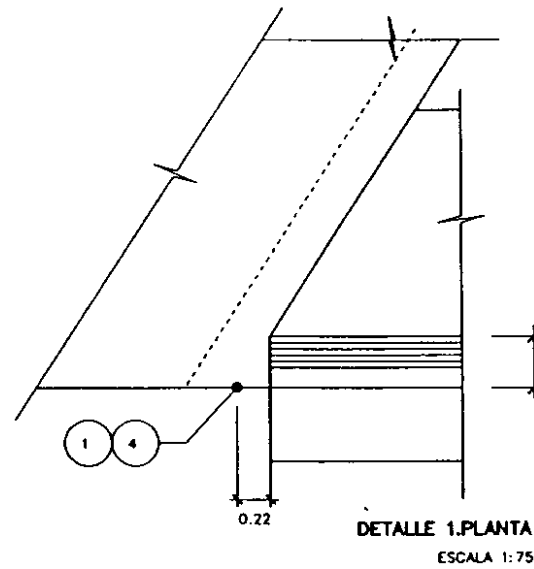
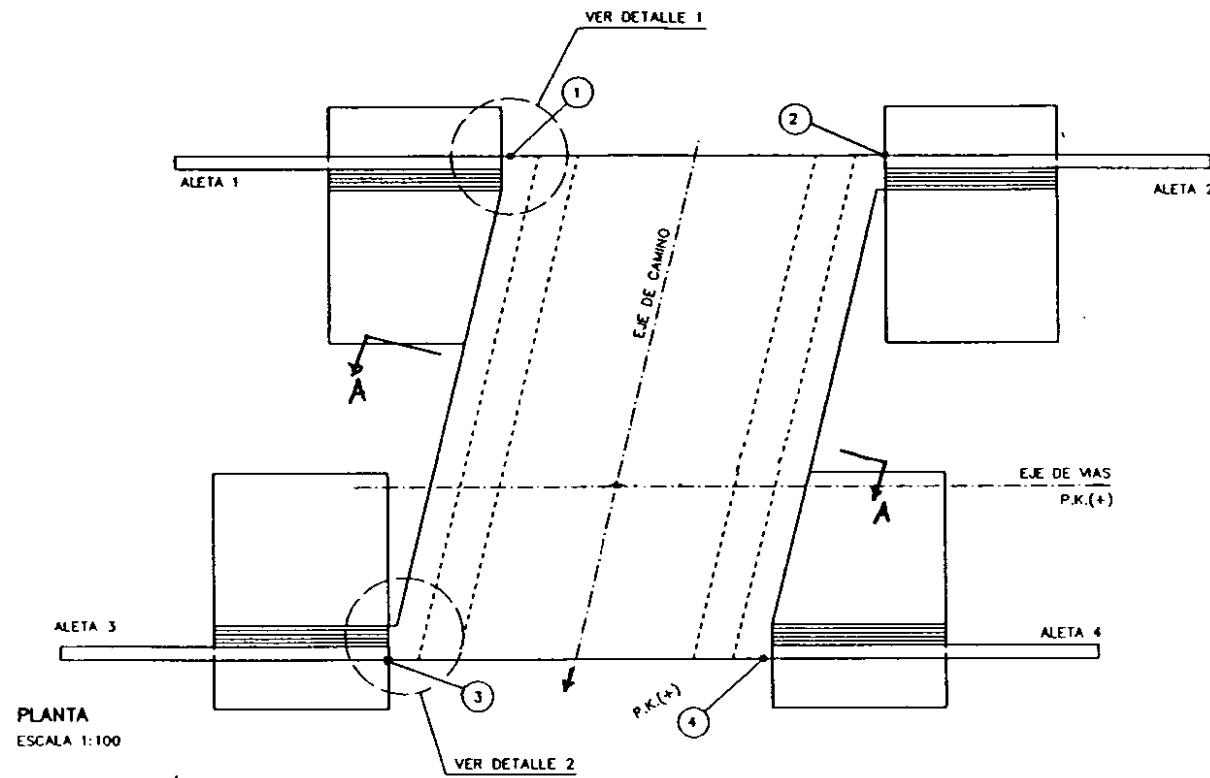
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2º CALCULOS

PASOS INFERIORES EVN2-0.3, EVN2-1.0 Y E-1516.8

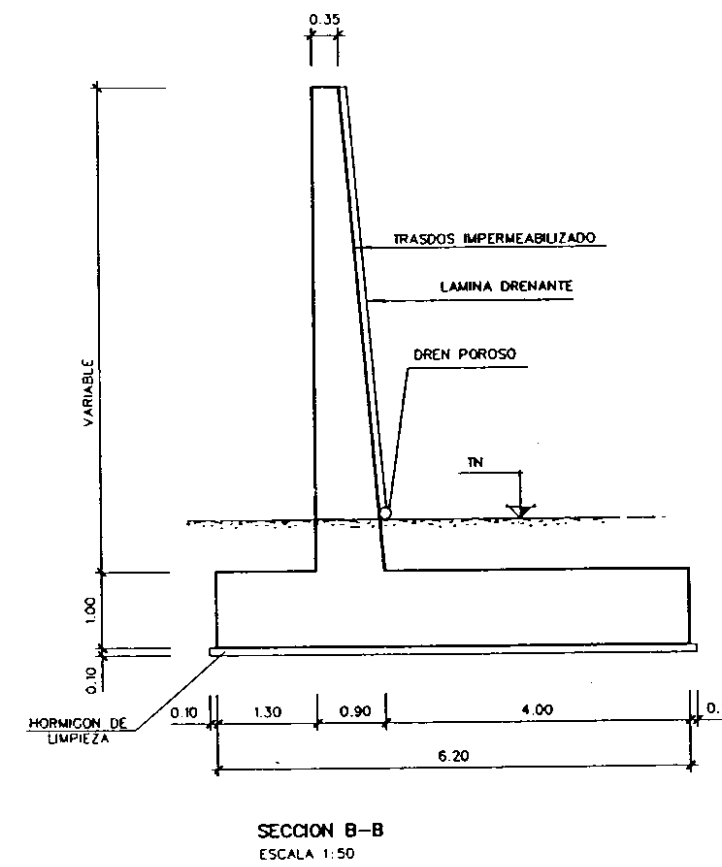
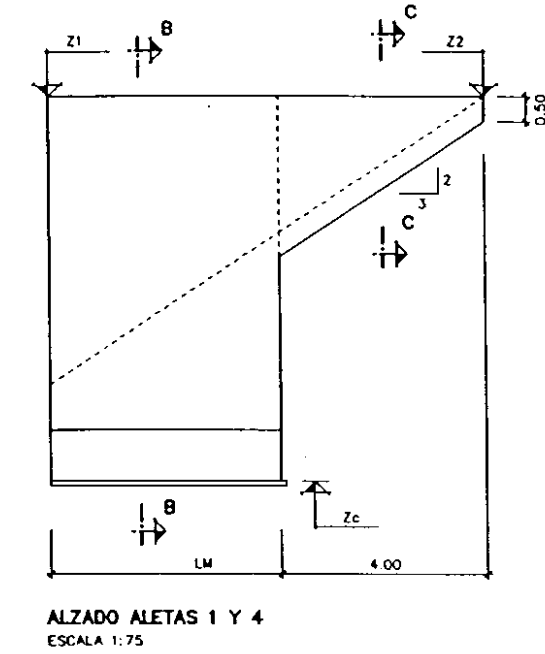
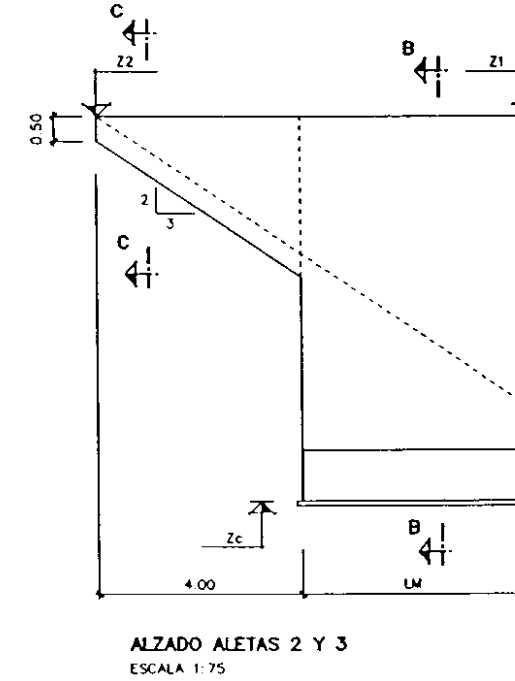
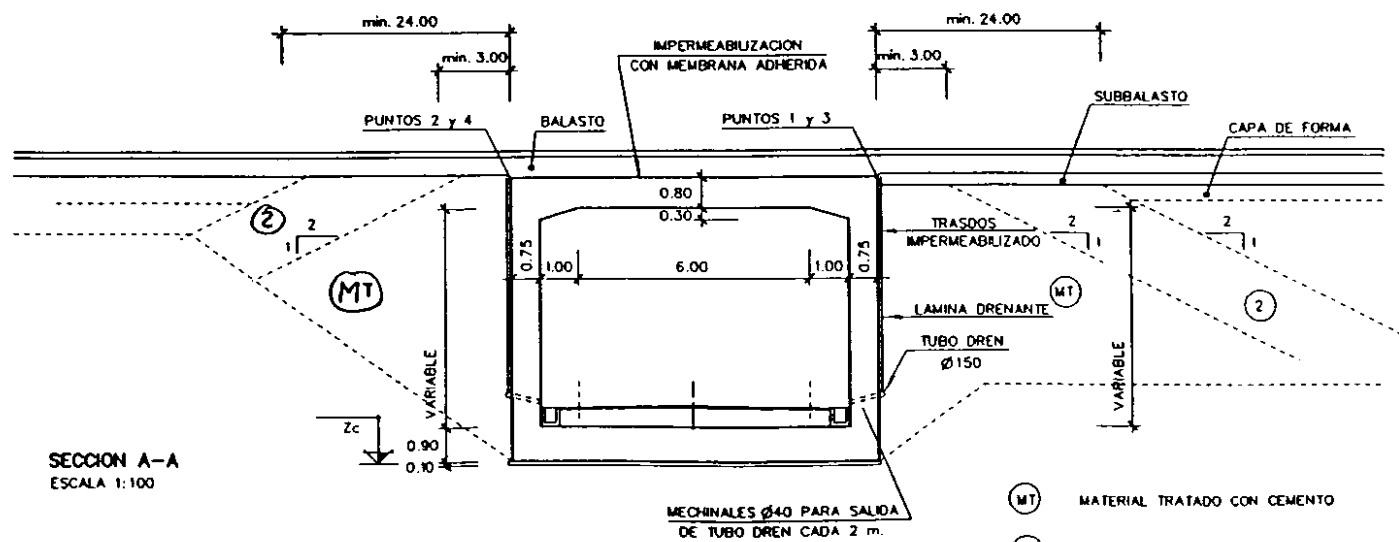
1º DEFINICION GEOMETRICA

DEFINICION GEOMETRICA ESTRUCTURA EVN2-0.3



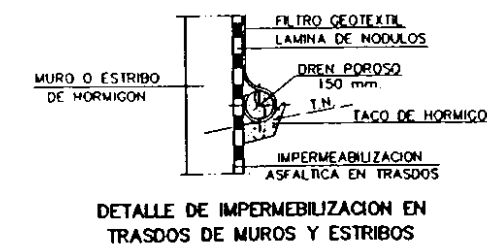
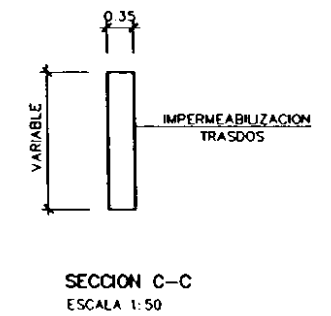
PUNTOS DE REPLANTEO

PUNTO	X	Y	Z
1	671252.849	4609159.507	301.618
2	671292.631	4609159.518	301.609
3	671279.717	4609146.709	301.669
4	671289.498	4609146.712	301.660

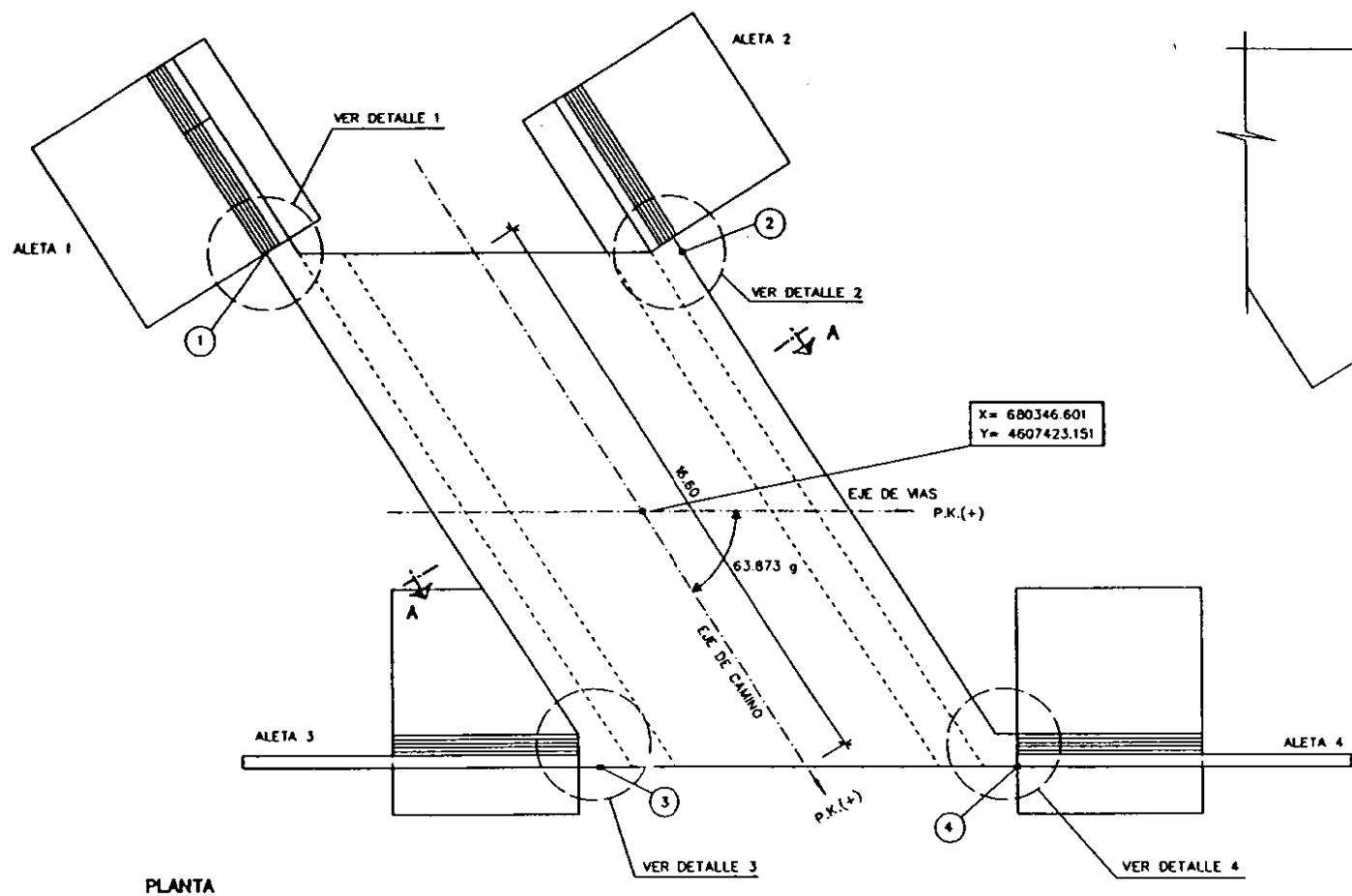


PUNTOS DE REPLANTEO DE ALETAS

ALETA	LM	Z1	Z2	Zc
1	4.5	301.618	301.652	294.043
2	4.5	301.609	301.230	293.993
3	4.5	301.669	301.720	294.326
4	4.5	301.660	301.304	294.276

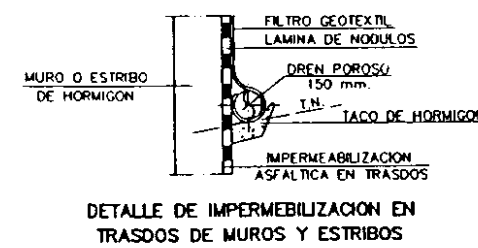
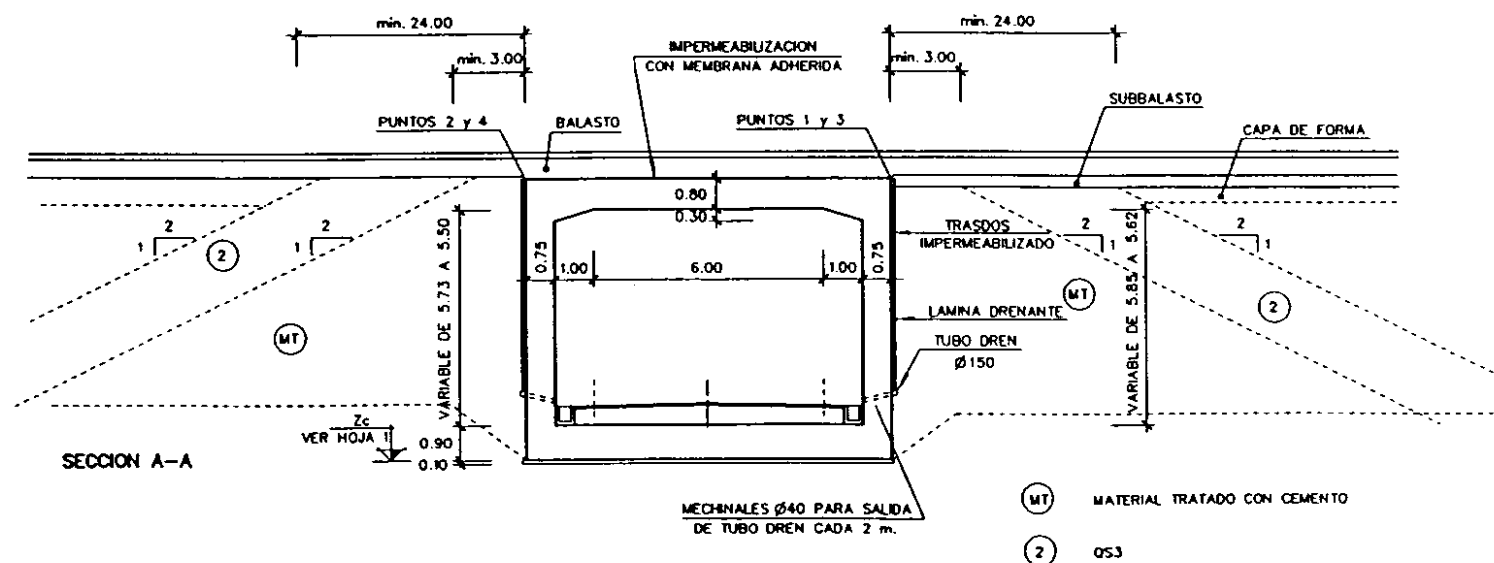
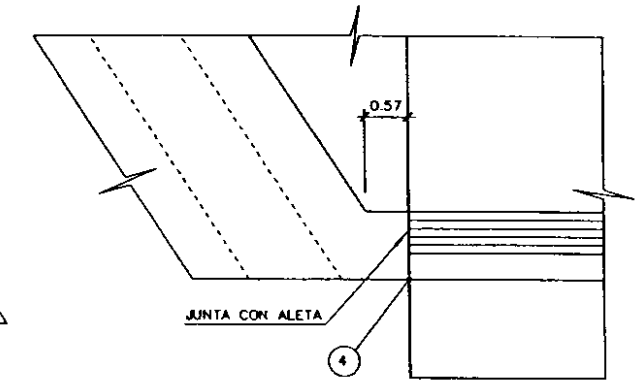
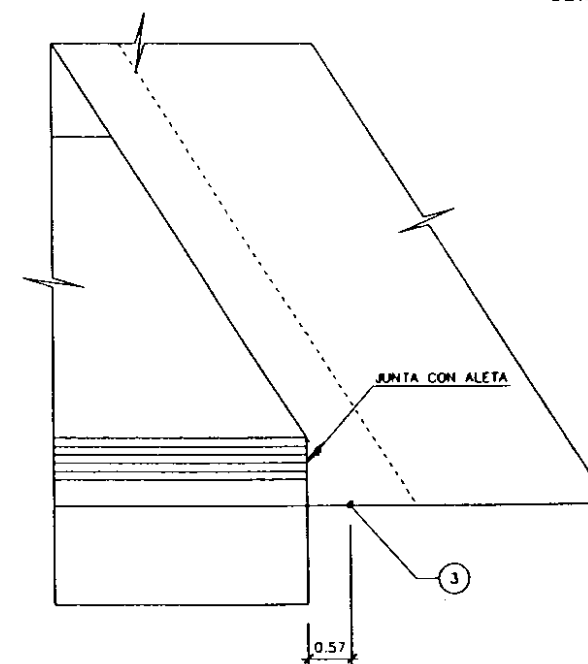
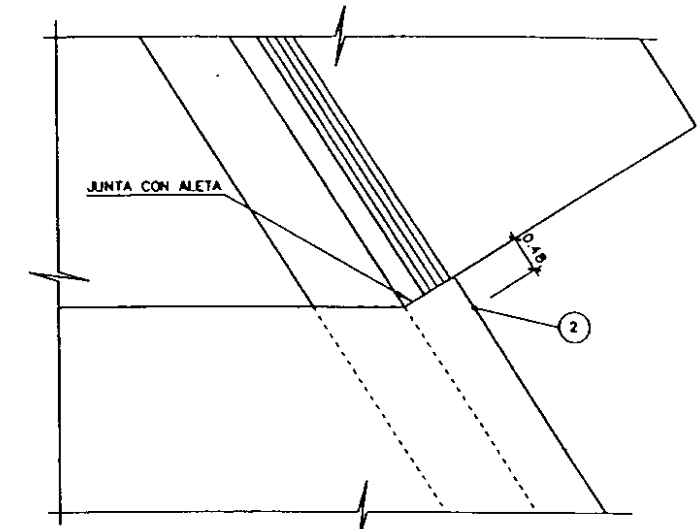
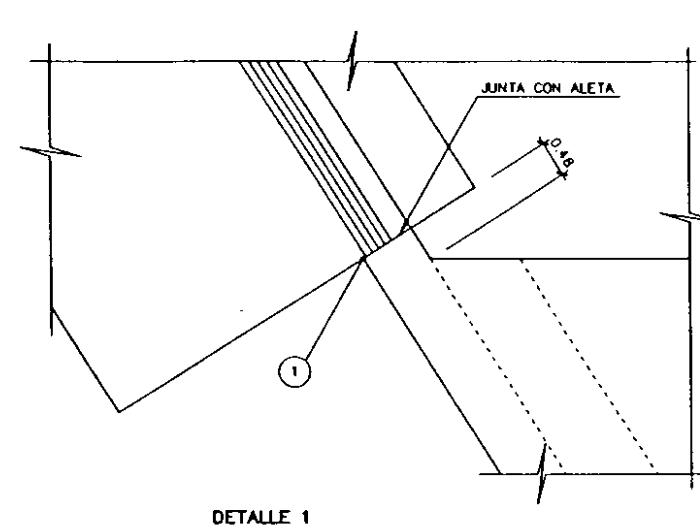


DEFINICION GEOMETRICA ESTRUCTURA E-1516.8

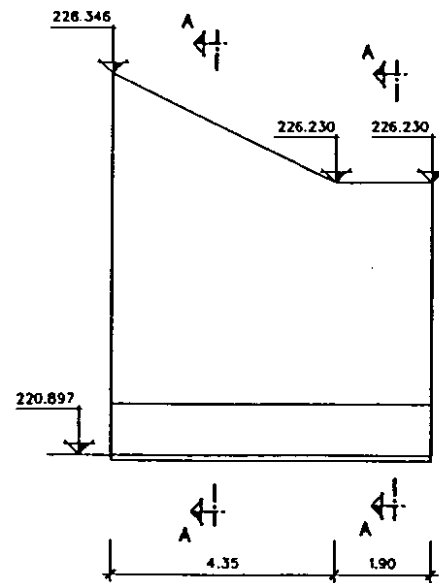


PUNTOS DE REPLANTEO

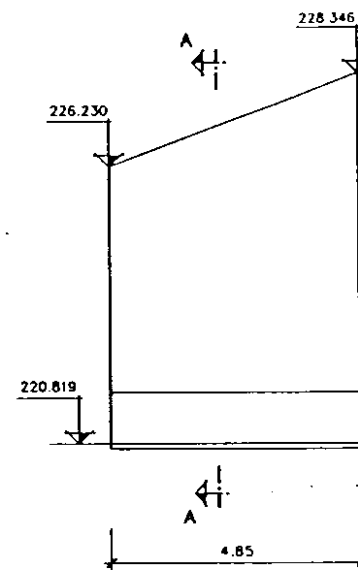
PUNTO	X	Y	Z
1	680340.541	4607433.836	228.346
2	680350.693	4607428.949	228.346
3	680342.510	4607417.351	228.346
4	680352.662	4607412.465	228.346



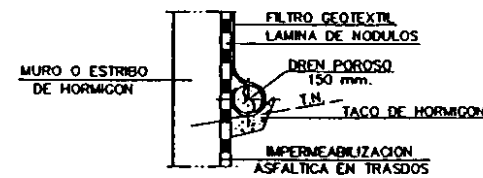
ALETAS ESTRUCTURA E-1516.8



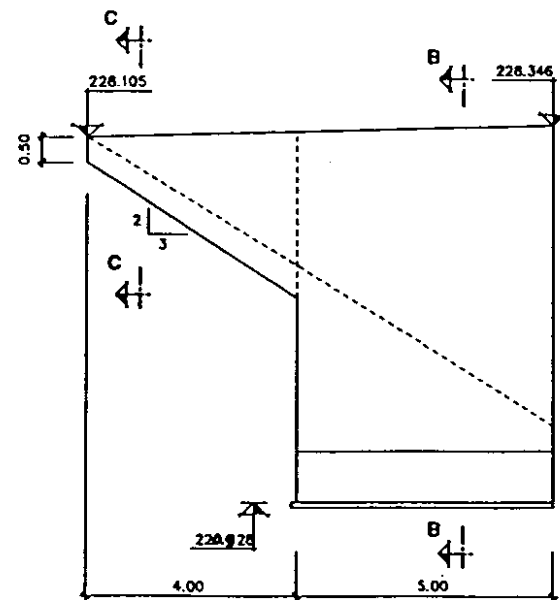
ALZADO ALETA 1
ESCALA 1:75



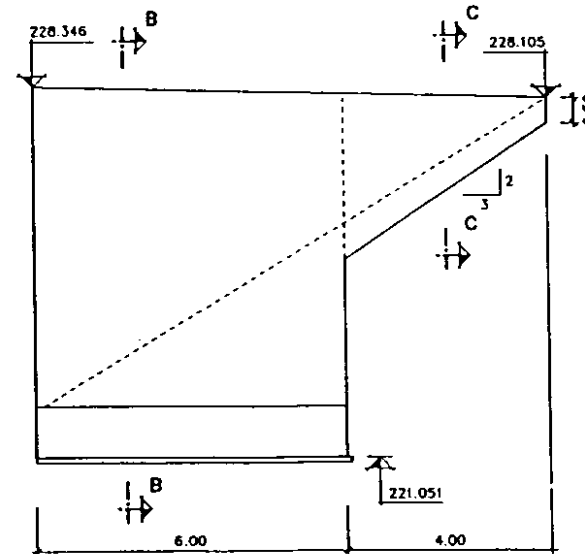
ALZADO ALETA 2
ESCALA 1:75



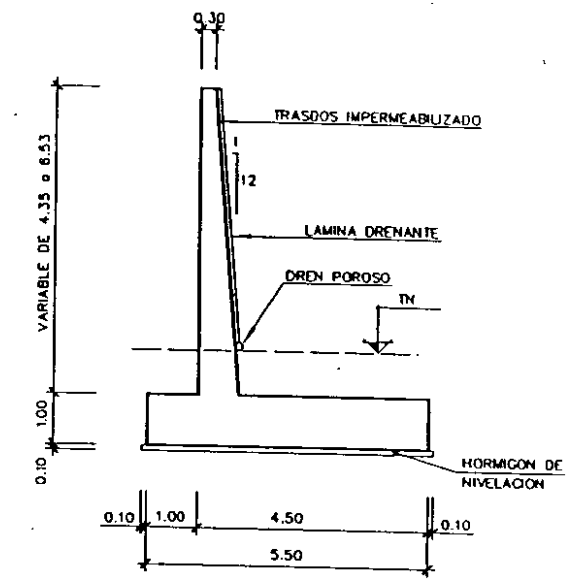
DETALLE DE IMPERMEABILIZACION EN
TRASDOS DE MUROS



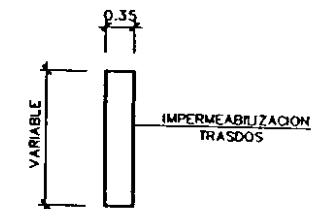
ALZADO ALETA 3
ESCALA 1:75



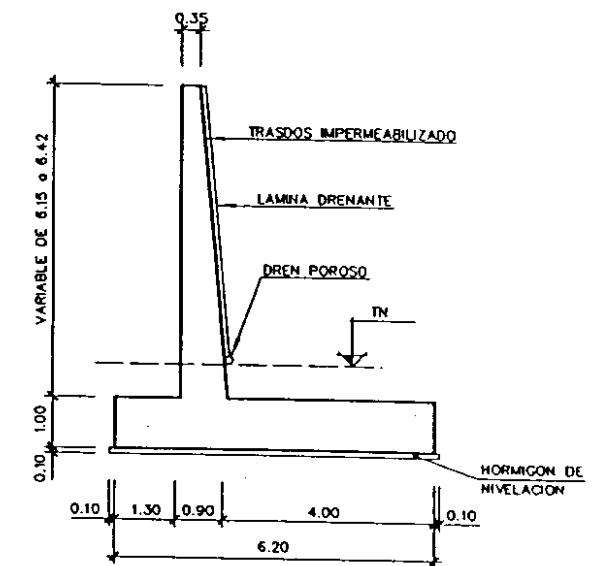
ALZADO ALETA 4
ESCALA 1:75



SECCION A-A
ESCALA 1:75

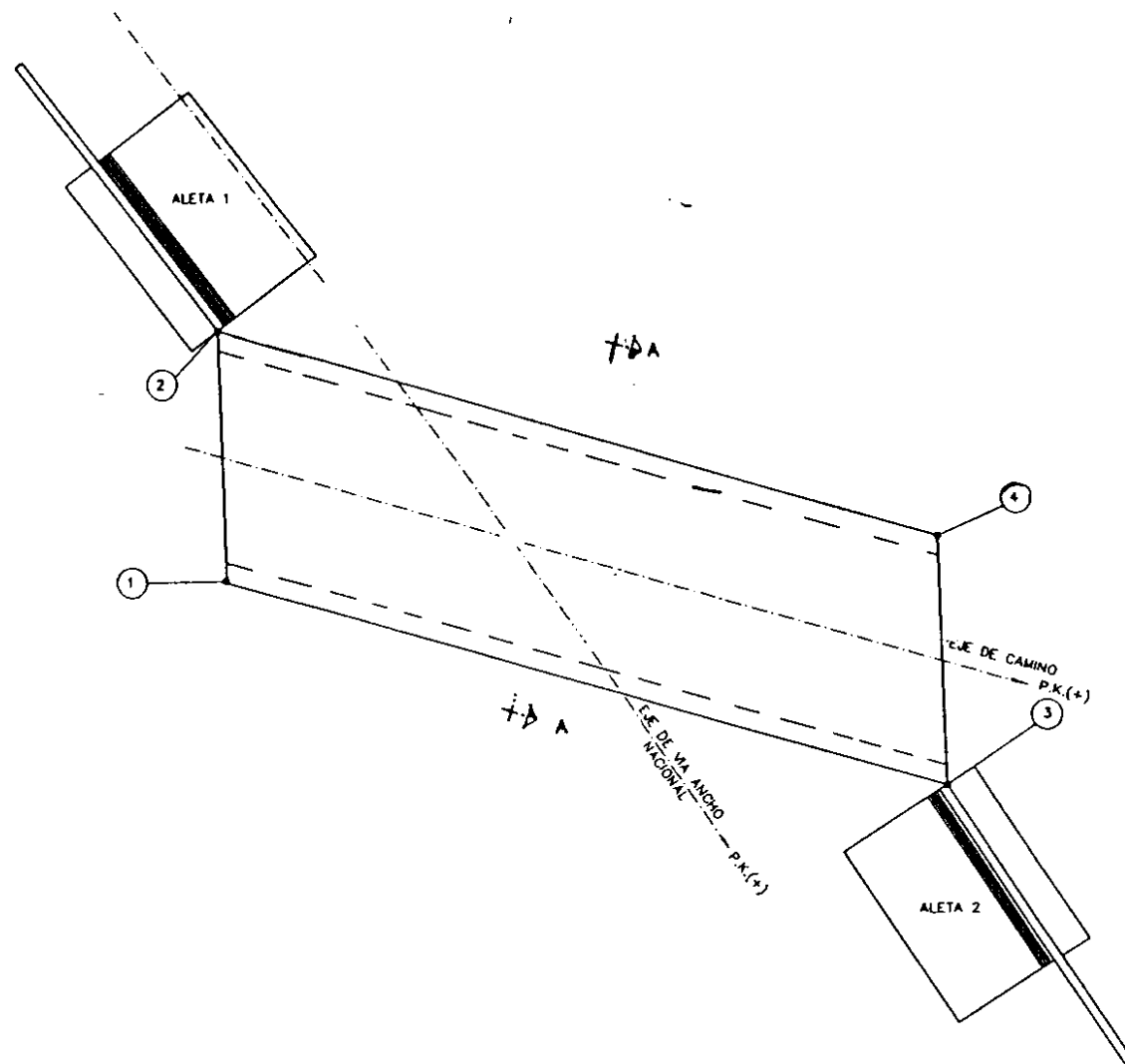


SECCION C-C
ESCALA 1:50

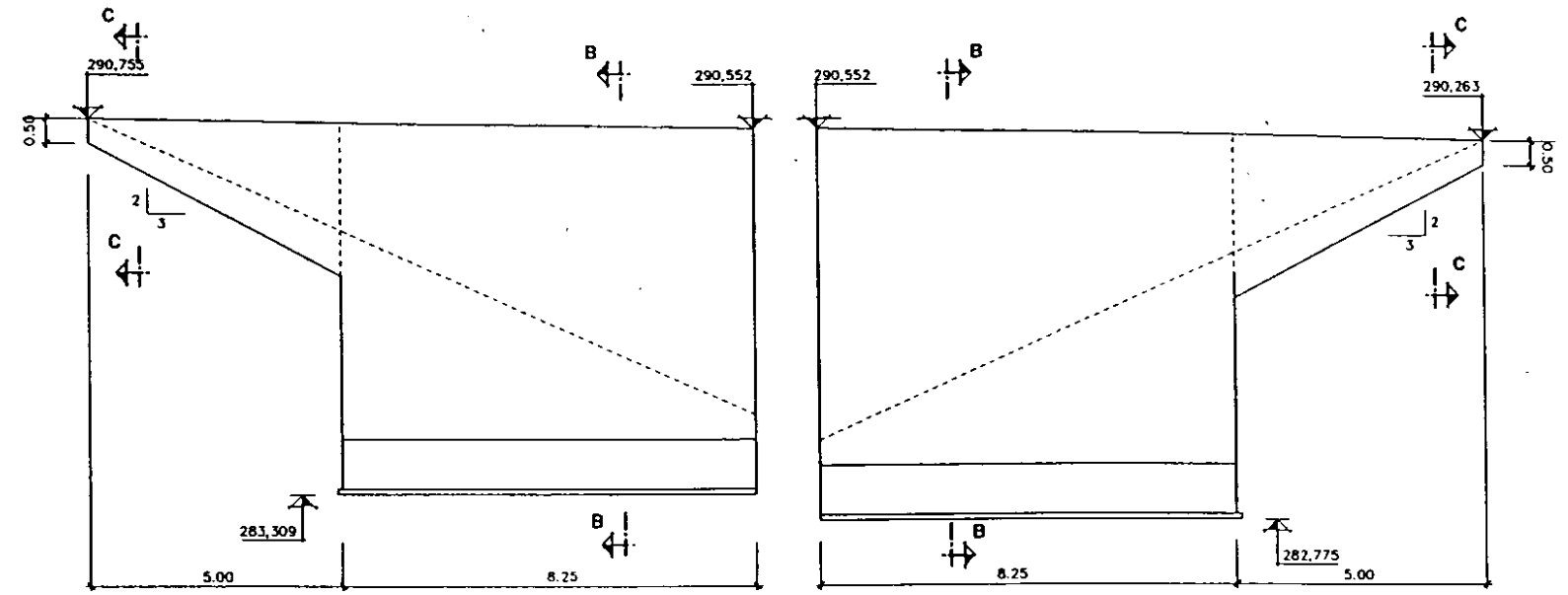


SECCION B-B
ESCALA 1:75

DEFINICION GEOMETRICA ESTRUCTURA EVN2-1.0

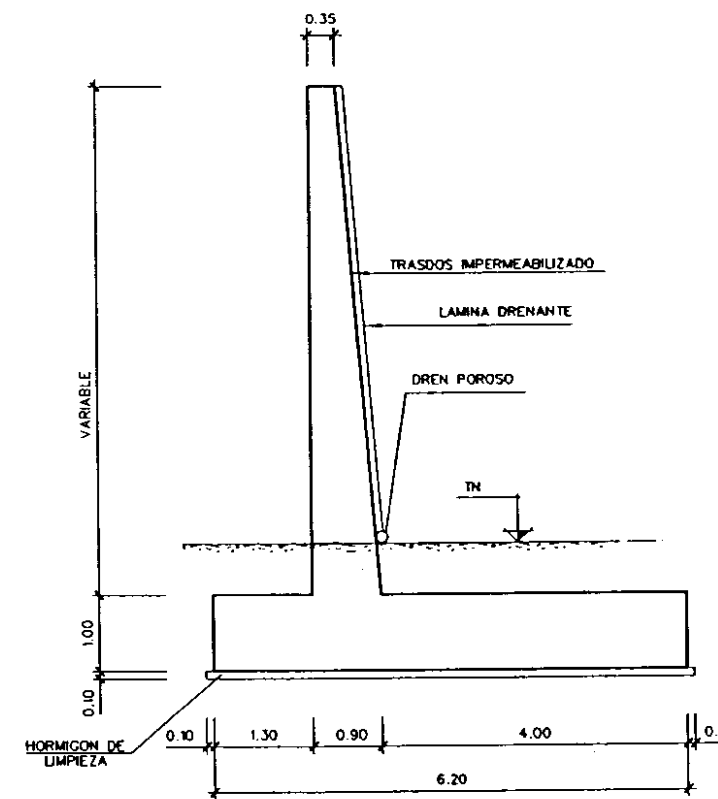


PLANTA



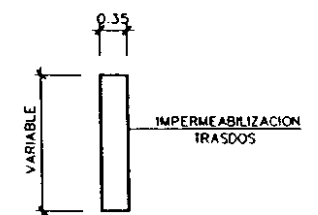
ALZADO ALETA 1

ALZADO ALETA 2

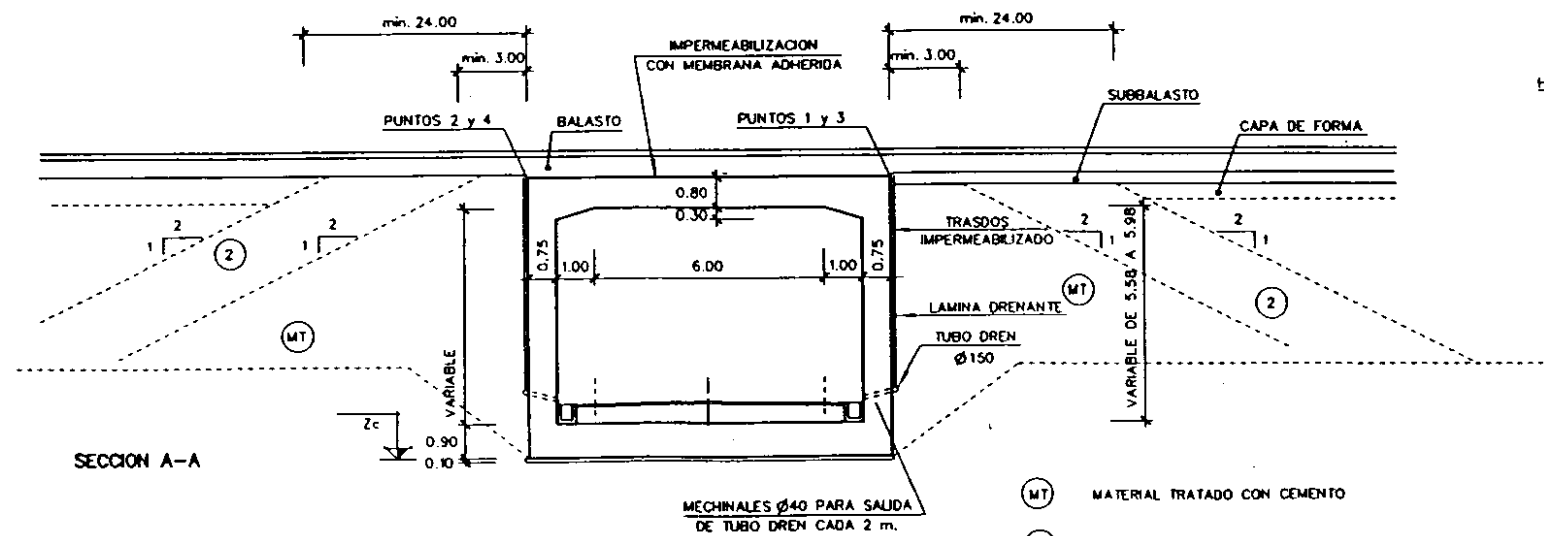


SECCION B-B

PUNTOS DE REPLANTEO			
PUNTO	X	Y	Z
1	671894.595	4608895.241	290.552
2	671894.267	4608905.224	290.552
3	671923.054	4608887.019	290.552
4	671922.726	4608897.002	290.552

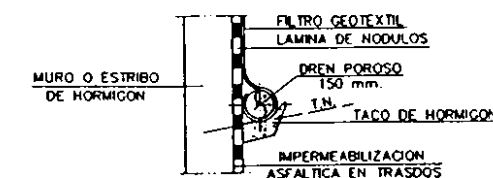


SECCION C-C



SECCION A-A

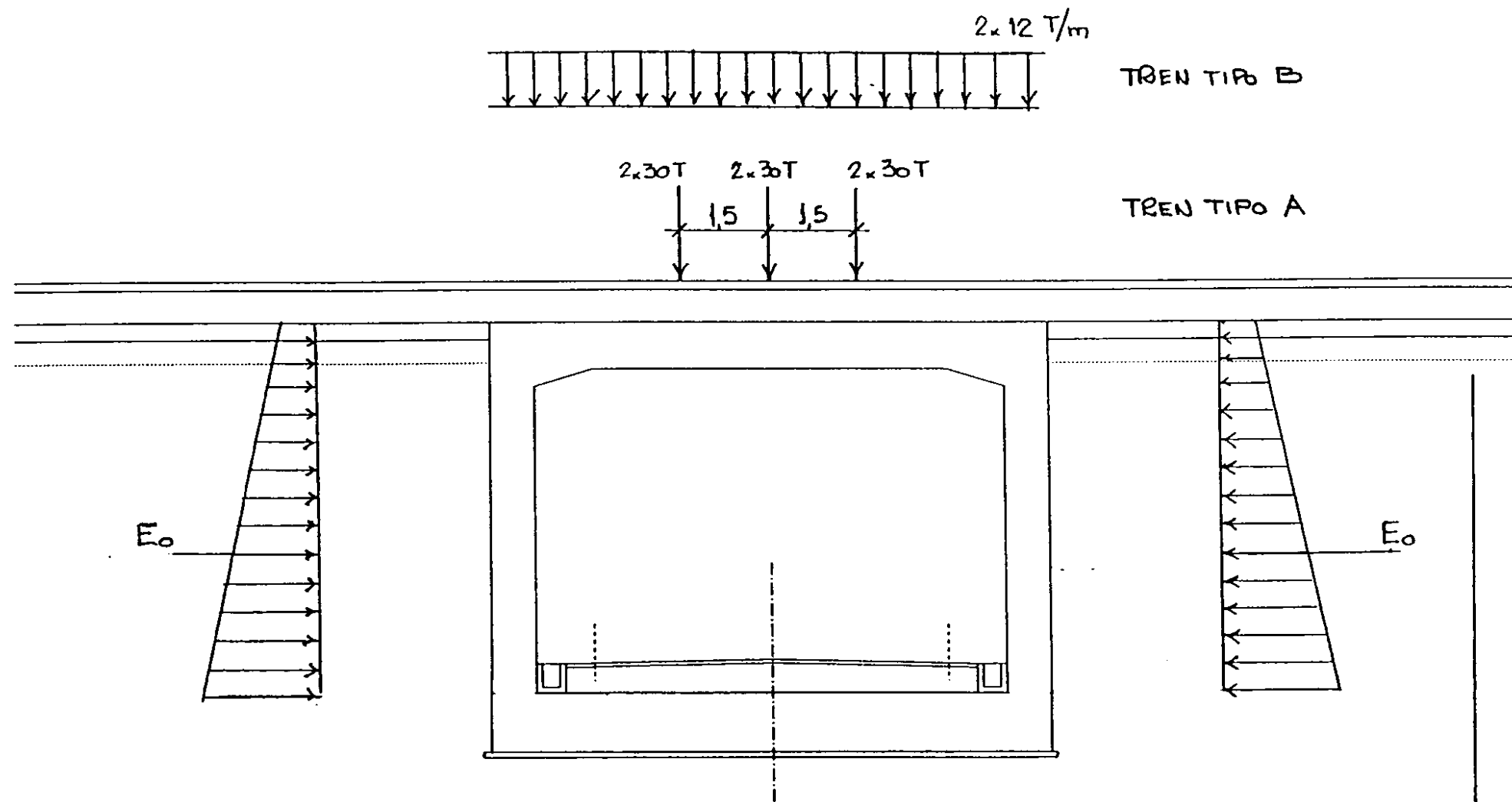
- (MT) MATERIAL TRATADO CON CEMENTO
- (2) OS3



DETALLE DE IMPERMEABILIZACION EN TRASDOS DE MUROS Y ESTRIBOS

PASOS INFERIORES EVN2-0.3, EVN2-1.0 Y E-1516.8

2º CALCULOS



Coef. Impacto

$$V = 200 \text{ km/h}$$

$$T = 0,05 \text{ seg.}$$

$$L = 8,80 \text{ m}$$

$$M = \frac{VT}{2L} = 0,57$$

$$I = 65 \frac{M}{1-M+M^2} = 50$$

$$\phi_0 = 1,50$$

CARGAS PERMANENTES (g)

$$g: \text{Riel + Travesas: } \frac{0,12 \text{ T/m} + 0,52 \text{ T/m}}{2,4 \text{ m}} = 0,27 \text{ T/m}^2$$

$$\text{Balasto: } 0,8 \text{ m} \times 1,6 \text{ T/m}^3 = \frac{1,28 \text{ T/m}^2}{1,55 \text{ T/m}^2 + \text{Peso Propio Pórtico}}$$

SOBRECARGAS (CARGAS VARIABLES)Tren: TREN TIPO A (Q_A)TREN TIPO B (Q_B)Empuje Terreno: (E_0)

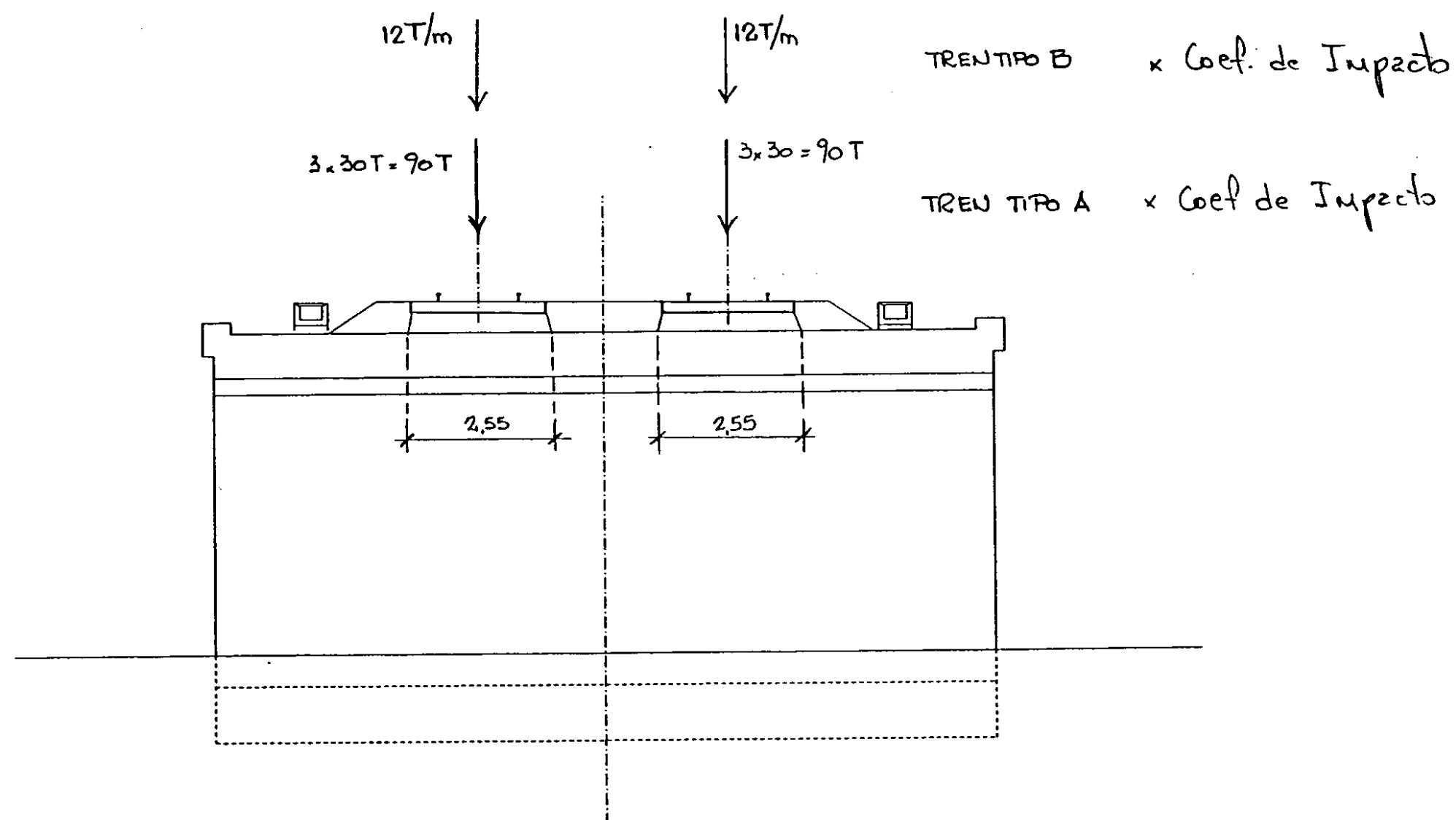
ESTADO LIMITE ULTIMO

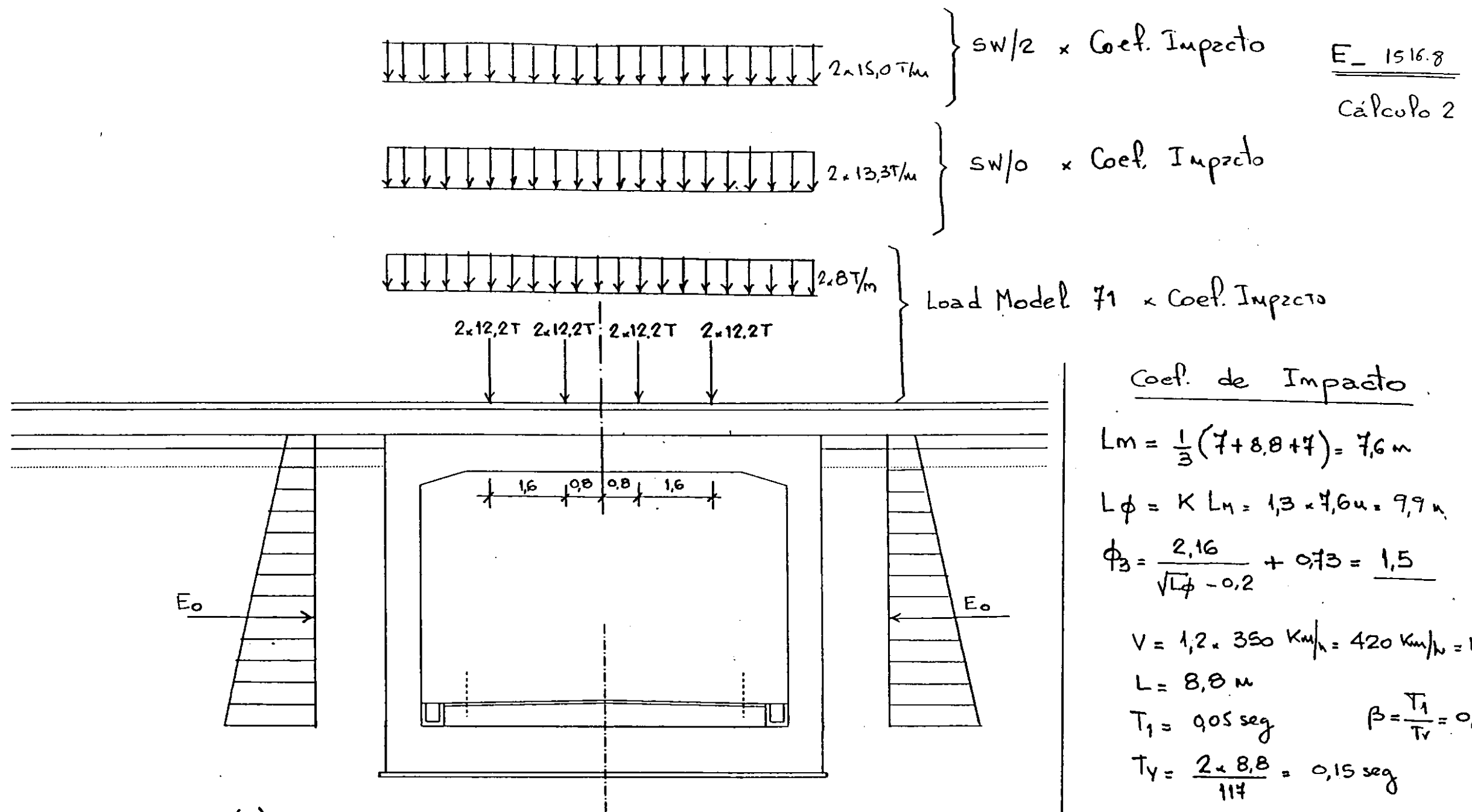
$$S_d = 1,5 [g] + 1,5 \text{ ó } 0,0 [Q_A \text{ ó } Q_B] + 1,5 \text{ ó } 0,0 [E_0]$$

ESTADOS LIMITES DE SERVICIO

$$S_k = 1,0 [g] + 1,0 \text{ ó } 0,0 [Q_A \text{ ó } Q_B] + 1,0 \text{ ó } 0,0 [E_0]$$

E-1516.8
Cálculo 1





Coef. de Impacto

$$L_m = \frac{1}{3}(7 + 8.8 + 7) = 7.6 \text{ m}$$

$$L_\phi = K L_m = 1.3 \times 7.6 \text{ m} = 9.9 \text{ m}$$

$$\phi_3 = \frac{2.16}{\sqrt{L_\phi} - 0.2} + 0.73 = 1.5$$

$$V = 1.2 \times 350 \text{ km/h} = 420 \text{ km/h} = 117 \text{ m/s}$$

$$L = 8.8 \text{ m}$$

$$T_1 = 905 \text{ seg} \quad \beta = \frac{T_1}{T_v} = 0.33$$

$$T_v = \frac{2 \times 8.8}{117} = 0.15 \text{ seg}$$

$$\frac{f_{din}}{f_{est}} = \frac{1 + \beta}{1 - \beta^2} = 1.5$$

$$\text{COEF. DE IMPACTO} = 1.50$$

CARGAS PERMANENTES (g)

- Peso propio y elementos no estructurales

$$\text{RIEL Y TRAVESAS} \quad \frac{0.12 \text{ T/m} + 0.52 \text{ T/m}}{2.4 \text{ m}} = 0.24 \text{ T/m}^2$$

$$\text{BALASTO} \quad 0.80 \text{ m} \times 1.6 \text{ T/m}^3 = 1.28 \text{ T/m}^2$$

$$1.55 \text{ T/m}^2 + \text{Peso propio Pórtico}$$

- Empuje del Terreno: (E_0)

SOBRECARGAS (Q)

$$\text{LOAD Model 71} \quad [Q_{LM71}]$$

$$SW/0 \quad [Q_{SW/0}]$$

$$SW/2 \quad [Q_{SW/2}]$$

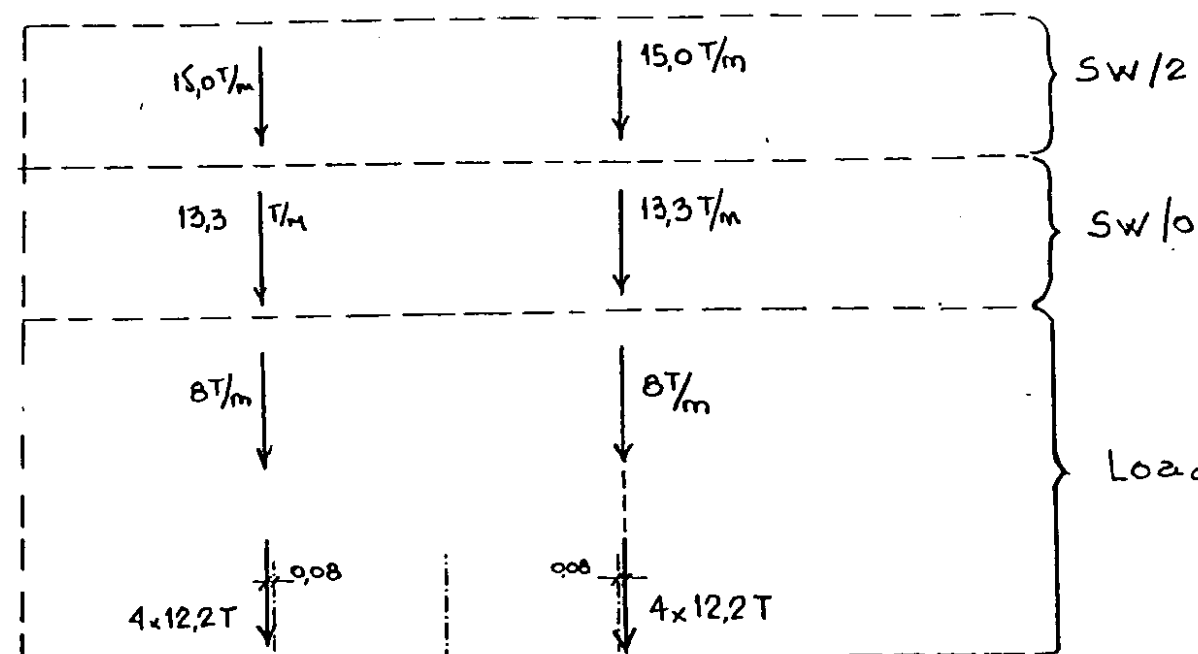
ESTADO LIMITE ÚLTIMO

$$S_d = 1.35 [g] + 1.00 [E_0] + \begin{cases} 1.45 [Q_{LM71}] \\ 1.45 [Q_{SW/0}] \\ 1.20 [Q_{SW/2}] \end{cases}$$

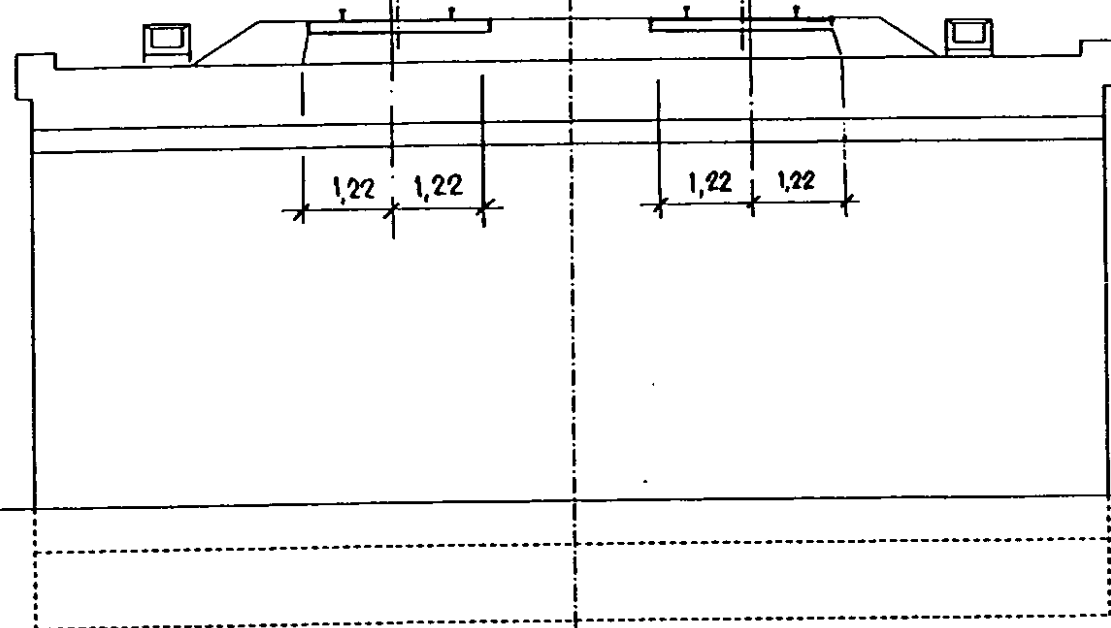
ESTADOS LIMITES DE SERVICIO

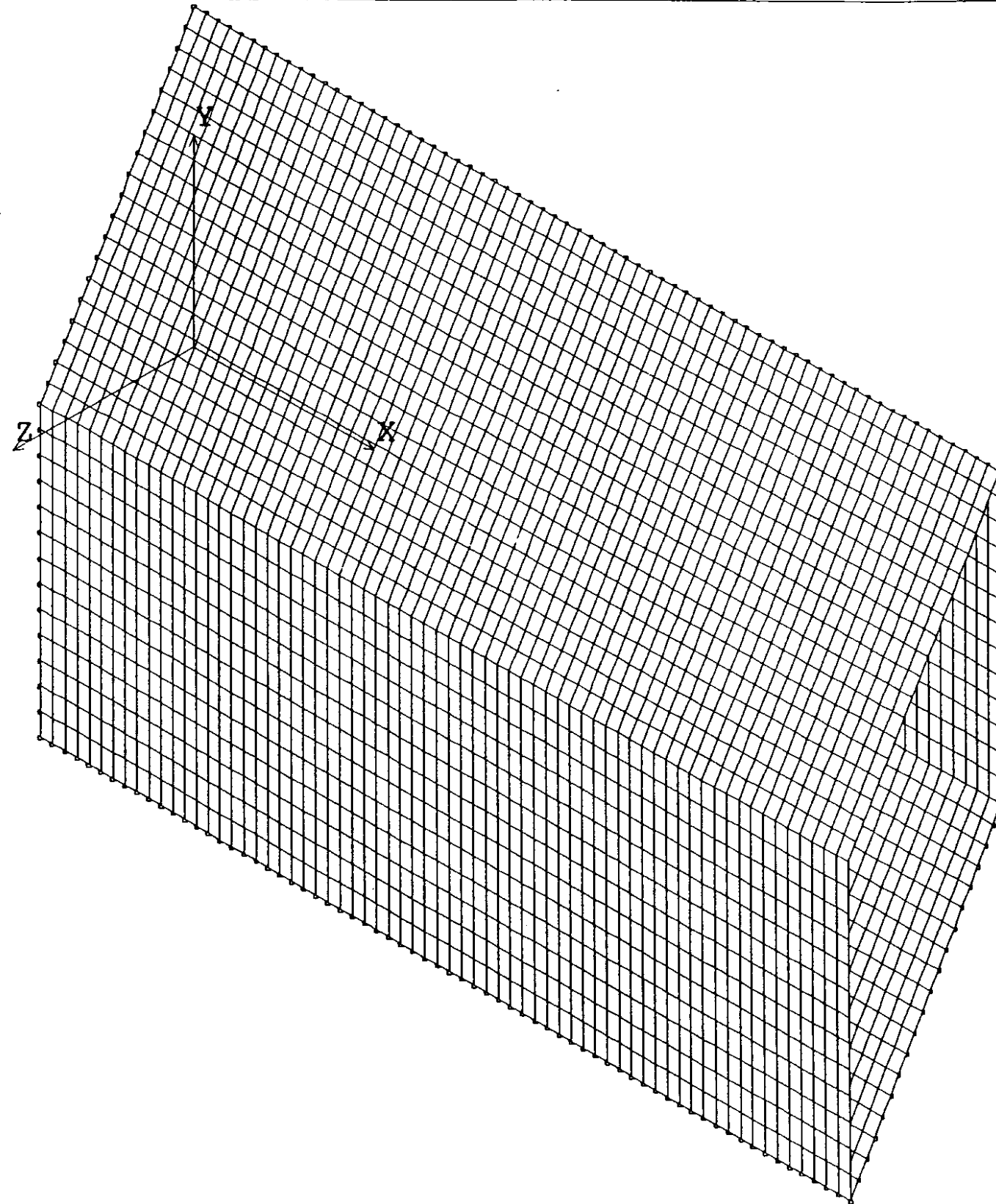
$$S_k = 1.00 [g] + 1.00 [E_0] + 1.00 [Q_{LM71}]$$

E - 1516.8
Cálculo 2



$$25,0 T - 8 T/m \cdot 1,6 m = 12,2 Ton$$





Element group data

Element group number= 1

Element name:

SHELL4T Four node thick shell elements

Type of Shell element= 2

EQ. 0, QUAD 2 element

EQ. 1, QUAD 4 element

Real constant data

Real constant set 1

Associated with:

SHELL4T Four node thick shell elements

Thickness of the plate = .75000

Temperature Gradient = .00000

Real constant set 2

Associated with:

SHELL4T Four node thick shell elements

Thickness of the plate = 1.1000

Temperature Gradient = .00000

Real constant set 3

Associated with:

SHELL4T Four node thick shell elements

Thickness of the plate = 1.0072

Temperature Gradient = .00000

Real constant set 4

Associated with:

SHELL4T Four node thick shell elements

Thickness of the plate = .86908

Temperature Gradient = .00000

Real constant set 5

Associated with:

SHELL4T Four node thick shell elements

Thickness of the plate = .80000

Temperature Gradient = .00000

Real constant set 6

Associated with:

SHELL4T Four node thick shell elements

Thickness of the plate = .90000

Temperature Gradient = .00000

Foundation stiffness = 500.00

Material property data

Material property set 1

	Value	Temp curve no.
EX : X Elastic Modulus	.35000E+07	0
NUXY : Poisson Ratio	.20000	0
DENS : Mass Density	2.5000	0

Nodal input data

NODE BOUNDARY CONDITION CODES NODAL
POINT COORDINATES

(0 = FREE ; 1 = FIXED)

	X	Y	Z	XX	YY	ZZ	X	Y	Z
1	1	1	0	0	0	0	.00000	.00000	.00000
2	1	0	0	0	0	0	.00000	.46923	.00000
3	1	0	0	0	0	0	.00000	.93846	.00000
4	1	0	0	0	0	0	.00000	1.4077	.00000
5	1	0	0	0	0	0	.00000	1.8769	.00000
6	1	0	0	0	0	0	.00000	2.3462	.00000
7	1	0	0	0	0	0	.00000	2.8154	.00000
8	1	0	0	0	0	0	.00000	3.2846	.00000
9	1	0	0	0	0	0	.00000	3.7538	.00000
10	1	0	0	0	0	0	.00000	4.2231	.00000
11	1	0	0	0	0	0	.00000	4.6923	.00000
12	1	0	0	0	0	0	.00000	5.1615	.00000
13	1	0	0	0	0	0	.00000	5.6308	.00000
14	1	0	0	0	0	0	.00000	6.1000	.00000
15	1	0	0	0	0	0	.25000	.00000	.00000
16	1	0	0	0	0	0	.25000	.46923	.00000
17	1	0	0	0	0	0	.25000	.93846	.00000
18	1	0	0	0	0	0	.25000	1.4077	.00000
19	1	0	0	0	0	0	.25000	1.8769	.00000
20	1	0	0	0	0	0	.25000	2.3462	.00000
21	1	0	0	0	0	0	.25000	2.8154	.00000
22	1	0	0	0	0	0	.25000	3.2846	.00000
23	1	0	0	0	0	0	.25000	3.7538	.00000
24	1	0	0	0	0	0	.25000	4.2231	.00000
25	1	0	0	0	0	0	.25000	4.6923	.00000
26	1	0	0	0	0	0	.25000	5.1615	.00000
27	1	0	0	0	0	0	.25000	5.6308	.00000
28	1	0	0	0	0	0	.25000	6.1000	.00000
29	1	0	0	0	0	0	.50000	.00000	.00000
30	1	0	0	0	0	0	.50000	.46923	.00000
31	1	0	0	0	0	0	.50000	.93846	.00000
32	1	0	0	0	0	0	.50000	1.4077	.00000
33	1	0	0	0	0	0	.50000	1.8769	.00000
34	1	0	0	0	0	0	.50000	2.3462	.00000
35	1	0	0	0	0	0	.50000	2.8154	.00000
36	1	0	0	0	0	0	.50000	3.2846	.00000
37	1	0	0	0	0	0	.50000	3.7538	.00000
38	1	0	0	0	0	0	.50000	4.2231	.00000
39	1	0	0	0	0	0	.50000	4.6923	.00000
40	1	0	0	0	0	0	.50000	5.1615	.00000
41	1	0	0	0	0	0	.50000	5.6308	.00000
42	1	0	0	0	0	0	.50000	6.1000	.00000
43	1	0	0	0	0	0	.75000	.00000	.00000
44	1	0	0	0	0	0	.75000	.46923	.00000
45	1	0	0	0	0	0	.75000	.93846	.00000
46	1	0	0	0	0	0	.75000	1.4077	.00000
47	1	0	0	0	0	0	.75000	1.8769	.00000
48	1	0	0	0	0	0	.75000	2.3462	.00000
49	1	0	0	0	0	0	.75000	2.8154	.00000
50	1	0	0	0	0	0	.75000	3.2846	.00000
51	1	0	0	0	0	0	.75000	3.7538	.00000
52	1	0	0	0	0	0	.75000	4.2231	.00000
53	1	0	0	0	0	0	.75000	4.6923	.00000
54	1	0	0	0	0	0	.75000	5.1615	.00000
55	1	0	0	0	0	0	.75000	5.6308	.00000
56	1	0	0	0	0	0	.75000	6.1000	.00000
57	1	0	0	0	0	0	1.0000	.00000	.00000
58	1	0	0	0	0	0	1.0000	.46923	.00000
59	1	0	0	0	0	0	1.0000	.93846	.00000
60	1	0	0	0	0	0	1.0000	1.4077	.00000
61	1	0	0	0	0	0	1.0000	1.8769	.00000
62	1	0	0	0	0	0	1.0000	2.3462	.00000

63	1	0	0	0	0	0	1.0000	2.8154	.00000
64	1	0	0	0	0	0	1.0000	3.2846	.00000
65	1	0	0	0	0	0	1.0000	3.7538	.00000
66	1	0	0	0	0	0	1.0000	4.2231	.00000
67	1	0	0	0	0	0	1.0000	4.6923	.00000
68	1	0	0	0	0	0	1.0000	5.1615	.00000
69	1	0	0	0	0	0	1.0000	5.6308	.00000
70	1	0	0	0	0	0	1.0000	6.1000	.00000
71	1	0	0	0	0	0	1.2500	.00000	.00000
72	1	0	0	0	0	0	1.2500	.46923	.00000
73	1	0	0	0	0	0	1.2500	.93846	.00000
74	1	0	0	0	0	0	1.2500	1.4077	.00000
75	1	0	0	0	0	0	1.2500	1.8769	.00000
76	1	0	0	0	0	0	1.2500	2.3462	.00000
77	1	0	0	0	0	0	1.2500	2.8154	.00000
78	1	0	0	0	0	0	1.2500	3.2846	.00000
79	1	0	0	0	0	0	1.2500	3.7538	.00000
80	1	0	0	0	0	0	1.2500	4.2231	.00000
81	1	0	0	0	0	0	1.2500	4.6923	.00000
82	1	0	0	0	0	0	1.2500	5.1615	.00000
83	1	0	0	0	0	0	1.2500	5.6308	.00000
84	1	0	0	0	0	0	1.2500	6.1000	.00000
85	1	0	0	0	0	0	1.5000	.00000	.00000
86	1	0	0	0	0	0	1.5000	.46923	.00000
87	1	0	0	0	0	0	1.5000	.93846	.00000
88	1	0	0	0	0	0	1.5000	1.4077	.00000
89	1	0	0	0	0	0	1.5000	1.8769	.00000
90	1	0	0	0	0	0	1.5000	2.3462	.00000
91	1	0	0	0	0	0	1.5000	2.8154	.00000
92	1	0	0	0	0	0	1.5000	3.2846	.00000
93	1	0	0	0	0	0	1.5000	3.7538	.00000
94	1	0	0	0	0	0	1.5000	4.2231	.00000
95	1	0	0	0	0	0	1.5000	4.6923	.00000
96	1	0	0	0	0	0	1.5000	5.1615	.00000
97	1	0	0	0	0	0	1.5000	5.6308	.00000
98	1	0	0	0	0	0	1.5000	6.1000	.00000
99	1	0	0	0	0	0	1.7500	.00000	.00000
100	1	0	0	0	0	0	1.7500	.46923	.00000
101	1	0	0	0	0	0	1.7500	.93846	.00000
102	1	0	0	0	0	0	1.7500	1.4077	.00000
103	1	0	0	0	0	0	1.7500	1.8769	.00000
104	1	0	0	0	0	0	1.7500	2.3462	.00000
105	1	0	0	0	0	0	1.7500	2.8154	.00000
106	1	0	0	0	0	0	1.7500	3.2846	.00000
107	1	0	0	0	0	0	1.7500	3.7538	.00000
108	1	0	0	0	0	0	1.7500	4.2231	.00000
109	1	0	0	0	0	0	1.7500	4.6923	.00000
110	1	0	0	0	0	0	1.7500	5.1615	.00000
111	1	0	0	0	0	0	1.7500	5.6308	.00000
112	1	0	0	0	0	0	1.7500	6.1000	.00000
113	1	0	0	0	0	0	2.0000	.00000	.00000
114	1	0	0	0	0	0	2.0000	.46923	.00000
115	1	0	0	0	0	0	2.0000	.93846	.00000
116	1	0	0	0	0	0	2.0000	1.4077	.00000
117	1	0	0	0	0	0	2.0000	1.8769	.00000
118	1	0	0	0	0	0	2.0000	2.3462	.00000
119	1	0	0	0	0	0	2.0000	2.8154	.00000
120	1	0	0	0	0	0	2.0000	3.2846	.00000
121	1	0	0	0	0	0	2.0000	3.7538	.00000
122	1	0	0	0	0	0	2.0000	4.2231	.00000
123	1	0	0	0	0	0	2.0000	4.6923	.00000
124	1	0	0	0	0	0	2.0000	5.1615	.00000
125	1	0	0	0	0	0	2.0000	5.6308	.00000
126	1	0	0	0	0	0	2.0000	6.1000	.00000
127	1	0	0	0	0	0	2.2500	.00000	.00000
128	1	0	0	0	0	0	2.2500	.46923	.00000
129	1	0	0	0	0	0	2.2500	.93846	.00000
130	1	0	0	0	0	0	2.2500	1.4077	.00000
131	1	0	0	0	0	0	2.2500	1.8769	.00000
132	1								

1015	0	0	0	0	0	0	2.5036	6.1000	2.7632	1083	0	0	0	0	0	0	6.4684	6.1000	7.8289	1151	0	0	0	0	0	0	5.1303	6.1000	4.1447	1219	0	0	0	0	0	0	3.7923	6.1000	46053
1016	0	0	0	0	0	0	2.7958	6.1000	3.2237	1084	0	0	0	0	0	0	6.7607	6.1000	8.2895	1152	0	0	0	0	0	0	5.4226	6.1000	4.6053	1220	0	0	0	0	0	0	4.0845	6.1000	92105
1017	0	0	0	0	0	0	3.0881	6.1000	3.6842	1085	1	0	0	0	0	0	7.0529	6.1000	8.7500	1153	0	0	0	0	0	0	5.7148	6.1000	5.0658	1221	0	0	0	0	0	0	4.3768	6.1000	1.3816
1018	0	0	0	0	0	0	3.3803	6.1000	4.1447	1086	0	0	0	0	0	0	2.0423	6.1000	46053	1154	0	0	0	0	0	0	6.0071	6.1000	5.5263	1222	0	0	0	0	0	0	4.6690	6.1000	1.8421
1019	0	0	0	0	0	0	3.6726	6.1000	4.6053	1087	0	0	0	0	0	0	2.3345	6.1000	92105	1155	0	0	0	0	0	0	6.2994	6.1000	5.9868	1223	0	0	0	0	0	0	4.9613	6.1000	2.3026
1020	0	0	0	0	0	0	3.9648	6.1000	5.0658	1088	0	0	0	0	0	0	2.6268	6.1000	1.3816	1156	0	0	0	0	0	0	6.5916	6.1000	6.4474	1224	0	0	0	0	0	0	5.2536	6.1000	2.7632
1021	0	0	0	0	0	0	4.2571	6.1000	5.5263	1089	0	0	0	0	0	0	2.9190	6.1000	1.8421	1157	0	0	0	0	0	0	6.8839	6.1000	6.9079	1225	0	0	0	0	0	0	5.5458	6.1000	3.2237
1022	0	0	0	0	0	0	4.5494	6.1000	5.9868	1090	0	0	0	0	0	0	3.2113	6.1000	2.3026	1158	0	0	0	0	0	0	7.1761	6.1000	7.3684	1226	0	0	0	0	0	0	5.8381	6.1000	3.6842
1023	0	0	0	0	0	0	4.8416	6.1000	6.4474	1091	0	0	0	0	0	0	3.5036	6.1000	2.7632	1159	0	0	0	0	0	0	7.4684	6.1000	7.8289	1227	0	0	0	0	0	0	6.1303	6.1000	4.1447
1024	0	0	0	0	0	0	5.1339	6.1000	6.9079	1092	0	0	0	0	0	0	3.7958	6.1000	3.2237	1160	0	0	0	0	0	0	7.7607	6.1000	8.2895	1228	0	0	0	0	0	0	6.4226	6.1000	4.6053
1025	0	0	0	0	0	0	5.4261	6.1000	7.3684	1093	0	0	0	0	0	0	4.0881	6.1000	3.6842	1161	1	0	0	0	0	0	8.0529	6.1000	8.7500	1229	0	0	0	0	0	0	6.7148	6.1000	5.0658
1026	0	0	0	0	0	0	5.7184	6.1000	7.8289	1094	0	0	0	0	0	0	4.3803	6.1000	4.1447	1162	0	0	0	0	0	0	3.0423	6.1000	46053	1230	0	0	0	0	0	0	7.0071	6.1000	5.5263
1027	0	0	0	0	0	0	6.0107	6.1000	8.2895	1095	0	0	0	0	0	0	4.6726	6.1000	4.6053	1163	0	0	0	0	0	0	3.3345	6.1000	92105	1231	0	0	0	0	0	0	7.2994	6.1000	5.9868
1028	1	0	0	0	0	0	6.3029	6.1000	8.7500	1096	0	0	0	0	0	0	4.9648	6.1000	5.0658	1164	0	0	0	0	0	0	3.6268	6.1000	1.3816	1232	0	0	0	0	0	0	7.5916	6.1000	6.4474
1029	0	0	0	0	0	0	1.2923	6.1000	46053	1097	0	0	0	0	0	0	5.2571	6.1000	5.5263	1165	0	0	0	0	0	0	3.9190	6.1000	1.8421	1233	0	0	0	0	0	0	7.8839	6.1000	6.9079
1030	0	0	0	0	0	0	1.5845	6.1000	92105	1098	0	0	0	0	0	0	5.5494	6.1000	5.9868	1166	0	0	0	0	0	0	4.2113	6.1000	2.3026	1234	0	0	0	0	0	0	8.1761	6.1000	7.3684
1031	0	0	0	0	0	0	1.8768	6.1000	1.3816	1099	0	0	0	0	0	0	5.8416	6.1000	6.4474	1167	0	0	0	0	0	0	4.5036	6.1000	2.7632	1235	0	0	0	0	0	0	8.4684	6.1000	7.8289
1032	0	0	0	0	0	0	2.1690	6.1000	1.8421	1100	0	0	0	0	0	0	6.1339	6.1000	6.9079	1168	0	0	0	0	0	0	4.7958	6.1000	3.2237	1236	0	0	0	0	0	0	8.7607	6.1000	8.2895
1033	0	0	0	0	0	0	2.4613	6.1000	2.3026	1101	0	0	0	0	0	0	6.4261	6.1000	7.3684	1169	0	0	0	0	0	0	5.0881	6.1000	3.6842	1237	1	0	0	0	0	0	9.0529	6.1000	8.7500
1034	0	0	0	0	0	0	2.7536	6.1000	2.7632	1102	0	0	0	0	0	0	6.7184	6.1000	7.8289	1170	0	0	0	0	0	0	5.3803	6.1000	4.1447	1238	0	0	0	0	0	0	4.0423	6.1000	46053
1035	0	0	0	0	0	0	3.0458	6.1000	3.2237	1103	0	0	0	0	0	0	7.0107	6.1000	8.2895	1171	0	0	0	0	0	0	5.6726	6.1000	4.6053	1239	0	0	0	0	0	0	4.3345	6.1000	92105
1036	0	0	0	0	0	0	3.3381	6.1000	3.6842	1104	1	0	0	0	0	0	7.3029	6.1000	8.7500	1172	0	0	0	0	0	0	5.9648	6.1000	5.0658	1240	0	0	0	0	0	0	4.6268	6.1000	1.3816
1037	0	0	0	0	0	0	3.6303	6.1000	4.1447	1105	0	0	0	0	0	0	2.2923	6.1000	46053	1173	0	0	0	0	0	0	6.2571	6.1000	5.5263	1241	0	0	0	0	0	0	4.9190	6.1000	1.8421
1038	0	0	0	0	0	0	3.9226	6.1000	4.6053	1106	0	0	0	0	0	0	2.5845	6.1000	92105	1174	0	0	0	0	0	0	6.5494	6.1000	5.9868	1242	0	0	0	0	0	0	5.2113	6.1000	2.3026
1039	0	0	0	0	0	0	4.2148	6.1000	5.0658	1107	0	0	0	0	0	0	2.8768	6.1000	1.3816	1175	0	0	0	0	0	0	6.8416	6.1000	6.4474	1243	0	0	0	0	0	0	5.5036	6.1000	2.7632
1040	0	0	0	0	0	0	4.5071	6.1000	5.5263	1108	0	0	0	0	0	0	3.1690	6.1000	1.8421	1176	0	0	0	0	0	0	7.1339	6.1000	6.9079	1244	0	0	0	0	0	0	5.7958	6.1000	3.2237
1041	0	0	0	0	0	0	4.7994	6.1000	5.9868	1109	0	0	0	0	0	0	3.4613	6.1000	2.3026	1177	0	0	0	0	0	0	7.4261	6.1000	7.3684	1245	0	0	0	0	0	0	6.0881	6.1000	3.6842
1042	0	0	0	0	0	0	5.0916	6.1000	6.4474	1110	0	0	0	0	0	0	3.7536	6.1000	2.7632	1178	0	0	0	0	0	0	7.7184	6.1000	7.8289	1246	0	0	0	0	0	0	6.3803	6.1000	4.1447
1043	0	0	0	0	0	0	5.3839	6.1000	6.9079	1111	0	0	0	0	0	0	4.0458	6.1000	3.2237	1179	0	0	0	0	0	0	8.0107	6.1000	8.2895	1247	0	0	0	0	0	0	6.6726	6.1000	4.6053
1044	0	0	0	0	0	0	5.6761	6.1000	7.3684	1112	0	0	0	0	0	0	4.3381	6.1000	3.6842	1180	1	0	0	0	0	0	8.3029	6.1000	8.7500	1248	0	0	0	0	0	0	6.9648	6.1000	5.0658
1045	0	0	0	0	0	0	5.9684	6.1000	7.8289	1113	0	0	0	0	0	0	4.6303	6.1000	4.1447	1181	0	0	0	0	0	0	3.2923	6.1000	46053	1249	0	0	0	0	0	0	7.2571	6.1000	5.5263
1046	0	0	0	0	0	0	6.2607	6.1000	8.2895	1114	0	0	0	0	0	0	4.9226	6.1000	4.6053	1182	0	0	0	0	0	0	3.5845	6.1000	92105	1250	0	0	0	0	0	0	7.5494	6.1000	5.9868
1047	1	0	0	0	0	0	6.5529	6.1000	8.7500	1115	0	0	0	0	0	0	5.2148	6.1000	5.0658	1183	0	0	0	0	0	0	3.8768	6.1000	1.3816	1251	0	0	0	0	0	0	7.8416	6.1000	6.4474
1048	0	0	0	0	0	0	1.5423	6.1000	46053	1116	0	0	0	0	0	0	5.5071	6.1000	5.5263	1184	0	0	0	0	0	0	4.1690	6.1000	1.8421	1252	0	0	0	0	0	0	8.1339	6.1000	6.9079
1049	0	0	0	0	0	0	1.8345	6.1000	92105	1117	0	0	0	0	0	0	5.7994	6.1000	5.9868	1185	0	0	0	0	0	0	4.4613	6.1000	2.3026	1253	0	0	0	0	0	0	8.4261	6.1000	7.3684
1050	0	0	0	0	0	0	2.1268	6.1000	1.3816	1118	0	0	0	0	0	0	6.0916	6.1000	6.4474	1186	0	0	0	0	0	0	4.7536	6.1000	2.7632	1254	0	0	0	0	0	0	8.7184	6.1000	7.8289
1051	0	0	0	0	0	0	2.4190	6.1000	1.8421	1119	0	0	0	0	0	0	6.3839	6.1000	6.9079	1187	0	0	0	0	0	0	5.0458	6.1000	3.2237	1255	0	0	0	0	0	0	9.0107	6.1000	8.2895
1052	0	0	0	0	0	0	2.7113	6.1000	2.3026	1120	0	0	0	0	0	0	6.6761	6.1000	7.3684	1188	0	0	0	0	0	0	5.3381	6.1000	3.6842	1256	1	0	0	0	0	0	9.3029	6.1000	8.7500
1053	0	0	0	0	0	0	3.0036	6.1000	2.7632	1121	0	0	0	0	0	0	6.9684	6.1000	7.8289	1189	0	0	0	0	0	0	5.6303	6.1000	4.1447	1257	0	0	0	0	0	0	4.2923	6.1000	46053
105																																							

1287	0	0	0	0	0	0	7.7571	6.1000	5.5263	1355	0	0	0	0	0	0	6.4190	6.1000	1.8421	1423	0	0	0	0	0	0	10.384	6.1000	6.9079	1491	0	0	0	0	0	0	9.0458	6.1000	3.2237
1288	0	0	0	0	0	0	8.0494	6.1000	5.9868	1356	0	0	0	0	0	0	6.7113	6.1000	2.3026	1424	0	0	0	0	0	0	10.676	6.1000	7.3684	1492	0	0	0	0	0	0	9.3381	6.1000	3.6842
1289	0	0	0	0	0	0	8.3416	6.1000	6.4474	1357	0	0	0	0	0	0	7.0036	6.1000	2.7632	1425	0	0	0	0	0	0	10.968	6.1000	7.8289	1493	0	0	0	0	0	0	9.6303	6.1000	4.1447
1290	0	0	0	0	0	0	8.6339	6.1000	6.9079	1358	0	0	0	0	0	0	7.2958	6.1000	3.2237	1426	0	0	0	0	0	0	11.261	6.1000	8.2895	1494	0	0	0	0	0	0	9.9226	6.1000	4.6053
1291	0	0	0	0	0	0	8.9261	6.1000	7.3684	1359	0	0	0	0	0	0	7.5881	6.1000	3.6842	1427	1	0	0	0	0	0	11.553	6.1000	8.7500	1495	0	0	0	0	0	0	10.215	6.1000	5.0658
1292	0	0	0	0	0	0	9.2184	6.1000	7.8289	1360	0	0	0	0	0	0	7.8803	6.1000	4.1447	1428	0	0	0	0	0	0	6.5423	6.1000	4.6053	1496	0	0	0	0	0	0	10.507	6.1000	5.5263
1293	0	0	0	0	0	0	9.5107	6.1000	8.2895	1361	0	0	0	0	0	0	8.1726	6.1000	4.6053	1429	0	0	0	0	0	0	6.8345	6.1000	9.2105	1497	0	0	0	0	0	0	10.799	6.1000	5.9868
1294	1	0	0	0	0	0	9.8029	6.1000	8.7500	1362	0	0	0	0	0	0	8.4648	6.1000	5.0658	1430	0	0	0	0	0	0	7.1268	6.1000	1.3816	1498	0	0	0	0	0	0	11.092	6.1000	6.4474
1295	0	0	0	0	0	0	4.7923	6.1000	4.6053	1363	0	0	0	0	0	0	8.7571	6.1000	5.5263	1431	0	0	0	0	0	0	7.4190	6.1000	1.8421	1499	0	0	0	0	0	0	11.384	6.1000	6.9079
1296	0	0	0	0	0	0	5.0845	6.1000	9.2105	1364	0	0	0	0	0	0	9.0494	6.1000	5.9868	1432	0	0	0	0	0	0	7.7113	6.1000	2.3026	1500	0	0	0	0	0	0	11.676	6.1000	7.3684
1297	0	0	0	0	0	0	5.3768	6.1000	1.3816	1365	0	0	0	0	0	0	9.3416	6.1000	6.4474	1433	0	0	0	0	0	0	8.0036	6.1000	2.7632	1501	0	0	0	0	0	0	11.968	6.1000	7.8289
1298	0	0	0	0	0	0	5.6690	6.1000	1.8421	1366	0	0	0	0	0	0	9.6339	6.1000	6.9079	1434	0	0	0	0	0	0	8.2958	6.1000	3.2237	1502	0	0	0	0	0	0	12.261	6.1000	8.2895
1299	0	0	0	0	0	0	5.9613	6.1000	2.3026	1367	0	0	0	0	0	0	9.9261	6.1000	7.3684	1435	0	0	0	0	0	0	8.5881	6.1000	3.6842	1503	1	0	0	0	0	0	12.553	6.1000	8.7500
1300	0	0	0	0	0	0	6.2536	6.1000	2.7632	1368	0	0	0	0	0	0	10.218	6.1000	7.8289	1436	0	0	0	0	0	0	8.8803	6.1000	4.1447	1504	0	0	0	0	0	0	7.5423	6.1000	4.6053
1301	0	0	0	0	0	0	6.5458	6.1000	3.2237	1369	0	0	0	0	0	0	10.511	6.1000	8.2895	1437	0	0	0	0	0	0	9.1726	6.1000	4.6053	1505	0	0	0	0	0	0	7.8345	6.1000	9.2105
1302	0	0	0	0	0	0	6.8381	6.1000	3.6842	1370	1	0	0	0	0	0	10.803	6.1000	8.7500	1438	0	0	0	0	0	0	9.4648	6.1000	5.0658	1506	0	0	0	0	0	0	8.1268	6.1000	1.3816
1303	0	0	0	0	0	0	7.1303	6.1000	4.1447	1371	0	0	0	0	0	0	5.7923	6.1000	4.6053	1439	0	0	0	0	0	0	9.7571	6.1000	5.5263	1507	0	0	0	0	0	0	8.4190	6.1000	1.8421
1304	0	0	0	0	0	0	7.4226	6.1000	4.6053	1372	0	0	0	0	0	0	6.0845	6.1000	9.2105	1440	0	0	0	0	0	0	10.049	6.1000	5.9868	1508	0	0	0	0	0	0	8.7113	6.1000	2.3026
1305	0	0	0	0	0	0	7.7148	6.1000	5.0658	1373	0	0	0	0	0	0	6.3768	6.1000	1.3816	1441	0	0	0	0	0	0	10.342	6.1000	6.4474	1509	0	0	0	0	0	0	9.0036	6.1000	2.7632
1306	0	0	0	0	0	0	8.0071	6.1000	5.5263	1374	0	0	0	0	0	0	6.6690	6.1000	1.8421	1442	0	0	0	0	0	0	10.634	6.1000	6.9079	1510	0	0	0	0	0	0	9.2958	6.1000	3.2237
1307	0	0	0	0	0	0	8.2994	6.1000	5.9868	1375	0	0	0	0	0	0	6.9613	6.1000	2.3026	1443	0	0	0	0	0	0	10.926	6.1000	7.3684	1511	0	0	0	0	0	0	9.5881	6.1000	3.6842
1308	0	0	0	0	0	0	8.5916	6.1000	6.4474	1376	0	0	0	0	0	0	7.2536	6.1000	2.7632	1444	0	0	0	0	0	0	11.218	6.1000	7.8289	1512	0	0	0	0	0	0	9.8803	6.1000	4.1447
1309	0	0	0	0	0	0	8.8839	6.1000	6.9079	1377	0	0	0	0	0	0	7.5458	6.1000	3.2237	1445	0	0	0	0	0	0	11.511	6.1000	8.2895	1513	0	0	0	0	0	0	10.173	6.1000	4.6053
1310	0	0	0	0	0	0	9.1761	6.1000	7.3684	1378	0	0	0	0	0	0	7.8381	6.1000	3.6842	1446	1	0	0	0	0	0	11.803	6.1000	8.7500	1514	0	0	0	0	0	0	10.465	6.1000	5.0658
1311	0	0	0	0	0	0	9.4684	6.1000	7.8289	1379	0	0	0	0	0	0	8.1303	6.1000	4.1447	1447	0	0	0	0	0	0	6.7923	6.1000	4.6053	1515	0	0	0	0	0	0	10.757	6.1000	5.5263
1312	0	0	0	0	0	0	9.7607	6.1000	8.2895	1380	0	0	0	0	0	0	8.4226	6.1000	4.6053	1448	0	0	0	0	0	0	7.0845	6.1000	9.2105	1516	0	0	0	0	0	0	11.049	6.1000	5.9868
1313	1	0	0	0	0	0	10.053	6.1000	8.7500	1381	0	0	0	0	0	0	8.7148	6.1000	5.0658	1449	0	0	0	0	0	0	7.3768	6.1000	1.3816	1517	0	0	0	0	0	0	11.342	6.1000	6.4474
1314	0	0	0	0	0	0	5.0423	6.1000	4.6053	1382	0	0	0	0	0	0	9.0071	6.1000	5.5263	1450	0	0	0	0	0	0	7.6690	6.1000	1.8421	1518	0	0	0	0	0	0	11.634	6.1000	6.9079
1315	0	0	0	0	0	0	5.3345	6.1000	9.2105	1383	0	0	0	0	0	0	9.2994	6.1000	5.9868	1451	0	0	0	0	0	0	7.9613	6.1000	2.3026	1519	0	0	0	0	0	0	11.926	6.1000	7.3684
1316	0	0	0	0	0	0	5.6268	6.1000	1.3816	1384	0	0	0	0	0	0	9.5916	6.1000	6.4474	1452	0	0	0	0	0	0	8.2536	6.1000	2.7632	1520	0	0	0	0	0	0	12.218	6.1000	7.8289
1317	0	0	0	0	0	0	5.9190	6.1000	1.8421	1385	0	0	0	0	0	0	9.8839	6.1000	6.9079	1453	0	0	0	0	0	0	8.5458	6.1000	3.2237	1521	0	0	0	0	0	0	12.511	6.1000	8.2895
1318	0	0	0	0	0	0	6.2113	6.1000	2.3026	1386	0	0	0	0	0	0	10.176	6.1000	7.3684	1454	0	0	0	0	0	0	8.8381	6.1000	3.6842	1522	1	0	0	0	0	0	12.803	6.1000	8.7500
1319	0	0	0	0	0	0	6.5036	6.1000	2.7632	1387	0	0	0	0	0	0	10.468	6.1000	7.8289	1455	0	0	0	0	0	0	9.1303	6.1000	4.1447	1523	0	0	0	0	0	0	7.7923	6.1000	4.6053
1320	0	0	0	0	0	0	6.7958	6.1000	3.2237	1388	0	0	0	0	0	0	10.761	6.1000	8.2895	1456	0	0	0	0	0	0	9.4226	6.1000	4.6053	1524	0	0	0	0	0	0	8.0845	6.1000	9.2105
1321	0	0	0	0	0	0	7.0881	6.1000	3.6842	1389	1	0	0	0	0	0	11.053	6.1000	8.7500	1457	0	0	0	0	0	0	9.7148	6.1000	5.0658	1525	0	0	0	0	0	0	8.3768	6.1000	1.3816
1322	0	0	0	0	0	0	7.3803	6.1000	4.1447	1390	0	0	0	0	0	0	6.0423	6.1000	4.6053	1458	0	0	0	0	0	0	10.007	6.1000	5.5263	1526	0	0	0	0	0	0	8.6690	6.1000	1.8421
1323	0	0	0	0	0	0	7.6726	6.1000	4.6053	1391	0	0	0	0	0	0	6.3345	6.1000	9.2105	1459	0	0	0	0	0	0	10.299	6.1000	5.9868	1527	0	0	0	0	0	0	8.9613	6.1000	2.3026
1324	0	0	0	0	0	0	7.9648	6.1000	5.0658	1392	0	0	0	0	0	0	6.6268	6.1000	1.3816	1460	0	0	0	0	0	0	10.592	6.1000	6.4474	1528	0	0	0	0	0	0	9.2535	6.1000	2.7632
1325	0	0	0	0	0	0	8.2571	6.1000	5.5263	1393	0	0	0	0	0	0	6.9190	6.1000	1.8421	1461	0	0	0	0	0	0	10.884	6.1000	6.9079	1529	0	0	0	0	0	0	9.5458	6.1000	3.

1559	0	0	0	0	0	0	13.011	6.1000	8.2895	1627	0	0	0	0	0	0	11.673	6.1000	4.6053	1695	0	0	0	0	0	0	10.335	6.1000	.92105	1763	0	0	0	0	0	0	14.299	6.1000	5.9868
1560	1	0	0	0	0	0	13.303	6.1000	8.7500	1628	0	0	0	0	0	0	11.965	6.1000	5.0658	1696	0	0	0	0	0	0	10.627	6.1000	1.3816	1764	0	0	0	0	0	0	14.592	6.1000	6.4474
1561	0	0	0	0	0	0	8.2923	6.1000	.46053	1629	0	0	0	0	0	0	12.257	6.1000	5.5263	1697	0	0	0	0	0	0	10.919	6.1000	1.8421	1765	0	0	0	0	0	0	14.884	6.1000	6.9079
1562	0	0	0	0	0	0	8.5845	6.1000	.92105	1630	0	0	0	0	0	0	12.549	6.1000	5.9868	1698	0	0	0	0	0	0	11.211	6.1000	2.3026	1766	0	0	0	0	0	0	15.176	6.1000	7.3684
1563	0	0	0	0	0	0	8.8768	6.1000	1.3816	1631	0	0	0	0	0	0	12.842	6.1000	6.4474	1699	0	0	0	0	0	0	11.504	6.1000	2.7632	1767	0	0	0	0	0	0	15.468	6.1000	7.8289
1564	0	0	0	0	0	0	9.1690	6.1000	1.8421	1632	0	0	0	0	0	0	13.134	6.1000	6.9079	1700	0	0	0	0	0	0	11.796	6.1000	3.2237	1768	0	0	0	0	0	0	15.761	6.1000	8.2895
1565	0	0	0	0	0	0	9.4613	6.1000	2.3026	1633	0	0	0	0	0	0	13.426	6.1000	7.3684	1701	0	0	0	0	0	0	12.088	6.1000	3.6842	1769	1	0	0	0	0	0	16.053	6.1000	8.7500
1566	0	0	0	0	0	0	9.7536	6.1000	2.7632	1634	0	0	0	0	0	0	13.718	6.1000	7.8289	1702	0	0	0	0	0	0	12.380	6.1000	4.1447	1770	0	0	0	0	0	0	11.042	6.1000	.46053
1567	0	0	0	0	0	0	10.046	6.1000	3.2237	1635	0	0	0	0	0	0	14.011	6.1000	8.2895	1703	0	0	0	0	0	0	12.673	6.1000	4.6053	1771	0	0	0	0	0	0	11.335	6.1000	.92105
1568	0	0	0	0	0	0	10.338	6.1000	3.6842	1636	1	0	0	0	0	0	14.303	6.1000	8.7500	1704	0	0	0	0	0	0	12.965	6.1000	5.0658	1772	0	0	0	0	0	0	11.627	6.1000	1.3816
1569	0	0	0	0	0	0	10.630	6.1000	4.1447	1637	0	0	0	0	0	0	9.2923	6.1000	.46053	1705	0	0	0	0	0	0	13.257	6.1000	5.5263	1773	0	0	0	0	0	0	11.919	6.1000	1.8421
1570	0	0	0	0	0	0	10.923	6.1000	4.6053	1638	0	0	0	0	0	0	9.5845	6.1000	.92105	1706	0	0	0	0	0	0	13.549	6.1000	5.9868	1774	0	0	0	0	0	0	12.211	6.1000	2.3026
1571	0	0	0	0	0	0	11.215	6.1000	5.0658	1639	0	0	0	0	0	0	9.8768	6.1000	1.3816	1707	0	0	0	0	0	0	13.842	6.1000	6.4474	1775	0	0	0	0	0	0	12.504	6.1000	2.7632
1572	0	0	0	0	0	0	11.507	6.1000	5.5263	1640	0	0	0	0	0	0	10.169	6.1000	1.8421	1708	0	0	0	0	0	0	14.134	6.1000	6.9079	1776	0	0	0	0	0	0	12.796	6.1000	3.2237
1573	0	0	0	0	0	0	11.799	6.1000	5.9868	1641	0	0	0	0	0	0	10.461	6.1000	2.3026	1709	0	0	0	0	0	0	14.426	6.1000	7.3684	1777	0	0	0	0	0	0	13.088	6.1000	3.6842
1574	0	0	0	0	0	0	12.092	6.1000	6.4474	1642	0	0	0	0	0	0	10.754	6.1000	2.7632	1710	0	0	0	0	0	0	14.718	6.1000	7.8289	1778	0	0	0	0	0	0	13.380	6.1000	4.1447
1575	0	0	0	0	0	0	12.384	6.1000	6.9079	1643	0	0	0	0	0	0	11.046	6.1000	3.2237	1711	0	0	0	0	0	0	15.011	6.1000	8.2895	1779	0	0	0	0	0	0	13.673	6.1000	4.6053
1576	0	0	0	0	0	0	12.676	6.1000	7.3684	1644	0	0	0	0	0	0	11.338	6.1000	3.6842	1712	1	0	0	0	0	0	15.303	6.1000	8.7500	1780	0	0	0	0	0	0	13.965	6.1000	5.0658
1577	0	0	0	0	0	0	12.968	6.1000	7.8289	1645	0	0	0	0	0	0	11.630	6.1000	4.1447	1713	0	0	0	0	0	0	10.292	6.1000	.46053	1781	0	0	0	0	0	0	14.257	6.1000	5.5263
1578	0	0	0	0	0	0	13.261	6.1000	8.2895	1646	0	0	0	0	0	0	11.923	6.1000	4.6053	1714	0	0	0	0	0	0	10.585	6.1000	.92105	1782	0	0	0	0	0	0	14.549	6.1000	5.9868
1579	1	0	0	0	0	0	13.553	6.1000	8.7500	1647	0	0	0	0	0	0	12.215	6.1000	5.0658	1715	0	0	0	0	0	0	10.877	6.1000	1.3816	1783	0	0	0	0	0	0	14.842	6.1000	6.4474
1580	0	0	0	0	0	0	8.5423	6.1000	.46053	1648	0	0	0	0	0	0	12.507	6.1000	5.5263	1716	0	0	0	0	0	0	11.169	6.1000	1.8421	1784	0	0	0	0	0	0	15.134	6.1000	6.9079
1581	0	0	0	0	0	0	8.8345	6.1000	.92105	1649	0	0	0	0	0	0	12.799	6.1000	5.9868	1717	0	0	0	0	0	0	11.461	6.1000	2.3026	1785	0	0	0	0	0	0	15.426	6.1000	7.3684
1582	0	0	0	0	0	0	9.1268	6.1000	1.3816	1650	0	0	0	0	0	0	13.092	6.1000	6.4474	1718	0	0	0	0	0	0	11.754	6.1000	2.7632	1786	0	0	0	0	0	0	15.718	6.1000	7.8289
1583	0	0	0	0	0	0	9.4190	6.1000	1.8421	1651	0	0	0	0	0	0	13.384	6.1000	6.9079	1719	0	0	0	0	0	0	12.046	6.1000	3.2237	1787	0	0	0	0	0	0	16.011	6.1000	8.2895
1584	0	0	0	0	0	0	9.7113	6.1000	2.3026	1652	0	0	0	0	0	0	13.676	6.1000	7.3684	1720	0	0	0	0	0	0	12.338	6.1000	3.6842	1788	1	0	0	0	0	0	16.303	6.1000	8.7500
1585	0	0	0	0	0	0	10.004	6.1000	2.7632	1653	0	0	0	0	0	0	13.968	6.1000	7.8289	1721	0	0	0	0	0	0	12.630	6.1000	4.1447	1789	0	0	0	0	0	0	11.292	6.1000	.46053
1586	0	0	0	0	0	0	10.296	6.1000	3.2237	1654	0	0	0	0	0	0	14.261	6.1000	8.2895	1722	0	0	0	0	0	0	12.923	6.1000	4.6053	1790	0	0	0	0	0	0	11.585	6.1000	.92105
1587	0	0	0	0	0	0	10.588	6.1000	3.6842	1655	1	0	0	0	0	0	14.553	6.1000	8.7500	1723	0	0	0	0	0	0	13.215	6.1000	5.0658	1791	0	0	0	0	0	0	11.877	6.1000	1.3816
1588	0	0	0	0	0	0	10.880	6.1000	4.1447	1656	0	0	0	0	0	0	9.5423	6.1000	.46053	1724	0	0	0	0	0	0	13.507	6.1000	5.5263	1792	0	0	0	0	0	0	12.169	6.1000	1.8421
1589	0	0	0	0	0	0	11.173	6.1000	4.6053	1657	0	0	0	0	0	0	9.8345	6.1000	.92105	1725	0	0	0	0	0	0	13.799	6.1000	5.9868	1793	0	0	0	0	0	0	12.461	6.1000	2.3026
1590	0	0	0	0	0	0	11.465	6.1000	5.0658	1658	0	0	0	0	0	0	10.127	6.1000	1.3816	1726	0	0	0	0	0	0	14.092	6.1000	6.4474	1794	0	0	0	0	0	0	12.754	6.1000	2.7632
1591	0	0	0	0	0	0	11.757	6.1000	5.5263	1659	0	0	0	0	0	0	10.419	6.1000	1.8421	1727	0	0	0	0	0	0	14.384	6.1000	6.9079	1795	0	0	0	0	0	0	13.046	6.1000	3.2237
1592	0	0	0	0	0	0	12.049	6.1000	5.9868	1660	0	0	0	0	0	0	10.711	6.1000	2.3026	1728	0	0	0	0	0	0	14.676	6.1000	7.3684	1796	0	0	0	0	0	0	13.338	6.1000	3.6842
1593	0	0	0	0	0	0	12.342	6.1000	6.4474	1661	0	0	0	0	0	0	11.004	6.1000	2.7632	1729	0	0	0	0	0	0	14.968	6.1000	7.8289	1797	0	0	0	0	0	0	13.630	6.1000	4.1447
1594	0	0	0	0	0	0	12.634	6.1000	6.9079	1662	0	0	0	0	0	0	11.296	6.1000	3.2237	1730	0	0	0	0	0	0	15.261	6.1000	8.2895	1798	0	0	0	0	0	0	13.923	6.1000	4.6053
1595	0	0	0	0	0	0	12.926	6.1000	7.3684	1663	0	0	0	0	0	0	11.588	6.1000	3.6842	1731	1	0	0	0	0	0	15.553	6.1000	8.7500	1799	0	0	0	0	0	0	14.215	6.1000	5.0658
1596	0	0	0	0	0	0	13.218	6.1000	7.8289	1664	0	0	0	0	0	0	11.880	6.1000	4.1447	1732	0	0	0	0	0	0	10.542	6.1000	.46053	1800	0	0	0	0	0	0	14.507	6.1000	5.5263
1597	0	0	0	0	0	0	13.511	6.1000	8.2895	1665	0	0	0	0	0	0	12.173	6.1000	4.6053	1733	0	0	0	0	0	0	10.835	6.1000	.92105	1801	0	0	0	0	0	0	14.799	6.1000	5.9868
159																																							

1831	0	0	0	0	0	0	12.961	6.1000	2.3026	1899	0	0	0	0	0	0	16.926	6.1000	7.3684	1967	0	0	0	0	0	0	15.588	6.1000	3.6842	2035	1	0	0	0	0	0	19.553	6.1000	8.7500
1832	0	0	0	0	0	0	13.254	6.1000	2.7632	1900	0	0	0	0	0	0	17.218	6.1000	7.8289	1968	0	0	0	0	0	0	15.880	6.1000	4.1447	2036	0	0	0	0	0	0	14.542	6.1000	.46053
1833	0	0	0	0	0	0	13.546	6.1000	3.2237	1901	0	0	0	0	0	0	17.511	6.1000	8.2895	1969	0	0	0	0	0	0	16.173	6.1000	4.6053	2037	0	0	0	0	0	0	14.835	6.1000	.92105
1834	0	0	0	0	0	0	13.838	6.1000	3.6842	1902	1	0	0	0	0	0	17.803	6.1000	8.7500	1970	0	0	0	0	0	0	16.465	6.1000	5.0658	2038	0	0	0	0	0	0	15.127	6.1000	1.3816
1835	0	0	0	0	0	0	14.130	6.1000	4.1447	1903	0	0	0	0	0	0	12.792	6.1000	.46053	1971	0	0	0	0	0	0	16.757	6.1000	5.5263	2039	0	0	0	0	0	0	15.419	6.1000	1.8421
1836	0	0	0	0	0	0	14.423	6.1000	4.6053	1904	0	0	0	0	0	0	13.085	6.1000	.92105	1972	0	0	0	0	0	0	17.049	6.1000	5.9868	2040	0	0	0	0	0	0	15.711	6.1000	2.3026
1837	0	0	0	0	0	0	14.715	6.1000	5.0658	1905	0	0	0	0	0	0	13.377	6.1000	1.3816	1973	0	0	0	0	0	0	17.342	6.1000	6.4474	2041	0	0	0	0	0	0	16.004	6.1000	2.7632
1838	0	0	0	0	0	0	15.007	6.1000	5.5263	1906	0	0	0	0	0	0	13.669	6.1000	1.8421	1974	0	0	0	0	0	0	17.634	6.1000	6.9079	2042	0	0	0	0	0	0	16.296	6.1000	3.2237
1839	0	0	0	0	0	0	15.299	6.1000	5.9868	1907	0	0	0	0	0	0	13.961	6.1000	2.3026	1975	0	0	0	0	0	0	17.926	6.1000	7.3684	2043	0	0	0	0	0	0	16.588	6.1000	3.6842
1840	0	0	0	0	0	0	15.592	6.1000	6.4474	1908	0	0	0	0	0	0	14.254	6.1000	2.7632	1976	0	0	0	0	0	0	18.218	6.1000	7.8289	2044	0	0	0	0	0	0	16.880	6.1000	4.1447
1841	0	0	0	0	0	0	15.884	6.1000	6.9079	1909	0	0	0	0	0	0	14.546	6.1000	3.2237	1977	0	0	0	0	0	0	18.511	6.1000	8.2895	2045	0	0	0	0	0	0	17.173	6.1000	4.6053
1842	0	0	0	0	0	0	16.176	6.1000	7.3684	1910	0	0	0	0	0	0	14.838	6.1000	3.6842	1978	1	0	0	0	0	0	18.803	6.1000	8.7500	2046	0	0	0	0	0	0	17.465	6.1000	5.0658
1843	0	0	0	0	0	0	16.468	6.1000	7.8289	1911	0	0	0	0	0	0	15.130	6.1000	4.1447	1979	0	0	0	0	0	0	13.792	6.1000	.46053	2047	0	0	0	0	0	0	17.757	6.1000	5.5263
1844	0	0	0	0	0	0	16.761	6.1000	8.2895	1912	0	0	0	0	0	0	15.423	6.1000	4.6053	1980	0	0	0	0	0	0	14.085	6.1000	.92105	2048	0	0	0	0	0	0	18.049	6.1000	5.9868
1845	1	0	0	0	0	0	17.053	6.1000	8.7500	1913	0	0	0	0	0	0	15.715	6.1000	5.0658	1981	0	0	0	0	0	0	14.377	6.1000	1.3816	2049	0	0	0	0	0	0	18.342	6.1000	6.4474
1846	0	0	0	0	0	0	12.042	6.1000	.46053	1914	0	0	0	0	0	0	16.007	6.1000	5.5263	1982	0	0	0	0	0	0	14.669	6.1000	1.8421	2050	0	0	0	0	0	0	18.634	6.1000	6.9079
1847	0	0	0	0	0	0	12.335	6.1000	.92105	1915	0	0	0	0	0	0	16.299	6.1000	5.9868	1983	0	0	0	0	0	0	14.961	6.1000	2.3026	2051	0	0	0	0	0	0	18.926	6.1000	7.3684
1848	0	0	0	0	0	0	12.627	6.1000	1.3816	1916	0	0	0	0	0	0	16.592	6.1000	6.4474	1984	0	0	0	0	0	0	15.254	6.1000	2.7632	2052	0	0	0	0	0	0	19.218	6.1000	7.8289
1849	0	0	0	0	0	0	12.919	6.1000	1.8421	1917	0	0	0	0	0	0	16.884	6.1000	6.9079	1985	0	0	0	0	0	0	15.546	6.1000	3.2237	2053	0	0	0	0	0	0	19.511	6.1000	8.2895
1850	0	0	0	0	0	0	13.211	6.1000	2.3026	1918	0	0	0	0	0	0	17.176	6.1000	7.3684	1986	0	0	0	0	0	0	15.838	6.1000	3.6842	2054	1	0	0	0	0	0	19.803	6.1000	8.7500
1851	0	0	0	0	0	0	13.504	6.1000	2.7632	1919	0	0	0	0	0	0	17.468	6.1000	7.8289	1987	0	0	0	0	0	0	16.130	6.1000	4.1447	2055	0	0	0	0	0	0	14.792	6.1000	.46053
1852	0	0	0	0	0	0	13.796	6.1000	3.2237	1920	0	0	0	0	0	0	17.761	6.1000	8.2895	1988	0	0	0	0	0	0	16.423	6.1000	4.6053	2056	0	0	0	0	0	0	15.085	6.1000	.92105
1853	0	0	0	0	0	0	14.088	6.1000	3.6842	1921	1	0	0	0	0	0	18.053	6.1000	8.7500	1989	0	0	0	0	0	0	16.715	6.1000	5.0658	2057	0	0	0	0	0	0	15.377	6.1000	1.3816
1854	0	0	0	0	0	0	14.380	6.1000	4.1447	1922	0	0	0	0	0	0	13.042	6.1000	.46053	1990	0	0	0	0	0	0	17.007	6.1000	5.5263	2058	0	0	0	0	0	0	15.669	6.1000	1.8421
1855	0	0	0	0	0	0	14.673	6.1000	4.6053	1923	0	0	0	0	0	0	13.335	6.1000	.92105	1991	0	0	0	0	0	0	17.299	6.1000	5.9868	2059	0	0	0	0	0	0	15.961	6.1000	2.3026
1856	0	0	0	0	0	0	14.965	6.1000	5.0658	1924	0	0	0	0	0	0	13.627	6.1000	1.3816	1992	0	0	0	0	0	0	17.592	6.1000	6.4474	2060	0	0	0	0	0	0	16.254	6.1000	2.7632
1857	0	0	0	0	0	0	15.257	6.1000	5.5263	1925	0	0	0	0	0	0	13.919	6.1000	1.8421	1993	0	0	0	0	0	0	17.884	6.1000	6.9079	2061	0	0	0	0	0	0	16.546	6.1000	3.2237
1858	0	0	0	0	0	0	15.549	6.1000	5.9868	1926	0	0	0	0	0	0	14.211	6.1000	2.3026	1994	0	0	0	0	0	0	18.176	6.1000	7.3684	2062	0	0	0	0	0	0	16.838	6.1000	3.6842
1859	0	0	0	0	0	0	15.842	6.1000	6.4474	1927	0	0	0	0	0	0	14.504	6.1000	2.7632	1995	0	0	0	0	0	0	18.468	6.1000	7.8289	2063	0	0	0	0	0	0	17.130	6.1000	4.1447
1860	0	0	0	0	0	0	16.134	6.1000	6.9079	1928	0	0	0	0	0	0	14.796	6.1000	3.2237	1996	0	0	0	0	0	0	18.761	6.1000	8.2895	2064	0	0	0	0	0	0	17.423	6.1000	4.6053
1861	0	0	0	0	0	0	16.426	6.1000	7.3684	1929	0	0	0	0	0	0	15.088	6.1000	3.6842	1997	1	0	0	0	0	0	19.053	6.1000	8.7500	2065	0	0	0	0	0	0	17.715	6.1000	5.0658
1862	0	0	0	0	0	0	16.718	6.1000	7.8289	1930	0	0	0	0	0	0	15.380	6.1000	4.1447	1998	0	0	0	0	0	0	14.042	6.1000	.46053	2066	0	0	0	0	0	0	18.007	6.1000	5.5263
1863	0	0	0	0	0	0	17.011	6.1000	8.2895	1931	0	0	0	0	0	0	15.673	6.1000	4.6053	1999	0	0	0	0	0	0	14.335	6.1000	.92105	2067	0	0	0	0	0	0	18.299	6.1000	5.9868
1864	1	0	0	0	0	0	17.303	6.1000	8.7500	1932	0	0	0	0	0	0	15.965	6.1000	5.0658	2000	0	0	0	0	0	0	14.627	6.1000	1.3816	2068	0	0	0	0	0	0	18.592	6.1000	6.4474
1865	0	0	0	0	0	0	12.292	6.1000	.46053	1933	0	0	0	0	0	0	16.257	6.1000	5.5263	2001	0	0	0	0	0	0	14.919	6.1000	1.8421	2069	0	0	0	0	0	0	18.884	6.1000	6.9079
1866	0	0	0	0	0	0	12.585	6.1000	.92105	1934	0	0	0	0	0	0	16.549	6.1000	5.9868	2002	0	0	0	0	0	0	15.211	6.1000	2.3026	2070	0	0	0	0	0	0	19.176	6.1000	7.3684
1867	0	0	0	0	0	0	12.877	6.1000	1.3816	1935	0	0	0	0	0	0	16.842	6.1000	6.4474	2003	0	0	0	0	0	0	15.504	6.1000	2.7632	2071	0	0	0	0	0	0	19.468	6.1000	7.8289
1868	0	0	0	0	0	0	13.169	6.1000	1.8421	1936	0	0	0	0	0	0	17.134	6.1000	6.9079	2004	0	0	0	0	0	0	15.796	6.1000	3.2237	2072	0	0	0	0	0	0	19.761	6.1000	8.2895
1869	0	0	0	0	0	0	13.461	6.1000	2.3026	1937	0	0	0	0	0	0	17.426	6.1000	7.3684	2005	0	0	0	0	0	0	16.088	6.1000	3.6842	2073	1	0	0	0	0	0	20.053	6.1000	8.7500
1870</																																							

2103	0	0	0	0	0	0	18.215	6.1000	5.0658	2171	0	0	0	0	0	0	16.877	6.1000	1.3816	2239	0	0	0	0	0	0	20.842	6.1000	6.4474	2307	1	0	0	0	0	0	6.5529	.93846	8.7500
2104	0	0	0	0	0	0	18.507	6.1000	5.5263	2172	0	0	0	0	0	0	17.169	6.1000	1.8421	2240	0	0	0	0	0	0	21.134	6.1000	6.9079	2308	1	0	0	0	0	0	6.5529	.46923	8.7500
2105	0	0	0	0	0	0	18.799	6.1000	5.9868	2173	0	0	0	0	0	0	17.461	6.1000	2.3026	2241	0	0	0	0	0	0	21.426	6.1000	7.3684	2309	1	0	0	0	0	0	6.5529	.00000	8.7500
2106	0	0	0	0	0	0	19.092	6.1000	6.4474	2174	0	0	0	0	0	0	17.754	6.1000	2.7632	2242	0	0	0	0	0	0	21.718	6.1000	7.8289	2310	1	0	0	0	0	0	6.8029	5.6308	8.7500
2107	0	0	0	0	0	0	19.384	6.1000	6.9079	2175	0	0	0	0	0	0	18.046	6.1000	3.2237	2243	0	0	0	0	0	0	22.011	6.1000	8.2895	2311	1	0	0	0	0	0	6.8029	5.1615	8.7500
2108	0	0	0	0	0	0	19.676	6.1000	7.3684	2176	0	0	0	0	0	0	18.338	6.1000	3.6842	2244	1	0	0	0	0	0	22.303	6.1000	8.7500	2312	1	0	0	0	0	0	6.8029	4.6923	8.7500
2109	0	0	0	0	0	0	19.968	6.1000	7.8289	2177	0	0	0	0	0	0	18.630	6.1000	4.1447	2245	1	0	0	0	0	0	5.5529	5.6308	8.7500	2313	1	0	0	0	0	0	6.8029	4.2231	8.7500
2110	0	0	0	0	0	0	20.261	6.1000	8.2895	2178	0	0	0	0	0	0	18.923	6.1000	4.6053	2246	1	0	0	0	0	0	5.5529	5.1615	8.7500	2314	1	0	0	0	0	0	6.8029	3.7538	8.7500
2111	1	0	0	0	0	0	20.553	6.1000	8.7500	2179	0	0	0	0	0	0	19.215	6.1000	5.0658	2247	1	0	0	0	0	0	5.5529	4.6923	8.7500	2315	1	0	0	0	0	0	6.8029	3.2846	8.7500
2112	0	0	0	0	0	0	15.542	6.1000	.46053	2180	0	0	0	0	0	0	19.507	6.1000	5.5263	2248	1	0	0	0	0	0	5.5529	4.2231	8.7500	2316	1	0	0	0	0	0	6.8029	2.8154	8.7500
2113	0	0	0	0	0	0	15.835	6.1000	.92105	2181	0	0	0	0	0	0	19.799	6.1000	5.9868	2249	1	0	0	0	0	0	5.5529	3.7538	8.7500	2317	1	0	0	0	0	0	6.8029	2.3462	8.7500
2114	0	0	0	0	0	0	16.127	6.1000	1.3816	2182	0	0	0	0	0	0	20.092	6.1000	6.4474	2250	1	0	0	0	0	0	5.5529	3.2846	8.7500	2318	1	0	0	0	0	0	6.8029	1.8769	8.7500
2115	0	0	0	0	0	0	16.419	6.1000	1.8421	2183	0	0	0	0	0	0	20.384	6.1000	6.9079	2251	1	0	0	0	0	0	5.5529	2.8154	8.7500	2319	1	0	0	0	0	0	6.8029	1.4077	8.7500
2116	0	0	0	0	0	0	16.711	6.1000	2.3026	2184	0	0	0	0	0	0	20.676	6.1000	7.3684	2252	1	0	0	0	0	0	5.5529	2.3462	8.7500	2320	1	0	0	0	0	0	6.8029	.93846	8.7500
2117	0	0	0	0	0	0	17.004	6.1000	2.7632	2185	0	0	0	0	0	0	20.968	6.1000	7.8289	2253	1	0	0	0	0	0	5.5529	1.8769	8.7500	2321	1	0	0	0	0	0	6.8029	.46923	8.7500
2118	0	0	0	0	0	0	17.296	6.1000	3.2237	2186	0	0	0	0	0	0	21.261	6.1000	8.2895	2254	1	0	0	0	0	0	5.5529	1.4077	8.7500	2322	1	0	0	0	0	0	6.8029	.00000	8.7500
2119	0	0	0	0	0	0	17.588	6.1000	3.6842	2187	1	0	0	0	0	0	21.553	6.1000	8.7500	2255	1	0	0	0	0	0	5.5529	.93846	8.7500	2323	1	0	0	0	0	0	7.0529	5.6308	8.7500
2120	0	0	0	0	0	0	17.880	6.1000	4.1447	2188	0	0	0	0	0	0	16.542	6.1000	.46053	2256	1	0	0	0	0	0	5.5529	.46923	8.7500	2324	1	0	0	0	0	0	7.0529	5.1615	8.7500
2121	0	0	0	0	0	0	18.173	6.1000	4.6053	2189	0	0	0	0	0	0	16.835	6.1000	.92105	2257	1	0	0	0	0	0	5.5529	.00000	8.7500	2325	1	0	0	0	0	0	7.0529	4.6923	8.7500
2122	0	0	0	0	0	0	18.465	6.1000	5.0658	2190	0	0	0	0	0	0	17.127	6.1000	1.3816	2258	1	0	0	0	0	0	5.8029	5.6308	8.7500	2326	1	0	0	0	0	0	7.0529	4.2231	8.7500
2123	0	0	0	0	0	0	18.757	6.1000	5.5263	2191	0	0	0	0	0	0	17.419	6.1000	1.8421	2259	1	0	0	0	0	0	5.8029	5.1615	8.7500	2327	1	0	0	0	0	0	7.0529	3.7538	8.7500
2124	0	0	0	0	0	0	19.049	6.1000	5.9868	2192	0	0	0	0	0	0	17.711	6.1000	2.3026	2260	1	0	0	0	0	0	5.8029	4.6923	8.7500	2328	1	0	0	0	0	0	7.0529	3.2846	8.7500
2125	0	0	0	0	0	0	19.342	6.1000	6.4474	2193	0	0	0	0	0	0	18.004	6.1000	2.7632	2261	1	0	0	0	0	0	5.8029	4.2231	8.7500	2329	1	0	0	0	0	0	7.0529	2.8154	8.7500
2126	0	0	0	0	0	0	19.634	6.1000	6.9079	2194	0	0	0	0	0	0	18.296	6.1000	3.2237	2262	1	0	0	0	0	0	5.8029	3.7538	8.7500	2330	1	0	0	0	0	0	7.0529	2.3462	8.7500
2127	0	0	0	0	0	0	19.926	6.1000	7.3684	2195	0	0	0	0	0	0	18.588	6.1000	3.6842	2263	1	0	0	0	0	0	5.8029	3.2846	8.7500	2331	1	0	0	0	0	0	7.0529	1.8769	8.7500
2128	0	0	0	0	0	0	20.218	6.1000	7.8289	2196	0	0	0	0	0	0	18.880	6.1000	4.1447	2264	1	0	0	0	0	0	5.8029	2.8154	8.7500	2332	1	0	0	0	0	0	7.0529	1.4077	8.7500
2129	0	0	0	0	0	0	20.511	6.1000	8.2895	2197	0	0	0	0	0	0	19.173	6.1000	4.6053	2265	1	0	0	0	0	0	5.8029	2.3462	8.7500	2333	1	0	0	0	0	0	7.0529	.93846	8.7500
2130	1	0	0	0	0	0	20.803	6.1000	8.7500	2198	0	0	0	0	0	0	19.465	6.1000	5.0658	2266	1	0	0	0	0	0	5.8029	1.8769	8.7500	2334	1	0	0	0	0	0	7.0529	.46923	8.7500
2131	0	0	0	0	0	0	15.792	6.1000	.46053	2199	0	0	0	0	0	0	19.757	6.1000	5.5263	2267	1	0	0	0	0	0	5.8029	1.4077	8.7500	2335	1	0	0	0	0	0	7.0529	.00000	8.7500
2132	0	0	0	0	0	0	16.085	6.1000	.92105	2200	0	0	0	0	0	0	20.049	6.1000	5.9868	2268	1	0	0	0	0	0	5.8029	.93846	8.7500	2336	1	0	0	0	0	0	7.3029	5.6308	8.7500
2133	0	0	0	0	0	0	16.377	6.1000	1.3816	2201	0	0	0	0	0	0	20.342	6.1000	6.4474	2269	1	0	0	0	0	0	5.8029	.46923	8.7500	2337	1	0	0	0	0	0	7.3029	5.1615	8.7500
2134	0	0	0	0	0	0	16.669	6.1000	1.8421	2202	0	0	0	0	0	0	20.634	6.1000	6.9079	2270	1	0	0	0	0	0	5.8029	.00000	8.7500	2338	1	0	0	0	0	0	7.3029	4.6923	8.7500
2135	0	0	0	0	0	0	16.961	6.1000	2.3026	2203	0	0	0	0	0	0	20.926	6.1000	7.3684	2271	1	0	0	0	0	0	6.0529	5.6308	8.7500	2339	1	0	0	0	0	0	7.3029	4.2231	8.7500
2136	0	0	0	0	0	0	17.254	6.1000	2.7632	2204	0	0	0	0	0	0	21.218	6.1000	7.8289	2272	1	0	0	0	0	0	6.0529	5.1615	8.7500	2340	1	0	0	0	0	0	7.3029	3.7538	8.7500
2137	0	0	0	0	0	0	17.546	6.1000	3.2237	2205	0	0	0	0	0	0	21.511	6.1000	8.2895	2273	1	0	0	0	0	0	6.0529	4.6923	8.7500	2341	1	0	0	0	0	0	7.3029	3.2846	8.7500
2138	0	0	0	0	0	0	17.838	6.1000	3.6842	2206	1	0	0	0	0	0	21.803	6.1000	8.7500	2274	1	0	0	0	0	0	6.0529	4.2231	8.7500	2342	1	0	0	0	0	0	7.3029	2.8154	8.7500
2139	0	0	0	0	0	0	18.130	6.1000	4.1447	2207	0	0	0	0	0	0	16.792	6.1000	.46053	2275	1	0	0	0	0	0	6.0529	3.7538	8.7500	2343	1	0	0	0	0	0	7.3029	2.3462	8.7500
2140	0	0	0	0	0	0	18.423	6.1000	4.6053	2208	0	0	0	0	0	0	17.085	6.1000	.92105	2276	1	0	0	0	0	0	6.0529	3.2846	8.7500	2344	1	0	0	0	0	0	7.3029	1.8769	8.7500
2141	0	0	0	0	0	0	18.715	6.1000	5.0658	2209	0	0	0	0	0	0	17.377	6.1000	1.3816	2277	1	0	0	0	0	0	6.0529	2.8154	8.7500	2345	1	0	0	0	0	0	7.3029	1.4077	8.7500
2142	0																																						

2919	1	0	0	0	0	0	18.303	.46923	8.7500	2987	1	0	0	0	0	0	19.803	5.1615	8.7500	3055	1	0	0	0	0	0	21.053	3.7538	8.7500	3123	1	0	0	0	0	0	22.303	2.3462	8.7500
2920	1	0	0	0	0	0	18.303	.00000	8.7500	2988	1	0	0	0	0	0	19.803	4.6923	8.7500	3056	1	0	0	0	0	0	21.053	3.2846	8.7500	3124	1	0	0	0	0	0	22.303	1.8769	8.7500
2921	1	0	0	0	0	0	18.553	5.6308	8.7500	2989	1	0	0	0	0	0	19.803	4.2231	8.7500	3057	1	0	0	0	0	0	21.053	2.8154	8.7500	3125	1	0	0	0	0	0	22.303	1.4077	8.7500
2922	1	0	0	0	0	0	18.553	5.1615	8.7500	2990	1	0	0	0	0	0	19.803	3.7538	8.7500	3058	1	0	0	0	0	0	21.053	2.3462	8.7500	3126	1	0	0	0	0	0	22.303	.93846	8.7500
2923	1	0	0	0	0	0	18.553	4.6923	8.7500	2991	1	0	0	0	0	0	19.803	3.2846	8.7500	3059	1	0	0	0	0	0	21.053	1.8769	8.7500	3127	1	0	0	0	0	0	22.303	.46923	8.7500
2924	1	0	0	0	0	0	18.553	4.2231	8.7500	2992	1	0	0	0	0	0	19.803	2.8154	8.7500	3060	1	0	0	0	0	0	21.053	1.4077	8.7500	3128	1	0	0	0	0	0	22.303	.00000	8.7500
2925	1	0	0	0	0	0	18.553	3.7538	8.7500	2993	1	0	0	0	0	0	19.803	2.3462	8.7500	3061	1	0	0	0	0	0	21.053	.93846	8.7500	3129	0	0	0	0	0	0	.29226	.00000	.46053
2926	1	0	0	0	0	0	18.553	3.2846	8.7500	2994	1	0	0	0	0	0	19.803	1.8769	8.7500	3062	1	0	0	0	0	0	21.053	.46923	8.7500	3130	0	0	0	0	0	0	.58452	.00000	.92105
2927	1	0	0	0	0	0	18.553	2.8154	8.7500	2995	1	0	0	0	0	0	19.803	1.4077	8.7500	3063	1	0	0	0	0	0	21.053	.00000	8.7500	3131	0	0	0	0	0	0	.87678	.00000	1.3816
2928	1	0	0	0	0	0	18.553	2.3462	8.7500	2996	1	0	0	0	0	0	19.803	.93846	8.7500	3064	1	0	0	0	0	0	21.303	5.6308	8.7500	3132	0	0	0	0	0	0	1.1690	.00000	1.8421
2929	1	0	0	0	0	0	18.553	1.8769	8.7500	2997	1	0	0	0	0	0	19.803	.46923	8.7500	3065	1	0	0	0	0	0	21.303	5.1615	8.7500	3133	0	0	0	0	0	0	1.4613	.00000	2.3026
2930	1	0	0	0	0	0	18.553	1.4077	8.7500	2998	1	0	0	0	0	0	19.803	.00000	8.7500	3066	1	0	0	0	0	0	21.303	4.6923	8.7500	3134	0	0	0	0	0	0	1.7536	.00000	2.7632
2931	1	0	0	0	0	0	18.553	.93846	8.7500	2999	1	0	0	0	0	0	20.053	5.6308	8.7500	3067	1	0	0	0	0	0	21.303	4.2231	8.7500	3135	0	0	0	0	0	0	2.0458	.00000	3.2237
2932	1	0	0	0	0	0	18.553	.46923	8.7500	3000	1	0	0	0	0	0	20.053	5.1615	8.7500	3068	1	0	0	0	0	0	21.303	3.7538	8.7500	3136	0	0	0	0	0	0	2.3381	.00000	3.6842
2933	1	0	0	0	0	0	18.553	.00000	8.7500	3001	1	0	0	0	0	0	20.053	4.6923	8.7500	3069	1	0	0	0	0	0	21.303	3.2846	8.7500	3137	0	0	0	0	0	0	2.6303	.00000	4.1447
2934	1	0	0	0	0	0	18.803	5.6308	8.7500	3002	1	0	0	0	0	0	20.053	4.2231	8.7500	3070	1	0	0	0	0	0	21.303	2.8154	8.7500	3138	0	0	0	0	0	0	2.9226	.00000	4.6053
2935	1	0	0	0	0	0	18.803	5.1615	8.7500	3003	1	0	0	0	0	0	20.053	3.7538	8.7500	3071	1	0	0	0	0	0	21.303	2.3462	8.7500	3139	0	0	0	0	0	0	3.2148	.00000	5.0658
2936	1	0	0	0	0	0	18.803	4.6923	8.7500	3004	1	0	0	0	0	0	20.053	3.2846	8.7500	3072	1	0	0	0	0	0	21.303	1.8769	8.7500	3140	0	0	0	0	0	0	3.5071	.00000	5.5263
2937	1	0	0	0	0	0	18.803	4.2231	8.7500	3005	1	0	0	0	0	0	20.053	2.8154	8.7500	3073	1	0	0	0	0	0	21.303	1.4077	8.7500	3141	0	0	0	0	0	0	3.7994	.00000	5.9868
2938	1	0	0	0	0	0	18.803	3.7538	8.7500	3006	1	0	0	0	0	0	20.053	2.3462	8.7500	3074	1	0	0	0	0	0	21.303	.93846	8.7500	3142	0	0	0	0	0	0	4.0916	.00000	6.4474
2939	1	0	0	0	0	0	18.803	3.2846	8.7500	3007	1	0	0	0	0	0	20.053	1.8769	8.7500	3075	1	0	0	0	0	0	21.303	.46923	8.7500	3143	0	0	0	0	0	0	4.3839	.00000	6.9079
2940	1	0	0	0	0	0	18.803	2.8154	8.7500	3008	1	0	0	0	0	0	20.053	1.4077	8.7500	3076	1	0	0	0	0	0	21.303	.00000	8.7500	3144	0	0	0	0	0	0	4.6761	.00000	7.3684
2941	1	0	0	0	0	0	18.803	2.3462	8.7500	3009	1	0	0	0	0	0	20.053	.93846	8.7500	3077	1	0	0	0	0	0	21.553	5.6308	8.7500	3145	0	0	0	0	0	0	4.9684	.00000	7.8289
2942	1	0	0	0	0	0	18.803	1.8769	8.7500	3010	1	0	0	0	0	0	20.053	.46923	8.7500	3078	1	0	0	0	0	0	21.553	5.1615	8.7500	3146	0	0	0	0	0	0	5.2607	.00000	8.2895
2943	1	0	0	0	0	0	18.803	1.4077	8.7500	3011	1	0	0	0	0	0	20.053	.00000	8.7500	3079	1	0	0	0	0	0	21.553	4.6923	8.7500	3147	0	0	0	0	0	0	.54226	.00000	.46053
2944	1	0	0	0	0	0	18.803	.93846	8.7500	3012	1	0	0	0	0	0	20.303	5.6308	8.7500	3080	1	0	0	0	0	0	21.553	4.2231	8.7500	3148	0	0	0	0	0	0	.83452	.00000	.92105
2945	1	0	0	0	0	0	18.803	.46923	8.7500	3013	1	0	0	0	0	0	20.303	5.1615	8.7500	3081	1	0	0	0	0	0	21.553	3.7538	8.7500	3149	0	0	0	0	0	0	1.1268	.00000	1.3816
2946	1	0	0	0	0	0	18.803	.00000	8.7500	3014	1	0	0	0	0	0	20.303	4.6923	8.7500	3082	1	0	0	0	0	0	21.553	3.2846	8.7500	3150	0	0	0	0	0	0	1.4190	.00000	1.8421
2947	1	0	0	0	0	0	19.053	5.6308	8.7500	3015	1	0	0	0	0	0	20.303	4.2231	8.7500	3083	1	0	0	0	0	0	21.553	2.8154	8.7500	3151	0	0	0	0	0	0	1.7113	.00000	2.3026
2948	1	0	0	0	0	0	19.053	5.1615	8.7500	3016	1	0	0	0	0	0	20.303	3.7538	8.7500	3084	1	0	0	0	0	0	21.553	2.3462	8.7500	3152	0	0	0	0	0	0	2.0036	.00000	2.7632
2949	1	0	0	0	0	0	19.053	4.6923	8.7500	3017	1	0	0	0	0	0	20.303	3.2846	8.7500	3085	1	0	0	0	0	0	21.553	1.8769	8.7500	3153	0	0	0	0	0	0	2.2958	.00000	3.2237
2950	1	0	0	0	0	0	19.053	4.2231	8.7500	3018	1	0	0	0	0	0	20.303	2.8154	8.7500	3086	1	0	0	0	0	0	21.553	1.4077	8.7500	3154	0	0	0	0	0	0	2.5881	.00000	3.6842
2951	1	0	0	0	0	0	19.053	3.7538	8.7500	3019	1	0	0	0	0	0	20.303	2.3462	8.7500	3087	1	0	0	0	0	0	21.553	.93846	8.7500	3155	0	0	0	0	0	0	2.8803	.00000	4.1447
2952	1	0	0	0	0	0	19.053	3.2846	8.7500	3020	1	0	0	0	0	0	20.303	1.8769	8.7500	3088	1	0	0	0	0	0	21.553	.46923	8.7500	3156	0	0	0	0	0	0	3.1726	.00000	4.6053
2953	1	0	0	0	0	0	19.053	2.8154	8.7500	3021	1	0	0	0	0	0	20.303	1.4077	8.7500	3089	1	0	0	0	0	0	21.553	.00000	8.7500	3157	0	0	0	0	0	0	3.4648	.00000	5.0658
2954	1	0	0	0	0	0	19.053	2.3462	8.7500	3022	1	0	0	0	0	0	20.303	.93846	8.7500	3090	1	0	0	0	0	0	21.803	5.6308	8.7500	3158	0	0	0	0	0	0	3.7571	.00000	5.5263
2955	1	0	0	0	0	0	19.053	1.8769	8.7500	3023	1	0	0	0	0	0	20.303	.46923	8.7500	3091	1	0	0	0	0	0	21.803	5.1615	8.7500	3159	0	0	0	0	0	0	4.0494	.00000	5.9868
2956	1	0	0	0	0	0	19.053	1.4077	8.7500	3024	1	0	0	0	0	0	20.303	.00000	8.7500	3092	1	0	0	0	0	0	21.803	4.6923	8.7500	3160	0	0	0	0	0	0	4.3416	.00000	6.4474
2957	1	0	0	0	0	0	19.053	.93846	8.7500	3025	1	0	0	0	0	0	20.553	5.6308	8.7500	3093	1	0	0	0	0	0	21.803	4.2231	8.7500	3161	0	0	0	0	0	0	4.6339	.00000	6.9079
2958	1	0	0	0	0	0	19.053	.46923																															

3191	0	0	0	0	0	0	3.3803	.00000	4.1447	3259	0	0	0	0	0	0	3.2113	.00000	2.3026	3327	0	0	0	0	0	0	3.0423	.00000	.46053	3395	0	0	0	0	0	0	7.8839	.00000	6.9079
3192	0	0	0	0	0	0	3.6726	.00000	4.6053	3260	0	0	0	0	0	0	3.5036	.00000	2.7632	3328	0	0	0	0	0	0	3.3345	.00000	.92105	3396	0	0	0	0	0	0	8.1761	.00000	7.3684
3193	0	0	0	0	0	0	3.9648	.00000	5.0658	3261	0	0	0	0	0	0	3.7958	.00000	3.2237	3329	0	0	0	0	0	0	3.6268	.00000	1.3816	3397	0	0	0	0	0	0	8.4684	.00000	7.8289
3194	0	0	0	0	0	0	4.2571	.00000	5.5263	3262	0	0	0	0	0	0	4.0881	.00000	3.6842	3330	0	0	0	0	0	0	3.9190	.00000	1.8421	3398	0	0	0	0	0	0	8.7607	.00000	8.2895
3195	0	0	0	0	0	0	4.5494	.00000	5.9868	3263	0	0	0	0	0	0	4.3803	.00000	4.1447	3331	0	0	0	0	0	0	4.2113	.00000	2.3026	3399	0	0	0	0	0	0	4.0423	.00000	.46053
3196	0	0	0	0	0	0	4.8416	.00000	6.4474	3264	0	0	0	0	0	0	4.6726	.00000	4.6053	3332	0	0	0	0	0	0	4.5036	.00000	2.7632	3400	0	0	0	0	0	0	4.3345	.00000	.92105
3197	0	0	0	0	0	0	5.1339	.00000	6.9079	3265	0	0	0	0	0	0	4.9648	.00000	5.0658	3333	0	0	0	0	0	0	4.7958	.00000	3.2237	3401	0	0	0	0	0	0	4.6268	.00000	1.3816
3198	0	0	0	0	0	0	5.4261	.00000	7.3684	3266	0	0	0	0	0	0	5.2571	.00000	5.5263	3334	0	0	0	0	0	0	5.0881	.00000	3.6842	3402	0	0	0	0	0	0	4.9190	.00000	1.8421
3199	0	0	0	0	0	0	5.7184	.00000	7.8289	3267	0	0	0	0	0	0	5.5494	.00000	5.9868	3335	0	0	0	0	0	0	5.3803	.00000	4.1447	3403	0	0	0	0	0	0	5.2113	.00000	2.3026
3200	0	0	0	0	0	0	6.0107	.00000	8.2895	3268	0	0	0	0	0	0	5.8416	.00000	6.4474	3336	0	0	0	0	0	0	5.6726	.00000	4.6053	3404	0	0	0	0	0	0	5.5036	.00000	2.7632
3201	0	0	0	0	0	0	1.2923	.00000	.46053	3269	0	0	0	0	0	0	6.1339	.00000	6.9079	3337	0	0	0	0	0	0	5.9648	.00000	5.0658	3405	0	0	0	0	0	0	5.7958	.00000	3.2237
3202	0	0	0	0	0	0	1.5845	.00000	.92105	3270	0	0	0	0	0	0	6.4261	.00000	7.3684	3338	0	0	0	0	0	0	6.2571	.00000	5.5263	3406	0	0	0	0	0	0	6.0881	.00000	3.6842
3203	0	0	0	0	0	0	1.8768	.00000	1.3816	3271	0	0	0	0	0	0	6.7184	.00000	7.8289	3339	0	0	0	0	0	0	6.5494	.00000	5.9868	3407	0	0	0	0	0	0	6.3803	.00000	4.1447
3204	0	0	0	0	0	0	2.1690	.00000	1.8421	3272	0	0	0	0	0	0	7.0107	.00000	8.2895	3340	0	0	0	0	0	0	6.8416	.00000	6.4474	3408	0	0	0	0	0	0	6.6726	.00000	4.6053
3205	0	0	0	0	0	0	2.4613	.00000	2.3026	3273	0	0	0	0	0	0	2.2923	.00000	.46053	3341	0	0	0	0	0	0	7.1339	.00000	6.9079	3409	0	0	0	0	0	0	6.9648	.00000	5.0658
3206	0	0	0	0	0	0	2.7536	.00000	2.7632	3274	0	0	0	0	0	0	2.5845	.00000	.92105	3342	0	0	0	0	0	0	7.4261	.00000	7.3684	3410	0	0	0	0	0	0	7.2571	.00000	5.5263
3207	0	0	0	0	0	0	3.0458	.00000	3.2237	3275	0	0	0	0	0	0	2.8768	.00000	1.3816	3343	0	0	0	0	0	0	7.7184	.00000	7.8289	3411	0	0	0	0	0	0	7.5494	.00000	5.9868
3208	0	0	0	0	0	0	3.3381	.00000	3.6842	3276	0	0	0	0	0	0	3.1690	.00000	1.8421	3344	0	0	0	0	0	0	8.0107	.00000	8.2895	3412	0	0	0	0	0	0	7.8416	.00000	6.4474
3209	0	0	0	0	0	0	3.6303	.00000	4.1447	3277	0	0	0	0	0	0	3.4613	.00000	2.3026	3345	0	0	0	0	0	0	3.2923	.00000	.46053	3413	0	0	0	0	0	0	8.1339	.00000	6.9079
3210	0	0	0	0	0	0	3.9226	.00000	4.6053	3278	0	0	0	0	0	0	3.7536	.00000	2.7632	3346	0	0	0	0	0	0	3.5845	.00000	.92105	3414	0	0	0	0	0	0	8.4261	.00000	7.3684
3211	0	0	0	0	0	0	4.2148	.00000	5.0658	3279	0	0	0	0	0	0	4.0458	.00000	3.2237	3347	0	0	0	0	0	0	3.8768	.00000	1.3816	3415	0	0	0	0	0	0	8.7184	.00000	7.8289
3212	0	0	0	0	0	0	4.5071	.00000	5.5263	3280	0	0	0	0	0	0	4.3381	.00000	3.6842	3348	0	0	0	0	0	0	4.1690	.00000	1.8421	3416	0	0	0	0	0	0	9.0107	.00000	8.2895
3213	0	0	0	0	0	0	4.7994	.00000	5.9868	3281	0	0	0	0	0	0	4.6303	.00000	4.1447	3349	0	0	0	0	0	0	4.4613	.00000	2.3026	3417	0	0	0	0	0	0	4.2923	.00000	.46053
3214	0	0	0	0	0	0	5.0916	.00000	6.4474	3282	0	0	0	0	0	0	4.9226	.00000	4.6053	3350	0	0	0	0	0	0	4.7536	.00000	2.7632	3418	0	0	0	0	0	0	4.5845	.00000	.92105
3215	0	0	0	0	0	0	5.3839	.00000	6.9079	3283	0	0	0	0	0	0	5.2148	.00000	5.0658	3351	0	0	0	0	0	0	5.0458	.00000	3.2237	3419	0	0	0	0	0	0	4.8768	.00000	1.3816
3216	0	0	0	0	0	0	5.6761	.00000	7.3684	3284	0	0	0	0	0	0	5.5071	.00000	5.5263	3352	0	0	0	0	0	0	5.3381	.00000	3.6842	3420	0	0	0	0	0	0	5.1690	.00000	1.8421
3217	0	0	0	0	0	0	5.9684	.00000	7.8289	3285	0	0	0	0	0	0	5.7994	.00000	5.9868	3353	0	0	0	0	0	0	5.6303	.00000	4.1447	3421	0	0	0	0	0	0	5.4613	.00000	2.3026
3218	0	0	0	0	0	0	6.2607	.00000	8.2895	3286	0	0	0	0	0	0	6.0916	.00000	6.4474	3354	0	0	0	0	0	0	5.9226	.00000	4.6053	3422	0	0	0	0	0	0	5.7536	.00000	2.7632
3219	0	0	0	0	0	0	1.5423	.00000	.46053	3287	0	0	0	0	0	0	6.3839	.00000	6.9079	3355	0	0	0	0	0	0	6.2148	.00000	5.0658	3423	0	0	0	0	0	0	6.0458	.00000	3.2237
3220	0	0	0	0	0	0	1.8345	.00000	.92105	3288	0	0	0	0	0	0	6.6761	.00000	7.3684	3356	0	0	0	0	0	0	6.5071	.00000	5.5263	3424	0	0	0	0	0	0	6.3381	.00000	3.6842
3221	0	0	0	0	0	0	2.1268	.00000	1.3816	3289	0	0	0	0	0	0	6.9684	.00000	7.8289	3357	0	0	0	0	0	0	6.7994	.00000	5.9868	3425	0	0	0	0	0	0	6.6303	.00000	4.1447
3222	0	0	0	0	0	0	2.4190	.00000	1.8421	3290	0	0	0	0	0	0	7.2607	.00000	8.2895	3358	0	0	0	0	0	0	7.0916	.00000	6.4474	3426	0	0	0	0	0	0	6.9226	.00000	4.6053
3223	0	0	0	0	0	0	2.7113	.00000	2.3026	3291	0	0	0	0	0	0	2.5423	.00000	.46053	3359	0	0	0	0	0	0	7.3839	.00000	6.9079	3427	0	0	0	0	0	0	7.2148	.00000	5.0658
3224	0	0	0	0	0	0	3.0036	.00000	2.7632	3292	0	0	0	0	0	0	2.8345	.00000	.92105	3360	0	0	0	0	0	0	7.6761	.00000	7.3684	3428	0	0	0	0	0	0	7.5071	.00000	5.5263
3225	0	0	0	0	0	0	3.2958	.00000	3.2237	3293	0	0	0	0	0	0	3.1268	.00000	1.3816	3361	0	0	0	0	0	0	7.9684	.00000	7.8289	3429	0	0	0	0	0	0	7.7994	.00000	5.9868
3226	0	0	0	0	0	0	3.5881	.00000	3.6842	3294	0	0	0	0	0	0	3.4190	.00000	1.8421	3362	0	0	0	0	0	0	8.2607	.00000	8.2895	3430	0	0	0	0	0	0	8.0916	.00000	6.4474
3227	0	0	0	0	0	0	3.8803	.00000	4.1447	3295	0	0	0	0	0	0	3.7113	.00000	2.3026	3363	0	0	0	0	0	0	3.5423	.00000	.46053	3431	0	0	0	0	0	0	8.3839	.00000	6.9079
3228	0	0	0	0	0	0	4.1726	.00000	4.6053	3296	0	0	0	0	0	0	4.0036	.00000	2.7632	3364	0	0	0	0	0	0	3.8345	.00000	.92105	3432	0	0	0	0	0	0	8.6761	.00000	7.3684
3229	0	0	0	0	0	0	4.4648	.00000	5.0658	3297	0	0	0	0	0	0	4.2958	.00000	3.2237	3365	0	0	0	0	0	0	4.1268	.00000	1.3816	3433	0	0	0	0	0	0	8.9684	.00000	7.8289
3230	0	0	0	0	0	0	4.7571	.00000	5.5263	3298	0	0	0	0	0	0	4.5881	.00000	3.6842	3366																			

3463	0	0	0	0	0	0	7.7148	.00000	5.0658	3531	0	0	0	0	0	0	7.5458	.00000	3.2237	3599	0	0	0	0	0	0	7.3768	.00000	1.3816	3667	0	0	0	0	0	0	12.218	.00000	7.8289
3464	0	0	0	0	0	0	8.0071	.00000	5.5263	3532	0	0	0	0	0	0	7.8381	.00000	3.6842	3600	0	0	0	0	0	0	7.6690	.00000	1.8421	3668	0	0	0	0	0	0	12.511	.00000	8.2895
3465	0	0	0	0	0	0	8.2994	.00000	5.9868	3533	0	0	0	0	0	0	8.1303	.00000	4.1447	3601	0	0	0	0	0	0	7.9613	.00000	2.3026	3669	0	0	0	0	0	0	7.7923	.00000	4.6053
3466	0	0	0	0	0	0	8.5916	.00000	6.4474	3534	0	0	0	0	0	0	8.4226	.00000	4.6053	3602	0	0	0	0	0	0	8.2536	.00000	2.7632	3670	0	0	0	0	0	0	8.0845	.00000	9.2105
3467	0	0	0	0	0	0	8.8839	.00000	6.9079	3535	0	0	0	0	0	0	8.7148	.00000	5.0658	3603	0	0	0	0	0	0	8.5458	.00000	3.2237	3671	0	0	0	0	0	0	8.3768	.00000	1.3816
3468	0	0	0	0	0	0	9.1761	.00000	7.3684	3536	0	0	0	0	0	0	9.0071	.00000	5.5263	3604	0	0	0	0	0	0	8.8381	.00000	3.6842	3672	0	0	0	0	0	0	8.6690	.00000	1.8421
3469	0	0	0	0	0	0	9.4684	.00000	7.8289	3537	0	0	0	0	0	0	9.2994	.00000	5.9868	3605	0	0	0	0	0	0	9.1303	.00000	4.1447	3673	0	0	0	0	0	0	8.9613	.00000	2.3026
3470	0	0	0	0	0	0	9.7607	.00000	8.2895	3538	0	0	0	0	0	0	9.5916	.00000	6.4474	3606	0	0	0	0	0	0	9.4226	.00000	4.6053	3674	0	0	0	0	0	0	9.2535	.00000	2.7632
3471	0	0	0	0	0	0	5.0423	.00000	4.6053	3539	0	0	0	0	0	0	9.8839	.00000	6.9079	3607	0	0	0	0	0	0	9.7148	.00000	5.0658	3675	0	0	0	0	0	0	9.5458	.00000	3.2237
3472	0	0	0	0	0	0	5.3345	.00000	9.2105	3540	0	0	0	0	0	0	10.176	.00000	7.3684	3608	0	0	0	0	0	0	10.007	.00000	5.5263	3676	0	0	0	0	0	0	9.8381	.00000	3.6842
3473	0	0	0	0	0	0	5.6268	.00000	1.3816	3541	0	0	0	0	0	0	10.468	.00000	7.8289	3609	0	0	0	0	0	0	10.299	.00000	5.9868	3677	0	0	0	0	0	0	10.130	.00000	4.1447
3474	0	0	0	0	0	0	5.9190	.00000	1.8421	3542	0	0	0	0	0	0	10.761	.00000	8.2895	3610	0	0	0	0	0	0	10.592	.00000	6.4474	3678	0	0	0	0	0	0	10.423	.00000	4.6053
3475	0	0	0	0	0	0	6.2113	.00000	2.3026	3543	0	0	0	0	0	0	6.0423	.00000	4.6053	3611	0	0	0	0	0	0	10.884	.00000	6.9079	3679	0	0	0	0	0	0	10.715	.00000	5.0658
3476	0	0	0	0	0	0	6.5036	.00000	2.7632	3544	0	0	0	0	0	0	6.3345	.00000	9.2105	3612	0	0	0	0	0	0	11.176	.00000	7.3684	3680	0	0	0	0	0	0	11.007	.00000	5.5263
3477	0	0	0	0	0	0	6.7958	.00000	3.2237	3545	0	0	0	0	0	0	6.6268	.00000	1.3816	3613	0	0	0	0	0	0	11.468	.00000	7.8289	3681	0	0	0	0	0	0	11.299	.00000	5.9868
3478	0	0	0	0	0	0	7.0881	.00000	3.6842	3546	0	0	0	0	0	0	6.9190	.00000	1.8421	3614	0	0	0	0	0	0	11.761	.00000	8.2895	3682	0	0	0	0	0	0	11.592	.00000	6.4474
3479	0	0	0	0	0	0	7.3803	.00000	4.1447	3547	0	0	0	0	0	0	7.2113	.00000	2.3026	3615	0	0	0	0	0	0	7.0423	.00000	4.6053	3683	0	0	0	0	0	0	11.884	.00000	6.9079
3480	0	0	0	0	0	0	7.6726	.00000	4.6053	3548	0	0	0	0	0	0	7.5036	.00000	2.7632	3616	0	0	0	0	0	0	7.3345	.00000	9.2105	3684	0	0	0	0	0	0	12.176	.00000	7.3684
3481	0	0	0	0	0	0	7.9648	.00000	5.0658	3549	0	0	0	0	0	0	7.7958	.00000	3.2237	3617	0	0	0	0	0	0	7.6268	.00000	1.3816	3685	0	0	0	0	0	0	12.468	.00000	7.8289
3482	0	0	0	0	0	0	8.2571	.00000	5.5263	3550	0	0	0	0	0	0	8.0881	.00000	3.6842	3618	0	0	0	0	0	0	7.9190	.00000	1.8421	3686	0	0	0	0	0	0	12.761	.00000	8.2895
3483	0	0	0	0	0	0	8.5494	.00000	5.9868	3551	0	0	0	0	0	0	8.3803	.00000	4.1447	3619	0	0	0	0	0	0	8.2113	.00000	2.3026	3687	0	0	0	0	0	0	8.0423	.00000	4.6053
3484	0	0	0	0	0	0	8.8416	.00000	6.4474	3552	0	0	0	0	0	0	8.6726	.00000	4.6053	3620	0	0	0	0	0	0	8.5036	.00000	2.7632	3688	0	0	0	0	0	0	8.3345	.00000	9.2105
3485	0	0	0	0	0	0	9.1339	.00000	6.9079	3553	0	0	0	0	0	0	8.9648	.00000	5.0658	3621	0	0	0	0	0	0	8.7958	.00000	3.2237	3689	0	0	0	0	0	0	8.6268	.00000	1.3816
3486	0	0	0	0	0	0	9.4261	.00000	7.3684	3554	0	0	0	0	0	0	9.2571	.00000	5.5263	3622	0	0	0	0	0	0	9.0881	.00000	3.6842	3690	0	0	0	0	0	0	8.9190	.00000	1.8421
3487	0	0	0	0	0	0	9.7184	.00000	7.8289	3555	0	0	0	0	0	0	9.5494	.00000	5.9868	3623	0	0	0	0	0	0	9.3803	.00000	4.1447	3691	0	0	0	0	0	0	9.2113	.00000	2.3026
3488	0	0	0	0	0	0	10.011	.00000	8.2895	3556	0	0	0	0	0	0	9.8416	.00000	6.4474	3624	0	0	0	0	0	0	9.6726	.00000	4.6053	3692	0	0	0	0	0	0	9.5035	.00000	2.7632
3489	0	0	0	0	0	0	5.2923	.00000	4.6053	3557	0	0	0	0	0	0	10.134	.00000	6.9079	3625	0	0	0	0	0	0	9.9648	.00000	5.0658	3693	0	0	0	0	0	0	9.7958	.00000	3.2237
3490	0	0	0	0	0	0	5.5845	.00000	9.2105	3558	0	0	0	0	0	0	10.426	.00000	7.3684	3626	0	0	0	0	0	0	10.257	.00000	5.5263	3694	0	0	0	0	0	0	10.088	.00000	3.6842
3491	0	0	0	0	0	0	5.8768	.00000	1.3816	3559	0	0	0	0	0	0	10.718	.00000	7.8289	3627	0	0	0	0	0	0	10.549	.00000	5.9868	3695	0	0	0	0	0	0	10.380	.00000	4.1447
3492	0	0	0	0	0	0	6.1690	.00000	1.8421	3560	0	0	0	0	0	0	11.011	.00000	8.2895	3628	0	0	0	0	0	0	10.842	.00000	6.4474	3696	0	0	0	0	0	0	10.673	.00000	4.6053
3493	0	0	0	0	0	0	6.4613	.00000	2.3026	3561	0	0	0	0	0	0	6.2923	.00000	4.6053	3629	0	0	0	0	0	0	11.134	.00000	6.9079	3697	0	0	0	0	0	0	10.965	.00000	5.0658
3494	0	0	0	0	0	0	6.7536	.00000	2.7632	3562	0	0	0	0	0	0	6.5845	.00000	9.2105	3630	0	0	0	0	0	0	11.426	.00000	7.3684	3698	0	0	0	0	0	0	11.257	.00000	5.5263
3495	0	0	0	0	0	0	7.0458	.00000	3.2237	3563	0	0	0	0	0	0	6.8768	.00000	1.3816	3631	0	0	0	0	0	0	11.718	.00000	7.8289	3699	0	0	0	0	0	0	11.549	.00000	5.9868
3496	0	0	0	0	0	0	7.3381	.00000	3.6842	3564	0	0	0	0	0	0	7.1690	.00000	1.8421	3632	0	0	0	0	0	0	12.011	.00000	8.2895	3700	0	0	0	0	0	0	11.842	.00000	6.4474
3497	0	0	0	0	0	0	7.6303	.00000	4.1447	3565	0	0	0	0	0	0	7.4613	.00000	2.3026	3633	0	0	0	0	0	0	7.2923	.00000	4.6053	3701	0	0	0	0	0	0	12.134	.00000	6.9079
3498	0	0	0	0	0	0	7.9226	.00000	4.6053	3566	0	0	0	0	0	0	7.7536	.00000	2.7632	3634	0	0	0	0	0	0	7.5845	.00000	9.2105	3702	0	0	0	0	0	0	12.426	.00000	7.3684
3499	0	0	0	0	0	0	8.2148	.00000	5.0658	3567	0	0	0	0	0	0	8.0458	.00000	3.2237	3635	0	0	0	0	0	0	7.8768	.00000	1.3816	3703	0	0	0	0	0	0	12.718	.00000	7.8289
3500	0	0	0	0	0	0	8.5071	.00000	5.5263	3568	0	0	0	0	0	0	8.3381	.00000	3.6842	3636	0	0	0	0	0	0	8.1690	.00000	1.8421	3704	0	0	0	0	0	0	13.011	.00000	8.2895
3501	0	0	0	0	0	0	8.7994	.00000	5.9868	3569	0	0	0	0	0	0	8.6303	.00000	4.1447	3637	0	0	0	0	0	0	8.4613	.00000	2.3026	3705	0	0	0	0	0	0	8.2923	.00000	4.6053
3502	0	0	0	0	0	0	9.0916	.00000	6.4474	3570	0	0	0	0	0	0	8.9226	.00000																					

3735	0	0	0	0	0	0	12.049	.00000	5.9868	3803	0	0	0	0	0	0	11.880	.00000	4.1447	3871	0	0	0	0	0	0	11.711	.00000	2.3026	3939	0	0	0	0	0	0	11.542	.00000	4.6053
3736	0	0	0	0	0	0	12.342	.00000	6.4474	3804	0	0	0	0	0	0	12.173	.00000	4.6053	3872	0	0	0	0	0	0	12.004	.00000	2.7632	3940	0	0	0	0	0	0	11.835	.00000	9.2105
3737	0	0	0	0	0	0	12.634	.00000	6.9079	3805	0	0	0	0	0	0	12.465	.00000	5.0658	3873	0	0	0	0	0	0	12.296	.00000	3.2237	3941	0	0	0	0	0	0	12.127	.00000	1.3816
3738	0	0	0	0	0	0	12.926	.00000	7.3684	3806	0	0	0	0	0	0	12.757	.00000	5.5263	3874	0	0	0	0	0	0	12.588	.00000	3.6842	3942	0	0	0	0	0	0	12.419	.00000	1.8421
3739	0	0	0	0	0	0	13.218	.00000	7.8289	3807	0	0	0	0	0	0	13.049	.00000	5.9868	3875	0	0	0	0	0	0	12.880	.00000	4.1447	3943	0	0	0	0	0	0	12.711	.00000	2.3026
3740	0	0	0	0	0	0	13.511	.00000	8.2895	3808	0	0	0	0	0	0	13.342	.00000	6.4474	3876	0	0	0	0	0	0	13.173	.00000	4.6053	3944	0	0	0	0	0	0	13.004	.00000	2.7632
3741	0	0	0	0	0	0	8.7923	.00000	4.6053	3809	0	0	0	0	0	0	13.634	.00000	6.9079	3877	0	0	0	0	0	0	13.465	.00000	5.0658	3945	0	0	0	0	0	0	13.296	.00000	3.2237
3742	0	0	0	0	0	0	9.0845	.00000	9.2105	3810	0	0	0	0	0	0	13.926	.00000	7.3684	3878	0	0	0	0	0	0	13.757	.00000	5.5263	3946	0	0	0	0	0	0	13.588	.00000	3.6842
3743	0	0	0	0	0	0	9.3768	.00000	1.3816	3811	0	0	0	0	0	0	14.218	.00000	7.8289	3879	0	0	0	0	0	0	14.049	.00000	5.9868	3947	0	0	0	0	0	0	13.880	.00000	4.1447
3744	0	0	0	0	0	0	9.6690	.00000	1.8421	3812	0	0	0	0	0	0	14.511	.00000	8.2895	3880	0	0	0	0	0	0	14.342	.00000	6.4474	3948	0	0	0	0	0	0	14.173	.00000	4.6053
3745	0	0	0	0	0	0	9.9613	.00000	2.3026	3813	0	0	0	0	0	0	9.7923	.00000	4.6053	3881	0	0	0	0	0	0	14.634	.00000	6.9079	3949	0	0	0	0	0	0	14.465	.00000	5.0658
3746	0	0	0	0	0	0	10.254	.00000	2.7632	3814	0	0	0	0	0	0	10.085	.00000	9.2105	3882	0	0	0	0	0	0	14.926	.00000	7.3684	3950	0	0	0	0	0	0	14.757	.00000	5.5263
3747	0	0	0	0	0	0	10.546	.00000	3.2237	3815	0	0	0	0	0	0	10.377	.00000	1.3816	3883	0	0	0	0	0	0	15.218	.00000	7.8289	3951	0	0	0	0	0	0	15.049	.00000	5.9868
3748	0	0	0	0	0	0	10.838	.00000	3.6842	3816	0	0	0	0	0	0	10.669	.00000	1.8421	3884	0	0	0	0	0	0	15.511	.00000	8.2895	3952	0	0	0	0	0	0	15.342	.00000	6.4474
3749	0	0	1	0	0	0	11.130	.00000	4.1447	3817	0	0	0	0	0	0	10.961	.00000	2.3026	3885	0	0	0	0	0	0	10.792	.00000	4.6053	3953	0	0	0	0	0	0	15.634	.00000	6.9079
3750	0	0	0	0	0	0	11.423	.00000	4.6053	3818	0	0	0	0	0	0	11.254	.00000	2.7632	3886	0	0	0	0	0	0	11.085	.00000	9.2105	3954	0	0	0	0	0	0	15.926	.00000	7.3684
3751	0	0	0	0	0	0	11.715	.00000	5.0658	3819	0	0	0	0	0	0	11.546	.00000	3.2237	3887	0	0	0	0	0	0	11.377	.00000	1.3816	3955	0	0	0	0	0	0	16.218	.00000	7.8289
3752	0	0	0	0	0	0	12.007	.00000	5.5263	3820	0	0	0	0	0	0	11.838	.00000	3.6842	3888	0	0	0	0	0	0	11.669	.00000	1.8421	3956	0	0	0	0	0	0	16.511	.00000	8.2895
3753	0	0	0	0	0	0	12.299	.00000	5.9868	3821	0	0	0	0	0	0	12.130	.00000	4.1447	3889	0	0	0	0	0	0	11.961	.00000	2.3026	3957	0	0	0	0	0	0	11.792	.00000	4.6053
3754	0	0	0	0	0	0	12.592	.00000	6.4474	3822	0	0	0	0	0	0	12.423	.00000	4.6053	3890	0	0	0	0	0	0	12.254	.00000	2.7632	3958	0	0	0	0	0	0	12.085	.00000	9.2105
3755	0	0	0	0	0	0	12.884	.00000	6.9079	3823	0	0	0	0	0	0	12.715	.00000	5.0658	3891	0	0	0	0	0	0	12.546	.00000	3.2237	3959	0	0	0	0	0	0	12.377	.00000	1.3816
3756	0	0	0	0	0	0	13.176	.00000	7.3684	3824	0	0	0	0	0	0	13.007	.00000	5.5263	3892	0	0	0	0	0	0	12.838	.00000	3.6842	3960	0	0	0	0	0	0	12.669	.00000	1.8421
3757	0	0	0	0	0	0	13.468	.00000	7.8289	3825	0	0	0	0	0	0	13.299	.00000	5.9868	3893	0	0	0	0	0	0	13.130	.00000	4.1447	3961	0	0	0	0	0	0	12.961	.00000	2.3026
3758	0	0	0	0	0	0	13.761	.00000	8.2895	3826	0	0	0	0	0	0	13.592	.00000	6.4474	3894	0	0	0	0	0	0	13.423	.00000	4.6053	3962	0	0	0	0	0	0	13.254	.00000	2.7632
3759	0	0	0	0	0	0	9.0423	.00000	4.6053	3827	0	0	0	0	0	0	13.884	.00000	6.9079	3895	0	0	0	0	0	0	13.715	.00000	5.0658	3963	0	0	0	0	0	0	13.546	.00000	3.2237
3760	0	0	0	0	0	0	9.3345	.00000	9.2105	3828	0	0	0	0	0	0	14.176	.00000	7.3684	3896	0	0	0	0	0	0	14.007	.00000	5.5263	3964	0	0	0	0	0	0	13.838	.00000	3.6842
3761	0	0	0	0	0	0	9.6268	.00000	1.3816	3829	0	0	0	0	0	0	14.468	.00000	7.8289	3897	0	0	0	0	0	0	14.299	.00000	5.9868	3965	0	0	0	0	0	0	14.130	.00000	4.1447
3762	0	0	0	0	0	0	9.9190	.00000	1.8421	3830	0	0	0	0	0	0	14.761	.00000	8.2895	3898	0	0	0	0	0	0	14.592	.00000	6.4474	3966	0	0	0	0	0	0	14.423	.00000	4.6053
3763	0	0	0	0	0	0	10.211	.00000	2.3026	3831	0	0	0	0	0	0	10.042	.00000	4.6053	3899	0	0	0	0	0	0	14.884	.00000	6.9079	3967	0	0	0	0	0	0	14.715	.00000	5.0658
3764	0	0	0	0	0	0	10.504	.00000	2.7632	3832	0	0	0	0	0	0	10.335	.00000	9.2105	3900	0	0	0	0	0	0	15.176	.00000	7.3684	3968	0	0	0	0	0	0	15.007	.00000	5.5263
3765	0	0	0	0	0	0	10.796	.00000	3.2237	3833	0	0	0	0	0	0	10.627	.00000	1.3816	3901	0	0	0	0	0	0	15.468	.00000	7.8289	3969	0	0	0	0	0	0	15.299	.00000	5.9868
3766	0	0	0	0	0	0	11.088	.00000	3.6842	3834	0	0	0	0	0	0	10.919	.00000	1.8421	3902	0	0	0	0	0	0	15.761	.00000	8.2895	3970	0	0	0	0	0	0	15.592	.00000	6.4474
3767	0	0	0	0	0	0	11.380	.00000	4.1447	3835	0	0	0	0	0	0	11.211	.00000	2.3026	3903	0	0	0	0	0	0	11.042	.00000	4.6053	3971	0	0	0	0	0	0	15.884	.00000	6.9079
3768	0	0	0	0	0	0	11.673	.00000	4.6053	3836	0	0	0	0	0	0	11.504	.00000	2.7632	3904	0	0	0	0	0	0	11.335	.00000	9.2105	3972	0	0	0	0	0	0	16.176	.00000	7.3684
3769	0	0	0	0	0	0	11.965	.00000	5.0658	3837	0	0	0	0	0	0	11.796	.00000	3.2237	3905	0	0	0	0	0	0	11.627	.00000	1.3816	3973	0	0	0	0	0	0	16.468	.00000	7.8289
3770	0	0	0	0	0	0	12.257	.00000	5.5263	3838	0	0	0	0	0	0	12.088	.00000	3.6842	3906	0	0	0	0	0	0	11.919	.00000	1.8421	3974	0	0	0	0	0	0	16.761	.00000	8.2895
3771	0	0	0	0	0	0	12.549	.00000	5.9868	3839	0	0	0	0	0	0	12.380	.00000	4.1447	3907	0	0	0	0	0	0	12.211	.00000	2.3026	3975	0	0	0	0	0	0	12.042	.00000	4.6053
3772	0	0	0	0	0	0	12.842	.00000	6.4474	3840	0	0	0	0	0	0	12.673	.00000	4.6053	3908	0	0	0	0	0	0	12.504	.00000	2.7632	3976	0	0	0	0	0	0	12.335	.00000	9.2105
3773	0	0	0	0	0	0	13.134	.00000	6.9079	3841	0	0	0	0	0	0	12.965	.00000	5.0658	3909	0	0	0	0	0	0	12.796	.00000	3.2237	3977	0	0	0	0	0	0	12.627	.00000	1.3816
3774	0	0	0	0	0	0	13.426	.00000	7.3684	3842	0	0	0	0	0	0	13.257	.00000																					

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4279	0	0	0	0	0	0	20.718	.00000	7.8289
4280	0	0	0	0	0	0	21.011	.00000	8.2895
4281	0	0	0	0	0	0	16.292	.00000	.46053
4282	0	0	0	0	0	0	16.585	.00000	.92105
4283	0	0	0	0	0	0	16.877	.00000	1.3816
4284	0	0	0	0	0	0	17.169	.00000	1.8421
4285	0	0	0	0	0	0	17.461	.00000	2.3026
4286	0	0	0	0	0	0	17.754	.00000	2.7632
4287	0	0	0	0	0	0	18.046	.00000	3.2237
4288	0	0	0	0	0	0	18.338	.00000	3.6842
4289	0	0	0	0	0	0	18.630	.00000	4.1447
4290	0	0	0	0	0	0	18.923	.00000	4.6053
4291	0	0	0	0	0	0	19.215	.00000	5.0658
4292	0	0	0	0	0	0	19.507	.00000	5.5263
4293	0	0	0	0	0	0	19.799	.00000	5.9868
4294	0	0	0	0	0	0	20.092	.00000	6.4474
4295	0	0	0	0	0	0	20.384	.00000	6.9079
4296	0	0	0	0	0	0	20.676	.00000	7.3684
4297	0	0	0	0	0	0	20.968	.00000	7.8289
4298	0	0	0	0	0	0	21.261	.00000	8.2895
4299	0	0	0	0	0	0	16.542	.00000	.46053
4300	0	0	0	0	0	0	16.835	.00000	.92105
4301	0	0	0	0	0	0	17.127	.00000	1.3816
4302	0	0	0	0	0	0	17.419	.00000	1.8421
4303	0	0	0	0	0	0	17.711	.00000	2.3026
4304	0	0	0	0	0	0	18.004	.00000	2.7632
4305	0	0	0	0	0	0	18.296	.00000	3.2237
4306	0	0	0	0	0	0	18.588	.00000	3.6842
4307	0	0	0	0	0	0	18.880	.00000	4.1447
4308	0	0	0	0	0	0	19.173	.00000	4.6053
4309	0	0	0	0	0	0	19.465	.00000	5.0658
4310	0	0	0	0	0	0	19.757	.00000	5.5263
4311	0	0	0	0	0	0	20.049	.00000	5.9868
4312	0	0	0	0	0	0	20.342	.00000	6.4474
4313	0	0	0	0	0	0	20.634	.00000	6.9079
4314	0	0	0	0	0	0	20.926	.00000	7.3684
4315	0	0	0	0	0	0	21.218	.00000	7.8289
4316	0	0	0	0	0	0	21.511	.00000	8.2895
4317	0	0	0	0	0	0	16.792	.00000	.46053
4318	0	0	0	0	0	0	17.085	.00000	.92105
4319	0	0	0	0	0	0	17.377	.00000	1.3816
4320	0	0	0	0	0	0	17.669	.00000	1.8421
4321	0	0	0	0	0	0	17.961	.00000	2.3026
4322	0	0	0	0	0	0	18.254	.00000	2.7632
4323	0	0	0	0	0	0	18.546	.00000	3.2237
4324	0	0	0	0	0	0	18.838	.00000	3.6842
4325	0	0	0	0	0	0	19.130	.00000	4.1447
4326	0	0	0	0	0	0	19.423	.00000	4.6053
4327	0	0	0	0	0	0	19.715	.00000	5.0658
4328	0	0	0	0	0	0	20.007	.00000	5.5263
4329	0	0	0	0	0	0	20.299	.00000	5.9868
4330	0	0	0	0	0	0	20.592	.00000	6.4474
4331	0	0	0	0	0	0	20.884	.00000	6.9079
4332	0	0	0	0	0	0	21.176	.00000	7.3684
4333	0	0	0	0	0	0	21.468	.00000	7.8289
4334	0	0	0	0	0	0	21.761	.00000	8.2895
4335	0	0	0	0	0	0	17.042	.00000	.46053
4336	0	0	0	0	0	0	17.335	.00000	.92105
4337	0	0	0	0	0	0	17.627	.00000	1.3816
4338	0	0	0	0	0	0	17.919	.00000	1.8421
4339	0	0	0	0	0	0	18.211	.00000	2.3026
4340	0	0	0	0	0	0	18.504	.00000	2.7632
4341	0	0	0	0	0	0	18.796	.00000	3.2237
4342	0	0	0	0	0	0	19.088	.00000	3.6842
4343	0	0	0	0	0	0	19.380	.00000	4.1447
4344	0	0	0	0	0	0	19.673	.00000	4.6053
4345	0	0	0	0	0	0	19.965	.00000	5.0658
4346	0	0	0	0	0	0	20.257	.00000	5.5263

4347	0	0	0	0	0	0	20.549	.00000	5.9868
4348	0	0	0	0	0	0	20.842	.00000	6.4474
4349	0	0	0	0	0	0	21.134	.00000	6.9079
4350	0	0	0	0	0	0	21.426	.00000	7.3684
4351	0	0	0	0	0	0	21.718	.00000	7.8289
4352	0	0	0	0	0	0	22.011	.00000	8.2895

Element input data

ELEM EGRP MP REAL ECS NODE 1 NODE 2 NODE 3
 NODE 4 NODE 5 NODE 6

NODE 7 NODE 8 NODE 9 NODE 10

NODE 11 NODE 12

NODE 13 NODE 14 NODE 15 NODE 16

NODE 17 NODE 18

NODE 19 NODE 20

1	1	1	1	-1	1	2	16	15
2	1	1	1	-1	2	3	17	16
3	1	1	1	-1	3	4	18	17
4	1	1	1	-1	4	5	19	18
5	1	1	1	-1	5	6	20	19
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7	1	1	1	-1	7	8	22	21
8	1	1	1	-1	8	9	23	22
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12	1	1	1	-1	12	13	27	26
13	1	1	1	-1	13	14	28	27
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153																																			

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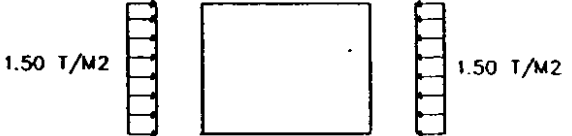
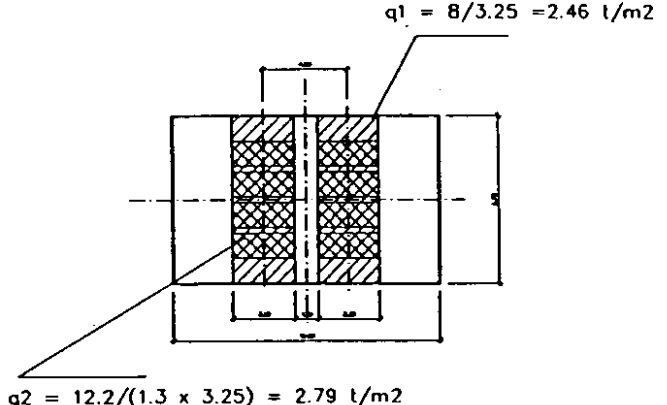
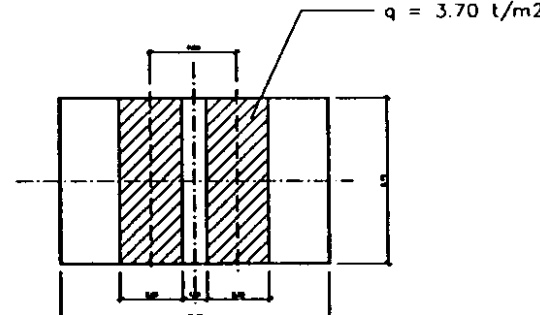
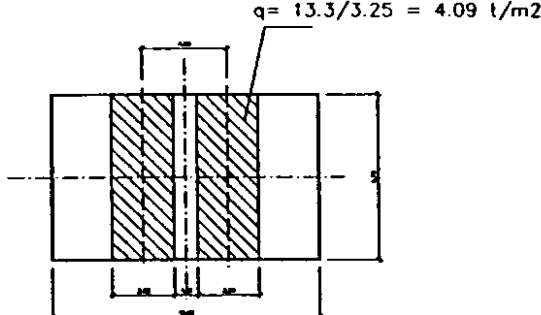
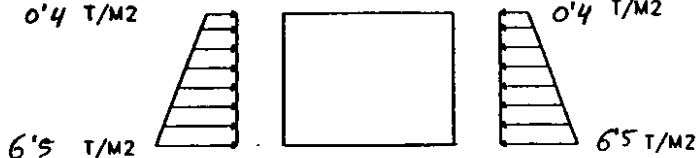
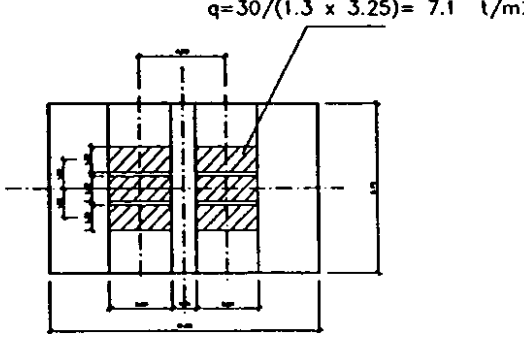
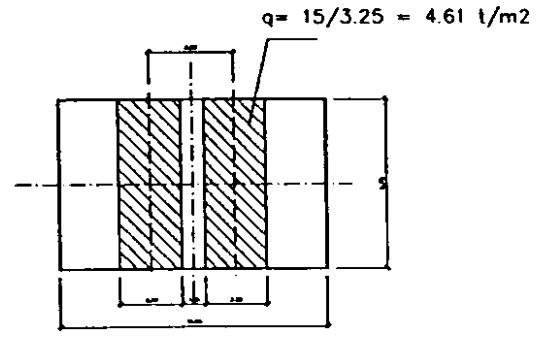
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3965	1	1	6	-1	4028	2894	2907	4046	4033	1	1	6	-1	4092	4093	4111	4110	4101	1	1	6	-1	4156	4157	4175	4174	4169	1	1	6	-1	4221	4222	4240	4239
3966	1	1	6	-1	701	4029	4047	715	4034	1	1	6	-1	4093	4094	4112	4111	4102	1	1	6	-1	4157	4158	4176	4175	4170	1	1	6	-1	4222	4223	4241	4240
3967	1	1	6	-1	4029	4030	4048	4047	4035	1	1	6	-1	4094	4095	4113	4112	4103	1	1	6	-1	4158	4159	4177	4176	4171	1	1	6	-1	4223	4224	4242	4241
3968	1	1	6	-1	4030	4031	4049	4048	4036	1	1	6	-1	4095	4096	4114	4113	4104	1	1	6	-1	4159	4160	4178	4177	4172	1	1	6	-1	4224	4225	4243	4242
3969	1	1	6	-1	4031	4032	4050	4049	4037	1	1	6	-1	4096	4097	4115	4114	4105	1	1	6	-1	4160	4161	4179	4178	4173	1	1	6	-1	4225	4226	4244	4243
3970	1	1	6	-1	4032	4033	4051	4050	4038	1	1	6	-1	4097	4098	4116	4115	4106	1	1	6	-1	4161	4162	4180	4179	4174	1	1	6	-1	4226	3037	3050	4244
3971	1	1	6	-1	4033	4034	4052	4051	4039	1	1	6	-1	4098	4099	4117	4116	4107	1	1	6	-1	4162	4163	4181	4180	4175	1	1	6	-1	855	4227	4245	869
3972	1	1	6	-1	4034	4035	4053	4052	4040	1	1	6	-1	4099	4100	4118	4117	4108	1	1	6	-1	4163	4164	4182	4181	4176	1	1	6	-1	4227	4228	4246	4245
3973	1	1	6	-1	4035	4036	4054	4053	4041	1	1	6	-1	4100	2946	2959	4118	4109	1	1	6	-1	4164	4165	4183	4182	4177	1	1	6	-1	4228	4229	4247	4246
3974	1	1	6	-1	4036	4037	4055	4054	4042	1	1	6	-1	757	4101	4119	771	4110	1	1	6	-1	4165	4166	4184	4183	4178	1	1	6	-1	4229	4230	4248	4247
3975	1	1	6	-1	4037	4038	4056	4055	4043	1	1	6	-1	4101	4102	4120	4119	4111	1	1	6	-1	4166	4167	4185	4184	4179	1	1	6	-1	4230	4231	4249	4248
3976	1	1	6	-1	4038	4039	4057	4056	4044	1	1	6	-1	4102	4103	4121	4120	4112	1	1	6	-1	4167	4168	4186	4185	4180	1	1	6	-1	4231	4232	4250	4249
3977	1	1	6	-1	4039	4040	4058	4057	4045	1	1	6	-1	4103	4104	4122	4121	4113	1	1	6	-1	4168	4169	4187	4186	4181	1	1	6	-1	4232	4233	4251	4250
3978	1	1	6	-1	4040	4041	4059	4058	4046	1	1	6	-1	4104	4105	4123	4122	4114	1	1	6	-1	4169	4170	4188	4187	4182	1	1	6	-1	4233	4234	4252	4251
3979	1	1	6	-1	4041	4042	4060	4059	4047	1	1	6	-1	4105	4106	4124	4123	4115	1	1	6	-1	4170	4171	4189	4188	4183	1	1	6	-1	4234	4235	4253	4252
398																																			

4208	1	1	6	-1	4258	4259	4277	4276
4209	1	1	6	-1	4259	4260	4278	4277
4210	1	1	6	-1	4260	4261	4279	4278
4211	1	1	6	-1	4261	4262	4280	4279
4212	1	1	6	-1	4262	3063	3076	4280
4213	1	1	6	-1	883	4263	4281	897
4214	1	1	6	-1	4263	4264	4282	4281
4215	1	1	6	-1	4264	4265	4283	4282
4216	1	1	6	-1	4265	4266	4284	4283
4217	1	1	6	-1	4266	4267	4285	4284
4218	1	1	6	-1	4267	4268	4286	4285
4219	1	1	6	-1	4268	4269	4287	4286
4220	1	1	6	-1	4269	4270	4288	4287
4221	1	1	6	-1	4270	4271	4289	4288
4222	1	1	6	-1	4271	4272	4290	4289
4223	1	1	6	-1	4272	4273	4291	4290
4224	1	1	6	-1	4273	4274	4292	4291
4225	1	1	6	-1	4274	4275	4293	4292
4226	1	1	6	-1	4275	4276	4294	4293
4227	1	1	6	-1	4276	4277	4295	4294
4228	1	1	6	-1	4277	4278	4296	4295
4229	1	1	6	-1	4278	4279	4297	4296
4230	1	1	6	-1	4279	4280	4298	4297
4231	1	1	6	-1	4280	3076	3089	4298
4232	1	1	6	-1	897	4281	4299	911
4233	1	1	6	-1	4281	4282	4300	4299
4234	1	1	6	-1	4282	4283	4301	4300
4235	1	1	6	-1	4283	4284	4302	4301
4236	1	1	6	-1	4284	4285	4303	4302
4237	1	1	6	-1	4285	4286	4304	4303
4238	1	1	6	-1	4286	4287	4305	4304
4239	1	1	6	-1	4287	4288	4306	4305
4240	1	1	6	-1	4288	4289	4307	4306
4241	1	1	6	-1	4289	4290	4308	4307
4242	1	1	6	-1	4290	4291	4309	4308
4243	1	1	6	-1	4291	4292	4310	4309
4244	1	1	6	-1	4292	4293	4311	4310
4245	1	1	6	-1	4293	4294	4312	4311
4246	1	1	6	-1	4294	4295	4313	4312
4247	1	1	6	-1	4295	4296	4314	4313
4248	1	1	6	-1	4296	4297	4315	4314
4249	1	1	6	-1	4297	4298	4316	4315
4250	1	1	6	-1	4298	3089	3102	4316
4251	1	1	6	-1	911	4299	4317	925
4252	1	1	6	-1	4299	4300	4318	4317
4253	1	1	6	-1	4300	4301	4319	4318
4254	1	1	6	-1	4301	4302	4320	4319
4255	1	1	6	-1	4302	4303	4321	4320
4256	1	1	6	-1	4303	4304	4322	4321
4257	1	1	6	-1	4304	4305	4323	4322
4258	1	1	6	-1	4305	4306	4324	4323
4259	1	1	6	-1	4306	4307	4325	4324
4260	1	1	6	-1	4307	4308	4326	4325
4261	1	1	6	-1	4308	4309	4327	4326
4262	1	1	6	-1	4309	4310	4328	4327
4263	1	1	6	-1	4310	4311	4329	4328
4264	1	1	6	-1	4311	4312	4330	4329
4265	1	1	6	-1	4312	4313	4331	4330
4266	1	1	6	-1	4313	4314	4332	4331
4267	1	1	6	-1	4314	4315	4333	4332
4268	1	1	6	-1	4315	4316	4334	4333
4269	1	1	6	-1	4316	3102	3115	4334
4270	1	1	6	-1	925	4317	4335	939
4271	1	1	6	-1	4317	4318	4336	4335
4272	1	1	6	-1	4318	4319	4337	4336
4273	1	1	6	-1	4319	4320	4338	4337
4274	1	1	6	-1	4320	4321	4339	4338
4275	1	1	6	-1	4321	4322	4340	4339

4276	1	1	6	-1	4322	4323	4341	4340
4277	1	1	6	-1	4323	4324	4342	4341
4278	1	1	6	-1	4324	4325	4343	4342
4279	1	1	6	-1	4325	4326	4344	4343
4280	1	1	6	-1	4326	4327	4345	4344
4281	1	1	6	-1	4327	4328	4346	4345
4282	1	1	6	-1	4328	4329	4347	4346
4283	1	1	6	-1	4329	4330	4348	4347
4284	1	1	6	-1	4330	4331	4349	4348
4285	1	1	6	-1	4331	4332	4350	4349
4286	1	1	6	-1	4332	4333	4351	4350
4287	1	1	6	-1	4333	4334	4352	4351
4288	1	1	6	-1	4334	3115	3128	4352

E-156.8 . HIPOTESIS DE CARGA CONSIDERADAS EN EL MODELO 3D

HIPOTESIS 1: PESO PROPIO (PESO ESPECIFICO 2.5 t/m³)	HIPOTESIS 4: EMPUJE DEL TERRENO DEBIDO A UNA SOBRECARGA DE 3 T/M² 	HIPOTESIS 7: TREN LM-71 
HIPOTESIS 2: CARGA MUERTA (PESO DE BALASTO, TRAVESAS Y CARRILES) q = 1'55 T/m²	HIPOTESIS 5: TREN TIPO B (2 x 12 t/m) 	HIPOTESIS 8: TREN TIPO SW/0 
HIPOTESIS 3: EMPUJE DEL TERRENO 	HIPOTESIS 6: TREN TIPO A 	HIPOTESIS 9: TREN TIPO SW/2 

RESULTADOS COSMOS. Esfuerzos característicos en hastiales y dintel.																											
Proyecto :			L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV																								
Estructura:			E-1516.8																								
Hipotesis→ Elem	PESO PROPIO			CARGA MUERTA			EMPUJE TIERRAS			EMPUJE SC			TREN TIPO B			TREN TIPO A			TREN LM-71			TREN SW/0			TREN SW/2		
	NX	MX	VX	NX	MX	VX	NX	MX	VX	NX	MX	VX	NX	MX	VX	NX	MX	VX	NX	MX	VX	NX	MX	VX	NX	MX	VX
	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)
430	-19.9	15.1	-1.5	-6.6	4.2	0.3	-0.3	3.6	-12.4	-0.1	1.7	-4.3	-7.6	4.5	0.7	-5.6	2.9	1.1	-7.9	4.5	0.9	-8.4	5.0	0.7	-9.5	5.6	0.8
431	-19.0	14.4	-1.5	-6.6	4.4	0.3	-0.3	-1.6	-9.6	-0.1	-0.2	-3.6	-7.9	4.8	0.6	-5.8	3.3	1.0	-8.2	4.9	0.9	-8.7	5.3	0.7	-9.8	6.0	0.8
432	-18.2	13.7	-1.5	-6.6	4.5	0.3	-0.3	-5.5	-7.0	-0.1	-1.7	-2.9	-8.1	5.1	0.6	-6.0	3.8	1.0	-8.5	5.3	0.9	-9.0	5.6	0.7	-10.2	6.3	0.8
433	-17.3	12.9	-1.6	-6.6	4.6	0.3	-0.3	-8.2	-4.6	-0.1	-2.9	-2.2	-8.4	5.3	0.6	-6.2	4.2	1.0	-8.7	5.6	0.9	-9.3	5.9	0.7	-10.5	6.6	0.8
434	-16.4	12.2	-1.6	-6.6	4.8	0.3	-0.3	-9.8	-2.4	-0.1	-3.8	-1.5	-8.7	5.6	0.6	-6.4	4.7	1.0	-9.0	6.0	0.9	-9.6	6.2	0.7	-10.8	6.9	0.8
435	-15.6	11.5	-1.6	-6.6	4.9	0.3	-0.3	-10.5	-0.5	-0.1	-4.3	-0.8	-9.0	5.8	0.7	-6.6	5.1	1.1	-9.3	6.4	0.9	-9.9	6.5	0.7	-11.2	7.3	0.8
436	-14.7	10.7	-1.6	-6.6	5.1	0.3	-0.3	-10.3	1.3	-0.1	-4.5	-0.1	-9.2	6.1	0.7	-6.8	5.6	1.1	-9.6	6.8	0.9	-10.2	6.8	0.8	-11.5	7.6	0.9
437	-13.8	10.0	-1.6	-6.6	5.2	0.3	-0.3	-9.4	2.8	-0.1	-4.4	0.6	-9.5	6.4	0.7	-7.1	6.1	1.2	-10.0	7.2	1.0	-10.5	7.1	0.8	-11.9	8.0	0.9
438	-13.0	9.2	-1.6	-6.6	5.3	0.3	-0.3	-7.8	4.1	-0.1	-3.9	1.3	-9.8	6.8	0.8	-7.4	6.6	1.2	-10.3	7.7	1.1	-10.8	7.5	0.9	-12.2	8.5	1.0
439	-12.1	8.5	-1.6	-6.6	5.4	0.3	-0.3	-5.6	5.1	-0.1	-3.1	2.1	-10.0	7.2	0.8	-7.7	7.2	1.3	-10.6	8.2	1.2	-11.1	8.0	0.9	-12.5	9.0	1.0
440	-11.3	7.7	-1.6	-6.6	5.6	0.3	-0.3	-3.0	6.0	-0.1	-2.0	2.8	-10.3	7.6	0.9	-8.1	7.9	1.5	-11.0	8.8	1.3	-11.4	8.5	1.0	-12.8	9.5	1.1
441	-10.4	6.9	-1.6	-6.6	5.7	0.3	-0.2	0.0	6.6	-0.1	-0.5	3.5	-10.4	8.2	1.0	-8.5	8.7	1.6	-11.3	9.5	1.4	-11.5	9.0	1.1	-13.0	10.2	1.2
442	-9.6	6.2	-1.6	-6.6	5.8	0.3	-0.2	3.2	7.0	-0.1	1.3	4.2	-10.5	8.7	1.0	-9.0	9.6	1.7	-11.6	10.3	1.4	-11.6	9.6	1.1	-13.1	10.8	1.2
859	-92.3	22.4	3.2	-32.1	6.3	2.5	14.1	4.2	-15.6	5.8	1.7	-5.4	-35.7	7.5	1.9	-27.4	4.9	2.2	-37.5	7.5	2.3	-39.5	8.2	2.1	-44.5	9.3	2.3
860	-55.4	19.5	-0.7	-19.5	5.9	1.2	6.6	-1.6	-12.6	2.7	-0.3	-4.7	-21.3	6.8	0.6	-16.4	4.8	1.3	-22.4	7.0	1.0	-23.6	7.5	0.7	-26.5	8.5	0.8
861	-44.1	16.9	-0.6	-16.0	5.5	1.3	4.5	-5.5	-9.9	1.9	-1.8	-4.0	-16.9	6.4	0.7	-13.2	4.7	1.4	-17.9	6.6	1.1	-18.7	7.0	0.8	-21.1	7.9	0.9
862	-37.1	15.4	-1.3	-14.1	5.5	1.2	3.4	-8.3	-7.0	1.4	-3.0	-3.2	-14.3	6.3	0.5	-11.3	5.0	1.2	-15.1	6.7	0.8	-15.8	6.9	0.5	-17.8	7.8	0.6
863	-32.7	14.2	-2.0	-13.1	5.5	0.9	2.8	-10.0	-4.0	1.2	-3.9	-2.2	-12.5	6.3	0.2	-10.1	5.3	1.0	-13.4	6.8	0.5	-13.9	7.0	0.2	-15.6	7.8	0.2
864	-29.6	13.1	-2.6	-12.6	5.6	0.7	2.5	-10.8	-1.2	1.1	-4.4	-1.1	-11.3	6.4	-0.1	-9.3	5.7	0.8	-12.1	7.0	0.2	-12.5	7.0	-0.1	-14.1	7.9	-0.1
865	-27.4	12.2	-3.2	-12.4	5.7	0.5	2.4	-10.6	1.4	1.0	-4.6	-0.1	-10.3	6.4	-0.4	-8.6	6.0	0.5	-11.1	7.2	-0.1	-11.3	7.1	-0.4	-12.8	8.0	-0.5
866	-25.9	11.3	-3.7	-12.5	5.9	0.2	2.4	-9.7	3.7	1.0	-4.5	1.0	-9.4	6.5	-0.7	-8.1	6.3	0.2	-10.2	7.3	-0.4	-10.4	7.2	-0.7	-11.7	8.1	-0.8
867	-25.0	10.5	-4.1	-13.0	6.1	-0.1	2.6	-8.1	5.7	1.2	-4.0	2.0	-8.6	6.5	-1.0	-7.6	6.6	-0.1	-9.4	7.4	-0.8	-9.5	7.2	-1.1	-10.7	8.1	-1.2
868	-25.0	9.7	-4.5	-14.0	6.4	-0.4	3.1	-5.9	7.2	1.4	-3.2	3.0	-7.8	6.4	-1.4	-7.1	6.8	-0.6	-8.6	7.4	-1.3	-8.6	7.0	-1.5	-9.7	7.9	-1.7
869	-26.4	9.1	-4.9	-15.9	6.7	-0.7	4.0	-3.3	8.3	1.8	-2.0	3.9	-7.0	6.1	-1.9	-6.4	6.8	-1.2	-7.7	7.2	-1.9	-7.7	6.8	-2.1	-8.7	7.6	-2.3
870	-30.2	8.8	-4.8	-19.4	7.4	-0.8	5.7	-0.4	8.7	2.6	-0.6	4.6	-6.0	5.6	-2.6	-5.6	6.5	-2.1	-6.7	6.7	-2.7	-6.7	6.2	-2.8	-7.5	7.0	-3.2
871	-47.1	8.4	-7.1	-31.4	8.0	-2.5	11.8	3.1	9.0	5.4	1.4	5.3	-4.6	4.6	-4.0	-3.4	5.7	-3.7	-4.9	5.7	-4.4	-5.1	5.1	-4.4	-5.7	5.8	-5.0
1499	1.3	3.8	-7.4	-0.3	4.4	-5.5	-6.8	4.8	0.1	-4.2	2.3	0.0	-0.7	6.9	-6.4	-1.3	8.6	-4.8	-1.0	8.5	-7.0	-0.8	7.7	-7.1	-0.9	8.6	-8.0
1500	1.9	-0.1	-6.3	-0.2	1.6	-4.8	-6.9	4.8	-0.1	-4.3	2.2	0.0	-0.9	3.2	-7.3	-1.4	5.5	-7.1	-1.1	4.3	-8.3	-0.9	3.6	-8.1	-1.1	4.0	-9.1
1501	1.4	-3.2	-5.4	-0.3	-0.9	-4.2	-6.8	4.8	-0.1	-4.2	2.2	-0.1	-0.8	-1.5	-6.8	-1.4	1.9	-7.5	-1.2	0.4	-7.9	-0.9	-1.7	-7.5	-1.0	-1.9	-8.5
1502	1.4	-6.0	-4.6	-0.3	-3.1	-3.6	-6.7	4.7	-0.1	-4.2	2.2	0.0	-0.4	-4.2	-5.9	-1.1	-2.4	-7.0	-0.6	-4.3	-6.9	-0.5	-4.7	-6.5	-0.6	-5.2	-7.4
1503	1.4	-8.4	-3.8	-0.3	-4.9	-3.0	-6.7	4.7	-0.1	-4.2	2.2	0.0	-0.6	-6.9	-5.0	-0.9	-5.8	-6.2	-0.8	-7.6	-6.0	-0.6	-7.7	-5.5	-0.7	-8.6	-6.2
1504	1.4	-10.3	-3.1	-0.3	-6.4	-2.4	-6.6	4.6	-0.1	-4.2	2.2	0.0	-0.6	-9.2	-4.0	-1.0	-9.1	-5.3	-0.8	-10.5	-5.0	-0.7	-10.2	-4.4	-0.8	-11.5	-5.0
1505	1.4	-11.9	-2.3	-0.3	-7.6	-1.8	-6.6	4.6	-0.1	-4.2	2.2	0.0	-0.7	-11.0	-3.0	-1.0	-11.9	-4.4	-0.9	-12.8	-3.9	-0.7	-12.2	-3.4	-0.8	-13.7	-3.8
1506	1.4	-13.0	-1.5	-0.3	-8.4	-1.2	-6.6	4.6	0.0	-4.2	2.2	0.0	-0.7	-12.3	-2.0	-1.0	-14.2	-3.3	-0.9	-14.6	-2.7	-0.8	-13.6	-2.3	-0.9	-15.3	-2.5
1507	1.4	-13.6	-0.8	-0.3	-8.9	-0.6	-6.6	4.6	0.0	-4.2	2.2	0.0	-0.7	-13.1	-1.0	-1.1	-15.8	-1.8	-0.9	-15.6	-1.4	-0.8	-14.4	-1.1	-0.9	-16.3	-1.3
1508	1.4	-13.8	0.0	-0.3	-9.																						

RESULTADOS COSMOS. Esfuerzos característicos en solera.

Proyecto : L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
Estructura: E-1516.8

Hipotesis--> Elem	PESO PROPIO			CARGA MUERTA			EMPUJE TIERRAS			EMPUJE SC			TREN TIPO B			TREN TIPO A			TREN LM-71			TREN SW/0			TREN SW/2		
	NX	MX	VX	NX	MX	VX	NX	MX	VX	NX	MX	VX	NX	MX	VX	NX	MX	VX	NX	MX	VX	NX	MX	VX	NX	MX	VX
	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)	(t/m)	(m.t/m)	(t/m)
3643	-1.4	-11.0	16.7	0.2	-2.7	5.4	-12.7	-6.5	0.1	-4.3	-2.6	0.0	0.6	-2.7	5.9	0.9	-1.4	4.3	0.8	-2.6	6.1	0.7	-3.0	6.6	0.7	-3.4	7.4
3644	-1.0	-2.6	14.5	0.3	0.1	4.7	-12.9	-6.4	0.2	-4.4	-2.6	0.1	0.5	0.4	5.3	0.7	0.9	3.9	0.7	0.7	5.5	0.6	0.4	5.9	0.7	0.5	6.6
3645	-1.7	5.1	12.6	0.2	2.5	4.1	-12.9	-6.3	0.2	-4.4	-2.6	0.1	0.6	3.1	4.6	0.8	2.9	3.4	0.7	3.5	4.8	0.6	3.5	5.1	0.7	3.9	5.8
3646	-1.6	11.5	10.7	0.2	4.6	3.5	-12.9	-6.3	0.2	-4.4	-2.5	0.1	0.5	5.5	3.9	0.8	4.7	2.9	0.7	5.9	4.1	0.6	6.1	4.3	0.7	6.8	4.9
3647	-1.5	17.0	8.9	0.2	6.4	2.9	-12.9	-6.2	0.1	-4.3	-2.5	0.1	0.5	7.5	3.3	0.8	6.1	2.4	0.7	8.0	3.4	0.6	8.3	3.6	0.7	9.3	4.1
3648	-1.5	21.5	7.1	0.2	7.8	2.3	-12.9	-6.1	0.1	-4.3	-2.5	0.1	0.5	9.1	2.6	0.8	7.3	1.9	0.7	9.7	2.7	0.6	10.1	2.9	0.6	11.3	3.2
3649	-1.5	25.0	5.3	0.2	9.0	1.7	-12.9	-6.1	0.1	-4.3	-2.5	0.0	0.5	10.4	1.9	0.8	8.3	1.4	0.7	11.0	2.0	0.6	11.5	2.1	0.6	12.9	2.4
3650	-1.5	27.5	3.5	0.2	9.8	1.1	-12.9	-6.1	0.1	-4.3	-2.5	0.0	0.5	11.3	1.3	0.8	9.0	1.0	0.7	12.0	1.3	0.5	12.5	1.4	0.6	14.1	1.6
3651	-1.5	29.0	1.8	0.2	10.3	0.6	-12.9	-6.0	0.0	-4.3	-2.4	0.0	0.5	11.8	0.6	0.8	9.4	0.5	0.7	12.5	0.7	0.5	13.1	0.7	0.6	14.7	0.8
3652	-1.5	29.5	0.0	0.2	10.4	0.0	-12.9	-6.0	0.0	-4.3	-2.4	0.0	0.5	12.0	0.0	0.8	9.5	0.0	0.7	12.7	0.0	0.5	13.3	0.0	0.6	15.0	0.0
4270	3.7	-12.1	61.5	2.9	-3.1	21.8	-25.0	-5.0	-12.7	-8.4	-1.9	-5.2	1.9	-3.7	24.4	2.1	-2.1	19.1	2.3	-3.6	25.8	2.1	-4.0	27.0	2.4	-4.6	30.4
4271	-0.5	5.2	51.1	1.3	2.4	18.2	-23.9	-4.9	-11.2	-8.0	-1.9	-4.6	0.3	2.8	20.3	0.7	2.6	16.0	0.5	3.1	21.5	0.3	3.1	22.5	0.4	3.4	25.3
4272	-1.6	13.8	47.3	0.8	5.2	16.7	-23.1	-4.9	-9.9	-7.8	-1.9	-4.0	-0.2	5.9	18.7	0.3	4.9	14.6	0.0	6.4	19.7	-0.2	6.6	20.7	-0.2	7.4	23.3
4273	-1.9	20.2	42.7	0.6	7.3	15.1	-22.5	-5.0	-8.9	-7.6	-2.0	-3.6	-0.4	8.3	16.9	0.1	6.7	13.2	-0.2	8.8	17.8	-0.4	9.2	18.6	-0.5	10.4	21.0
4274	-2.0	24.7	37.4	0.6	8.7	13.3	-22.2	-5.0	-8.2	-7.5	-2.0	-3.4	-0.5	9.9	14.8	-0.1	7.9	11.5	-0.4	10.5	15.6	-0.5	11.0	16.3	-0.6	12.4	18.4
4275	-2.0	27.4	32.0	0.5	9.6	11.4	-21.9	-5.1	-7.6	-7.4	-2.1	-3.1	-0.6	10.9	12.7	-0.2	8.6	9.9	-0.5	11.5	13.4	-0.6	12.1	14.0	-0.7	13.6	15.8
4276	-1.9	28.6	26.6	0.5	10.0	9.6	-21.8	-5.2	-7.2	-7.3	-2.1	-3.0	-0.6	11.3	10.6	-0.3	8.8	8.3	-0.5	12.0	11.2	-0.7	12.5	11.7	-0.8	14.1	13.2
4277	-1.8	28.6	21.1	0.5	10.0	7.7	-21.6	-5.2	-6.8	-7.3	-2.1	-2.8	-0.6	11.3	8.5	-0.3	8.8	6.7	-0.6	11.9	9.0	-0.7	12.4	9.3	-0.8	14.0	10.5
4278	-1.6	27.4	15.6	0.5	9.6	5.9	-21.5	-5.3	-6.4	-7.3	-2.2	-2.7	-0.7	10.8	6.4	-0.4	8.4	5.1	-0.6	11.4	6.8	-0.7	11.9	7.0	-0.8	13.4	7.9
4279	-1.5	25.3	10.3	0.6	8.9	4.1	-21.5	-5.3	-6.1	-7.3	-2.2	-2.5	-0.7	9.9	4.3	-0.4	7.7	3.5	-0.6	10.5	4.6	-0.7	11.0	4.7	-0.8	12.4	5.3

RESULTADOS COSMOS. Tensiones en cimentación.

Proyecto : L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
Estructura: E-1516.8

Hipotesis--> Elem	PESO PROPIO	CARGA MUERTA	EMPUJE TIERRAS	EMPUJE SC	TREN TIPO B	TREN TIPO A	TREN LM-71	TREN SW/0	TREN SW/2
	Tensión cim. (T/m²)	Tensión cim. (T/m²)	Tensión cim. (T/m²)	Tensión cim. (T/m²)	Tensión cim. (T/m²)	Tensión cim. (T/m²)	Tensión cim. (T/m²)	Tensión cim. (T/m²)	Tensión cim. (T/m²)
3643	7.3	1.7	-0.1	0.0	1.9	1.4	2.0	2.1	2.4
3644	7.2	1.6	-0.1	0.0	1.9	1.4	1.9	2.1	2.3
3645	7.2	1.6	0.0	0.0	1.8	1.4	1.9	2.0	2.3
3646	7.1	1.6	0.0	0.0	1.8	1.3	1.9	2.0	2.2
3647	7.0	1.6	0.0	0.0	1.8	1.3	1.8	2.0	2.2
3648	7.0	1.5	0.0	0.0	1.7	1.3	1.8	1.9	2.2
3649	6.9	1.5	0.0	0.0	1.7	1.3	1.8	1.9	2.1
3650	6.9	1.5	0.0	0.0	1.7	1.3	1.8	1.9	2.1
3651	6.9	1.5	0.0	0.0	1.7	1.3	1.8	1.9	2.1
3652	6.9	1.5	0.0	0.0	1.7	1.3	1.8	1.9	2.1
4270	7.3	1.6	-0.1	0.0	1.9	1.4	2.0	2.1	2.3
4271	7.2	1.6	0.0	0.0	1.8	1.4	1.9	2.0	2.3
4272	7.0	1.6	0.0	0.0	1.8	1.3	1.9	2.0	2.2
4273	6.9	1.5	0.0	0.0	1.7	1.3	1.8	1.9	2.2
4274	6.9	1.5	0.0	0.0	1.7	1.3	1.8	1.9	2.1
4275	6.8	1.5	0.0	0.0	1.7	1.2	1.7	1.9	2.1
4276	6.7	1.5	0.1	0.0	1.7	1.2	1.7	1.8	2.1
4277	6.7	1.4	0.1	0.0	1.6	1.2	1.7	1.8	2.1
4278	6.7	1.4	0.1	0.0	1.6	1.2	1.7	1.8	2.0
4279	6.7	1.4	0.1	0.0	1.6	1.2	1.7	1.8	2.1

CÁLCULO DE ARMADURAS

Proyecto : L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
Estructura: E-1516.8

Notación: PP= Peso propio
CM= Carga muerta de traviesas, carriles y balasto
E.t= Empuje de tierras

E.sc= Empuje de tierras debido a una sobrecarga de 3 t/m2
Tren A= Tren de cargas tipo A de la norma española.
Tren B= Tren de cargas tipo B de la norma española.

LM-71= Load model 71 del Eurocodigo 1
SW/0= Tren pesado tipo SW/0 del Eurocodigo 1
SW/2= Tren pesado tipo SW/2 del Eurocodigo 1

Envoltorio de M(+) en E.L.U. (Tracciones en cara interior de hastiales y dintel e inferior en solera).

Sección	Situación el.	Elemento	Cálculo	Coeficientes				Nd T/m	Md mT/m
				PP+CM	E.t	E.sc	Sobrecarga		
Empotramiento inferior de hastial	Eje de estructura	430	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	-23.86	-17.36
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	-23.86	-17.36
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-26.77	-22.91
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-26.77	-22.91
	Borde estructura	859	Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-26.77	-22.91
			Cálculo 1. Tren A	0.90	0.00	0.00	0.00	-111.91	-25.88
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	-111.91	-25.88
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-110.20	-32.95
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-110.20	-32.95
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-110.20	-32.95
Combinación pésima. Cálculo 1. Tren A								-23.86	-17.36

Media del hastial	Eje de estructura	436	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-19.72	-4.48
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-19.72	-5.74
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-21.79	-9.48
			Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-21.79	-9.47
			Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-21.79	-11.22
	Borde estructura	865	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-30.76	-6.78
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-30.76	-7.72
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-35.25	-11.82
			Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-35.25	-11.72
			Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-35.25	-13.55
Combinación pésima. Cálculo 1. Tren A								-19.72	-4.48

Empotramiento superior de hastial	Eje de estructura	442	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	-14.60	-10.77
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	-14.60	-10.77
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-16.46	-15.18
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-16.46	-15.18
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-16.46	-15.18
	Borde estructura	871	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	-70.68	-14.75
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	-70.68	-14.75
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-66.72	-19.47
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-66.72	-19.47
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-66.72	-19.47
Combinación pésima. Cálculo 1. Tren A								-14.60	-10.77

Empotramiento de dintel	Eje de estructura	1499	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	0.96	-7.35
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	0.96	-7.35
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-5.74	-13.01
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-5.74	-13.01
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-5.74	-13.01
	Borde estructura	2126	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	9.23	-9.42
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	9.23	-9.42
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-3.13	-13.51
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-3.13	-13.51
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-3.13	-13.51
Combinación pésima. Cálculo 1. Tren A								0.96	-7.35

Centro de dintel	Eje de estructura	1508	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	-0.76	71.10
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	0.08	64.37
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-7.13	61.04
			Cálculo 2. SW/0	1.35	1.00	0.00	1.45	-6.78	58.41
			Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-6.66	56.26
	Borde estructura	2135	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	6.70	38.49
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	7.60	39.81
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-4.44	33.52
			Cálculo 2. SW/0	1.35	1.00	0.00	1.45	-4.19	33.48
			Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-4.43	32.71
Combinación pésima. Cálculo 1. Tren A								-0.76	71.10

Empotramiento solera	Eje de estructura	3643	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	-25.19	37.33
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-25.98	40.26
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-22.86	36.37
			Cálculo 2. SW/0	1.35	1.35	1.35	1.45	-23.15	37.26
			Cálculo 2. SW/2	1.35	1.35	1.35	1.20	-23.25	36.82
	Borde estructura	4270	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	-35.45	37.97
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-35.98	41.44
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-31.27	37.71
			Cálculo 2. SW/0	1.35	1.35	1.35	1.45	-31.56	38.69
			Cálculo 2. SW/2	1.35	1.35	1.35	1.20	-31.87	38.09
Combinación pésima. Cálculo 1. Tren B								-25.98	40.26

Centro solera	Eje de estructura	3652	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-26.94	-23.29
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-26.94	-23.29
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-24.49	-28.55
			Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-24.49	-28.55
			Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-24.49	-28.55
	Borde estructura	4279	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-43.86	-19.44
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-43.86	-19.44
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-39.64	-23.99
			Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-39.64	-23.99
			Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-39.64	-23.99
Combinación pésima. Cálculo 1. Tren A								-43.86	-19.44

Envoltorio de M(+) en E.L.S. (Tracciones en cara interior de hastiales y dintel e inferior en solera).

				Coeficientes				N	M
Sección	Situación el.	Elemento	Cálculo	PP+CM	E.t	E.sc	Sobrecarga	T/m	mT/m
Empotramiento inferior de hastial	Eje de estructura	430	Cálculo 1. Tren A	1.00	0.00	0.00	0.00	-28.51	-19.29
			Cálculo 1. Tren B	1.00	0.00	0.00	0.00	-28.51	-19.29
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-26.77	-22.91
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-26.77	-22.91
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-26.77	-22.91
	Borde estructura	859	Cálculo 1. Tren A	1.00	0.00	0.00	0.00	-124.34	-28.76
			Cálculo 1. Tren B	1.00	0.00	0.00	0.00	-124.34	-28.76
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-110.20	-32.95
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-110.20	-32.95
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-110.20	-32.95
Combinación pésima. Cálculo 1. Tren A								-28.51	-19.29

Media del hastial	Eje de estructura	436	Cálculo 1. Tren A	1.00	1.00	1.00	0.00	-21.65	-9.30
			Cálculo 1. Tren B	1.00	1.00	1.00	0.00	-21.65	-10.14
			Cálculo 2. LM-71	1.00	1.00	1.00	0.00	-21.65	-11.11
			Cálculo 2. SW/0	1.00	1.00	1.00	0.00	-21.65	-11.11
			Cálculo 2. SW/2	1.00	1.00	1.00	0.00	-21.65	-12.40
	Borde estructura	865	Cálculo 1. Tren A	1.00	1.00	1.00	0.00	-36.43	-11.69
			Cálculo 1. Tren B	1.00	1.00	1.00	0.00	-36.43	-12.31
			Cálculo 2. LM-71	1.00	1.00	1.00	0.00	-36.43	-13.39
			Cálculo 2. SW/0	1.00	1.00	1.00	0.00	-36.43	-13.33
			Cálculo 2. SW/2	1.00	1.00	1.00	0.00	-36.43	-14.68
Combinación pésima. Cálculo 1. Tren A								-21.65	-9.30

Empotramiento superior de hastial	Eje de estructura	442	Cálculo 1. Tren A	1.00	0.00	0.00	0.00	-16.22	-11.97
			Cálculo 1. Tren B	1.00	0.00	0.00	0.00	-16.22	-11.97
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-16.46	-15.18
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-16.46	-15.18
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-16.46	-15.18
	Borde estructura	871	Cálculo 1. Tren A	1.00	0.00	0.00	0.00	-78.53	-16.38
			Cálculo 1. Tren B	1.00	0.00	0.00	0.00	-78.53	-16.38
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-66.72	-19.47
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-66.72	-19.47
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-66.72	-19.47
Combinación pésima. Cálculo 1. Tren A								-18.22	-11.97

CÁLCULO DE ARMADURAS

Proyecto : L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
Estructura: E-1516.8

Notación: PP= Peso propio
CM= Carga muerta de traviesas, carriles y balasto
E.t= Empuje de tierras

E.sc= Empuje de tierras debido a una sobrecarga de 3 t/m²
Tren A= Tren de cargas tipo A de la norma española.
Tren B= Tren de cargas tipo B de la norma española.

LM-71= Load model 71 del Eurocodigo 1
SW/0= Tren pesado tipo SW/0 del Eurocodigo 1
SW/2= Tren pesado tipo SW/2 del Eurocodigo 1

Envoltorio de M(-) en E.L.U. (Tracciones en cara exterior de hastiales y dintel y superior en solera).

Sección	Situación al.	Elemento	Cálculo	Coeficientes				Nd T/m	Md mT/m
				PP+CM	E.t	E.sc	Sobrecarga		
Empotramiento inferior de hastial	Eje de estructura	430	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	-53.04	-43.28
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-57.49	-46.98
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-53.55	-42.95
			Cálculo 2. SW/0	1.35	1.35	1.35	1.45	-54.63	-44.00
			Cálculo 2. SW/2	1.35	1.35	1.35	1.20	-53.40	-43.27
	Borde estructura	859	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	-218.13	-63.00
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-236.85	-68.83
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-222.45	-63.21
			Cálculo 2. SW/0	1.35	1.35	1.35	1.45	-226.69	-64.77
			Cálculo 2. SW/2	1.35	1.35	1.35	1.20	-220.94	-63.57
Combinación pésima. Cálculo 1. Tren B								-57.49	-46.98

Media del hastial	Eje de estructura	436	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	-47.30	-23.67
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-52.67	-23.67
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-49.93	-10.97
			Cálculo 2. SVV/0	1.35	1.00	0.00	1.45	-51.16	-10.97
			Cálculo 2. SVV/2	1.35	1.00	0.00	1.20	-49.68	-10.97
	Borde estructura	865	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	-78.17	-26.86
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-82.80	-26.86
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-75.49	-13.55
			Cálculo 2. SVV/0	1.35	1.00	0.00	1.45	-76.05	-13.55
			Cálculo 2. SVV/2	1.35	1.00	0.00	1.20	-74.39	-13.55
			Combinación pésima. Cálculo 1. Tren A				-47.30	-23.67	

Empotramiento superior de hastial	Eje de estructura	442	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	-45.04	-46.32	
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-48.49	-44.24	
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-47.65	-44.59	
			Cálculo 2. SW/0	1.35	1.35	1.35	1.45	-47.61	-43.11	
			Cálculo 2. SW/2	1.35	1.35	1.35	1.20	-45.92	-41.71	
	Borde estructura	871	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	-99.69	-44.06	
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-102.28	-41.74	
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-93.50	-40.48	
			Cálculo 2. SW/0	1.35	1.35	1.35	1.45	-93.80	-39.33	
			Cálculo 2. SW/2	1.35	1.35	1.35	1.20	-93.05	-38.58	
			Combinación pésima. Cálculo 1. Tren A						-45.04	-46.32

Empotramiento de dintel	Eje de estructura	1499	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	-17.83	-42.15
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-16.56	-38.52
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-15.68	-39.01
			Cálculo 2. SW/0	1.35	1.35	1.35	1.45	-15.18	-37.30
			Cálculo 2. SW/2	1.35	1.35	1.35	1.20	-15.06	-36.18
	Borde estructura	2126	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	-10.53	-24.93
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-8.54	-24.54
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-7.47	-22.71
			Cálculo 2. SW/0	1.35	1.35	1.35	1.45	-7.30	-22.41
			Cálculo 2. SW/2	1.35	1.35	1.35	1.20	-7.84	-22.27
			Combinación pésima. Cálculo 1. Tren A					-17.83	-42.15

Centro de dintel	Eje de estructura	1508	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-15.11	10.54
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-15.11	10.54
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-13.39	13.85
			Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-13.39	13.85
			Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-13.39	13.85
	Borde estructura	2135	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-25.47	8.35
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-25.47	8.35
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-22.37	11.20
			Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-22.37	11.20
			Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-22.37	11.20
Combinación pésima. Cálculo 1. Tren A								-25.47	8.35

Empotramiento solera	Eje de estructura	3643	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	-1.07	12.28
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	-1.07	12.28
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-13.91	20.13
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-13.91	20.13
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-13.91	20.13
	Borde estructura	4270	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	5.90	13.68
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	5.90	13.68
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-18.41	20.21
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-18.41	20.21
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-18.41	20.21
Combinación pésima. Cálculo 1. Tren A								-1.07	12.28

Centro solera	Eje de estructura	3652	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	-0.09	-81.34
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-0.85	-87.00
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-13.16	-75.62
			Cálculo 2. SW/0	1.35	1.00	0.00	1.45	-13.47	-76.82
			Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-13.54	-74.88
	Borde estructura	4278	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	-2.14	-68.61
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-2.79	-73.56
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-24.00	-63.55
			Cálculo 2. SW/0	1.35	1.00	0.00	1.45	-24.22	-64.63
			Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-24.11	-63.02
Combinación pésima. Cálculo 1. Tren B							-0.85	-87.00	

Envoltorio de M(-) en E.L.S. (Tracciones en cara exterior de hastiales y dintel y superior en solera).

				Coeficientes				N	M
Sección	Situación al.	Elemento	Cálculo	PP+CM	E.t	E.sc	Sobrecarga	T/m	mT/m
Empotramiento inferior de hastial	Eje de estructura	430	Cálculo 1. Tren A	1.00	1.00	1.00	1.00	-35.36	-28.86
			Cálculo 1. Tren B	1.00	1.00	1.00	1.00	-38.33	-31.32
			Cálculo 2. LM-71	1.00	1.00	1.00	1.00	-38.79	-31.32
			Cálculo 2. SW/0	1.00	1.00	1.00	1.00	-39.53	-32.04
			Cálculo 2. SW/2	1.00	1.00	1.00	1.00	-41.14	-32.99
	Borde estructura	859	Cálculo 1. Tren A	1.00	1.00	1.00	1.00	-145.42	-42.00
			Cálculo 1. Tren B	1.00	1.00	1.00	1.00	-157.90	-45.88
			Cálculo 2. LM-71	1.00	1.00	1.00	1.00	-160.61	-45.98
			Cálculo 2. SW/0	1.00	1.00	1.00	1.00	-163.54	-47.06
			Cálculo 2. SW/2	1.00	1.00	1.00	1.00	-171.07	-48.63
Combinación pésima. Cálculo 2. SW/2								-41.14	-32.99

Media del hastial	Eje de estructura	436	Cálculo 1. Tren A	1.00	0.00	0.00	1.00	-31.53	-15.78
			Cálculo 1. Tren B	1.00	0.00	0.00	1.00	-35.11	-15.78
			Cálculo 2. LM-71	1.00	1.00	0.00	1.00	-35.99	-5.44
			Cálculo 2. SW/0	1.00	1.00	0.00	1.00	-36.84	-5.44
			Cálculo 2. SW/2	1.00	1.00	0.00	1.00	-38.79	-5.44
	Borde estructura	865	Cálculo 1. Tren A	1.00	0.00	0.00	1.00	-52.78	-17.90
			Cálculo 1. Tren B	1.00	0.00	0.00	1.00	-55.20	-17.90
			Cálculo 2. LM-71	1.00	1.00	0.00	1.00	-54.08	-7.28
			Cálculo 2. SW/0	1.00	1.00	0.00	1.00	-54.47	-7.28
			Cálculo 2. SW/2	1.00	1.00	0.00	1.00	-56.63	-7.28
Combinación pésima. Cálculo 1. Tren A							-31.53	-15.78	

Empotramiento superior de hastial	Eje de estructura	442	Cálculo 1. Tren A	1.00	1.00	1.00	1.00	-30.03	-30.88
			Cálculo 1. Tren B	1.00	1.00	1.00	1.00	-32.33	-29.50
			Cálculo 2. LM-71	1.00	1.00	1.00	1.00	-34.01	-31.89
			Cálculo 2. SW/0	1.00	1.00	1.00	1.00	-33.98	-30.87
			Cálculo 2. SW/2	1.00	1.00	1.00	1.00	-36.20	-32.70
	Borde estructura	871	Cálculo 1. Tren A	1.00	1.00	1.00	1.00	-66.46	-28.37
			Cálculo 1. Tren B	1.00	1.00	1.00	1.00	-68.19	-27.83
			Cálculo 2. LM-71	1.00	1.00	1.00	1.00	-68.71	-29.36
			Cálculo 2. SW/0	1.00	1.00	1.00	1.00	-68.91	-28.56
			Cálculo 2. SW/2	1.00	1.00	1.00	1.00	-69.88	-29.54
Combinación pésima. Cálculo 2. SW/2								-36.20	-32.70

CÁLCULO DE ARMADURAS

Proyecto : L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
Estructura: E-1516.8

Notación: PP= Peso propio
CM= Carga muerta de traviesas, carriles y balasto
E,t= Empuje de tierras

E,sc= Empuje de tierras debido a una sobrecarga de 3 t/m²
Tren A= Tren de cargas tipo A de la norma española.
Tren B= Tren de cargas tipo B de la norma española.

LM-71= Load model 71 del Eurocodigo 1
SW/D= Tren pesado tipo SW/D del Eurocodigo 1
SW/2= Tren pesado tipo SW/2 del Eurocodigo 1

Envolvente de V(+) en E.L.U.

Sección	Situación el.	Elemento	Cálculo	Coeficientes				Vd mT/m
				PP+CM	E,t	E,sc	Sobrecarga	
Empotramiento inferior de hastial	Eje de estructura	430	Cálculo 1. Tren A	0.90	0.00	0.00	1.50	1.29
			Cálculo 1. Tren B	0.90	0.00	0.00	1.50	0.41
			Cálculo 2. LM-71	1.00	1.00	0.00	1.45	-11.65
			Cálculo 2. SW/D	1.00	1.00	0.00	1.45	-12.03
			Cálculo 2. SW/2	1.00	1.00	0.00	1.20	-12.14
	Borde estructura	859	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	13.54
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	12.74
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-3.02
			Cálculo 2. SW/D	1.35	1.00	0.00	1.45	-3.42
			Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-3.72
Combinación pésima. Cálculo 1. Tren A								13.54

Medio del hastial	Eje de estructura	436	Cálculo 1. Tren A	0.90	1.50	0.00	1.50	3.21
			Cálculo 1. Tren B	0.90	1.50	0.00	1.50	2.28
			Cálculo 2. LM-71	1.00	1.35	0.00	1.45	2.47
			Cálculo 2. SW/D	1.00	1.35	0.00	1.45	2.06
			Cálculo 2. SW/2	1.00	1.35	0.00	1.20	1.95
	Borde estructura	865	Cálculo 1. Tren A	0.90	1.50	0.00	1.50	0.78
			Cálculo 1. Tren B	0.90	1.50	0.00	0.00	-0.38
			Cálculo 2. LM-71	1.00	1.35	0.00	0.00	-0.86
			Cálculo 2. SW/D	1.00	1.35	0.00	0.00	-0.86
			Cálculo 2. SW/2	1.00	1.35	0.00	0.00	-0.86
Combinación pésima. Cálculo 1. Tren A								3.21

Empotramiento superior de hastial	Eje de estructura	442	Cálculo 1. Tren A	0.90	1.50	1.50	1.50	19.36
			Cálculo 1. Tren B	0.90	1.50	1.50	1.50	17.78
			Cálculo 2. LM-71	1.00	1.35	1.35	1.45	16.81
			Cálculo 2. SW/D	1.00	1.35	1.35	1.45	16.12
			Cálculo 2. SW/2	1.00	1.35	1.35	1.20	15.96
	Borde estructura	871	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	12.96
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	12.96
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	9.86
			Cálculo 2. SW/D	1.00	1.35	1.35	0.00	9.86
			Cálculo 2. SW/2	1.00	1.35	1.35	0.00	9.86
Combinación pésima. Cálculo 1. Tren A								19.36

Empotramiento de dintel	Eje de estructura	1499	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-11.40
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-11.40
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-12.71
			Cálculo 2. SW/D	1.00	1.35	1.35	0.00	-12.71
			Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-12.71
	Borde estructura	2126	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-23.17
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-23.17
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-30.58
			Cálculo 2. SW/D	1.00	1.35	1.35	0.00	-30.58
			Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-30.58
Combinación pésima. Cálculo 1. Tren A								-11.40

Centro de dintel	Eje de estructura	1508	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	0.00
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	0.00
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	0.00
			Cálculo 2. SW/D	1.35	1.35	1.35	1.45	0.00
			Cálculo 2. SW/2	1.35	1.35	1.35	1.20	0.00
	Borde estructura	2135	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	2.15
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	2.15
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	0.08
			Cálculo 2. SW/D	1.00	1.35	1.35	0.00	0.08
			Cálculo 2. SW/2	1.00	1.35	1.35	0.00	0.08
				Combinación pésima. Cálculo 1. Tren A				2.15

Empotramiento solera	Eje de estructura	3643	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	42.96
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	46.87
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	43.33
			Cálculo 2. SW/D	1.35	1.35	1.35	1.45	44.25
			Cálculo 2. SW/2	1.35	1.35	1.35	1.20	43.29
	Borde estructura	4270	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	167.87
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	179.84
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	155.81
			Cálculo 2. SW/D	1.35	1.00	0.00	1.45	158.44
			Cálculo 2. SW/2	1.35	1.00	0.00	1.20	154.49
Combinación pésima. Cálculo 1. Tren B								179.84

Centro solera	Eje de estructura	3652	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	0.00
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	0.00
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	0.00
			Cálculo 2. SW/D	1.00	1.35	1.35	0.00	0.00
			Cálculo 2. SW/2	1.00	1.35	1.35	0.00	0.00
	Borde estructura	4279	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	29.38
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	31.18
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	23.28
			Cálculo 2. SW/D	1.35	1.00	0.00	1.45	23.62
			Cálculo 2. SW/2	1.35	1.00	0.00	1.20	22.92
Combinación pésima. Cálculo 1. Tren B							31.18	

Envolvente de V(-) en E.L.U.

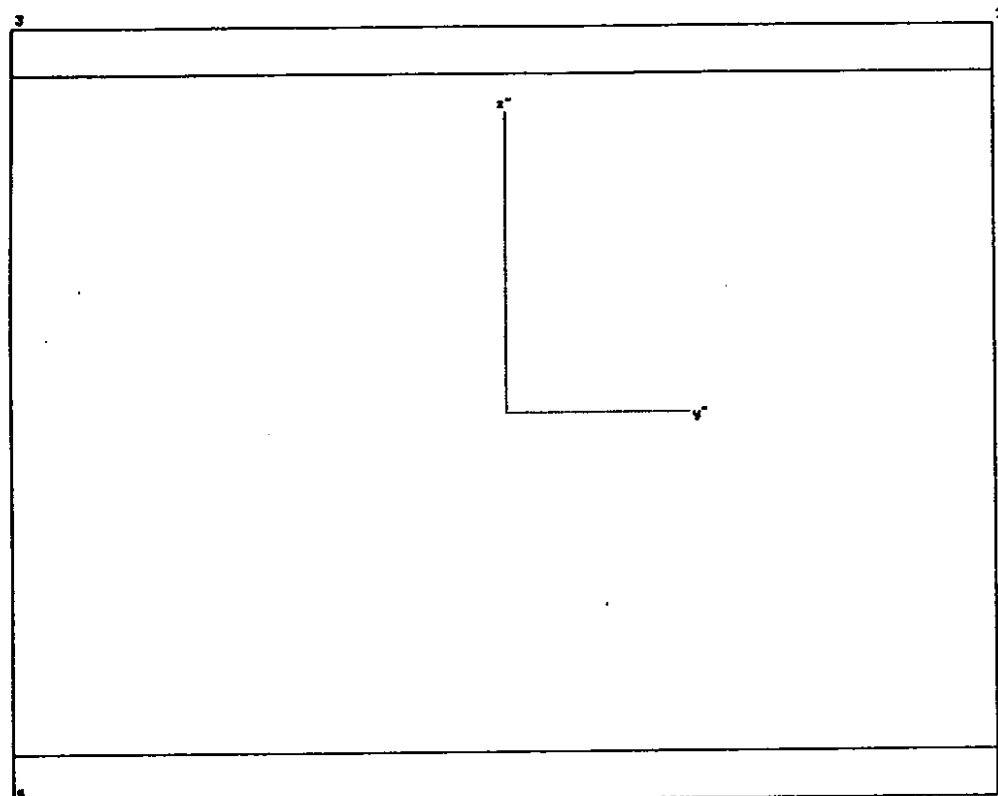
Envoltura de V ₁ en E.L.S.				Coeficientes				Vd mT/m
Sección	Situación el.	Elemento	Cálculo	PP+CM	E _t	E _{sc}	Sobrecarga	
Empotramiento inferior de hastial	Eje de estructura	430	Cálculo 1. Tren A	1.50	1.50	1.50	0.00	-26.91
			Cálculo 1. Tren B	1.50	1.50	1.50	0.00	-26.91
			Cálculo 2. LM-71	1.35	1.35	1.35	0.00	-24.22
			Cálculo 2. SW/D	1.35	1.35	1.35	0.00	-24.22
			Cálculo 2. SW/2	1.35	1.35	1.35	0.00	-24.22
	Borde estructura	859	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-26.37
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-26.37
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-22.66
			Cálculo 2. SW/D	1.00	1.35	1.35	0.00	-22.66
			Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-22.66
				Combinación pésima. Cálculo 1. Tren A				-26.91

Media del hastial	Eje de estructura	436	Cálculo 1. Tren A	1.50	0.00	1.50	0.00	-2.06
			Cálculo 1. Tren B	1.50	0.00	1.50	0.00	-2.06
			Cálculo 2. LM-71	1.35	1.00	1.35	0.00	-0.58
			Cálculo 2. SW/D	1.35	1.00	1.35	0.00	-0.58
			Cálculo 2. SW/2	1.35	1.00	1.35	0.00	-0.58
	Borde estructura	865	Cálculo 1. Tren A	1.50	0.00	1.50	0.00	-4.21
			Cálculo 1. Tren B	1.50	0.00	1.50	1.50	-5.06
			Cálculo 2. LM-71	1.35	1.00	1.35	1.45	-2.63
			Cálculo 2. SW/D	1.35	1.00	1.35	1.45	-3.32
			Cálculo 2. SW/2	1.35	1.00	1.35	1.20	-3.26
Combinación pésima. Cálculo 1. Tren B								-5.06

Empotramiento superior de hastial	Eje de estructura	442	Cálculo 1. Tren A	1.50	0.00	0.00	0.00	-2.03
			Cálculo 1. Tren B	1.50	0.00	0.00	0.00	-2.03
			Cálculo 2. LM-71	1.35	1.00	0.00	0.00	5.20
			Cálculo 2. SW/D	1.35	1.00	0.00	0.00	5.20
			Cálculo 2. SW/2	1.35	1.00	0.00	0.00	5.20
	Borde estructura	871	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	-22.72
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-23.28
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-13.43
			Cálculo 2. SW/D	1.35	1.00	0.00	1.45	-13.41
			Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-12.76
			Combinación pésima. Cálculo 1. Tren B					-23.26

Empotramiento de dintel	Eje de estructura	1499	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	-30.08
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-33.71
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-32.52
			Cálculo 2. SW/0	1.35	1.00	0.00	1.45	-32.66
			Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-31.63
	Borde estructura	2126	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	-90.79
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-91.80
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-74.96
			Cálculo 2. SW/0	1.35	1.00	0.00	1.45	-74.73
			Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-73.66
			Combinación pésima. Cálculo 1. Tren B					-91.80

Mstb. 1 : 7.0



Sección : "DINTEL" Armadura : "B1"
Tipo : tipo viga/ Rectángulo Unidades : [cm]
Material : "H250"

Ancho = 100.00 cm Canto = 80.00 cm

Características mecánicas de la sección:
Area : Ax= 0.800000 [m2]
Momentos de inercia : Iy= 0.042667 [m4] Iz= 0.066667 [m4]
Inercia a torsión : Ix= 0.087559 [m4]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.400000 [m]

I: R=dist.borde [m] W=I/R [m3] W/Ax [m]
Izq. Iz -0.500 -0.133333 0.167
dch. Iz 0.500 0.133333 -0.167
abajo Iy -0.400 -0.106667 0.133
arriba Iy 0.400 0.106667 -0.133

Armadura: "B1"

Nº	Nom.mat	Cod.dim.	Area [cm2]	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]
1	AEH500	(2)	0.00	-50.00	5.00	50.00	5.00
2	AEH500	(2)	0.00	-50.00	75.00	50.00	75.00

Total: 0.00 Cuantía de armadura: 0.000 [o/o]

Cód. dimensionamiento: (0) = As constante
Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada
Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero"AEH500"/Hormigón"H250")
Cortante Area mín.cercos Ancho alma ideal Canto útil Incl.bielas

Vz	0.00 [cm2/m]	100.00 [cm]	76.00 [cm]	0.00
Vy	0.00 [cm2/m]	80.00 [cm]	96.00 [cm]	0.00

Características del material:

Nom.Mat.	Módulo E [N/mm2]	0.85*fcd,fyd [N/mm2]	eps-fc [o/oo]	fct [N/mm2]	fcv [N/mm2]	fcw,mín [N/mm2]
"H250"	30000.0	-14.160	-2.000	0.0	0.646000	25.000
"AEH500"	210000.0	443.470				

Leyenda:

fcd,fyd resistencia de cálculo del hormigón,acero
eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)
fct resistencia de cálculo a tracción del hormigón
fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Dimensionamiento : Viga "DINTEL"/"B1"

Esfuerzos (Rotura)	N	Vy	Vz	Mx	My	Mz	Alpha
	7.600				39.810		45.0

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	13.31	13.31
2 "AEH500"	-50.0	75.0	50.0	75.0	0.00	-	0.00

Cuantía arm. 0.17 [o/o] Suma 13.31

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Deformaciones y tensiones extremas (Rotura):

1	Coordenadas	Eps	Estado-II	
	y [cm] z [cm]	[o/oo]	[kp/cm2]	
Hormigón-Min	-50.00 80.00	-1.158	-116.511	"H250"
Armadura-Min	-50.00 75.00	-0.414	-869.938	"AEH500"
Hormigón-Max	50.00 0.00	10.744	0.000	"H250"
Armadura-Max	50.00 5.00	10.000	4434.700	"AEH500"

Fibra neutra zn 72.22 cm yn -0.00 cm Angulo 0.0
Ancho zona comprim. 7.78 cm Zona comprimida/Canto útil 0.10

Dimensionamiento : Viga "DINTEL"/"B1"

Esfuerzos (Rotura)	N	Vy	Vz	Mx	My	Mz	Alpha
	-0.760000				71.100		45.0

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	22.56	22.56
2 "AEH500"	-50.0	75.0	50.0	75.0	0.00	-	0.00

Cuantía arm. 0.28 [o/o] Suma 22.56

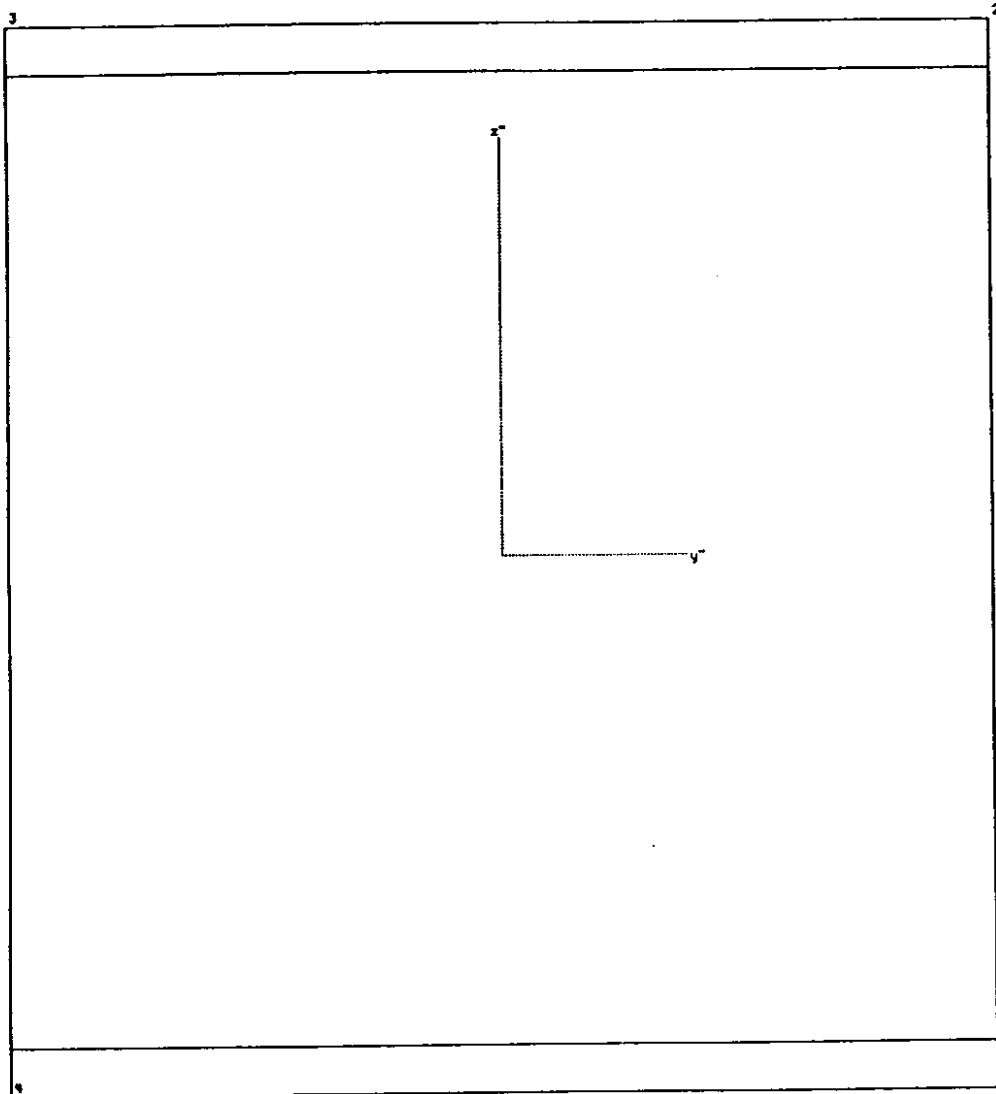
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Deformaciones y tensiones extremas (Rotura):

1	Coordenadas	Eps	Estado-II	
	y [cm] z [cm]	[o/oo]	[kp/cm2]	
Hormigón-Min	-50.00 80.00	-1.787	-140.001	"H250"
Armadura-Min	-50.00 75.00	-1.002	-2103.480	"AEH500"
Hormigón-Max	50.00 0.00	10.786	0.000	"H250"
Armadura-Max	50.00 5.00	10.000	4434.700	"AEH500"

Fibra neutra zn 68.63 cm yn -0.00 cm Angulo 0.0
Ancho zona comprim. 11.37 cm Zona comprimida/Canto útil 0.15

Hstb. 1 : 7.0



Sección : "CARTELA" Armadura : "B1"
Tipo : tipo viga/ Rectángulo Unidades : [cm]
Material : "H250"

Ancho = 100.00 cm Canto = 110.00 cm

Características mecánicas de la sección:
Area : Ax= 1.100 [m2]
Momentos de inercia : Iy= 0.110917 [m4] Iz= 0.091667 [m4]
Inercia a torsión : Ix= 0.168506 [m4]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.550000 [m]

I: R=dist.borde [m] W=I/R [m3] W/Ax [m]
izq. Iz -0.500 -0.183333 0.167
dch. Iz 0.500 0.183333 -0.167

Dimensionamiento : Viga "CARTELA"/"B1"

Esfuerzos (Rotura)							Unidades : [tm]	
N	Vy	Vz	Mx	My	Mz	Alpha		
-17.830				-42.150		45.0		

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	-	0.00
2 "AEH500"	-50.0	105.0	50.0	105.0	0.00	7.28	7.28

Cuantía arm. 0.07 [o/o] Suma 7.28

SUP. DINTEL

Deformaciones y tensiones extremas (Rotura):
1 Coordenadas Eps Estado-II
y [cm] z [cm] [o/oo] [kp/cm2]

Hormigón-Min	50.00	0.00	-0.937	-101.622	"H250"
Armadura-Min	50.00	5.00	-0.416	-874.599	"AEH500"
Hormigón-Max	-50.00	110.00	10.521	0.000	"H250"
Armadura-Max	-50.00	105.00	10.000	4434.700	"AEH500"

Fibra neutra zn 9.00 cm yn 0.00 cm Angulo 0.0
Ancho zona comprim. 9.00 cm Zona comprimida/Canto útil 0.09

Dimensionamiento : Viga "CARTELA"/"B1"

Esfuerzos (Rotura)							Unidades : [tm]	
N	Vy	Vz	Mx	My	Mz	Alpha		
-9.540				-24.540		45.0		

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	-	0.00
2 "AEH500"	-50.0	105.0	50.0	105.0	0.00	4.28	4.28

Cuantía arm. 0.04 [o/o] Suma 4.29

SUP. DINTEL
BORDE

abajo ly -0.550 -0.201666 0.183
arriba ly 0.550 0.201666 -0.183

Armadura : "B1"

N	Nom.mat	Cod.dim.	Area	y1	z1	y2	z2
			[cm2]	[cm]	[cm]	[cm]	[cm]
1	AEH500	(2)	0.00	-50.00	5.00	50.00	5.00
2	AEH500	(2)	0.00	-50.00	105.00	50.00	105.00

Total: 0.00 Cuantía de armadura: 0.000 [o/o]

Cód. dimensionamiento: (0) = As constante
Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada
Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero"AEH500"/Hormigón"H250")
Cortante Area mín.cercos Ancho alma ideal Canto útil Incl.bielas

Vz	0.00 [cm2/m]	100.00 [cm]	106.00 [cm]	0.00
Vy	0.00 [cm2/m]	110.00 [cm]	96.00 [cm]	0.00

Características del material:

Nom.Mat.	Módulo E	0.85*fcd,fyd	eps-fc	fct	fcv	fcw,mfn
	[kp/cm2]	[kp/cm2]	[o/oo]	[kp/cm2]	[kp/cm2]	[kp/cm2]
"H250"	300000.0	-141.600	-2.000	0.0	6.460	250.000
"AEH500"	2.10E+06	4434.700				

Leyenda:

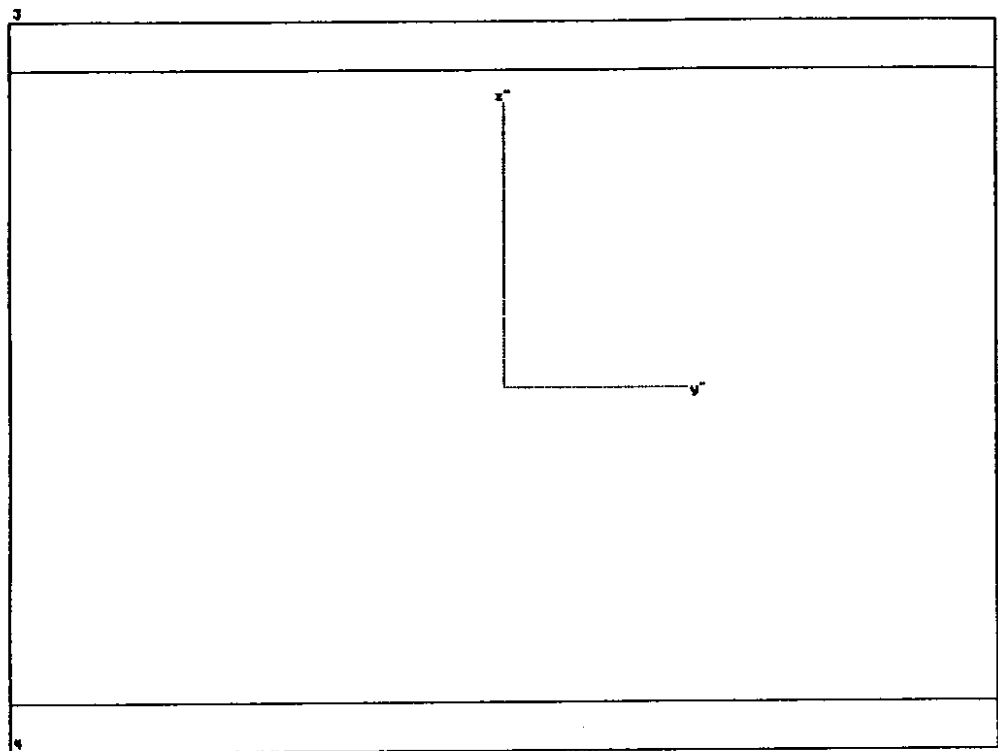
fcd,fyd resistencia de cálculo del hormigón,acero
eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)
fct resistencia de cálculo a tracción del hormigón
fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas		Eps	Estado-II	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	
Hormigón-Min	50.00	0.00	-0.681	-79.981	"H250"
Armadura-Min	50.00	5.00	-0.172	-361.336	"AEH500"
Hormigón-Max	-50.00	110.00	10.509	0.000	"H250"
Armadura-Max	-50.00	105.00	10.000	4434.700	"AEH500"

Fibra neutra zn 6.69 cm yn 0.00 cm Angulo 0.0
Ancho zona comprim. 6.69 cm Zona comprimida/Canto útil 0.06

Hstb. 1 : 7.0



Sección : "HASTIAL"
Tipo : tipo viga/ Rectángulo
Material : "H250"

Armadura : "B1"
Unidades : [cm]

Ancho = 100.00 cm Canto = 75.00 cm

Características mecánicas de la sección:
Area : Ax= 0.750000 [m2]
Momentos de inercia : Iy= 0.035156 [m4] Iz= 0.062500 [m4]
Inercia a torsión : Ix= 0.075915 [m4]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.375000 [m]

I: R=dist.borde [m] W=I/R [m3] W/Ax [m]
Izq. Iz -0.500 -0.125000 0.167
dch. Iz 0.500 0.125000 -0.167
abajo Iy -0.375 -0.093750 0.125
arriba Iy 0.375 0.093750 -0.125

Armadura: "B1"

Nº	Nom.mat	Cod.dim.	Area [cm2]	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]
1	AEH500	(2)	0.00	-50.00	5.00	50.00	5.00
2	AEH500	(2)	0.00	-50.00	70.00	50.00	70.00

Total: 0.00 Cuantía de armadura: 0.000 [o/o]

Cód. dimensionamiento: (0) = As constante
Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada
Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero"AEH500"/Hormigón"H250")
Cortante Area mín.cercos Ancho alma ideal Canto útil Incl.bielas
Vz 0.00 [cm2/m] 100.00 [cm] 71.00 [cm] 0.00
Vy 0.00 [cm2/m] 75.00 [cm] 96.00 [cm] 0.00

Características del material:
Nom.Mat. Módulo E 0.85*fcd,fyd eps-fc fct fcv fcu,mín
[kp/cm2] [kp/cm2] [o/o] [kp/cm2] [kp/cm2] [kp/cm2]
"H250" 300000.0 -141.600 -2.000 0.0 6.460 250.000
"AEH500" 2.10E+06 4434.700

Leyenda:
fcd,fyd resistencia de cálculo del hormigón,acero
eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)
fct resistencia de cálculo a tracción del hormigón
fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Dimensionamiento : Viga "HASTIAL"/"B1"

Esfuerzos (Rotura) Unidades : [tm]
N Vy Vz Mx My Mz Alpha
-57.490 -46.980 45.0
Armadura y1 z1 y2 z2 dado dimens. As-nuevo
Longitudinal: [cm] [cm] [cm] [cm] [cm2] [cm2] [cm2]
1 "AEH500" -50.0 5.0 50.0 5.0 0.00 - 0.00
2 "AEH500" -50.0 70.0 50.0 70.0 0.00 9.50 9.50
Cuantía arm. 0.13 [o/o] Suma 9.50

EXT. HASTIAL
BASE

Deformaciones y tensiones extremas (Rotura):
1 Coordenadas Eps Estado-II
y [cm] z [cm] [o/o] [kp/cm2]
Hormigón-Min 50.00 0.00 -1.861 -140.911 "H250"
Armadura-Min 50.00 5.00 -1.013 -2128.014 "AEH500"
Hormigón-Max -50.00 75.00 10.847 0.000 "H250"
Armadura-Max -50.00 70.00 10.000 4434.700 "AEH500"

Fibra neutra zn 10.98 cm yn 0.00 cm Angulo 0.0
Ancho zona comprim. 10.98 cm Zona comprimida/Canto útil 0.16

Dimensionamiento : Viga "HASTIAL"/"B1"

Esfuerzos (Rotura) Unidades : [tm]
N Vy Vz Mx My Mz Alpha
-47.300 -23.670 45.0
Armadura y1 z1 y2 z2 dado dimens. As-nuevo
Longitudinal: [cm] [cm] [cm] [cm] [cm2] [cm2] [cm2]
1 "AEH500" -50.0 5.0 50.0 5.0 0.00 - 0.00
2 "AEH500" -50.0 70.0 50.0 70.0 0.00 2.45 2.45
Cuantía arm. 0.03 [o/o] Suma 2.45

EXT. HASTIAL
MEDIO

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas		Eps	Estado-II	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	
Hormigón-Min	50.00	0.00	-1.305	-124.503	"H250"
Armadura-Min	50.00	5.00	-0.498	-1044.843	"AEH500"
Hormigón-Max	-50.00	75.00	10.808	0.000	"H250"
Armadura-Max	-50.00	70.00	10.000	4434.700	"AEH500"

Fibra neutra	zn	8.08 cm	yn	0.00 cm	Angulo	0.0
Ancho zona comprim.		8.08 cm	Zona comprimida/Canto útil			0.12

Dimensionamiento : Viga "HASTIAL"/"B1"

Esfuerzos (Rotura)							Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	Alpha	
-45.040					-46.320		45.0

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	-	0.00
2 "AEH500"	-50.0	70.0	50.0	70.0	0.00	10.63	10.63

Cuanta arm. 0.14 [o/o] Suma 10.63

EXT. HASTIAL
SUP

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas		Eps	Estado-II	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	
Hormigón-Min	50.00	0.00	-1.769	-139.711	"H250"
Armadura-Min	50.00	5.00	-0.928	-1949.509	"AEH500"
Hormigón-Max	-50.00	75.00	10.841	0.000	"H250"
Armadura-Max	-50.00	70.00	10.000	4434.700	"AEH500"

Fibra neutra	zn	10.52 cm	yn	0.00 cm	Angulo	0.0
Ancho zona comprim.		10.52 cm	Zona comprimida/Canto útil			0.15

Dimensionamiento : Viga "HASTIAL"/"B1"

Esfuerzos (Rotura)							Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	Alpha	
-236.850					-68.830		45.0

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	-	0.00
2 "AEH500"	-50.0	70.0	50.0	70.0	0.00	0.16	0.16

Cuanta arm. 0.00 [o/o] Suma 0.16

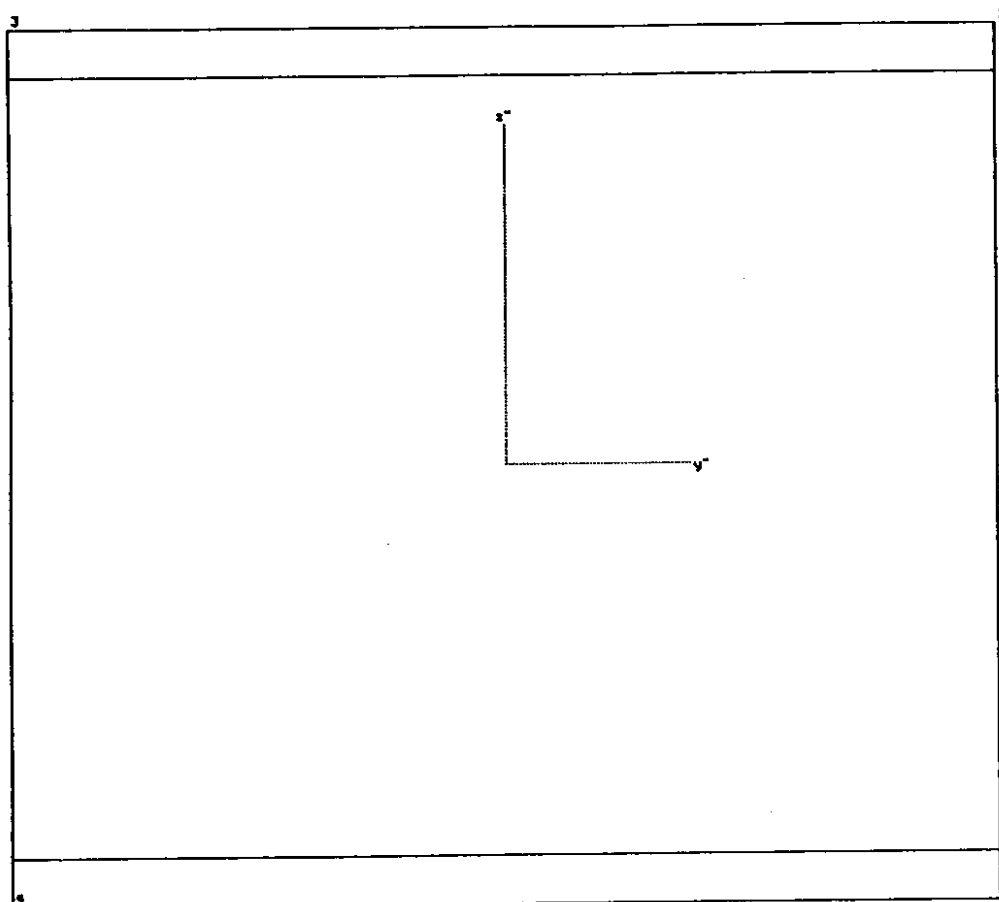
EXT. HASTIAL
BORDE (BASE)

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas		Eps	Estado-II	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	
Hormigón-Min	50.00	0.00	-3.500	-141.600	"H250"
Armadura-Min	50.00	5.00	-2.656	-4434.700	"AEH500"
Hormigón-Max	-50.00	75.00	9.159	0.000	"H250"
Armadura-Max	-50.00	70.00	8.315	4434.700	"AEH500"

Fibra neutra	zn	20.74 cm	yn	0.00 cm	Angulo	0.0
Ancho zona comprim.		20.74 cm	Zona comprimida/Canto útil			0.30

Mstb. 1 : 7.0



Sección : "SOLERA" Armadura : "B1"
Tipo : tipo viga/ Rectángulo Unidades : [cm]
Material : "H250"

Ancho = 100.00 cm Canto = 90.00 cm

Características mecánicas de la sección:

Area : Ax= 0.900000 [m2]
Momentos de inercia : Iy= 0.060750 [m4] Iz= 0.075000 [m4]
Inercia a torsión : Ix= 0.112680 [m4]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.450000 [m]

I: R=dist.borde [m] W=I/R [m3] W/Ax [m]
izq. Iz -0.500 -0.150000 0.167
dch. Iz 0.500 0.150000 -0.167
abajo Iy -0.450 -0.135000 0.150
arriba Iy 0.450 0.135000 -0.150

Armadura: "B1"

Nº	Nom.mat	Cod.dim.	Area [cm2]	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]
1	AEH500	(2)	0.00	-50.00	5.00	50.00	5.00
2	AEH500	(2)	0.00	-50.00	85.00	50.00	85.00
Total:			0.00	Cuantía de armadura: 0.000 [o/o]			

Cód. dimensionamiento: (0) = As constante
Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada
Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero"AEH500"/Hormigón"H250")

Cortante Area mín.cercos Ancho alma ideal Canto útil Incl.bielas

Vz	0.00 [cm2/m]	100.00 [cm]	86.00 [cm]	0.00
Vy	0.00 [cm2/m]	90.00 [cm]	96.00 [cm]	0.00

Características del material:

Nom.Mat.	Módulo E [kp/cm2]	0.85*fcd,fyd [kp/cm2]	eps-fc [o/o]	fct [kp/cm2]	fcv [kp/cm2]	fcw,mín [kp/cm2]
"H250"	300000.0	-141.600	-2.000	0.0	6.460	250.000
"AEH500"	2.10E+06	4434.700				

Leyenda:

fcd,fyd resistencia de cálculo del hormigón,acero

eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)

fct resistencia de cálculo a tracción del hormigón

fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Dimensionamiento : Viga "SOLERA"/"B1"

Esfuerzos (Rotura)							Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	Alpha	
-25.980				40.260		45.0	

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	8.11	8.11
2 "AEH500"	-50.0	85.0	50.0	85.0	0.00	-	0.00

Cuantía arm. 0.09 [o/o] Suma 8.11

INF. SOLERA

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas		Eps	Estado-II	
	y [cm]	z [cm]	[o/o]	[kp/cm2]	
Hormigón-Min	-50.00	90.00	-1.201	-118.998	"H250"
Armadura-Min	-50.00	85.00	-0.542	-1138.352	"AEH500"
Hormigón-Max	50.00	0.00	10.659	0.000	"H250"
Armadura-Max	50.00	5.00	10.000	4434.700	"AEH500"

Fibra neutra	zn	80.89 cm	yn	-0.00 cm	Angulo	0.0
Ancho zona comprim.		9.11 cm	Zona comprimida/Canto útil			0.11

Dimensionamiento : Viga "SOLERA"/"B1"

Esfuerzos (Rotura)							Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	Alpha	
-35.880				41.440		45.0	

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	7.33	7.33
2 "AEH500"	-50.0	85.0	50.0	85.0	0.00	-	0.00

Cuantía arm. 0.08 [o/o] Suma 7.33

INF. SOLERA BORDE

Deformaciones y tensiones extremas (Rotura):

1 Coordinadas Eps Estado-II
y [cm] z [cm] [o/oo] [kp/cm2]

Hormigón-Min	-50.00	90.00	-1.277	-123.100	"H250"
Armadura-Min	-50.00	85.00	-0.614	-1288.819	"AEH500"
Hormigón-Max	50.00	0.00	10.663	0.000	"H250"
Armadura-Max	50.00	5.00	10.000	4434.700	"AEH500"

Fibra neutra zn 80.37 cm yn -0.00 cm Angulo 0.0
Ancho zona comprim. 9.63 cm Zona comprimida/Canto útil 0.11

Dimensionamiento : Viga "SOLERA"/"B1"

Esfuerzos (Rotura)							Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	Alpha	
-0.850000				-87.000			45.0

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	-	0.00
2 "AEH500"	-50.0	85.0	50.0	85.0	0.00	24.30	24.30

Cuántia arm. 0.27 [o/o] Suma 24.30

SUP. SOLERA

Deformaciones y tensiones extremas (Rotura):

1 Coordinadas Eps Estado-II
y [cm] z [cm] [o/oo] [kp/cm2]

Hormigón-Min	50.00	0.00	-1.723	-138.882	"H250"
Armadura-Min	50.00	5.00	-1.033	-2169.971	"AEH500"
Hormigón-Max	-50.00	90.00	10.690	0.000	"H250"
Armadura-Max	-50.00	85.00	10.000	4434.700	"AEH500"

Fibra neutra zn 12.49 cm yn 0.00 cm Angulo 0.0
Ancho zona comprim. 12.49 cm Zona comprimida/Canto útil 0.15

Dimensionamiento : Viga "SOLERA"/"B1"

Esfuerzos (Rotura)							Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	Alpha	
-2.790				-73.560			45.0

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	-	0.00
2 "AEH500"	-50.0	85.0	50.0	85.0	0.00	20.19	20.19

Cuántia arm. 0.22 [o/o] Suma 20.19

SUP. SOLERA
BORDE

Deformaciones y tensiones extremas (Rotura):

1 Coordinadas Eps Estado-II
y [cm] z [cm] [o/oo] [kp/cm2]

Hormigón-Min	50.00	0.00	-1.544	-134.255	"H250"
Armadura-Min	50.00	5.00	-0.865	-1817.335	"AEH500"
Hormigón-Max	-50.00	90.00	10.679	0.000	"H250"
Armadura-Max	-50.00	85.00	10.000	4434.700	"AEH500"

Fibra neutra zn 11.37 cm yn 0.00 cm Angulo 0.0
Ancho zona comprim. 11.37 cm Zona comprimida/Canto útil 0.13

PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA TT1

Obra : L.A.V. MADRID - ZARAGOZA. Subtramo XV.E-1516.8.EMPOTRAMIENTO DINTEL.
Fecha: 29/6/1998
Hora : 15:16

CALCULO A CORTANTE DE SECCIONES RECTANGULARES

1. Datos

- Materiales:

fck [kp/cm²] = 250
fyk [kp/cm²] = 5100
GammaC = 1.50
GammaS = 1.15

- Tipo de Elemento Estructural:

Tipo: viga
En el cálculo no se considera la armadura comprimida

- Sección

b [cm] = 100.0
h [cm] = 110.0
r [cm] = 5.0

2. Dimensionamiento con cercos a 90°

Vd [Mp] = 33.71

A90_est [cm²/m] = 0.00

Vcu [Mp] = 67.78
Vu1 [Mp] = 525.00

PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA TT1

Obra : L.A.V. MADRID - ZARAGOZA. Subtramo XV.
E-1516.8. EMPOTRAMIENTO BORDE DINTEL.
Fecha: 29/6/1998
Hora : 16:45

CALCULO A CORTANTE DE SECCIONES RECTANGULARES

1. Datos

- Materiales:

fck [kp/cm²] = 250
fyk [kp/cm²] = 5100
GammaC = 1.50
GammaS = 1.15

- Tipo de Elemento Estructural:

Tipo: viga
En el cálculo no se considera la armadura comprimida

- Sección

b [cm] = 100.0
h [cm] = 110.0
r [cm] = 5.0

2. Dimensionamiento con cercos a 90°

Vd [Mp] = 91.80

A90_est [cm²/m] = 6.05 → 2cφ12/0'20

Vcu [Mp] = 67.78
Vu1 [Mp] = 525.00

PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA TT1

Obra : L.A.V. MADRID - ZARAGOZA. Subtramo XV. E-1516.8. DINTEL (BORDE)
Fecha: 29/6/1998
Hora : 15:16

CALCULO A CORTANTE DE SECCIONES RECTANGULARES

1. Datos

- Materiales:

fck [kp/cm²] = 250
fyk [kp/cm²] = 5100
GammaC = 1.50
GammaS = 1.15

- Tipo de Elemento Estructural:

Tipo: viga
En el cálculo no se considera la armadura comprimida

- Sección

b [cm] = 100.0
h [cm] = 80.0
r [cm] = 5.0

2. Dimensionamiento con cercos a 90°

Vd [Mp] = 25.06

A90_est [cm²/m] = 0.00

Vcu [Mp] = 48.41
Vu1 [Mp] = 375.00

PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA TT1

Obra : L.A.V. MADRID - ZARAGOZA. Subtramo XV. E-1516.8.
Fecha: 29/6/1998
Hora : 15:13

CALCULO A CORTANTE DE SECCIONES RECTANGULARES

1. Datos

- Materiales:

fck [kp/cm²] = 250
fyk [kp/cm²] = 5100
GammaC = 1.50
GammaS = 1.15

- Tipo de Elemento Estructural:

Tipo: viga
En el cálculo no se considera la armadura comprimida

- Sección

b [cm] = 100.0
h [cm] = 75.0
r [cm] = 5.0

2. Dimensionamiento con cercos a 90°

Vd [Mp] = 26.91

A90_est [cm²/m] = 0.00

Vcu [Mp] = 45.18
Vu1 [Mp] = 350.00

PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA TT1

Obra : L.A.V. MADRID - ZARAGOZA. Subtramo XV.E-1516.8.EMPOTRAMIENTO SOLERA.
Fecha: 29/6/1998
Hora : 15:17

CALCULO A CORTANTE DE SECCIONES RECTANGULARES

1. Datos

- Materiales:

fck [kp/cm²] = 250
fyk [kp/cm²] = 5100
GammaC = 1.50
GammaS = 1.15

- Tipo de Elemento Estructural:

Tipo: viga
En el cálculo no se considera la armadura comprimida

- Sección

b [cm] = 100.0
h [cm] = 90.0
r [cm] = 5.0

2. Dimensionamiento con cercos a 90°

Vd [Mp] = 46.67

A90_est [cm²/m] = 0.00

Vcu [Mp] = 54.87
Vu1 [Mp] = 425.00

PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA TT1

Obra : L.A.V. MADRID - ZARAGOZA. Subtramo XV.
E-1516.8. EMPOTRAMIENTO BORDE SOLERA.
Fecha: 29/6/1998
Hora : 16:43

CALCULO A CORTANTE DE SECCIONES RECTANGULARES

1. Datos

- Materiales:

fck [kp/cm²] = 250
fyk [kp/cm²] = 5100
GammaC = 1.50
GammaS = 1.15

- Tipo de Elemento Estructural:

Tipo: viga
En el cálculo no se considera la armadura comprimida

- Sección

b [cm] = 100.0
h [cm] = 90.0
r [cm] = 5.0

2. Dimensionamiento con cercos a 90°

Vd [Mp] = 179.84

A90_est [cm²/m] = 38.90 → 2cφ16/0'20

Vcu [Mp] = 54.87
Vu1 [Mp] = 425.00

PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA TT1

Obra : L.A.V. MADRID - ZARAGOZA. Subtramo XV. E-1516.8. BORDE SOLERA.
Fecha: 29/6/1998
Hora : 16:45

CALCULO A CORTANTE DE SECCIONES RECTANGULARES

1. Datos

- Materiales:

fck [kp/cm²] = 250
fyk [kp/cm²] = 5100
GammaC = 1.50
GammaS = 1.15

- Tipo de Elemento Estructural:

Tipo: viga
En el cálculo no se considera la armadura comprimida

- Sección

b [cm] = 100.0
h [cm] = 90.0
r [cm] = 5.0

2. Dimensionamiento con cercos a 90°

Vd [Mp] = 31.18

A90_est [cm²/m] = 0.00

Vcu [Mp] = 54.87
Vu1 [Mp] = 425.00

COMPROBACION DEL ESTADO LIMITE DE FISURACION DEBIDO A TENSIONES NORMALES	
Proyecto :	L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
Estructura:	E-1516.8

DATOS

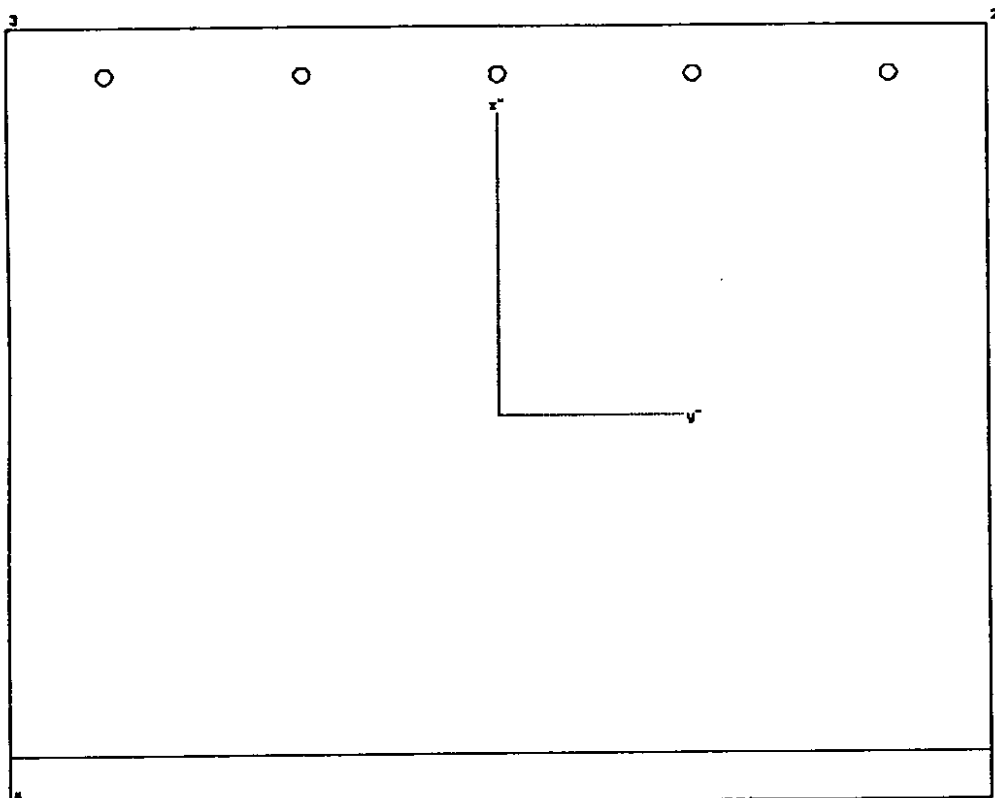
	Dintel (vano)	Dintel (empotramiento)	Hastial	Solera (vano)	Solera (empotramiento)
Axil de servicio (T) :	-0.51	-11.31	-36.20	-0.57	-23.21
Momento de servicio (mT) :	47.40	-28.24	-32.70	-58.00	28.98
Ambiente	II	II	II	II	II
Recubrimiento armaduras de tracción (cm) (c) :	3.500	3.500	3.500	3.500	3.500
Diámetro de la barra traccionada más gruesa (mm) (Φ) :	25.000	20.000	20.000	25.000	20.000
Distancia mínima entre barras (m) (s) :	0.150	0.200	0.200	0.150	0.200
Deformación fibra traccionada max (o/oo) (ϵ_1) :	1.070	0.729	1.068	1.131	0.798
Deformación fibra traccionada min (o/oo) (ϵ_2) :	0.000	0.000	0.000	0.000	0.000
Ac eficaz (m²) :	0.235	0.195	0.195	0.235	0.195
Armadura traccionada (cm²)(As) :	32.733	15.700	15.700	32.733	15.700
Tensión en armadura al fisurarse la sección (Kp/cm²)(σ_{sr}) :	1261.770	3450.800	2430.960	1395.770	2857.410
Tensión de servicio armadura en hipótesis de sección fisurada (Kp/cm²)(σ_s) :	2070.490	1448.570	2055.650	2213.970	1565.120
Módulo elasticidad acero (Es) (T/m²) :	21000000.000	21000000.000	21000000.000	21000000.000	21000000.000
Fck (Kp/cm²) :	250.000	250.000	250.000	250.000	250.000
Inercia sección (m4) :	0.043	0.111	0.035	0.061	0.061
Distancia cdg seccion a fibra traccionada (m) :	0.400	0.550	0.375	0.450	0.450

RESULTADOS

	1	2	3	4	5
Wk max (mm) =	0.200	0.200	0.200	0.200	0.200
Corrección Wk max por recubrimiento (mm) =	0.280	0.300	0.300	0.280	0.300
Corrección separación barras (m) =	0.150	0.200	0.200	0.150	0.200
K1 (se supone barras corrugadas) =	0.400	0.400	0.400	0.400	0.400
K2 =	0.125	0.125	0.125	0.125	0.125
K3 (se supone no carga noval) =	0.500	0.500	0.500	0.500	0.500
fctm (T/m²) =	269.858	269.858	269.858	269.858	269.858
Momento de fisuración (mT) =	28.785	54.421	25.299	36.431	36.431
S m (mm) =	189.740	234.204	234.204	189.740	234.204
ϵ_{sm} =	0.00080	0.00028	0.00039	0.00084	0.00030

Wk (mm) =	0.259	0.110	0.156	0.272	0.119
	Vale	Vale	Vale	Vale	Vale

Mstb. 1 : 7.0



Sección : "FISUDINT" Armadura : "B1"
Tipo : tipo viga/ Rectángulo Unidades : [cm]
Material : "H250"

Ancho = 100.00 cm Canto = 80.00 cm

Características mecánicas de la sección:
Area : Ax= 0.800000 [m2]
Momentos de inercia : Iy= 0.042667 [m4] Iz= 0.066667 [m4]
Inercia a torsión : Ix= 0.087559 [m4]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.400000 [m]

	I: R=dist.borde [m]	W=I/R [m3]	W/Ax [m]
izq. Iz	-0.500	-0.133333	0.167
dch. Iz	0.500	0.133333	-0.167
abajo Iy	-0.400	-0.106667	0.133
arriba Iy	0.400	0.106667	-0.133

Armadura: "B1"

Nº	Nom.mat	Cod.dim.	Area [cm2]	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]
1	AEH500	(2)	32.73	-50.00	5.00	50.00	5.00
2	AEH500	(2)	10.05	-40.00	75.00	40.00	75.00

Total: 42.79 Cuantía de armadura: 0.535 [o/o]

Cód. dimensionamiento: (0) = As constante
Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada
Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero"AEH500"/Hormigón"H250")
Cortante Area mín.cercos Ancho alma ideal Canto útil Incl.bielas

Vz	0.00 [cm2/m]	100.00 [cm]	76.00 [cm]	0.00
Vy	0.00 [cm2/m]	80.00 [cm]	96.00 [cm]	0.00

Características del material:

Nom.Mat.	Módulo E [kp/cm2]	0.85*fcd, fyd [kp/cm2]	eps-fc [o/oo]	fct [kp/cm2]	fcv [kp/cm2]	fcw,mín [kp/cm2]
"H250"	300000.0	-141.600	-2.000	0.0	6.460	250.000
"AEH500"	2.10E+06	4434.700				

Leyenda:

fcd,fyd resistencia de cálculo del hormigón, acero
eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)
fct resistencia de cálculo a tracción del hormigón
fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Comprobación de las tensiones en el estado II: Viga "FISUDINT"/"B1"

Esfuerzos (E.L.S.) Unidades : [tm]
N Vy Vz Mx My Mz
-0.510000 47.400

Deformaciones y tensiones extremas:

	Coordenadas y [cm]	Eps [o/oo]	Estado-II [kp/cm2]	Estado-I [kp/cm2]
Hormigón-Min	-50.00 80.00	-0.268	-80.368	-44.501 "H250"
Armadura-Min	-40.00 75.00	-0.184	-387.040	"AEH500"
Hormigón-Max	50.00 0.00	1.070	0.000	44.374 "H250"
Armadura-Max	50.00 5.00	0.986	2070.491	"AEH500"

Fibra neutra zn 63.98 cm yn -0.00 cm Angulo 0.0
Ancho zona comprim. 16.02 cm Zona comprimida/Canto útil 0.21

Esfuerzos : Rigideces secantes: Deformaciones:
N = -0.510000 [t] EAx= 1272.386 [t] 4.008218E-04
My= 47.400 [tm] Ely= 28352.9 [tm2] 1.671789E-03 [1/m]
Mz= 0.000 [tm] *Elz= 46915.2 [tm2] -2.297128E-14 [1/m]
(* Rigidez tangencial I

Deformaciones y tensiones en vertices de la sección:

	Coordenadas y [cm]	Eps [o/oo]	Est. I [kp/cm2]	Est. II [kp/cm2]	Dist.Fuerz.Compr. [t]	[cm]
	50.00 0.00	1.070	44.374	0.000	-64.393	34.66
	50.00 80.00	-0.268	-44.501	-80.368		
	-50.00 80.00	-0.268	-44.501	-80.368		
	-50.00 0.00	1.070	44.374	0.000		

Deformaciones y tensiones de la armadura pasiva (Estado II):

Nº	Coordenadas y [cm]	Eps [o/oo]	Sigma-s [kp/cm2]
1	-50.000 5.000	0.986	2070.49
	50.000 5.000	0.986	2070.49
2	-40.000 75.000	-0.184	-387.04
	40.000 75.000	-0.184	-387.04

Comprobación de las tensiones en el estado II: Viga "FISUDINT"/"B1"

Esfuerzos (E.L.S.)						Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	
						28.785

Deformaciones y tensiones extremas:

3	Coordenadas		Eps	Estado-II	Estado-I	
	y [cm]	z [cm]				
			[o/oo]	[kp/cm2]	[kp/cm2]	
Hormigón-Min	-50.00	80.00	-0.163	-48.769	-26.986	"H250"
Armadura-Min	-40.00	75.00	-0.112	-234.506		"AEH500"
Hormigón-Max	50.00	0.00	0.652	0.000	26.986	"H250"
Armadura-Max	50.00	5.00	0.601	1261.768		"AEH500"

Fibra neutra	zn	64.03 cm	yn	-0.00 cm	Angulo	0.0
Ancho zona comprim.		15.97 cm	Zona comprimida/Canto útil			0.21

Esfuerzos		Rigideces secantes:		Deformaciones:	
N =	0.000 [t]	*EAx=	568976.3 [t]	2.445863E-04	
My=	28.785 [tm]	Ely=	28279.6 [tm2]	1.017873E-03 [1/m]	
Mz=	0.000 [tm]	*Elz=	46781.3 [tm2]	-1.558560E-13 [1/m]	
(*) Rigidez tangencial !					

Deformaciones y tensiones en vertices de la sección:

y [cm]	Coordenadas		Eps	Est. I	Est. II	Dist.Fuerz.Compr.	
	y [cm]	z [cm]					
			[o/oo]	[kp/cm2]	[kp/cm2]	[t]	[cm]
50.00	0.00	0.652	26.986	0.000	-38.944	34.68	
50.00	80.00	-0.163	-26.986	-48.769			
-50.00	80.00	-0.163	-26.986	-48.769			
-50.00	0.00	0.652	26.986	0.000			

Deformaciones y tensiones de la armadura pasiva (Estado I):

N°	Coordenadas		Eps	Sigma-s	
	y [cm]	z [cm]			
			[o/oo]	[kp/cm2]	
1	-50.000	5.000	0.601	1261.77	
	50.000	5.000	0.601	1261.77	
2	-40.000	75.000	-0.112	-234.51	
	40.000	75.000	-0.112	-234.51	

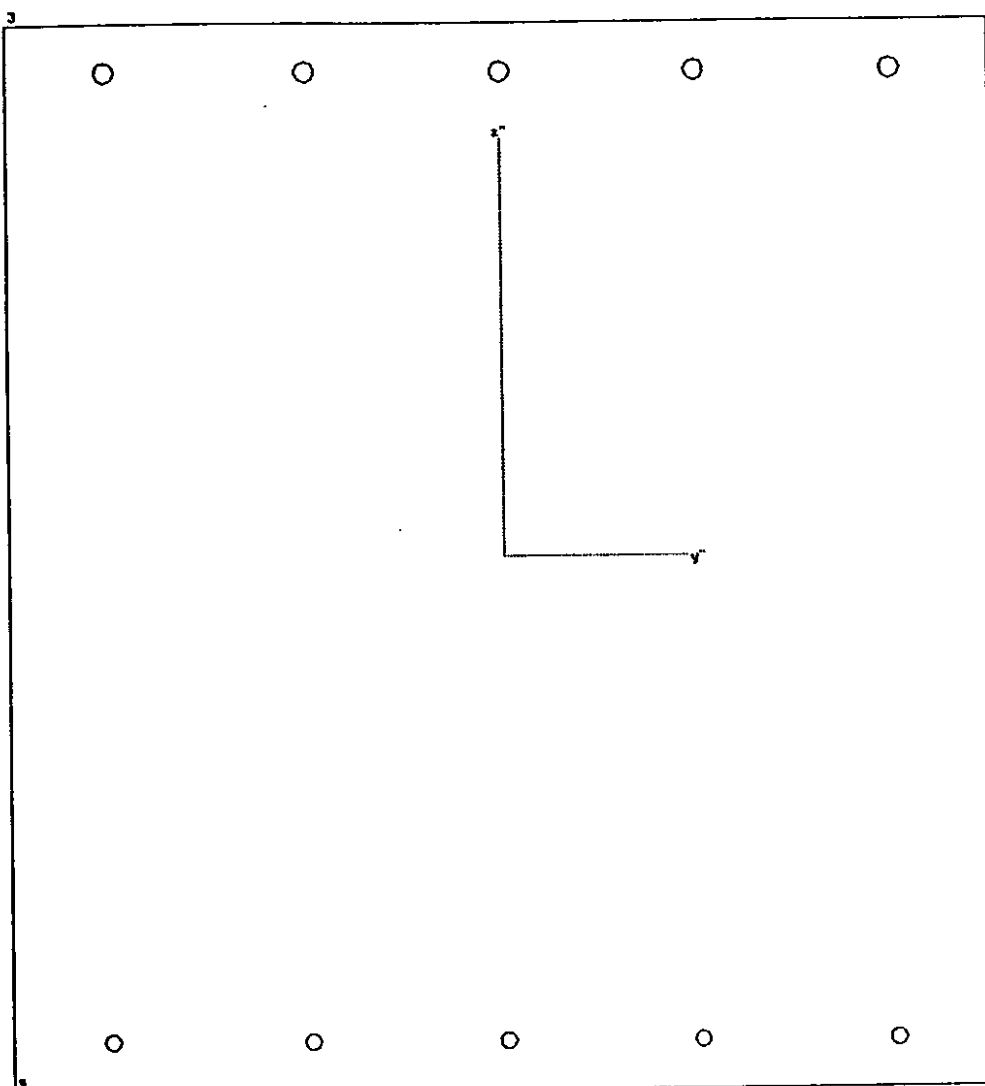
Parámetros globales de cálculo :

Norma: EH-1991
Inclinación estándar bielas comprimidas hormigón ..: 45.00 [Grados]
Coeficiente de fluencia phi: 0.00
Factor minoración de la resistencia de la sección : 1.00
Def. máxima en compresión centrada del hormigón ...: -2.00 [o/oo]
Deformación máxima en flexión en vigas: -3.50 [o/oo]
Def. máxima en tracción del acero en vigas: 10.00 [o/oo]
Modo de análisis / Inclinación del eje neutro: flexión esviada
Cuantía mínima de armadura long. para pilas: 0.40 [o/o]
Cuantía máxima de armadura long.: 8.00 [o/o]
Modo de pretensado: adherente
NO se usaron coef. de homogeneización para calcular las caract. mecánicas

Modelo para dimensionamiento a cortante:

Usar un canto útil constante en los cálculos a cortante
Cálculo separado para la arm. longitudinal adicional debida a cortante

Mstb. 1 : 7.0



Sección : "FISUCART" Armadura : "B1"
Tipo : tipo viga/ Rectángulo Unidades : [cm]
Material : "H250"

Ancho = 100.00 cm Canto = 110.00 cm

Características mecánicas de la sección:

Area : Ax= 1.100 [m2]
Momentos de inercia : Iy= 0.110917 [m4] Iz= 0.091667 [m4]
Inercia a torsión : Ix= 0.168506 [m4]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.550000 [m]

I: R=dist.borde [m] W=I/R [m3] W/Ax [m]
izq. Iz -0.500 -0.183333 0.167
dch. Iz 0.500 0.183333 -0.167

abajo ly -0.550 -0.201666 0.183
arriba ly 0.550 0.201666 -0.183

Armadura: "B1"

N°	Nom.mat	Cod.dim.	Area	y1	z1	y2	z2
			[cm2]	[cm]	[cm]	[cm]	[cm]
1	AEH500	(2)	10.05	-40.00	5.00	40.00	5.00
2	AEH500	(2)	15.71	-40.00	105.00	40.00	105.00

Total: 25.76 Cuantía de armadura: 0.234 [o/o]

Cód. dimensionamiento: (0) = As constante
Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada
Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero "AEH500"/Hormigón "H250")
Cortante Area mín.cercos Ancho alma ideal Canto útil Incl.bielas

Vz	0.00 [cm2/m]	100.00 [cm]	106.00 [cm]	0.00
Vy	0.00 [cm2/m]	110.00 [cm]	96.00 [cm]	0.00

Características del material:

Nom.Mat.	Módulo E	0.85*fcd,fyd	eps-fc	fct	fcv	fcw,mín
	[kp/cm2]	[kp/cm2]	[o/oo]	[kp/cm2]	[kp/cm2]	[kp/cm2]
"H250"	300000.0	-141.600	-2.000	0.0	6.460	250.000
"AEH500"	2.10E+06	4434.700				

Leyenda:

fcd,fyd resistencia de cálculo del hormigón,acero
eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)
fct resistencia de cálculo a tracción del hormigón
fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Comprobación de las tensiones en el estado II: Viga "FISUCART"/"B1"

Esfuerzos (E.L.S.)						Unidades : [tm]	
N	Vy	Vz	Mx	My	Mz		
-11.310				-28.240			

Deformaciones y tensiones extremas:

3	Coordenadas		Eps	Estado-II	Estado-I	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	
Normigón-Min	50.00	0.00	-0.129	-38.797	-15.032	"H250"
Armadura-Min	40.00	5.00	-0.090	-189.665		"AEH500"
Normigón-Max	-50.00	110.00	0.729	0.000	12.975	"H250"
Armadura-Max	-40.00	105.00	0.690	1448.570		"AEH500"

Fibra neutra	zn	16.58 cm	yn	0.00 cm	Angulo	0.0
Ancho zona comprim.		16.58 cm	Zona comprimida/Canto útil			0.16

Esfuerzos		: Rigideces secantes:		Deformaciones:	
N =	-11.310 [t]	EAx=	37732.8 [t]		2.997393E-04
My=	-28.240 [tm]	Ely=	36199.9 [tm2]		-7.801118E-04 [1/m]
Mz=	0.000 [tm]	EIz=	44328.7 [tm2]		2.321433E-14 [1/m]
(*) Rigidez tangencial I					

Deformaciones y tensiones en vertices de la sección:

Coordenadas		Eps	Est. I	Est. II	Dist.Fuerz.Compr.
y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	[t] [cm]
50.00	0.00	-0.129	-15.032	-38.797	-32.157 49.47
50.00	110.00	0.729	12.975	0.000	
-50.00	110.00	0.729	12.975	0.000	
-50.00	0.00	-0.129	-15.032	-38.797	

Deformaciones y tensiones de la armadura pasiva (Estado II):

Nº	Coordenadas		Eps	Sigma-s
	y [cm]	z [cm]	[o/oo]	[kp/cm2]
1	-40.000	5.000	-0.090	-189.66
	40.000	5.000	-0.090	-189.66
2	-40.000	105.000	0.690	1448.57
	40.000	105.000	0.690	1448.57

Comprobación de las tensiones en el estado II: Viga "FISUCART"/"B1"

Esfuerzos (E.L.S.)						Unidades : [tm]	
N	Vy	Vz	Mx	My	Mz		
				-54.421			

Deformaciones y tensiones extremas:

3	Coordenadas		Eps	Estado-II	Estado-I	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	
Normigón-Min	50.00	0.00	-0.247	-74.142	-26.986	"H250"
Armadura-Min	40.00	5.00	-0.157	-329.955		"AEH500"
Normigón-Max	-50.00	110.00	1.733	0.000	26.986	"H250"
Armadura-Max	-40.00	105.00	1.643	3450.804		"AEH500"

Fibra neutra	zn	13.73 cm	yn	0.00 cm	Angulo	0.0
Ancho zona comprim.		13.73 cm	Zona comprimida/Canto útil			0.13

Esfuerzos		: Rigideces secantes:		Deformaciones:	
N =	0.000 [t]	*EAX=	465914.5 [t]		7.430593E-04
My=	-54.421 [tm]	Ely=	30227.8 [tm2]		-1.800361E-03 [1/m]
Mz=	0.000 [tm]	EIz=	37203.3 [tm2]		2.326760E-15 [1/m]
(*) Rigidez tangencial I					

Deformaciones y tensiones en vertices de la sección:

Coordenadas		Eps	Est. I	Est. II	Dist.Fuerz.Compr.
y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	[t] [cm]
50.00	0.00	-0.247	-26.986	-74.142	-50.888 50.42
50.00	110.00	1.733	26.986	0.000	
-50.00	110.00	1.733	26.986	0.000	
-50.00	0.00	-0.247	-26.986	-74.142	

Deformaciones y tensiones de la armadura pasiva (Estado II):

Nº	Coordenadas		Eps	Sigma-s
	y [cm]	z [cm]	[o/oo]	[kp/cm2]
1	-40.000	5.000	-0.157	-329.95
	40.000	5.000	-0.157	-329.95
2	-40.000	105.000	1.643	3450.80
	40.000	105.000	1.643	3450.80

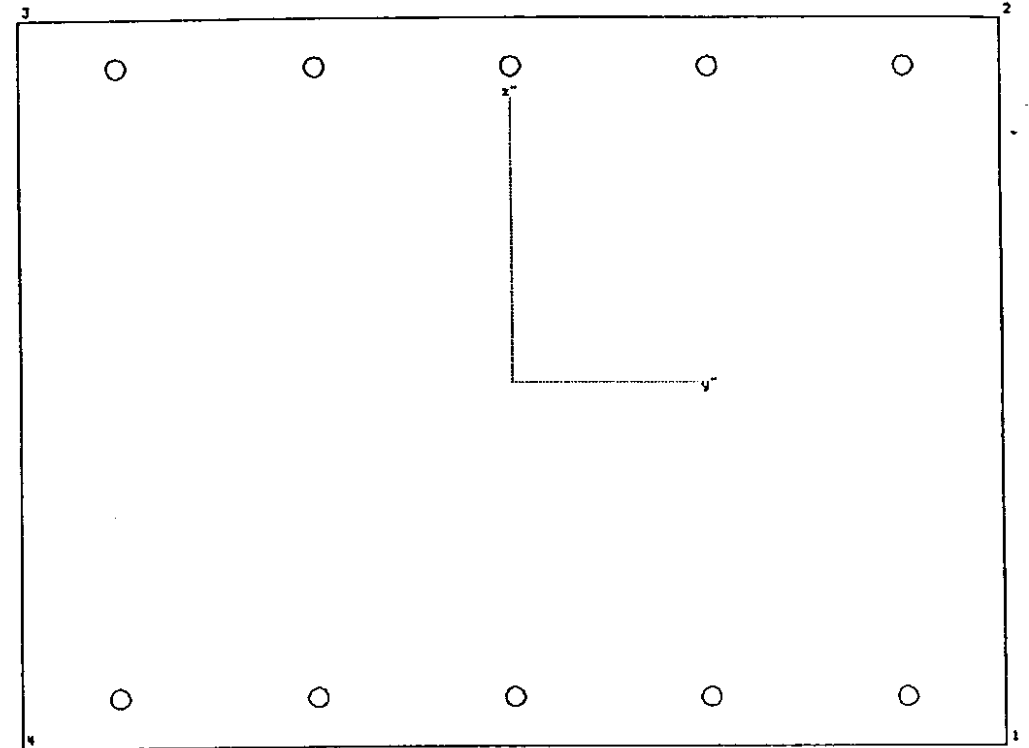
Parámetros globales de cálculo :

Norma EH-1991
Inclinación estándar bielas comprimidas hormigón .. 45.00 [Grados]
Coeficiente de fluencia phi 0.00
Factor minoración de la resistencia de la sección : 1.00
Def. máxima en compresión centrada del hormigón .. -2.00 [o/oo]
Deformación máxima en flexión en vigas -3.50 [o/oo]
Def. máxima en tracción del acero en vigas 10.00 [o/oo]
Modo de análisis / Inclinación del eje neutro flexión esviada
Cuantía mínima de armadura long. para pilas 0.40 [o/o]
Cuantía máxima de armadura long. 8.00 [o/o]
Modo de pretensado adherente
NO se usaron coef. de homogeneización para calcular las caract. mecánicas

Modelo para dimensionamiento a cortante:

Usar un canto útil constante en los cálculos a cortante
Cálculo separado para la arm. longitudinal adicional debida a cortante

Mstb. 1 : 7.0



Sección : "FISUCART" Armadura : "B1"
Tipo : tipo viga/ Rectángulo Unidades : [cm]
Material : "H250"

Ancho = 100.00 cm Canto = 75.00 cm

Características mecánicas de la sección:

Area : Ax= 0.750000 [m2]
Momentos de inercia : Iy= 0.035156 [m4] Iz= 0.062500 [m4]
Inercia a torsión : Ix= 0.075915 [m4]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.375000 [m]

	I:	R=dist.borde [m]	W=I/R [m3]	W/Ax [m]
izq.	Iz	-0.500	-0.125000	0.167
dch.	Iz	0.500	0.125000	-0.167
abajo	Iy	-0.375	-0.093750	0.125
arriba	Iy	0.375	0.093750	-0.125

Armadura: "B1"

Nº	Nom.mat	Cod.dim.	Area [cm2]	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]
1	AEH500	(2)	15.71	-40.00	5.00	40.00	5.00
2	AEH500	(2)	15.71	-40.00	70.00	40.00	70.00
Total:			31.42	Cuantía de armadura: 0.419 [o/o]			

Cód. dimensionamiento: (0) = As constante
Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada
Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero"AEH500"/Hormigón"H250")
Cortante Area mín.cercos Ancho alma ideal Canto útil Incl.bielas

	Vz	Vy	Area mín.cercos	Ancho alma ideal	Canto útil	Incl.bielas
Vz	0.00 [cm2/m]	100.00 [cm]	71.00 [cm]	0.00		
Vy	0.00 [cm2/m]	75.00 [cm]	96.00 [cm]	0.00		

Características del material:

Nom.Mat.	Módulo E	0.85*fcd,fyd	eps-fc	fct	fcv	fcw,mín
	[kp/cm2]	[kp/cm2]	[o/oo]	[kp/cm2]	[kp/cm2]	[kp/cm2]
"H250"	300000.0	-141.600	-2.000	0.0	6.460	250.000
"AEH500"	2.10E+06	4434.700				

Leyenda:
fcd,fyd resistencia de cálculo del hormigón,acero
eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)
fct resistencia de cálculo a tracción del hormigón
fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Comprobación de las tensiones en el estado II: Viga "FISUHAST"/"B1"

Esfuerzos (E.L.S.) Unidades : [tm]

N	Vy	Vz	Mx	My	Mz
-36.200				-32.700	

Deformaciones y tensiones extremas:

3	Coordenadas	Eps	Estado-II	Estado-I	
	y [cm] z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	
Hormigón-Min	50.00 0.00	-0.273	-81.848	-39.707	"H250"
Armadura-Min	40.00 5.00	-0.183	-385.181		"AEH500"
Hormigón-Max	-50.00 75.00	1.068	0.000	30.053	"H250"
Armadura-Max	-40.00 70.00	0.979	2055.654		"AEH500"

Fibra neutra zn 15.26 cm yn 0.00 cm Angulo 0.0
Ancho zona comprim. 15.26 cm Zona comprimida/Canto útil 0.22

Esfuerzos : Rigideces secantes: Deformaciones:

N	EAx	Ely	EIz
-36.200 [t]	91016.1 [t]	3.977317E-04	
-32.700 [tm]	18287.0 [tm2]	-1.788157E-03 [1/m]	
0.000 [tm]	41662.2 [tm2]	4.002967E-15 [1/m]	

(*) Rigidez tangencial !

Deformaciones y tensiones en vertices de la sección:

Coordenadas	Eps	Est. I	Est. II	Dist.Fuerz.Compr.
y [cm] z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	[t] [cm]
50.00 0.00	-0.273	-39.707	-81.848	-62.440 32.41
50.00 75.00	1.068	30.053	0.000	
-50.00 75.00	1.068	30.053	0.000	
-50.00 0.00	-0.273	-39.707	-81.848	

Deformaciones y tensiones de la armadura pasiva (Estado II):

Nº	Coordenadas	Eps	Sigma-s
	y [cm] z [cm]	[o/oo]	[kp/cm2]
1	-40.000 5.000	-0.183	-385.18
	40.000 5.000	-0.183	-385.18
2	-40.000 70.000	0.979	2055.65
	40.000 70.000	0.979	2055.65

Comprobación de las tensiones en el estado II: Viga "FISUHAST"/"B1"

Esfuerzos (E.L.S.) Unidades : [tm]

N	Vy	Vz	Mx	My	Mz
					-25.299

Deformaciones y tensiones extremas:

3	Coordenadas	Eps	Estado-II	Estado-I	
	y [cm] z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	
Hormigón-Min	50.00 0.00	-0.212	-63.567	-26.986	"H250"
Armadura-Min	40.00 5.00	-0.114	-239.543		"AEH500"
Hormigón-Max	-50.00 75.00	1.255	0.000	26.986	"H250"
Armadura-Max	-40.00 70.00	1.158	2430.965		"AEH500"

Fibra neutra zn 10.83 cm yn 0.00 cm Angulo 0.0
Ancho zona comprim. 10.83 cm Zona comprimida/Canto útil 0.15

Esfuerzos : Rigideces secantes: Deformaciones:

N	EAx	Ely	EIz
0.000 [t]	390887.0 [t]	5.217671E-04	
-25.299 [tm]	12931.3 [tm2]	-1.956416E-03 [1/m]	
0.000 [tm]	30594.7 [tm2]	1.646196E-16 [1/m]	

(*) Rigidez tangencial !

Deformaciones y tensiones en vertices de la sección:

Coordenadas	Eps	Est. I	Est. II	Dist.Fuerz.Compr.
y [cm] z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	[t] [cm]
50.00 0.00	-0.212	-26.986	-63.567	-34.423 33.89
50.00 75.00	1.255	26.986	0.000	
-50.00 75.00	1.255	26.986	0.000	
-50.00 0.00	-0.212	-26.986	-63.567	

Deformaciones y tensiones de la armadura pasiva (Estado II):

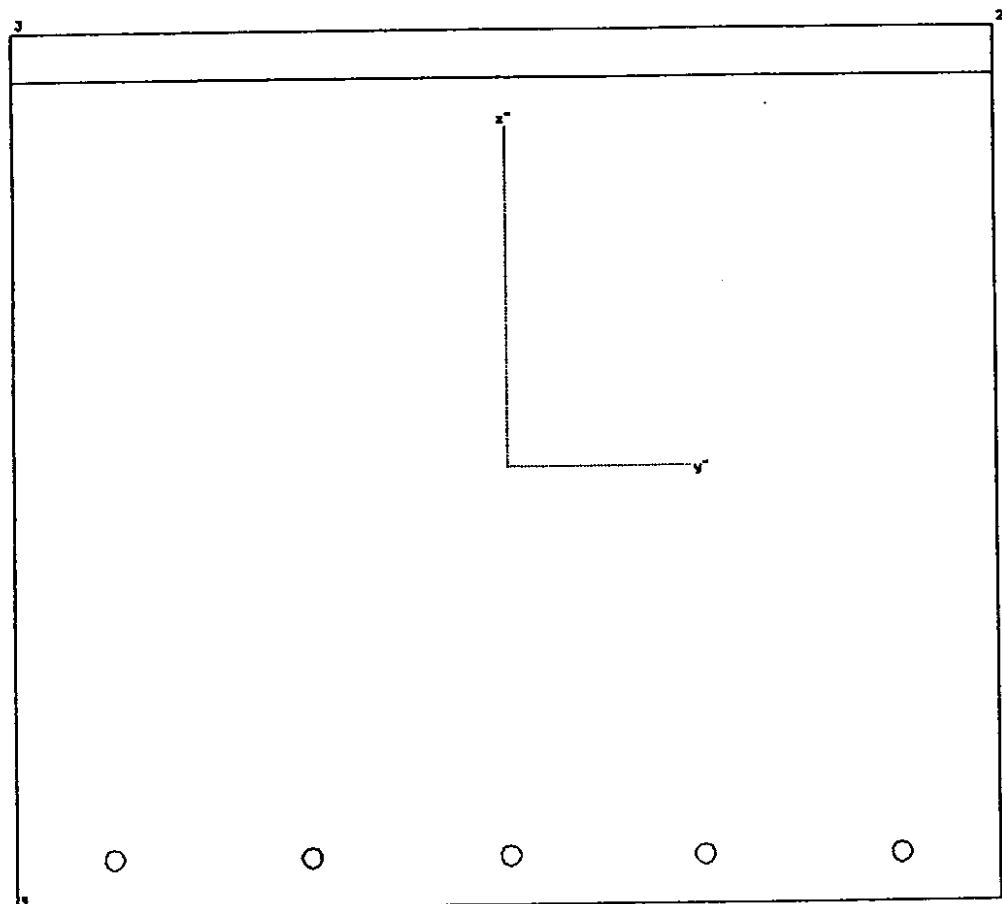
Nº	Coordenadas	Eps	Sigma-s
	y [cm] z [cm]	[o/oo]	[kp/cm2]
1	-40.000 5.000	-0.114	-239.54
	40.000 5.000	-0.114	-239.54
2	-40.000 70.000	1.158	2430.96
	40.000 70.000	1.158	2430.96

Parámetros globales de cálculo :

Norma: EH-1991
Inclinación estándar bielas comprimidas hormigón ..: 45.00 [Grados]
Coeficiente de fluencia phi: 0.00
Factor minoración de la resistencia de la sección ..: 1.00
Def. máxima en compresión centrada del hormigón ...: -2.00 [o/oo]
Deformación máxima en flexión en vigas: -3.50 [o/oo]
Def. máxima en tracción del acero en vigas: 10.00 [o/oo]
Modo de análisis / Inclinación del eje neutro: flexión esviada
Cuantía mínima de armadura long. para pilas: 0.40 [o/o]
Cuantía máxima de armadura long.: 8.00 [o/o]
Modo de pretensado: adherente
NO se usaron coef. de homogeneización para calcular las caract. mecánicas

Modelo para dimensionamiento a cortante:
Usar un canto útil constante en los cálculos a cortante
Cálculo separado para la arm. longitudinal adicional debida a cortante

Mstb. 1 : 7.0



Sección : "FISUSOLE" Armadura : "B1"
Tipo : tipo viga/ Rectángulo Unidades : (cm)
Material : "H350"

Ancho = 100.00 cm Canto = 90.00 cm

Características mecánicas de la sección:
Area : Ax= 0.900000 [m2]
Momentos de inercia : Iy= 0.060750 [m4] Iz= 0.075000 [m4]
Inercia a torsión : Ix= 0.112680 [m4]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.450000 [m]

I: R=dist.borde [m] W=I/R [m3] W/Ax [m]
izq. Iz -0.500 -0.150000 0.167
dch. Iz 0.500 0.150000 -0.167
abajo Iy -0.450 -0.135000 0.150
arriba Iy 0.450 0.135000 -0.150

Armadura: "B1"

Nº	Nom.mat	Cod.dim.	Area [cm2]	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]
1	AEH500	(2)	15.71	-40.00	5.00	40.00	5.00
2	AEH500	(2)	32.73	-50.00	85.00	50.00	85.00

Total: 48.44 Cuantía de armadura: 0.538 [o/o]

Cód. dimensionamiento: (0) = As constante
Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada
Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero"AEH500"/Hormigón"H350")
Cortante Area mfn.cercos Ancho alma ideal Canto útil Incl.bielas

Vz	0.00 [cm2/m]	100.00 [cm]	86.00 [cm]	0.00
Vy	0.00 [cm2/m]	90.00 [cm]	96.00 [cm]	0.00

Nom.Mat.	Módulo E	0.85*fcd,fyd	eps-fc	fct	fcv	fcw,min
[kp/cm2]	[kp/cm2]	[o/oo]	[kp/cm2]	[kp/cm2]	[kp/cm2]	[kp/cm2]
"H350"	350000.0	-198.300	-2.000	0.0	7.640	350.000
"AEH500"	2.10E+06	4434.700				

Leyenda:
fcd,fyd resistencia de cálculo del hormigón,acero
eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)
fct resistencia de cálculo a tracción del hormigón
fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Comprobación de las tensiones en el estado II: Viga "FISUSOLE"/"B1"

Esfuerzos (E.L.S.)						Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	
-0.570000					-58.000	

Deformaciones y tensiones extremas:						
N	Coordenadas	Eps.	Estado-II	Estado-I		
	y [cm] z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]		
Hormigón-Min	50.00 0.00	-0.243	-84.941	-43.026	"H350"	
Armadura-Min	40.00 5.00	-0.166	-349.435		"AEH500"	
Hormigón-Max	-50.00 90.00	1.131	0.000	42.900	"H350"	
Armadura-Max	-50.00 85.00	1.054	2213.968		"AEH500"	

Fibra neutra zn 15.91 cm yn 0.00 cm Angulo 0.0
Ancho zona comprim. 15.91 cm Zona comprimida/Canto útil 0.19

Esfuerzos				Rigideces secantes:		Deformaciones:	
N =	-0.570000 [t]	EAx=	1283.967 [t]		4.439366E-04		
My=	-58.000 [tm]	EIy=	38012.0 [tm2]		-1.525835E-03 [1/m]		
Mz=	0.000 [tm]	EIz=	53878.1 [tm2]		7.979268E-16 [1/m]		
(*) Rigidez tangencial I							

Deformaciones y tensiones en vertices de la sección:							
	Coordenadas	Eps	Est. I	Est. II	Dist.Fuerz.Compr.		
	y [cm] z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	[t]	[cm]	
	50.00 0.00	-0.243	-43.026	-84.941	-67.551	39.70	
	50.00 90.00	1.131	42.900	0.000			
	-50.00 90.00	1.131	42.900	0.000			
	-50.00 0.00	-0.243	-43.026	-84.941			

Deformaciones y tensiones de la armadura pasiva (Estado II):				
Nº	Coordenadas	Eps	Sigma-s	
	y [cm] z [cm]	[o/oo]	[kp/cm2]	
1	-40.000 5.000	-0.166	-349.43	
	40.000 5.000	-0.166	-349.43	
2	-50.000 85.000	1.054	2213.97	
	50.000 85.000	1.054	2213.97	

Comprobación de las tensiones en el estado II: Viga "FISUSOLE"/"B1"

Esfuerzos (E.L.S.)						Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	
						-36.431

Deformaciones y tensiones extremas:

3	Coordenadas		Eps	Estado-II	Estado-I	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	
Hormigón-Min	50.00	0.00	-0.152	-53.315	-26.986	"H350"
Armadura-Min	40.00	5.00	-0.104	-218.971		"AEH500"
Hormigón-Max	-50.00	90.00	0.713	0.000	26.986	"H350"
Armadura-Max	-50.00	85.00	0.665	1395.782		"AEH500"

Fibra neutra	zn	15.85 cm	yn	0.00 cm	Angulo	0.0
Ancho zona comprim.		15.85 cm	Zona comprimida/Canto útil			0.19

Esfuerzos		Rigideces secantes:		Deformaciones:	
N =	0.000 [t]	*EAx=	656424.1 [t]	2.801931E-04	
My=	-36.431 [tm]	Ely=	37903.1 [tm2]	-9.611621E-04 [1/m]	
Mz=	0.000 [tm]	*Elz=	53712.4 [tm2]	3.077025E-19 [1/m]	
(*) Rigidez tangencial !					

Deformaciones y tensiones en vertices de la sección:

	Coordenadas		Eps	Est. I	Est. II	Dist.Fuerz.Compr.
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	[t] [cm]
	50.00	0.00	-0.152	-26.986	-53.315	-42.249 39.72
	50.00	90.00	0.713	26.986	0.000	
	-50.00	90.00	0.713	26.986	0.000	
	-50.00	0.00	-0.152	-26.986	-53.315	

Deformaciones y tensiones de la armadura pasiva (Estado II):

Nº	Coordenadas		Eps	Sigma-s
	y [cm]	z [cm]	[o/oo]	[kp/cm2]
1	-40.000	5.000	-0.104	-218.97
	40.000	5.000	-0.104	-218.97
2	-50.000	85.000	0.665	1395.78
	50.000	85.000	0.665	1395.78

Comprobación de las tensiones en el estado II: Viga "FISUSOLE"/"B1"

Esfuerzos (E.L.S.)						Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	
						-23.210 28.980

Deformaciones y tensiones extremas:

3	Coordenadas		Eps	Estado-II	Estado-I	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	
Hormigón-Min	-50.00	90.00	-0.157	-54.960	-24.046	"H350"
Armadura-Min	-50.00	85.00	-0.104	-218.297		"AEH500"
Hormigón-Max	50.00	0.00	0.798	0.000	18.888	"H350"
Armadura-Max	40.00	5.00	0.745	1565.119		"AEH500"

Fibra neutra	zn	75.21 cm	yn	-0.00 cm	Angulo	0.0
Ancho zona comprim.		14.79 cm	Zona comprimida/Canto útil			0.17

Esfuerzos		Rigideces secantes:		Deformaciones:	
N =	-23.210 [t]	EAx=	72379.3 [t]	3.206718E-04	
My=	28.980 [tm]	Ely=	27299.5 [tm2]	1.061557E-03 [1/m]	
Mz=	0.000 [tm]	*Elz=	50631.8 [tm2]	-2.789665E-14 [1/m]	
(*) Rigidez tangencial !					

Deformaciones y tensiones en vertices de la sección:

	Coordenadas		Eps	Est. I	Est. II	Dist.Fuerz.Compr.
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	[t] [cm]
	50.00	0.00	0.798	18.888	0.000	-40.649 40.07
	50.00	90.00	-0.157	-24.046	-54.960	
	-50.00	90.00	-0.157	-24.046	-54.960	
	-50.00	0.00	0.798	18.888	0.000	

Deformaciones y tensiones de la armadura pasiva (Estado II):

Nº	Coordenadas		Eps	Sigma-s
	y [cm]	z [cm]	[o/oo]	[kp/cm2]
1	-40.000	5.000	0.745	1565.12
	40.000	5.000	0.745	1565.12
2	-50.000	85.000	-0.104	-218.30
	50.000	85.000	-0.104	-218.30

Comprobación de las tensiones en el estado II: Viga "FISUSOLE"/"B1"

Esfuerzos (E.L.S.)						Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	
						36.431

Deformaciones y tensiones extremas:

3	Coordenadas		Eps	Estado-II	Estado-I	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	
Hormigón-Min	-50.00	90.00	-0.198	-69.436	-26.986	"H350"
Armadura-Min	-50.00	85.00	-0.107	-224.024		"AEH500"
Hormigón-Max	50.00	0.00	1.452	0.000	26.986	"H350"
Armadura-Max	40.00	5.00	1.361	2857.412		"AEH500"

Fibra neutra	zn	79.18 cm	yn	-0.00 cm	Angulo	0.0
Ancho zona comprim.		10.82 cm	Zona comprimida/Canto útil			0.13

Esfuerzos		Rigideces secantes:		Deformaciones:	
N =	0.000 [t]	*EAx=	480289.6 [t]	6.269971E-04	
My=	36.431 [tm]	Ely=	19862.2 [tm2]	1.834188E-03 [1/m]	
Mz=	0.000 [tm]	*Elz=	39034.5 [tm2]	-7.765891E-16 [1/m]	
(*) Rigidez tangencial !					

Deformaciones y tensiones en vertices de la sección:

	Coordenadas		Eps	Est. I	Est. II	Dist.Fuerz.Compr.
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	[t] [cm]
	50.00	0.00	1.452	26.986	0.000	-37.551 41.39
	50.00	90.00	-0.198	-26.986	-69.436	
	-50.00	90.00	-0.198	-26.986	-69.436	
	-50.00	0.00	1.452	26.986	0.000	

Deformaciones y tensiones de la armadura pasiva (Estado II):

Nº	Coordenadas		Eps	Sigma-s
	y [cm]	z [cm]	[o/oo]	[kp/cm2]
1	-40.000	5.000	1.361	2857.41
	40.000	5.000	1.361	2857.41
2	-50.000	85.000	-0.107	-224.02
	50.000	85.000	-0.107	-224.02

Parámetros globales de cálculo :

Norma	EH-1991
Inclinación estándar bielas comprimidas hormigón	45.00 [Grados]
Coefficiente de fluencia phi	0.00
Factor minoración de la resistencia de la sección	1.00
Def. máxima en compresión centrada del hormigón	-2.00 [o/oo]
Deformación máxima en flexión en vigas	-3.50 [o/oo]
Def. máxima en tracción del acero en vigas	10.00 [o/oo]
Modo de análisis / Inclinación del eje neutro	flexión esviada
Cuánta mínima de armadura long. para pilas	0.40 [o/o]
Cuánta máxima de armadura long.	8.00 [o/o]
Modo de pretensado	adherente
NO se usaron coef. de homogeneización para calcular las caract. mecánicas	

Modelo para dimensionamiento a cortante:

Usar un canto útil constante en los cálculos a cortante
Cálculo separado para la arm. longitudinal adicional debida a cortante

CALCULO DE MUROS.

NOMBRE PROYECTO : L.A.V. MADRID - ZARAGOZA. Subtramo XV.
 NOMBRE OBRA : Aléas de marcos sin cobertura.

DATOS

GEOMETRIA DE CALCULO DEL MURO

C. Canto del muro en coronación (m) :	0.350
ST. Sobreespesor muro en trasdós (m) :	0.550
SI. Sobreespesor muro en intradós (m) :	0.000
P. Puntera zapata (m) :	1.300
T. Talón zapata (m) :	4.000
H. Altura muro (m) :	7.300
Hr. Canto zapata (m) :	1.000
Anchura total cimentación (m) :	6.200
Angulo trasdós muro (°) :	85.691

DEFINICION TERRENO

	X	Y
0. Coordenadas base trasdós (m) :	0.000	0.000
1. Coordenadas coronación trasdós (m) :	-0.550	7.300
2. Coordenadas fin tramo 1 terreno (m) :	3.650	7.300
3. Coordenadas fin tramo 2 terreno (m) :	7.300	7.300
4. Coordenadas fin tramo 3 terreno (m) :	10.950	7.300

COEFICIENTES DE SEGURIDAD

Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
γ _o (coeficiente combinación variables) :	1.00

Estado Límite Último	
Favorable	Desfavorable

Acciones permanentes (G)		
Peso propio, cargas muertas :	0.90	1.50
Acciones permanentes de valor no constante (G*)		
Terreno (peso propio y empujes) :	0.00	1.50
Acciones variables (Q)		
Sobrecargas :	0.00	1.50

CARACTERISTICAS DEL TERRENO

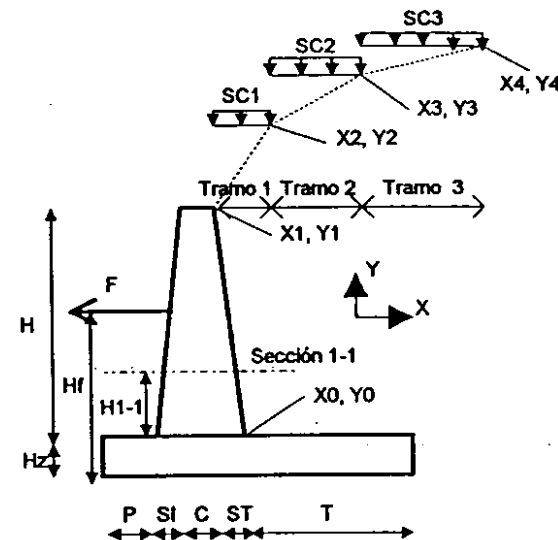
γ. Peso específico (T/m³) :	2.00
φ. Angulo rozamiento interno (°) :	30.000
δ _{int} . Angulo rozamiento muro-terras (°) :	0.000
δ _{ext} . Angulo rozamiento tierras-terras (°) :	0.000
μ. Coeficiente rozamiento zapata-terras :	0.580
Tensión admisible cimentación (T/m²) :	20.000

ARMADO

H1-1. Dist. sección 1 a sup. zapata (m) :	1.700
Recubrimiento atizado (m) :	0.050
Recubrimiento cimentación (m) :	0.050

Cuantías mínimas

Vertical muros (1/3 mín. cara)(o/o) :	0.900
Horizontal muros (1/3 mín. cara)(o/o) :	1.600
Cortante o montaje atizado (cm²/m²) :	4.500
Transversal zapata (sup+inf)(o/o) :	1.447
Longitudinal zapata (sup+inf)(o/o) :	1.447
Cortante zapata (cm²/m²) :	0.000
Perimetral zapata (en canto)(cm²/m) :	7.235

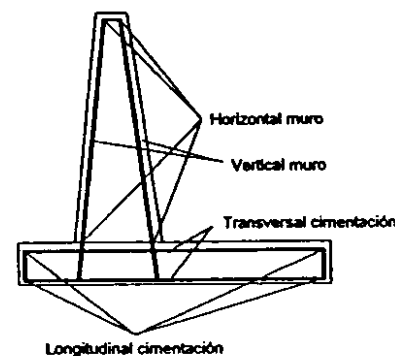


CARGAS (sin mayorar)

Acciones permanentes (G)	
Peso propio barrera coronación (T/m) :	0.750
Acciones permanentes de valor no constante (G*)	
Fg. Carga horizontal sobre muro (T/m) :	1.321
Hfg. Posición Fg a inferior zapata (m) :	6.710
Acciones variables (Q)	
SC1. Sobrecarga en tramo 1 (T/m) :	3.000
SC2. Sobrecarga en tramo 2 (T/m) :	3.000
SC3. Sobrecarga en tramo 3 (T/m) :	3.000
Fq. Carga horizontal sobre muro (T/m) :	1.606
Hfq. Posición Fq a inferior zapata (m) :	7.221

CARACTERISTICAS MATERIALES

Peso específico hormigón (T/m³) :	2.500
Hormigón atizado (T/m²) :	H-250
Hormigón cimentación (T/m²) :	H-250
Acero (T/m) :	AEH-500



RESUMEN ACCIONES SOBRE EL MURO

		F.vertical (T/m)	X (m)	F. Horizontal (T/m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 (ΣP _i , i=1..3)	8.603	1.583	—	—
	Sobre sección base muro (ΣP _i , i=1..3)	12.156	1.623	—	—
	Total peso propio (ΣP _i , i=1..6)	27.656	2.451	—	—
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E1 _i)	0.855	1.931	11.348	4.567
	Sobre sección base muro (E1 _i)	1.453	2.017	19.284	3.433
	Total tierras (E2 _i + E1 _i)	62.415	4.060	22.910	2.767
	Verticales sobre talón (ΣT _i)	58.400	4.200	—	—
	Verticales sobre talón (cortante) (ΣT _i)	44.530	4.675	—	—
Fuerza Fg	Sobre sección 1	—	—	1.321	6.710
	Sobre sección base muro	—	—	1.321	6.710
	Total Fg	—	—	1.321	6.710
Acciones variables (Q)					
Sobrecargas sobre terreno	Sección 1 (E1 _{sc})	0.458	1.861	6.079	5.500
	Base muro (E1 _{sc})	0.597	1.925	7.925	4.650
	Inf. cimentación (E2 _{sc} + E1 _{sc})	23.550	4.808	8.281	4.150
	Verticales sobre talón (ΣS _i , i=1..3)	21.900	5.025	—	—
	Verticales sobre talón (cortante) (ΣS _i)	9.150	4.675	—	—
Fuerza Fq	Sobre sección 1	—	—	1.606	7.221
	Sobre sección base muro	—	—	1.606	7.221
	Total Fq	—	—	1.606	7.221

COMPROBACIONES

SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	16.041	—
Acciones permanentes de valor no constante (G*)		
Tierras	36.201	22.910
Fuerza Fg	—	1.321
Acciones variables (Q)		
Sobrecargas sobre terreno	—	—
Fuerza Fq	—	1.606
TOTAL	52.241	25.836
Csd=	2.022	Vale

SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	67.779	—
Acciones permanentes de valor no constante (G*)		
Tierras	253.377	63.384
Fuerza Fg	—	8.861
Acciones variables (Q)		
Sobrecargas sobre terreno	—	—
Fuerza Fq	—	11.595
TOTAL	321.166	83.839
Csv=	3.831	Vale

TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	27.656	17.956
Acciones permanentes de valor no constante (G*)		
Tierras	62.415	3.493
Fuerza Fg	0.000	8.861
Acciones variables (Q)		
Sobrecargas sobre terreno	23.550	-5.854
Fuerza Fq	0.000	11.595
TOTAL	113.621	36.050
D (m) =	6.20	
σ puntera (T / m²) =	23.95	
σ talón (T / m²) =	12.70	
σ med (T / m²) =	18.33	
σ cob (T / m²) =	20	
Vale		

ARMADO

Secciones

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	0.90	1.00	0.90
	1-1	1.00	0.77	1.00	0.77
PUNTERA	2-2 f	1.00	1.00	1.00	1.00
	2-2 c	1.00	1.00	1.00	1.00
TALON	3-3 f	1.00	1.00	1.00	1.00
	3-3 c	1.00	1.00	1.00	1.00

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	14.016	140.723	45.203
	0-0 (-)	10.941	1.390	0.000
	1-1 (+)	9.713	76.501	30.531
	1-1 (-)	7.743	0.794	0.000
PUNTERA	2-2 f (+)	0.000	31.791	—
	2-2 f (-)	0.000	4.013	—
	2-2 c (+)	—	—	25.622
	2-2 c (-)	—	—	3.260
TALON	3-3 f (+)	-0.830	-16.742	—
	3-3 f (-)	-30.378	-100.723	—
	3-3 c (+)	—	—	0.811
	3-3 c (-)	—	—	-20.533

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm2/m	Minima cm2/m	Control cálculo	Adoptada cm2/m
ALZADO	Vert. trasdós	0-0 (+)	38.919	5.400	Vale	38.919
		0-0 (-)	0.000	2.700	Vale	
		1-1 (+)	24.238	4.632	Vale	24.238
		1-1 (-)	0.000	2.316	Vale	
	Vert. intrados	0-0 (+)	0.000	2.700	Vale	2.700
		0-0 (-)	0.000	2.700	Vale	
		1-1 (+)	0.000	2.316	Vale	
		1-1 (-)	0.000	2.316	Vale	
	Hor. trasdós (*)	—	7.784	9.600	Vale	9.600
	Hor. intrados (*)	—	0.000	4.800	Vale	4.800
	Cortante	0-0 (+)	0.000	4.500	Vale	4.500
		0-0 (-)	0.000	4.500	Vale	(cm²/m²)
PUNTERA	Trans. inferior	2-2 f (+)	7.642	7.235	Vale	7.642
		2-2 f (-)	0.954	7.235	Vale	
	Long. inf. (*)	—	1.528	7.235	Vale	7.235
		—	—	—	—	—
	Trans. superior	2-2 f (+)	0.000	7.235	Vale	31.782
		2-2 f (-)	0.000	7.235	Vale	
	Long. sup. (*)	—	0.000	7.235	Vale	7.235
		—	—	—	—	—
TALON	Trans. inferior	3-3 f (+)	0.000	7.235	Vale	7.642
		3-3 f (-)	0.000	7.235	Vale	
	Long. inf. (*)	—	0.000	7.235	Vale	7.235
		—	—	—	—	—
	Trans. superior	3-3 f (+)	4.187	7.235	Vale	31.782
		3-3 f (-)	31.782	7.235	Vale	
	Long. sup. (*)	—	6.356	7.235	Vale	7.235
		—	—	—	—	—
ZAPATA	Cortante	3-3 c (+)	0.000	0.000	Vale	0.000
		3-3 c (-)	0.000	0.000	Vale	(cm²/m²)
	Perimetral	—	0.000	7.235	Vale	7.235
		—	—	—	—	—

(*) Calculada como el 20% de la armadura perpendicular a ella

NOMBRE PROYECTO : L.A.V. MADRID - ZARAGOZA. Subtramo XV.DESIGNACION ALETA: Aleta para marcos sin cobertura de 4 m.

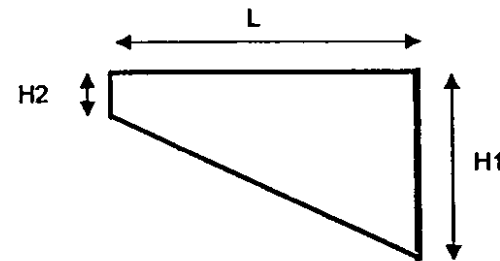
HOJA DE CALCULO DE ALETAS

DATOS REQUERIDOS:

DIMENSIONES(en metros)

H1= 3.17
H2= 0.5
L= 4

Espesor= 0.35
Recubrim.= 0.05



CARACTERISTICAS DE TERRENO

Peso tierras(T/m3) $\gamma = 2$
Angulo rozamiento interno ($^{\circ}$) $\phi = 30$
Ang. rozamiento tierras muro ($^{\circ}$) $\delta = 0$

COEFICIENTES DE SEGURIDAD

Mayoracion de cargas $\gamma_f = 1.5$
Minoracion acero $g_s = 1.15$
Minoracion hormigon $g_c = 1.5$

CARACTERISTICAS DE LOS MATERIALES

Peso especifico hgon(T/m3) $\gamma_h = 2.5$
Resistencia acero (T/m2) $F_{yk} = 51000$
Resistencia hormigon (T/m2) $F_{ck} = 2500$

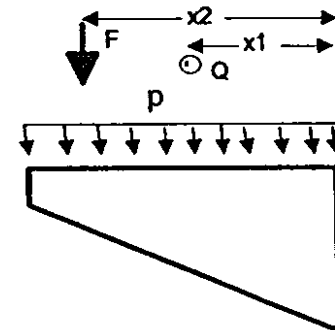
CARGAS (valores sin mayorar)

Cargas verticales

Sobrecarga vertical (t/m) $p = 0.75$
Carga vertical (t.) $F = 0.00$
Situacion x2 (m) $x_2 = 0$

Cargas horizontales

Carga horizontal (t.) $Q = 0$
Posicion x1 (m) $x_1 = 0$
Sobrecarga sobre terreno (ton/m2) $q = 3$



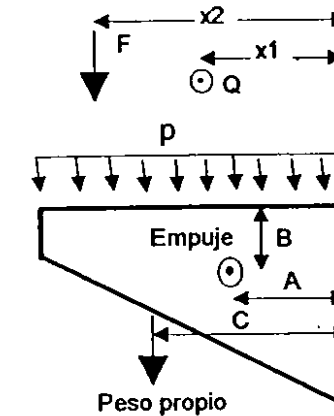
CUANTIAS MINIMAS

LONGITUDINAL SUPERIOR 0.400 o/oo
LONGITUDINAL INFERIOR 0.400 o/oo
CORTANTE 2.778 CM2/M
HORIZONTAL MUROS ALETA 0.900 o/oo
VERTICAL MUROS ALETA 1.600 o/oo
CORTANTE MUROS 0.000 CM2/M

NOMBRE PROYECTO : L.A.V. MADRID - ZARAGOZA. Subtramo XV.DESIGNACION ALETA: Aleta para marcos sin cobertura de 4 m.

HOJA DE CALCULO DE ALETAS

CARGAS DE PESO PROPIO Y EMPUJES DE TIERRAS SOBRE ESTRIBO(ton/m. sin mayorar)



COEFICIENTES EMPUJE ACTIVO ALETA

Coef. empuje activo $\lambda_h = 0.333$
Coef. empuje activo $\lambda_v = 0.000$

PESO PROPIO

	Peso	Dist.emp.	Dist. vert.
Peso aux. 1	1.750	2.000	0.250
Peso aux. 2	4.673	1.333	1.390
Peso propio	6.423	1.515	1.079

EMPUJE DE TIERRAS

HORIZONTAL	Empuje.	Dist.emp.	Dist. vert.
Auxiliar	0.111	3.000	-
Auxiliar	0.704	2.000	-
Auxiliar	4.466	1.000	-
Auxiliar	1.000	2.667	-
Auxiliar	6.340	1.333	-
Empuje hor.	12.622	1.373	1.293

VERTICAL

	Empuje.	Dist.emp.
Empuje aux.1	0.000	3.000
Empuje aux.2	0.000	2.000
Empuje aux.3	0.000	1.000
Empuje aux.4	0.000	2.667
Empuje aux.5	0.000	1.333
Empuje vert.	0.000	0.000

NOMBRE PROYECTO : L.A.V. MADRID - ZARAGOZA. Subtramo XV.

NOMBRE PROYECTO : L.A.V. MADRID - ZARAGOZA. Subtramo XV.

DESIGNACION ALETA: Aleta para marcos sin cobertura de 4 m.

DESIGNACION ALETA: Aleta para marcos sin cobertura de 4 m.

HOJA DE CALCULO DE ALETAS

HOJA DE CALCULO DE ALETAS

CALCULO DE SECCIONES

CALCULOS

ESFUERZOS DE DISEÑO

(Para cargas verticales, momentos positivos implica tracciones en cara superior)

Acciones	Verticales	Horizontales
M peso propio	9.730	0.000
M empuje hor.	0.000	17.328
M empuje vert.	0.000	0.000
M sobrec.vert.	6.000	0.000
M carga vert.	0.000	0.000
M carga hor.	0.000	0.000
Md (mt)	23.595	25.993
V peso propio	6.423	0.000
V empuje hor.	0.000	12.622
V empuje vert.	0.000	0.000
V sobrec.vert.	3.000	0.000
V carga vert.	0.000	0.000
V carga hor.	0.000	0.000
Vd (mt)	14.134	18.933

Fcd	1666.67	
0,85*Fcd	1416.67	
Fcv	64.55	
Es	21000000	
Fyd	44347.83	
FYAD	42000.00	
Acciones	Verticales	Horizontales
Md(m.t)	23.595	25.993
Md max/Md med	1.000	1.570
Md a usar calculo	23.595	40.817
Canto seccion	3.170	0.350
Canto util	3.120	0.300
ancho seccion	0.350	3.170
Ancho calculo	0.350	3.139
Def acero	0.010	0.010
Tension acero	44348	44348
X	0.015	0.032
As (cm.2)	1.709	32.427
Prof. fibra neutra	0.218	0.050
Def. hormigon	0.001	0.002
Comentarios	VALE	VALE
Vd	14.134	18.933
Vd compuesto		23.626
Vu1		470.913
Vsu		0.000
Vcu		60.795
Vu2		60.795
Comentarios		
As (cm.2)		0.000

ARMADO

	Calculo	Minima	total
Long. superior	1.709	4.438	4.438
Long inferior	0.000	4.438	4.438
Cortante	0.000	11.111	11.111
Horizontal trasdos	32.427	6.657	32.427
Vertical trasdos	0.000	11.200	11.200
Horizontal intrados	0.000	3.329	3.329
Vertical intrados	0.000	11.200	11.200
Cortante transversal		NO	

TOTAL ENVOLVENTE ARMADURA

Long. superior	4.438 cm²
Long inferior	4.438 cm²
Horizontal trasdos	10.229 cm²/m
Horizontal intrados	1.050 cm²/m
Estribos	8.378 cm²/m

CALCULO DE MUROS.

NOMBRE PROYECTO : L.A.V. MADRID - ZARAGOZA. Subtramo XV.
NOMBRE OBRA : Aletas EVN2-1.0

DATOS

GEOMETRIA DE CALCULO DEL MURO

C. Canto del muro en coronación (m) :	0.350
ST. Sobreespesor muro en trasdós (m) :	0.550
SI. Sobreespesor muro en intradós (m) :	0.000
P. Puntera zapata (m) :	1.300
T. Talón zapata (m) :	4.000
H. Altura muro (m) :	6.800
Hiz. Canto zapata (m) :	1.000
Anchura total cimentación (m) :	6.200
Angulo trasdós muro (°) :	85.376

DEFINICION TERRENO

	X	Y
0. Coordenadas base trasdós (m) :	0.000	0.000
1. Coordenadas coronación trasdós (m) :	-0.550	6.800
2. Coordenadas fin tramo 1 terreno (m) :	3.400	6.800
3. Coordenadas fin tramo 2 terreno (m) :	6.800	6.800
4. Coordenadas fin tramo 3 terreno (m) :	10.200	6.800

COEFICIENTES DE SEGURIDAD

Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
γ _o (coeficiente combinación variables) :	1.00

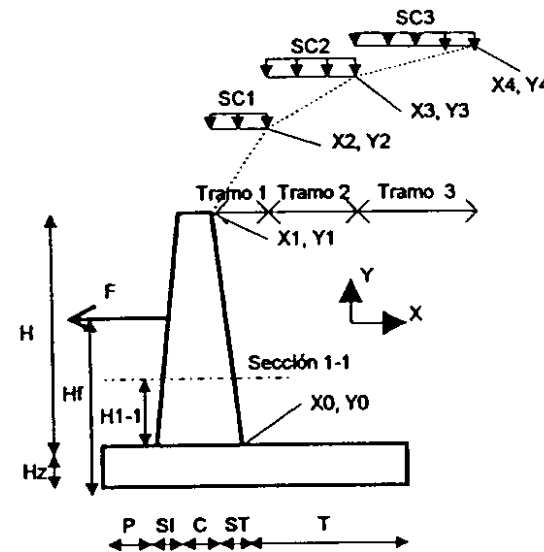
	Estado Límite Último	
	Favorable	Desfavorable
Acciones permanentes (G)		
Peso propio, cargas muertas :	0.90	1.50
Acciones permanentes de valor no constante (G*)		
Terreno (peso propio y empujes) :	0.00	1.50
Acciones variables (Q)		
Sobrecargas :	0.00	1.50

CARACTERISTICAS DEL TERRENO

γ. Peso específico (T/m³) :	2.00
φ. Angulo rozamiento interno (°) :	30.000
δ _{mt} . Angulo rozamiento muro-terras (°) :	0.000
φ _{tt} . Angulo rozamiento tierras-terras (°) :	0.000
μ. Coeficiente rozamiento zapata-terras :	0.580
Tensión admisible cimentación (T/m²) :	20.000

ARMADO

H1-1. Dist. sección 1 a sup. zapata (m) :	0.850
Recubrimiento alzado (m) :	0.050
Recubrimiento cimentación (m) :	0.050
Cuantías mínimas	
Vertical muros (1/3 mín. cara)(o/oo) :	0.900
Horizontal muros (1/3 mín. cara)(o/oo) :	1.600
Cortante o montaje alzado (cm²/m³) :	4.500
Transversal zapata (sup+inf)(o/oo) :	1.447
Longitudinal zapata (sup+inf)(o/oo) :	1.447
Cortante zapata (cm²/m³) :	0.000
Perimetral zapata (en canto)(cm³/m) :	7.235



CARGAS (sin mayorar)

Acciones permanentes (G)

Peso propio barrera coronación (T/m) :	0.750
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Acciones permanentes de valor no constante (G*)

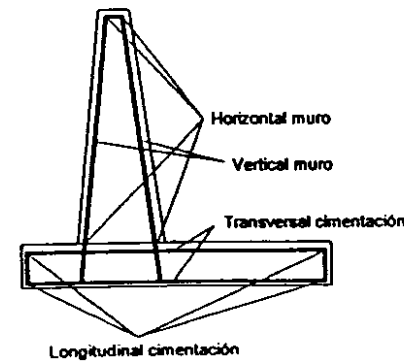
Fg. Carga horizontal sobre muro (T/m) :	1.134
Hlq. Posición Fg a inferior zapata (m) :	5.881

Acciones variables (Q)

SC1. Sobrecarga en tramo 1 (T/m) :	3.000
SC2. Sobrecarga en tramo 2 (T/m) :	3.000
SC3. Sobrecarga en tramo 3 (T/m) :	3.000
Fq. Carga horizontal sobre muro (T/m) :	1.312
Hlq. Posición Fq a inferior zapata (m) :	6.504

CARACTERISTICAS MATERIALES

Peso específico hormigón (T/m³) :	2.500
Hormigón alzado (T/m³) :	H - 250
Hormigón cimentación (T/m³) :	H - 250
Acero (T/m) :	AEH - 500



RESUMEN ACCIONES SOBRE EL MURO

		F.vertical (T / m)	X (m)	F. Horizontal (T / m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 (ΣP _i , i=1..3)	9.536	1.601	—	—
	Sobre sección base muro (ΣP _i , i=1..3)	11.375	1.622	—	—
	Total peso propio (ΣP _i , i=1..6)	26.875	2.475	—	—
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E1t)	1.043	1.971	12.890	3.833
	Sobre sección base muro (E1t)	1.362	2.017	16.835	3.267
	Total tierras (E2t + ΣT _i)	58.140	4.060	20.280	2.600
	Verticales sobre talón (ΣT _i)	54.400	4.200	—	—
	Verticales sobre talón (cortante) (ΣT _i)	41.480	4.675	—	—
Fuerza Fg	Sobre sección 1	—	—	1.134	5.881
	Sobre sección base muro	—	—	1.134	5.881
	Total Fg	—	—	1.134	5.881
Acciones variables (Q)					
Sobrecargas sobre terreno	Sección 1 (E1'sc)	0.526	1.891	6.499	4.825
	Base muro (E1'sc)	0.601	1.925	7.427	4.400
	Inf. cimentación (E2'sc + ΣS _i)	22.050	4.677	7.800	3.900
	Verticales sobre talón (ΣS _i , i=1..3)	20.400	4.900	—	—
	Verticales sobre talón (cortante) (ΣS _i)	9.150	4.675	—	—
Fuerza Fq	Sobre sección 1	—	—	1.312	6.504
	Sobre sección base muro	—	—	1.312	6.504
	Total Fq	—	—	1.312	6.504

COMPROBACIONES

SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	15.588	—
Acciones permanentes de valor no constante (G*)		
Tierras	33.721	20.280
Fuerza Fg	—	1.134
Acciones variables (Q)		
Sobrecargas sobre terreno	—	—
Fuerza Fq	—	1.312
TOTAL	49.309	22.726

Csd=	2.170	Vale
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SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	66.503	—
Acciones permanentes de valor no constante (G*)		
Tierras	236.022	52.728
Fuerza Fg	—	6.667
Acciones variables (Q)		
Sobrecargas sobre terreno	—	—
Fuerza Fq	—	8.534
TOTAL	302.526	67.929

Csv=	4.454	Vale
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TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	26.875	16.809
Acciones permanentes de valor no constante (G*)		
Tierras	58.140	-3.060
Fuerza Fg	0.000	6.667
Acciones variables (Q)		
Sobrecargas sobre terreno	22.050	-4.361
Fuerza Fq	0.000	8.534
TOTAL	107.065	24.588

D (m) =	6.20
σ puntera (T / m²) =	21.11
σ talón (T / m²) =	13.43
σ med (T / m²) =	17.27
σ cob (T / m²) =	18.65
Vale	

ARMADO

Secciones

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	0.90	1.00	0.90
	1-1	1.00	0.83	1.00	0.83
PUNTERA	2-2 f	1.00	1.00	1.00	1.00
	2-2 c	1.00	1.00	1.00	1.00
TALON	3-3 f	1.00	1.00	1.00	1.00
	3-3 c	1.00	1.00	1.00	1.00

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	13.181	114.857	40.063
	0-0 (-)	10.238	1.308	0.000
	1-1 (+)	10.934	83.810	32.751
	1-1 (-)	8.582	0.985	0.000
PUNTERA	2-2 f (+)	0.000	27.822	—
	2-2 f (-)	0.000	3.756	—
	2-2 c (+)	—	—	22.394
	2-2 c (-)	—	—	3.051
TALON	3-3 f (+)	-1.500	-11.941	—
	3-3 f (-)	-27.841	-83.952	—
	3-3 c (+)	—	—	0.908
	3-3 c (-)	—	—	-16.831

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm2/m	Minima cm2/m	Control cálculo	Adoptada cm2/m
ALZADO	Vert. trasdós	0-0 (+)	31.024	5.400	Vale	31.024
		0-0 (-)	0.000	2.700	Vale	
		1-1 (+)	24.315	4.988	Vale	24.315
		1-1 (-)	0.000	2.494	Vale	
	Vert. intradós	0-0 (+)	0.000	2.700	Vale	2.700
		0-0 (-)	0.000	2.700	Vale	
		1-1 (+)	0.000	2.494	Vale	
		1-1 (-)	0.000	2.494	Vale	
	Hor. trasdós (*)	—	6.205	9.600	Vale	9.600
	Hor. intradós (*)	—	0.000	4.800	Vale	4.800
	Cortante	0-0 (+)	0.000	4.500	Vale	4.500
		0-0 (-)	0.000	4.500	Vale	(cm²/m²)
		1-1 (+)	0.000	4.500	Vale	
		1-1 (-)	0.000	4.500	Vale	
PUNTERA	Trans. inferior	2-2 f (+)	6.677	7.235	Vale	7.235
		2-2 f (-)	0.893	7.235	Vale	
	Long. inf. (*)	—	1.335	7.235	Vale	7.235
	Trans. superior	2-2 f (+)	0.000	7.235	Vale	26.906
		2-2 f (-)	0.000	7.235	Vale	
	Long. sup. (*)	—	0.000	7.235	Vale	7.235
	Cortante	2-2 c (+)	0.000	0.000	Vale	0.000
		2-2 c (-)	0.000	0.000	Vale	(cm²/m²)
TALON	Trans. inferior	3-3 f (+)	0.000	7.235	Vale	7.235
		3-3 f (-)	0.000	7.235	Vale	
	Long. inf. (*)	—	0.000	7.235	Vale	7.235
	Trans. superior	3-3 f (+)	3.186	7.235	Vale	26.906
		3-3 f (-)	26.906	7.235	Vale	
	Long. sup. (*)	—	5.381	7.235	Vale	7.235
	Cortante	3-3 c (+)	0.000	0.000	Vale	0.000
		3-3 c (-)	0.000	0.000	Vale	(cm²/m²)
ZAPATA	Perimetral	—	0.000	7.235	Vale	7.235

(*) Calculada como el 20% de la armadura perpendicular a ella

CALCULO DE SECUENCIA DE MUROS . Resultados.

PROYECTO :	L.A.V. MADRID - ZARAGOZA. Subtramo XV
OBRA :	E-1516.8. Aletas 1 y 2.

	Módulo 1									
	Sección 1	Sección 2	Sección 3	Sección 4	Sección 5	Sección 6	Sección 7	Sección 8	Sección 9	Sección 10
GEOMETRIA SECCION										
C. Canto del muro en coronación (m) :	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300
ST. Sobreespesor muro en trasdós (m) :	0.544	0.524	0.505	0.485	0.466	0.446	0.426	0.407	0.387	0.368
Sl. Sobreespesor muro en intradós (m) :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
P. Puntera zapata (m) :	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
T. Talón zapata (m) :	3.656	3.676	3.695	3.715	3.734	3.754	3.774	3.793	3.813	3.832
H. Altura muro (m) :	6.527	6.292	6.057	5.822	5.587	5.351	5.116	4.881	4.646	4.411
H _z . Canto zapata (m) :	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
H1-1. Dist. sección 1 a sup. zapata (m) :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cota cimentación :	220.819	220.819	220.819	220.819	220.819	220.819	220.819	220.819	220.819	220.819
TERRENO										
X0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X1										
X2	0.050	0.447	0.843	1.240	1.637	2.034	2.430	2.827	3.224	3.621
X3	0.644	1.418	2.192	2.966	3.739	4.513	5.287	6.061	6.835	7.609
X4	13.698	13.511	13.325	13.139	12.952	12.766	12.579	12.393	12.206	12.020
Y0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Y1										
Y2	6.527	6.409	6.292	6.174	6.057	5.939	5.822	5.704	5.587	5.469
Y3	6.527	6.527	6.527	6.527	6.527	6.527	6.527	6.527	6.527	6.527
Y4	6.527	6.527	6.527	6.527	6.527	6.527	6.527	6.527	6.527	6.527
Vale terreno	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
COMPROBACIONES										
Coeficiente seguridad deslizamiento :	2.285	2.266	2.237	2.195	1.529	1.567	1.613	1.669	1.737	1.819
	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Coeficiente seguridad al vuelco :	5.129	5.162	5.099	4.926	2.903	3.094	3.318	3.582	3.895	4.268
	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Tensión máxima (T/m ²) :	14.717	13.573	13.441	15.024	22.001	20.456	18.928	17.435	15.987	14.596
Tensión media (T/m ²) :	15.163	14.625	14.023	12.948	12.630	12.272	11.903	11.527	11.146	10.763
Tensión cobaricentrica (T/m ²) :	15.313	14.984	14.220	13.679	16.780	15.779	14.818	13.902	13.033	12.213
	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
ARMADO										
1. Inferior transversal cimentación (cm ² /m) :	7.235	7.235	7.235	7.235	7.235	7.235	7.235	7.235	7.235	7.235
2. Superior transversal cimentación (cm ² /m) :	16.876	17.485	17.540	17.054	25.040	23.189	21.312	19.436	17.581	15.766
3. Inferior longitudinal cimentación (cm ² /m) :	7.235	7.235	7.235	7.235	7.235	7.235	7.235	7.235	7.235	7.235
4. Superior longitudinal cimentación (cm ² /m) :	7.235	7.235	7.235	7.235	7.235	7.235	7.235	7.235	7.235	7.235
5. Perimetral cimentación (cm ² /m) :	7.235	7.235	7.235	7.235	7.235	7.235	7.235	7.235	7.235	7.235
6a. Espera 6b (cm ² /m) :	21.489	19.223	16.966	14.762	12.646	10.165	9.174	8.203	7.271	6.423
6b. Vertical trasdós con solape (cm ² /m) :	21.489	19.223	16.966	14.762	12.646	10.165	9.174	8.203	7.271	6.423
7. Vertical trasdós sin solape (cm ² /m) :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8a. Espera 8b (cm ² /m) :	2.532	2.473	2.414	2.355	2.297	2.238	2.179	2.120	2.062	2.003
8b. Vertical intradós (cm ² /m) :	2.532	2.473	2.414	2.355	2.297	2.238	2.179	2.120	2.062	2.003
9. Horquilla coronación (cm ² /m) :	5.650	5.650	5.650	5.650	5.650	5.650	5.650	5.650	5.650	5.650
10. Horizontal trasdós (cm ² /m) :	9.002	8.793	8.584	8.375	8.166	7.957	7.748	7.539	7.330	7.121
11. Horizontal intradós (cm ² /m) :	4.501	4.396	4.292	4.187	4.083	3.978	3.874	3.769	3.665	3.560
12. Montaje muro y cortante (cm ² /m ²) :	4.500	4.500	4.500	4.500	4.500	4.500	4.500	4.500	4.500	4.500
13. Horquillas horizontales bordes (cm ² /m) :	9.002	8.793	8.584	8.375	8.166	7.957	7.748	7.539	7.330	7.121

NOMBRE PROYECTO : L.A.V. MADRID - ZARAGOZA. Subtramo XV.NOMBRE PROYECTO : L.A.V. MADRID - ZARAGOZA. Subtramo XV.DESIGNACION ALETA: Aleta para marcos sin cobertura de 5 m.DESIGNACION ALETA: Aleta para marcos sin cobertura de 5 m.

HOJA DE CALCULO DE ALETAS

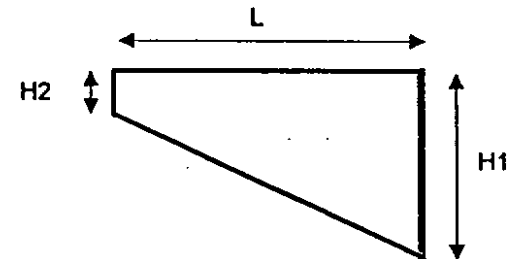
HOJA DE CALCULO DE ALETAS

DATOS REQUERIDOS:

CARGAS DE PESO PROPIO Y EMPUJES DE TIERRAS SOBRE ESTRIBO(ton/m. sin mayorar)

DIMENSIONES(en metros)

H1= 3.83
H2= 0.5
L= 5



Espesor= 0.35
Recubrim.= 0.05

CARACTERISTICAS DE TERRENO

Peso tierras(T/m3) $\gamma = 2$
Angulo rozamiento interno (°) $\phi = 30$
Ang. rozamiento tierras muro (°) $\delta = 0$

COEFICIENTES DE SEGURIDAD

Mayoracion de cargas $\gamma_f = 1.5$
Minoracion acero $g_s = 1.15$
Minoracion hormigon $g_c = 1.5$

CARACTERISTICAS DE LOS MATERIALES

Peso especifico hgon(T/m3) $\gamma_h = 2.5$
Resistencia acero (T/m2) $F_y k = 51000$
Resistencia hormigon (T/m2) $F_c k = 2500$

CARGAS (valores sin mayorar)

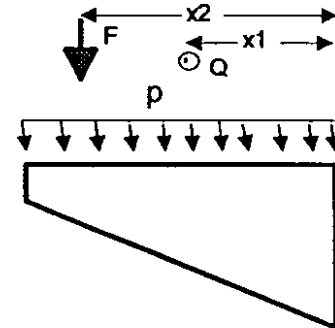
Cargas verticales

Sobrecarga vertical (t/m) $p = 0.75$
Carga vertical (t.) $F = 0.00$
Situacion x2 (m) $x_2 = 0$

Cargas horizontales

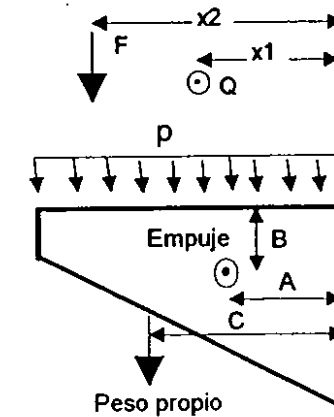
Carga horizontal (t.) $Q = 0$
Posicion x1 (m) $x_1 = 0$

Sobrecarga sobre terreno (ton/m2)

 $Q = 3$ 

CUANTIAS MINIMAS

LONGITUDINAL SUPERIOR 0.400 o/oo
LONGITUDINAL INFERIOR 0.400 o/oo
CORTANTE 2.778 CM2/M
HORIZONTAL MUROS ALETA 0.900 o/oo
VERTICAL MUROS ALETA 1.600 o/oo
CORTANTE MUROS 0.000 CM2/M



COEFICIENTES EMPUJE ACTIVO ALETA

Coef. empuje activo $\lambda_h = 0.333$
Coef. empuje activo $\lambda_v = 0.000$

PESO PROPIO

	Peso	Dist.emp.	Dist. vert.
Peso aux. 1	2.188	2.500	0.250
Peso aux. 2	7.284	1.667	1.610
Peso propio	9.472	1.859	1.296

EMPUJE DE TIERRAS

HORIZONTAL

	Empuje.	Dist.emp.	Dist. vert.
Auxiliar	0.139	3.750	-
Auxiliar	1.064	2.500	-
Auxiliar	8.149	1.250	-
Auxiliar	1.250	3.333	-
Auxiliar	9.575	1.667	-
Empuje hor.	20.177	1.660	1.585

VERTICAL

	Empuje.	Dist.emp.
Empuje aux.1	0.000	3.750
Empuje aux.2	0.000	2.500
Empuje aux.3	0.000	1.250
Empuje aux.4	0.000	3.333
Empuje aux.5	0.000	1.667
Empuje vert.	0.000	0.000

NOMBRE PROYECTO : L.A.V. MADRID - ZARAGOZA. Subtramo XV.DESIGNACION ALETA: Aleta para marcos sin cobertura de 5 m.HOJA DE CALCULO DE ALETASCALCULOSESFUERZOS DE DISEÑO

(Para cargas verticales, momentos positivos implica tracciones en cara superior)

Acciones	Verticales	Horizontales
M peso propio	17.609	0.000
M empuje hor.	0.000	33.492
M empuje vert.	0.000	0.000
M sobrec.vert.	9.375	0.000
M carga vert.	0.000	0.000
M carga hor.	0.000	0.000
Md (mt)	40.477	50.238
V peso propio	9.472	0.000
V empuje hor.	0.000	20.177
V empuje vert.	0.000	0.000
V sobrec.vert.	3.750	0.000
V carga vert.	0.000	0.000
V carga hor.	0.000	0.000
Vd (mt)	19.833	30.266

NOMBRE PROYECTO : L.A.V. MADRID - ZARAGOZA. Subtramo XV.DESIGNACION ALETA: Aleta para marcos sin cobertura de 5 m.HOJA DE CALCULO DE ALETASCALCULO DE SECCIONES

Fcd	1666.67	
0,85*Fcd	1416.67	
Fcv	64.55	
Es	21000000	
Fyd	44347.83	
FYAD	42000.00	
Acciones	Verticales	Horizontales
Md(m.t)	40.477	50.238
Md max/Md med	1.000	1.545
Md a usar calculo	40.477	77.604
Canto seccion	3.830	0.350
Canto util	3.780	0.300
ancho seccion	0.350	3.830
Ancho calculo	0.350	3.787
Def acero	0.010	0.010
Tension acero	44348	44348
X	0.022	0.053
As (cm.2)	2.422	63.968
Prof. fibra neutra	0.268	0.069
Def. hormigon	0.001	0.003
Comentarios	VALE	VALE
Vd	19.833	30.266
Vd compuesto		36.185
Vu1		568.003
Vsu		0.000
Vcu		73.329
Vu2		73.329
Comentarios		
As (cm.2)		0.000

ARMADO

	Calculo	Minima	total
Long. superior	2.422	5.362	5.362
Long inferior	0.000	5.362	5.362
Cortante	0.000	13.889	13.889
Horizontal trasdos	63.968	8.043	63.968
Vertical trasdos	0.000	14.000	14.000
Horizontal intrados	0.000	4.022	4.022
Vertical intrados	0.000	14.000	14.000
Cortante transversal		NO	

TOTAL ENVOLVENTE ARMADURA

Long. superior	5.362 cm²
Long inferior	5.362 cm²
Horizontal trasdos	16.702 cm²/m
Horizontal intrados	1.050 cm²/m
Estribos	8.378 cm²/m

4.4.4 Paso inferior E-1508.1

PASO INFERIOR E-1508.1

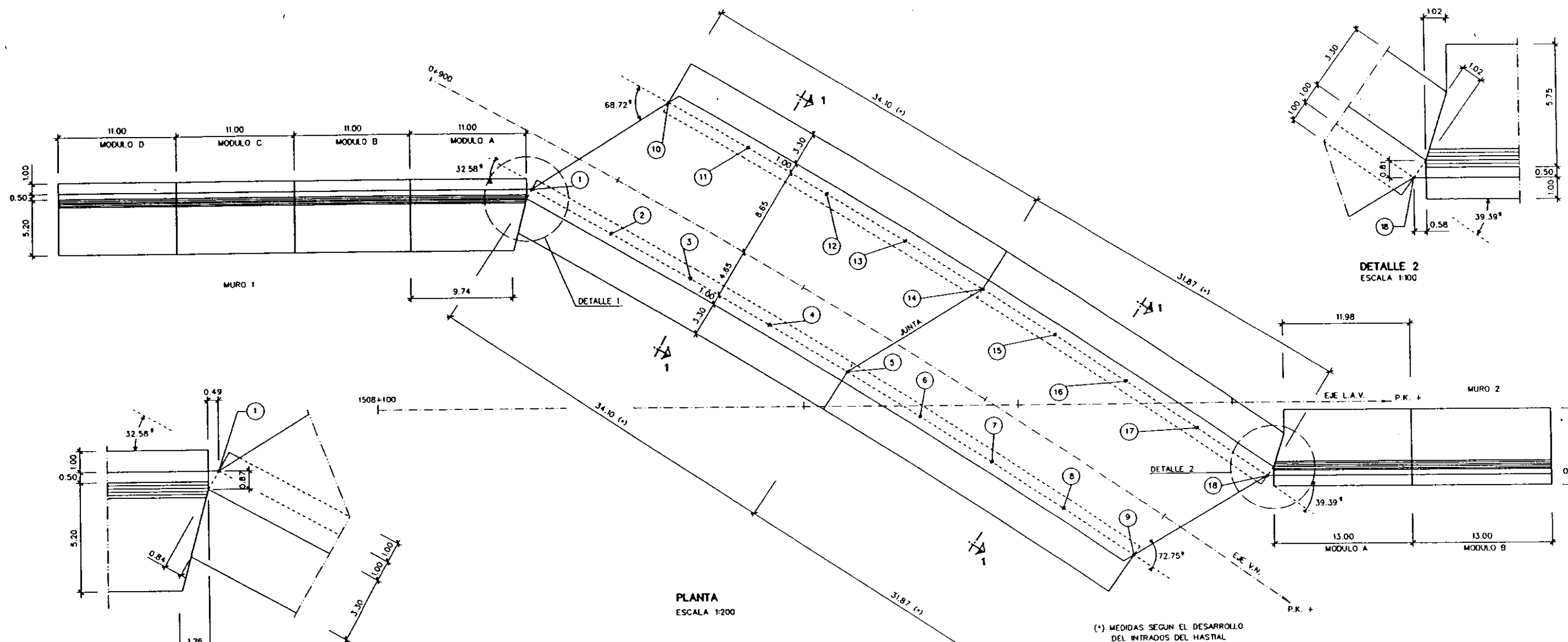
INDICE

1º DEFINICION GEOMETRICA

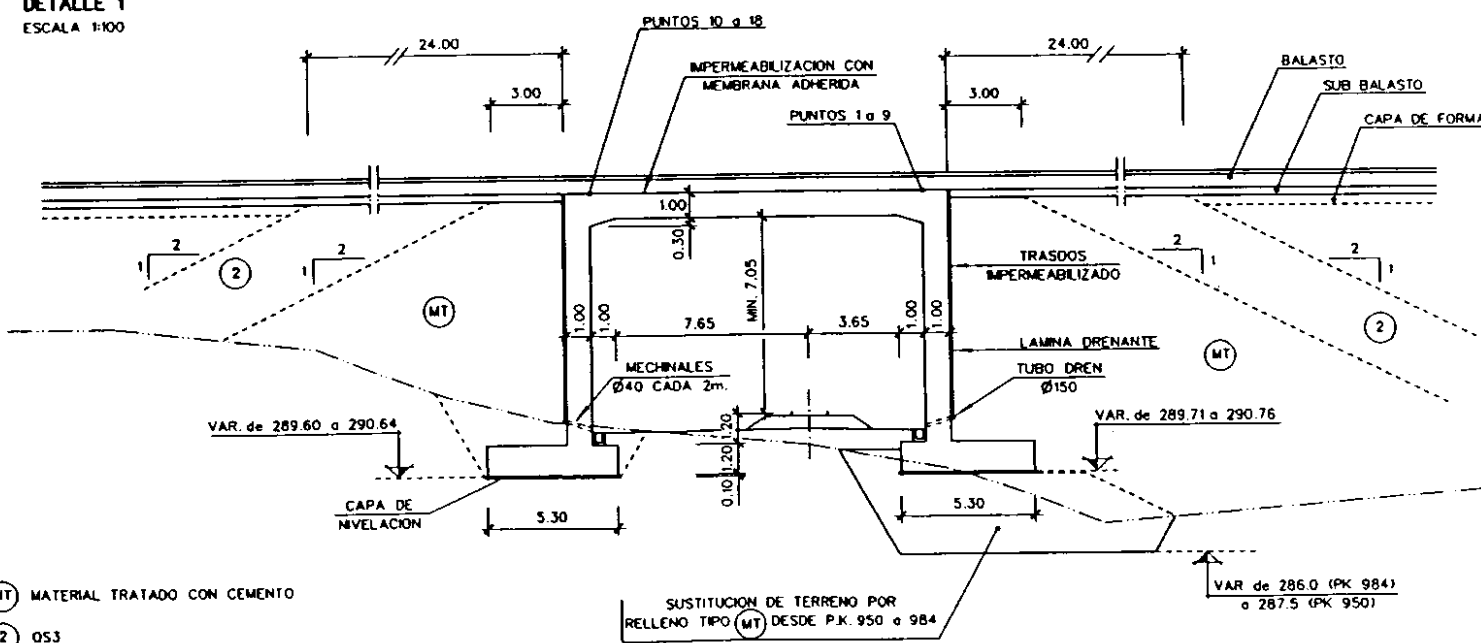
2º CALCULOS

PASO INFERIOR E-1508.1

1º DEFINICION GEOMETRICA



DETALLE 1
ESCALA 1:100



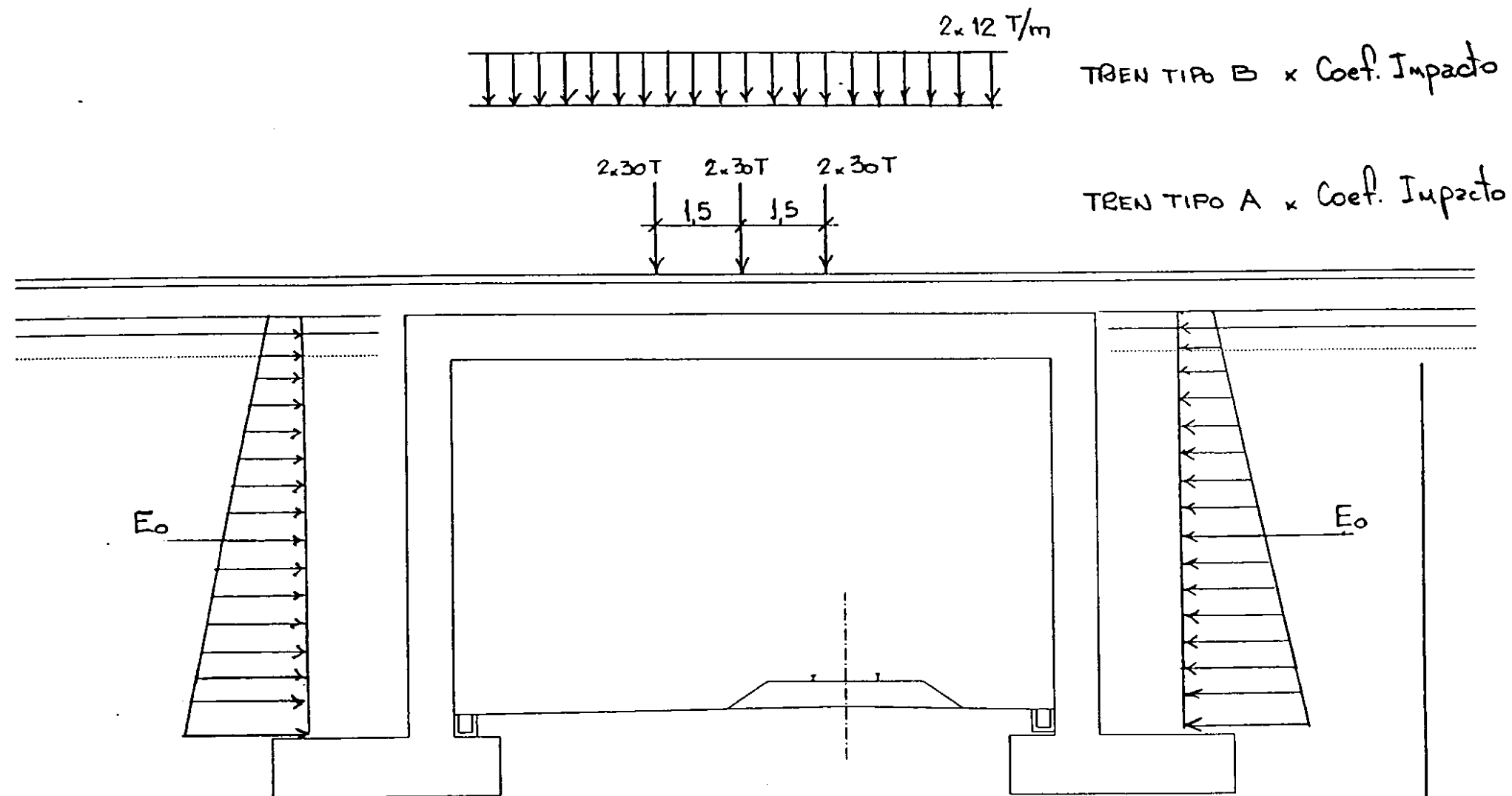
PUNTOS DE REPLANTEO			
PUNTO	X	Y	Z
1	671820.617	4608986.618	301.360
2	671826.845	4608980.796	301.320
3	671832.988	4608974.886	301.280
4	671839.047	4608968.888	301.240
5	671845.018	4608962.804	301.200
6	671850.520	4608957.041	301.163
7	671855.945	4608951.205	301.125
8	671861.293	4608945.295	301.088
9	671866.559	4608939.316	301.050
10	671835.114	4608991.351	301.290
11	671841.271	4608985.454	301.250
12	671847.343	4608979.473	301.210
13	671853.332	4608973.406	301.170
14	671859.236	4608967.256	301.130
15	671864.675	4608961.434	301.093
16	671870.038	4608955.541	301.055
17	671875.324	4608949.577	301.018
18	671880.530	4608943.546	300.980

(MT) MATERIAL TRATADO CON CEMENTO
(2) OSJ

SECCION 1-1
ESCALA 1:150

PASO INFERIOR E-1508.1

2º CALCULOS



CARGAS PERMANENTES (g)

$$g: \text{Riel + Traviessas: } \frac{0,12 \text{ T/m} + 0,52 \text{ T/m}}{2,4 \text{ m}} = 0,24 \text{ T/m}^2$$

$$\text{Balasto: } 0,60 \text{ m} \times 1,6 \text{ T/m}^3 = \frac{0,96 \text{ T/m}^2}{1,23 \text{ T/m}^2 + \text{Peso Propio Pórtico}}$$

SOBRECARGAS (CARGAS VARIABLES)

. Tren: TREN TIPO A (QA)

TREN TIPO B (QB)

. Empuje Terreno: (Eo)

Coef. Impacto

$$V = 200 \text{ km/h}$$

$$T = 0,077 \text{ seg.}$$

$$L = 14,30 \text{ m}$$

$$\mu = \frac{VT}{2L} = \frac{200 \cdot 0,077}{2 \cdot 14,3} = 0,54$$

$$I = 65 \frac{\mu}{1 - \mu + \mu^2} = 47$$

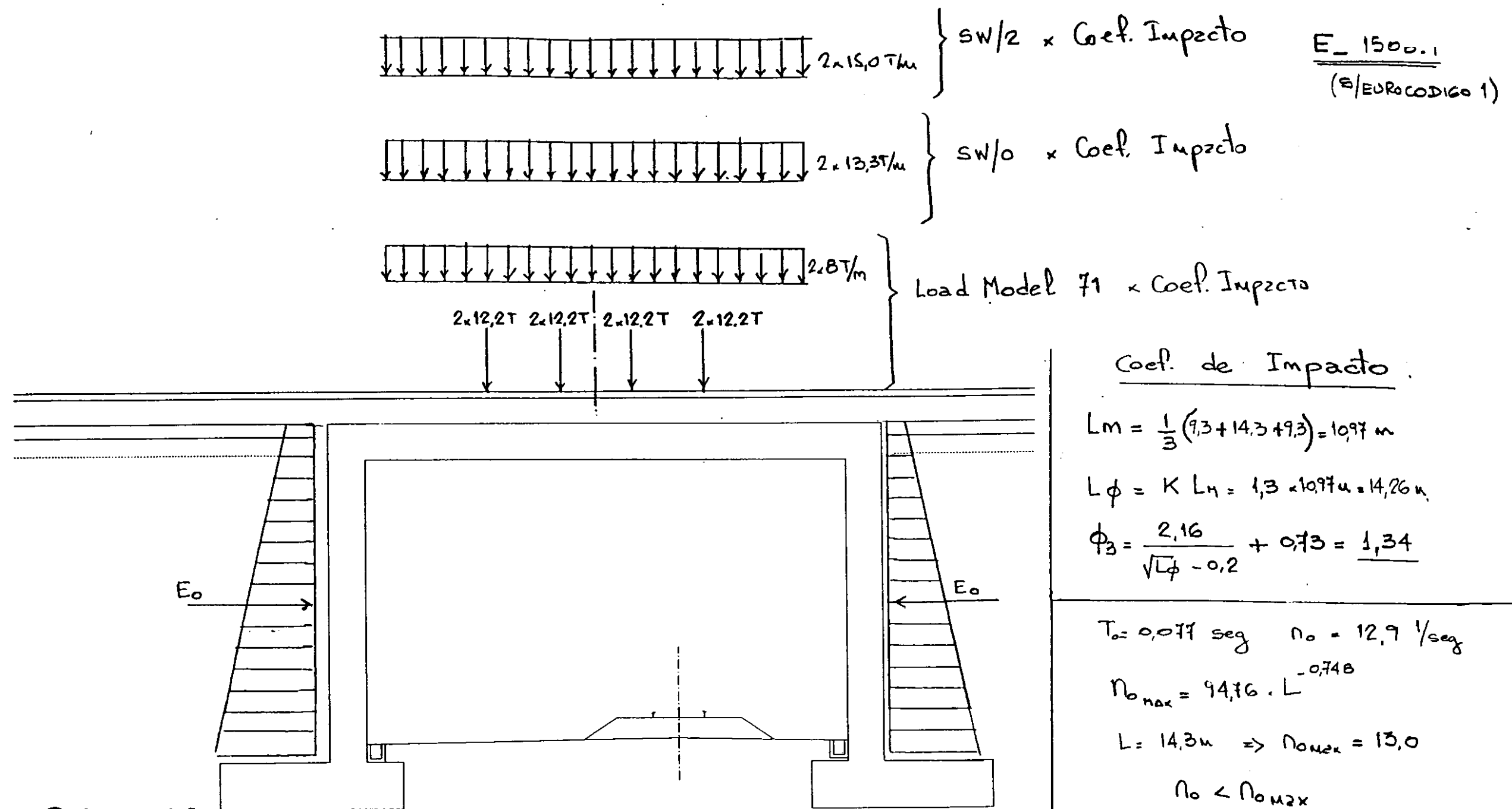
$$\phi_0 = 1,47$$

ESTADO LIMITE ULTIMO

$$S_d = 1,5 [g] + 1,5 \text{ ó } 0,0 [Q_A \text{ ó } Q_B] + 1,5 \text{ ó } 0,0 [E_o]$$

ESTADOS LIMITES DE SERVICIO

$$S_k = 1,0 [g] + 1,0 \text{ ó } 0,0 [Q_A \text{ ó } Q_B] + 1,0 \text{ ó } 0,0 [E_o]$$



CARGAS PERMANENTE (g)

• Peso propio y elementos no estructurales

RIEL Y TRAVIESAS $\frac{0.12 \text{ T/m} + 0.52 \text{ T/m}}{2.4 \text{ m}} = 0.27 \text{ T/m}^2$

BALASTA $0.60 \text{ m} \times 1.6 \text{ T/m}^3 = 0.96 \text{ T/m}^2$
 $1.23 \text{ T/m}^2 + \text{Peso propio Pórtico}$

• Empuje del Terreno: (Eo)

SOBRECARGAS (Q)

LOAD Model 71 $[Q_{LM71}]$

SW/0 $[Q_{SW/0}]$

SW/2 $[Q_{SW/2}]$

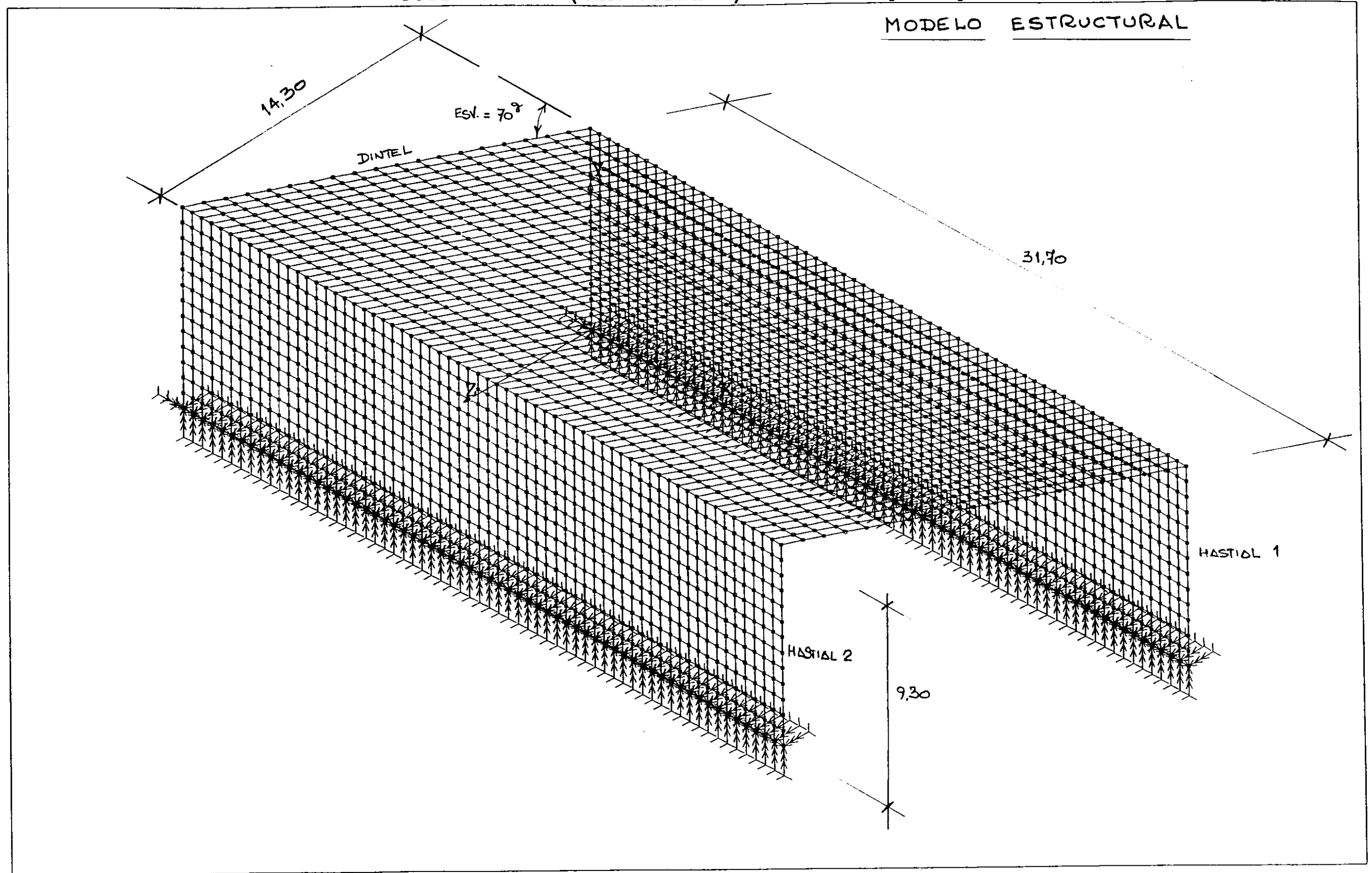
ESTADO LIMITE ÚLTIMO

$$S_d = 1.35 [g] + \frac{1.00 [E_o]}{1.35} + \begin{cases} 1.45 [Q_{LM71}] \\ 1.45 [Q_{SW/0}] \\ 1.20 [Q_{SW/2}] \end{cases}$$

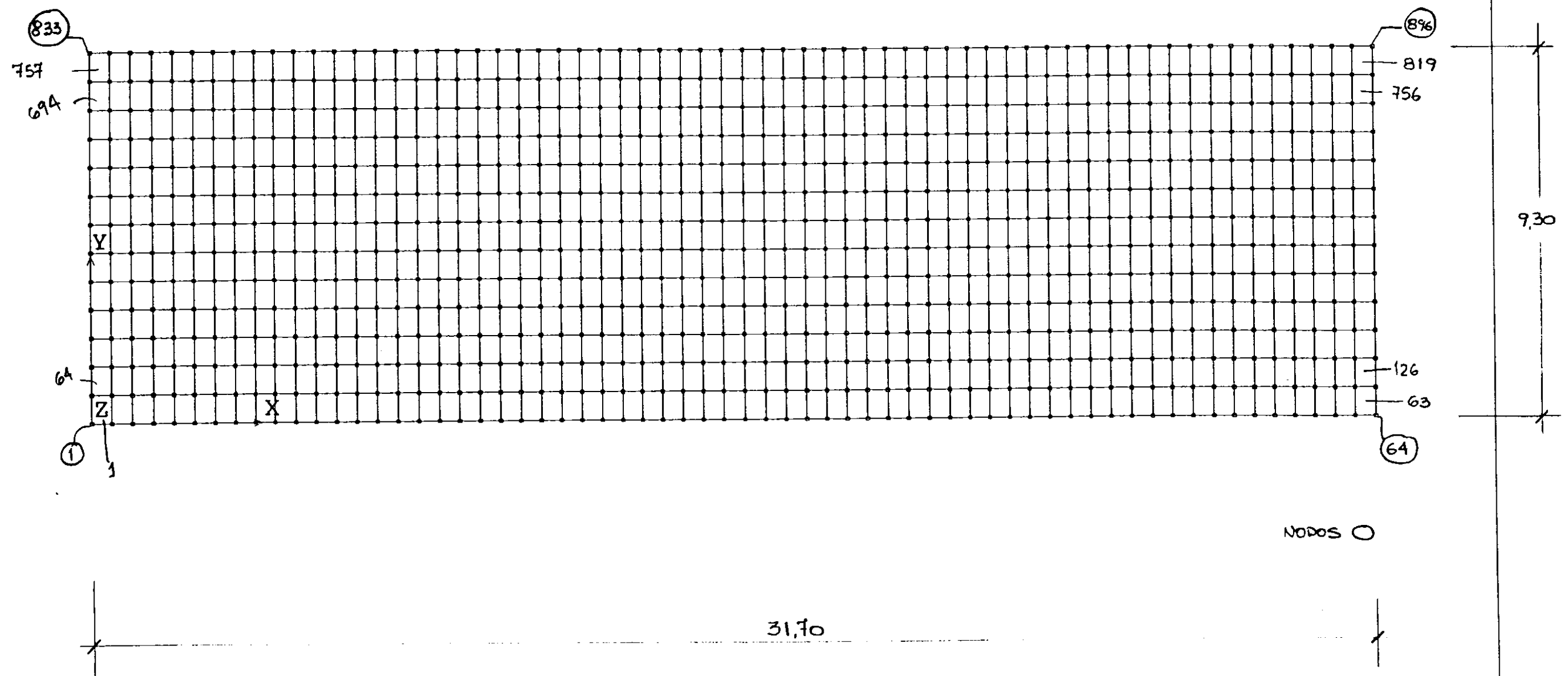
ESTADOS LIMITES DE SERVICIO

$$S_k = 1.00 [g] + 1.00 [E_o] + 1.00 [Q_{LM71}]$$

MODELO ESTRUCTURAL

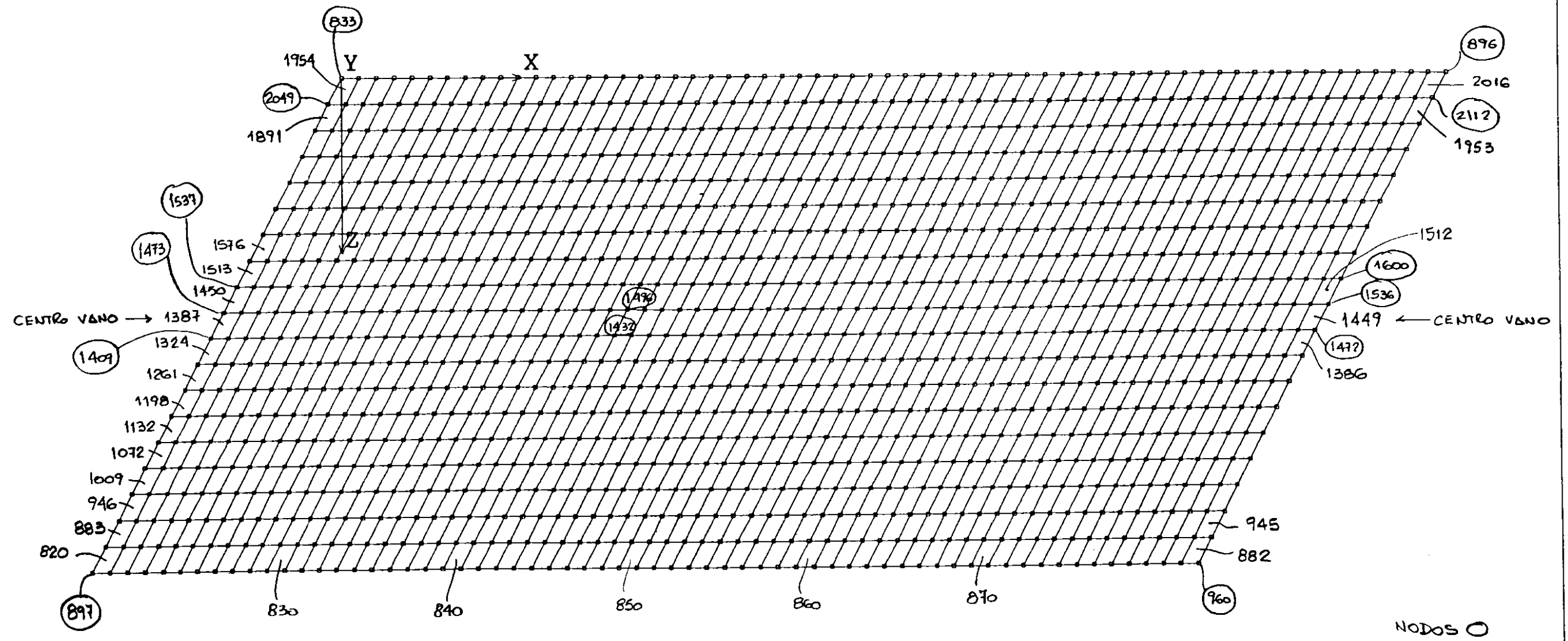


HASTIAL 1
NOMERACION DE NODOS
Y ELEMENTOS



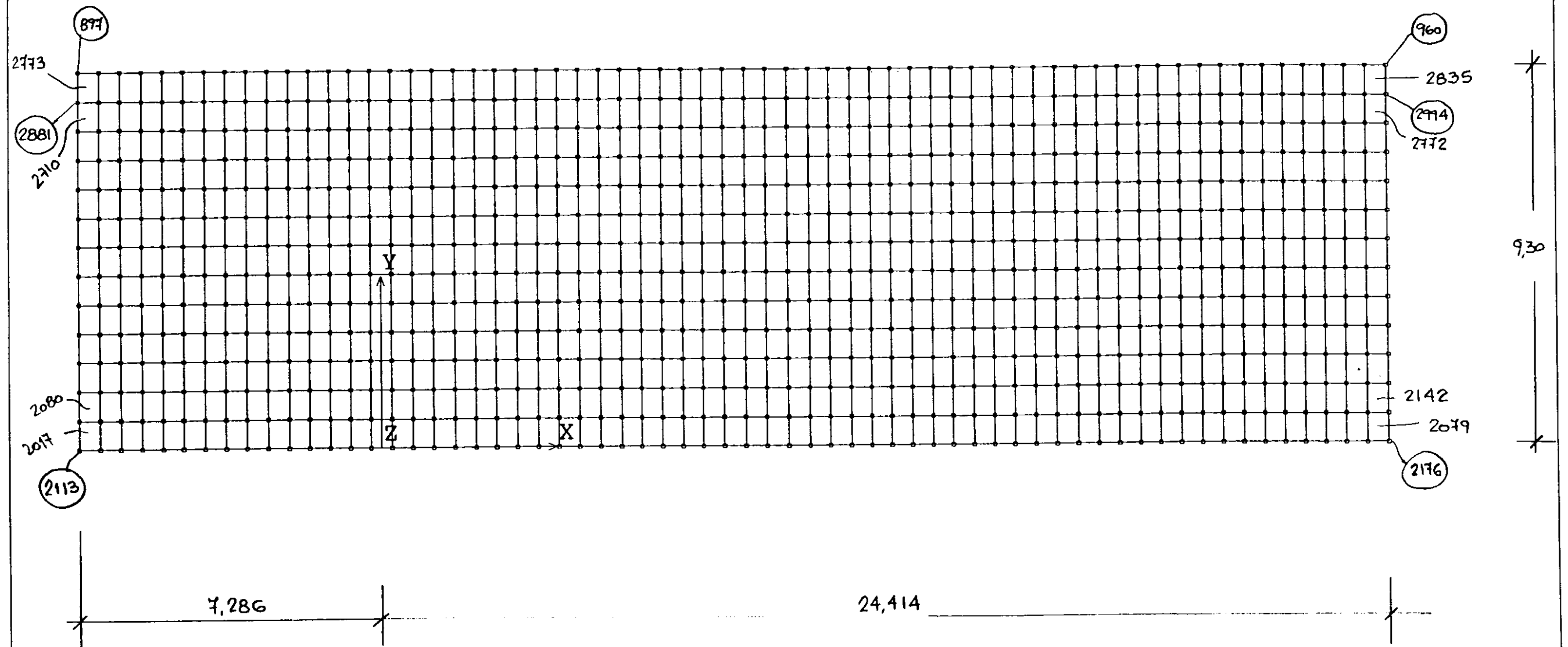
DINTEL

NUMERACION DE NODOS
Y ELEMENTOS



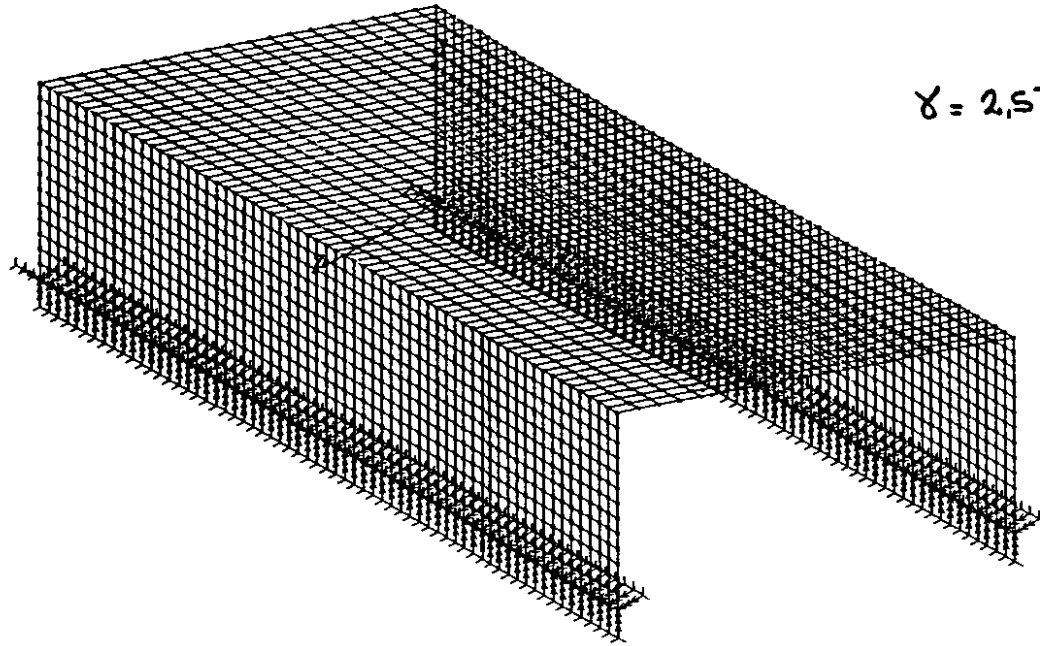
HASTIAL 2

NUMERACION DE NODOS Y ELEMENTOS



HIPOTESIS 1 - PESO PROPIO
(LC1)

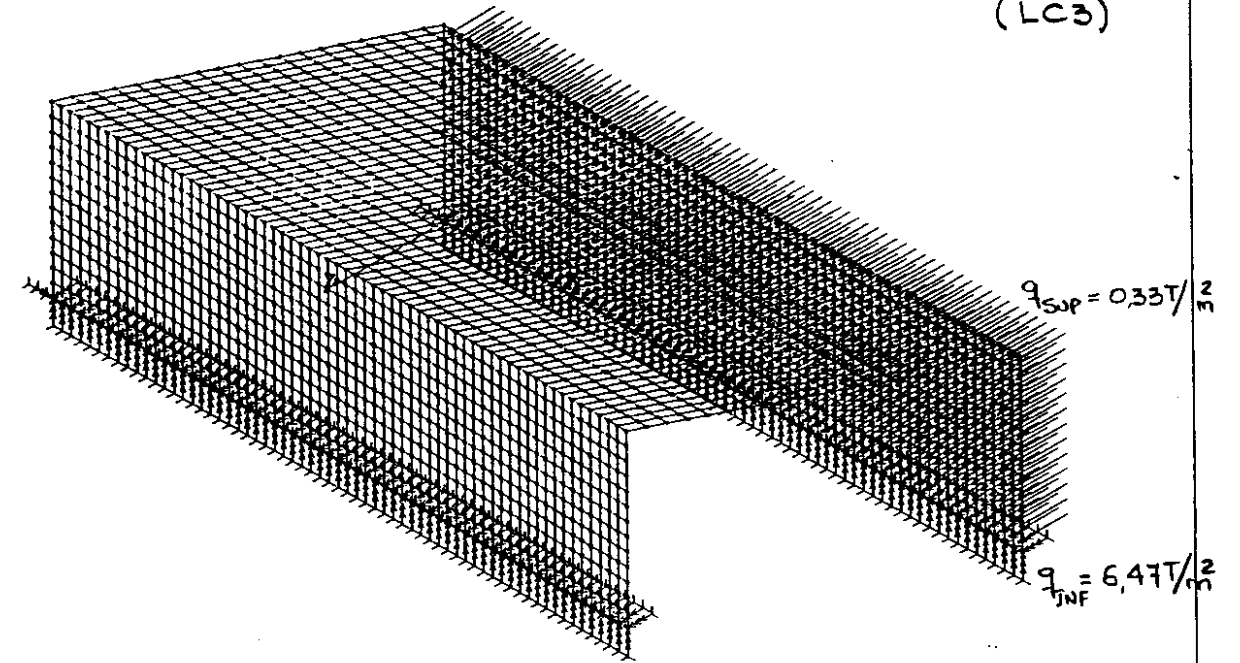
$$\gamma = 2,5 \text{ T/m}^3$$



HIPOTESIS 3 - EMPUJE
TERRENO
(LC3)

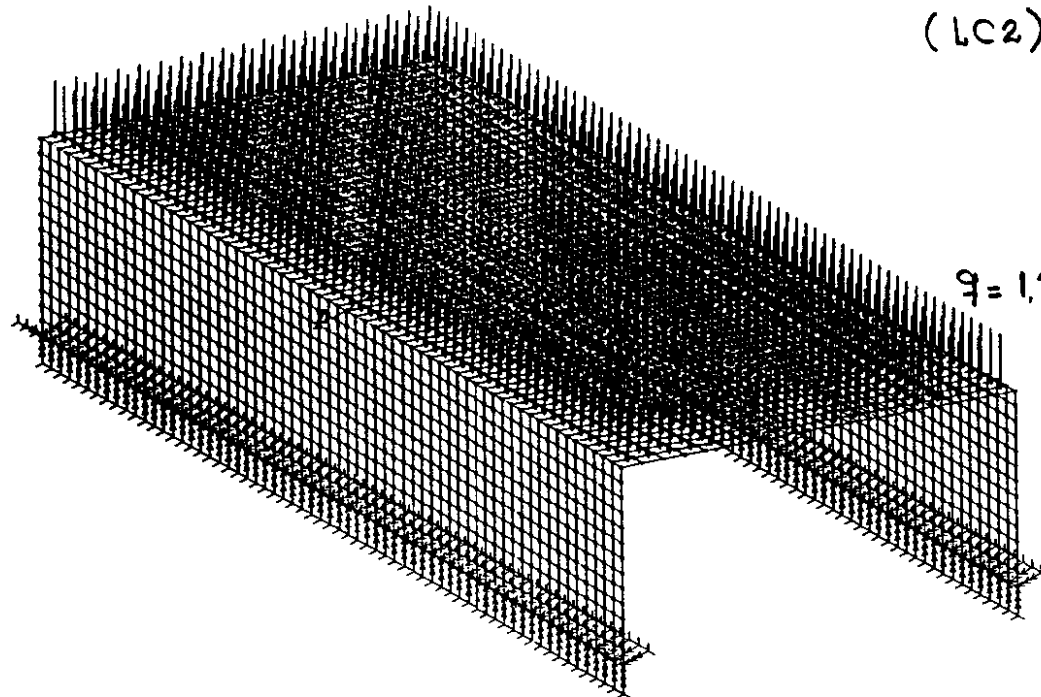
$$q_{\text{SUP}} = 0,33 \text{ T/m}^2$$

$$q_{\text{INF}} = 6,47 \text{ T/m}^2$$



HIPOTESIS 2 - CARGA MUERTA -
(LC2)

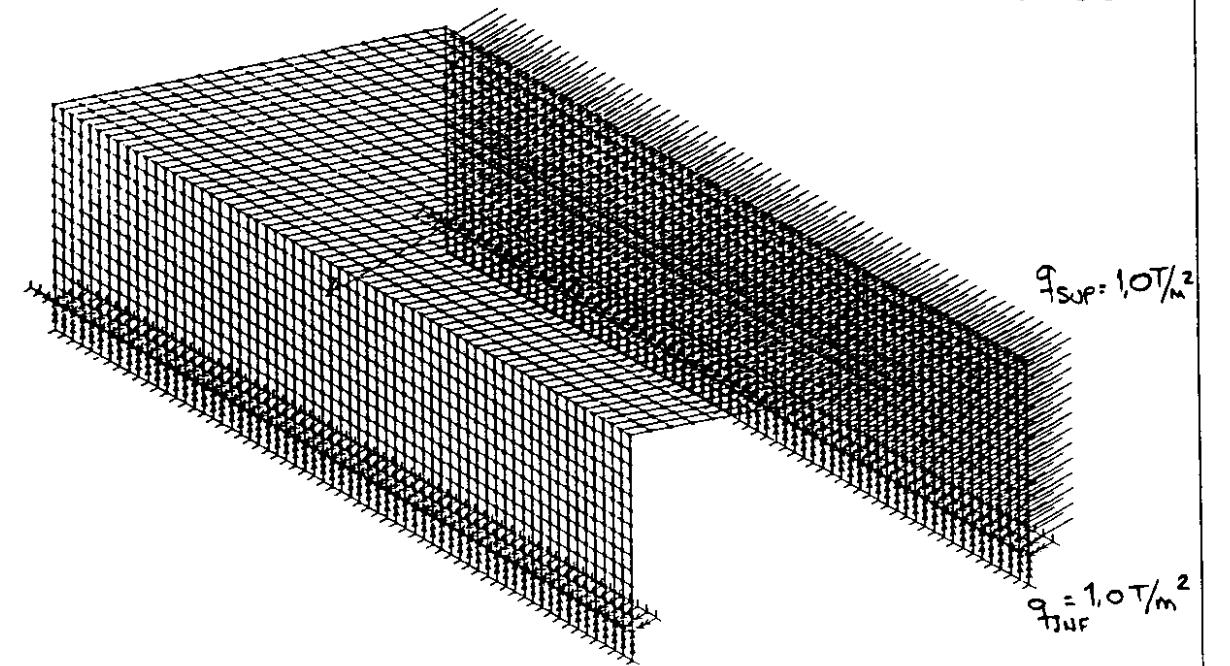
$$q = 1,23 \text{ T/m}^2$$

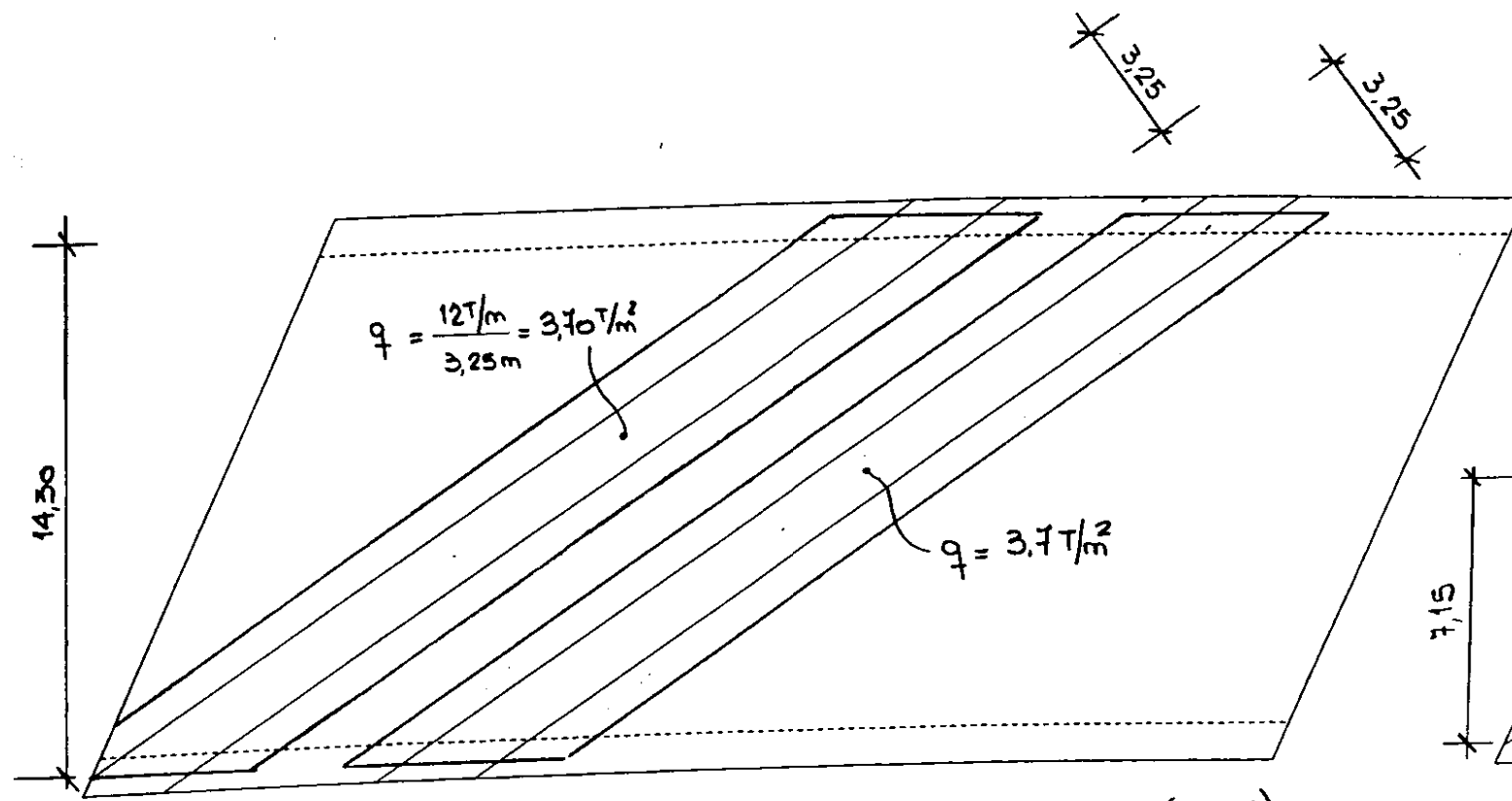


HIPOTESIS 4 - EMPUJE POR
SOBRECARGA

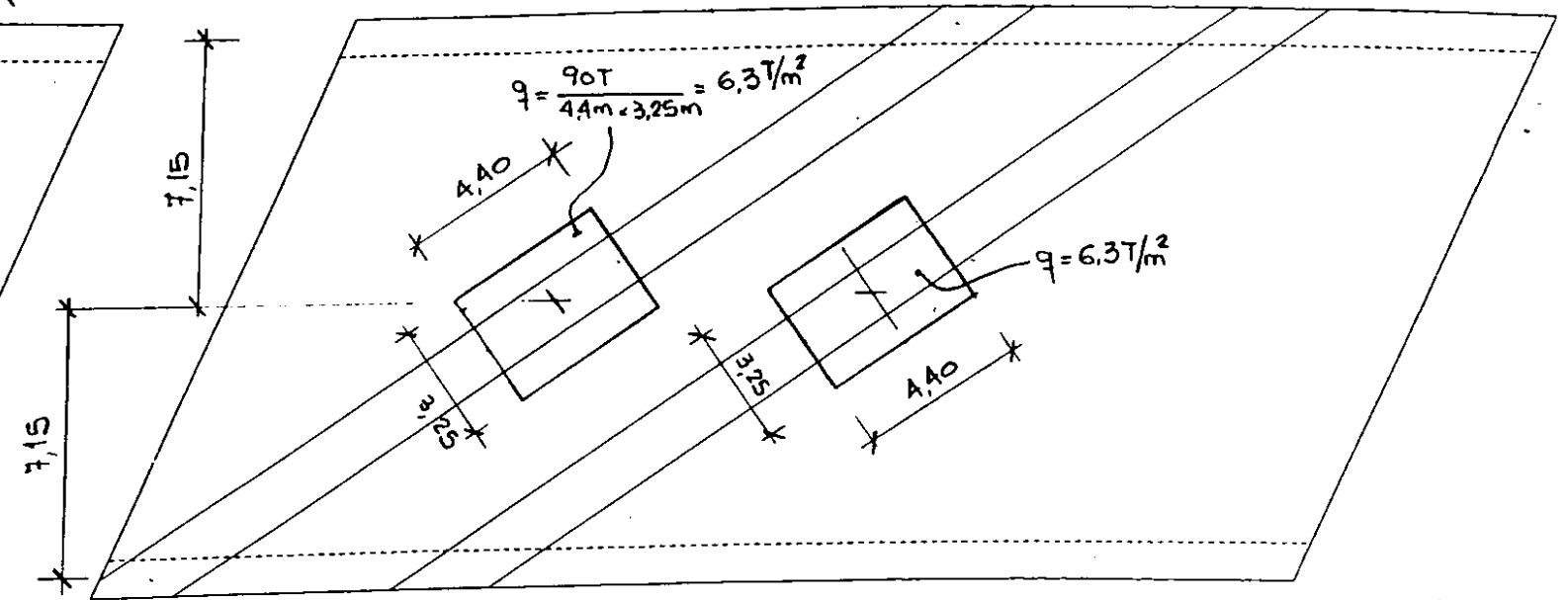
$$q_{\text{SUP}} = 1,0 \text{ T/m}^2$$

$$q_{\text{INF}} = 1,0 \text{ T/m}^2$$

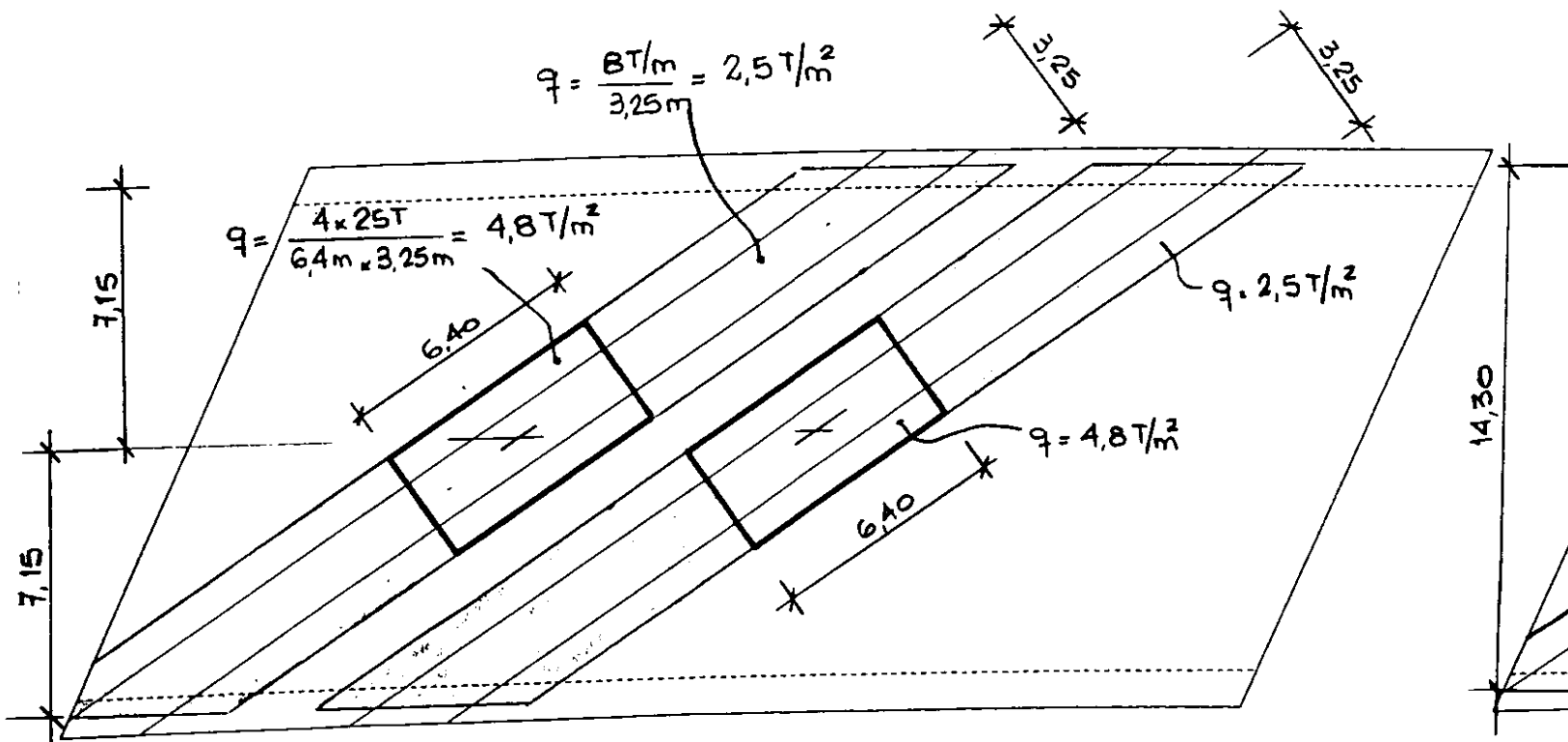




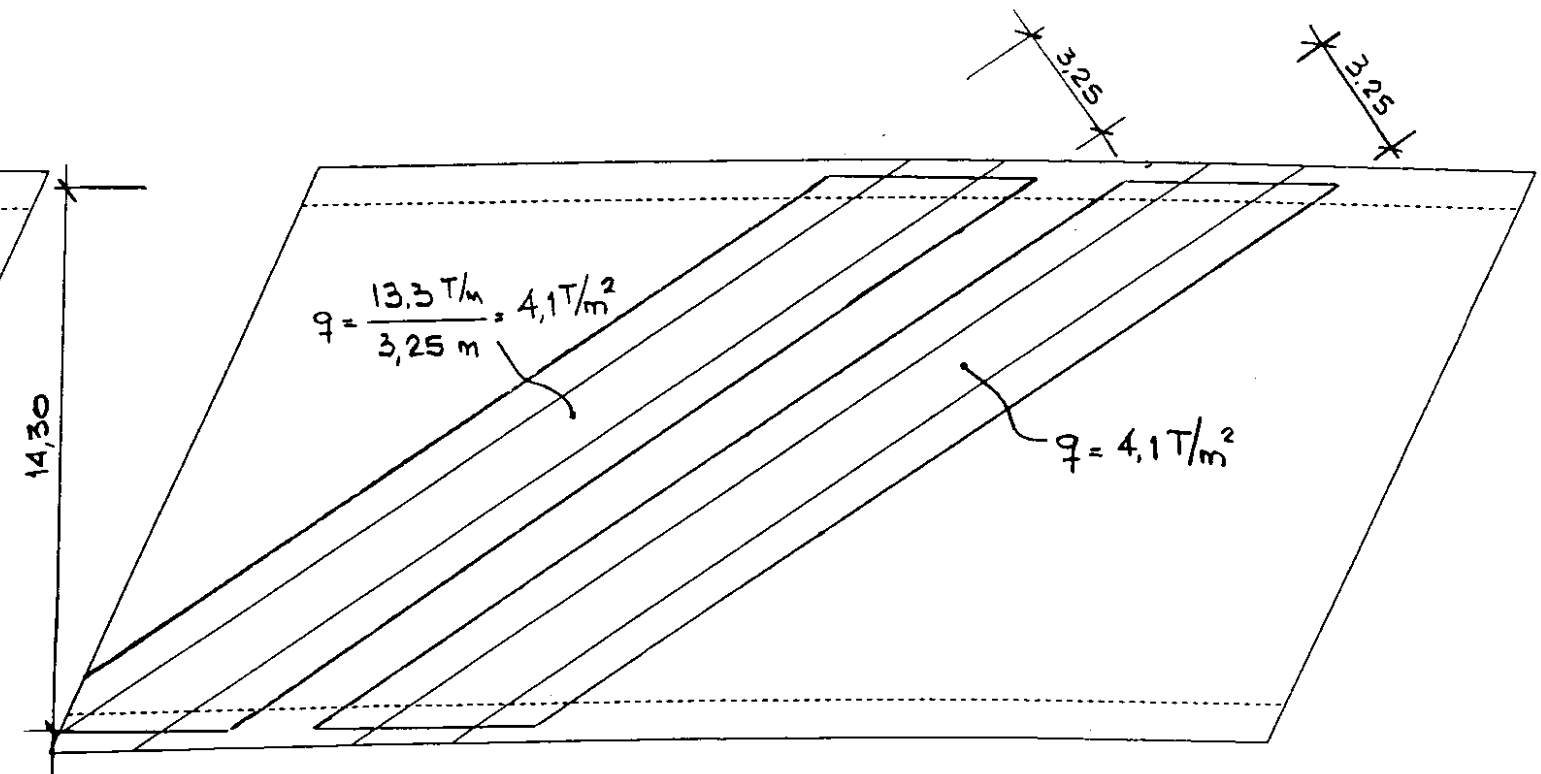
HIPOTESIS 5 (LC5)
TREN TIPO B ($2 \times 12T/m$)



HIPOTESIS 6 (LC6)
TREN TIPO A ($2 \times 90T$)

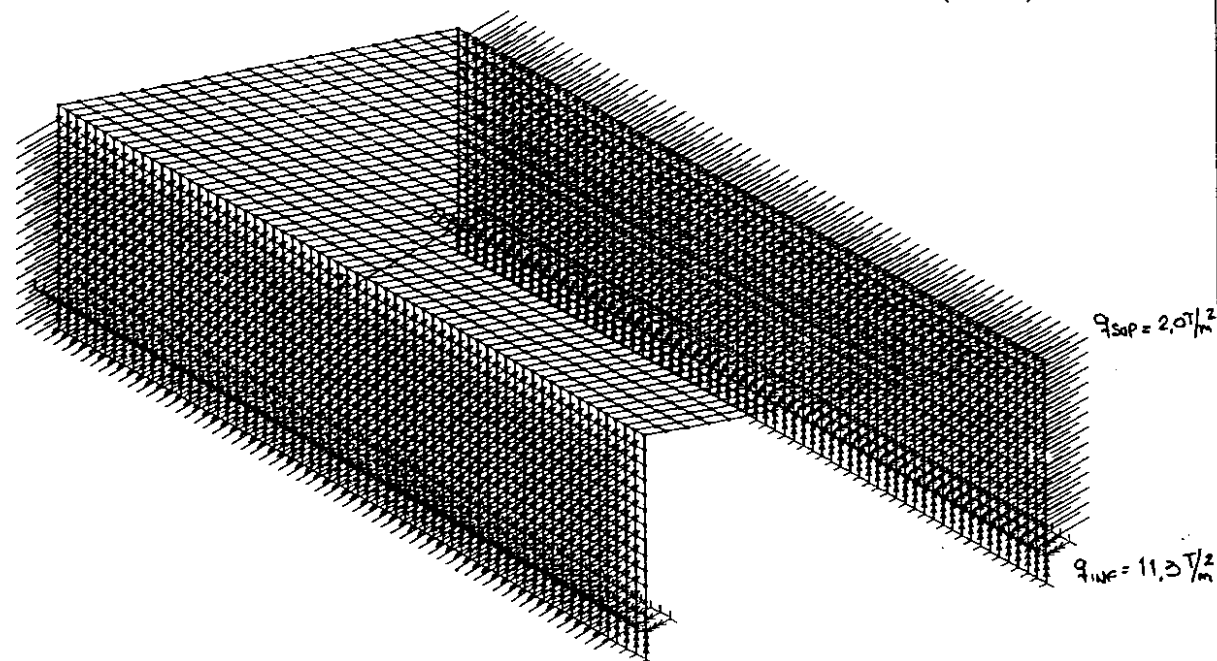


HIPOTESIS 7 (LC7)
TREN LM. 71

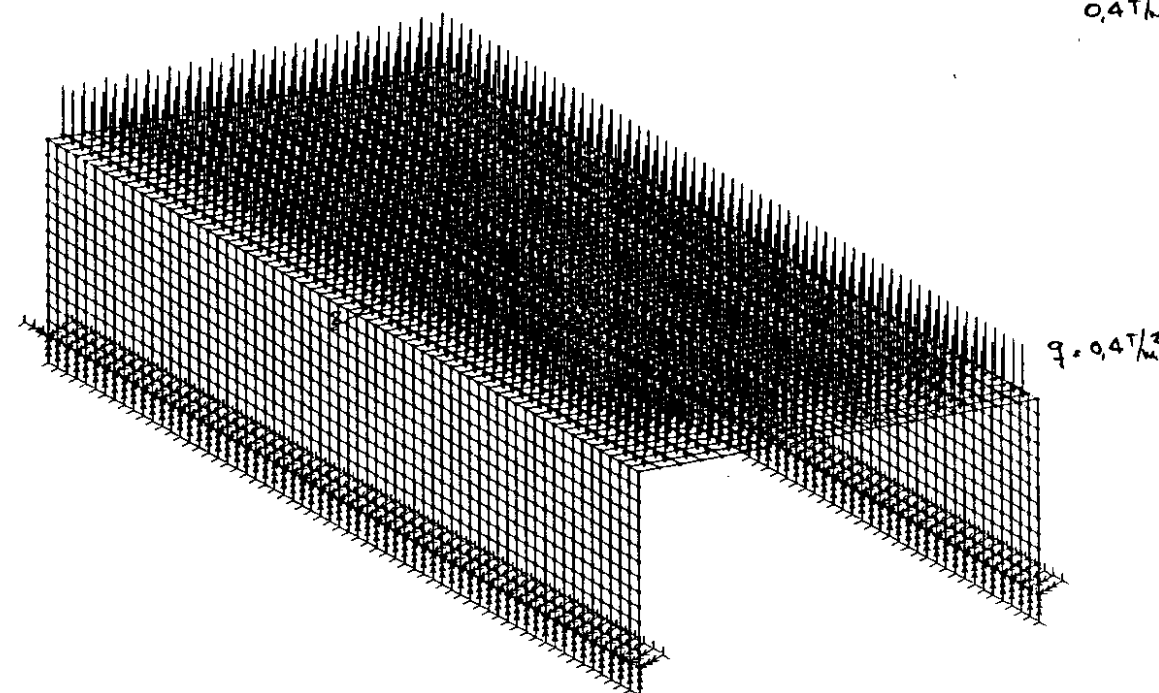


HIPOTESIS 8 (LC8)
SW/O

HIPOTESIS 9 - EMPUJE $K_0 = 0,5$
(LC9)



HIPOTESIS 10 - Sobrecarga
 $0,4 \text{ t/m}^2$



Tren de cargas más desfavorable

Load case	51	Combinación de cargas = $1.47 \cdot 1.50 \cdot (LC5)$					
Elem		NX	NY	NXY	MX	MY	MX Y
1387		-1.05	-4.35	-2.14	-2.73	-27.91	-9.50
1388		-1.01	-4.72	-2.19	-0.19	-31.51	-7.24
1389		-0.97	-5.07	-2.27	-0.05	-32.94	-6.45
1390		-0.94	-5.41	-2.35	-0.51	-34.02	-5.96
1391		-0.91	-5.74	-2.44	-1.19	-35.15	-5.47
1392		-0.89	-6.06	-2.54	-2.00	-36.44	-4.94
1393		-0.87	-6.38	-2.64	-2.94	-37.90	-4.34
1394		-0.84	-6.69	-2.74	-4.03	-39.57	-3.67
1395		-0.82	-7.01	-2.84	-5.32	-41.43	-2.95
1396		-0.79	-7.31	-2.94	-6.81	-43.49	-2.13
1397		-0.76	-7.61	-3.03	-8.57	-45.79	-1.19
1398		-0.73	-7.90	-3.12	-10.49	-48.23	-0.16
1399		-0.71	-8.18	-3.21	-12.24	-50.45	0.73
1400		-0.69	-8.43	-3.30	-13.68	-52.29	1.48
1401		-0.67	-8.66	-3.39	-15.03	-53.78	2.12
1402		-0.67	-8.87	-3.47	-16.27	-54.96	2.60
1403		-0.66	-9.05	-3.55	-17.30	-55.84	2.95
1404		-0.66	-9.21	-3.62	-18.13	-56.42	3.15
1405		-0.67	-9.33	-3.69	-18.71	-56.69	3.23
1406		-0.68	-9.44	-3.75	-19.07	-56.66	3.18
1407		-0.69	-9.51	-3.79	-19.20	-56.29	2.97
1408		-0.71	-9.57	-3.82	-19.32	-55.72	2.62
1409		-0.73	-9.59	-3.83	-19.39	-55.09	2.29
1410		-0.75	-9.60	-3.83	-19.37	-54.58	2.13
1411		-0.76	-9.58	-3.80	-19.41	-54.30	2.18
1412		-0.78	-9.54	-3.76	-19.47	-54.27	2.35
1413		-0.81	-9.47	-3.69	-19.79	-54.49	2.64
1414		-0.83	-9.38	-3.61	-20.18	-54.88	3.07
1415		-0.85	-9.27	-3.50	-20.31	-55.04	3.42
1416		-0.87	-9.13	-3.38	-20.08	-54.84	3.69
1417		-0.90	-8.97	-3.25	-19.70	-54.29	3.88
1418		-0.92	-8.79	-3.10	-19.20	-53.44	3.94
1419		-0.95	-8.58	-2.94	-18.52	-52.26	3.85
1420		-0.97	-8.36	-2.77	-17.66	-50.73	3.64
1421		-0.99	-8.11	-2.61	-16.54	-48.87	3.30
1422		-1.02	-7.86	-2.43	-15.20	-46.69	2.83
1423		-1.03	-7.58	-2.27	-13.60	-44.12	2.19
1424		-1.05	-7.30	-2.10	-11.98	-41.31	1.39
1425		-1.05	-7.01	-1.94	-10.30	-38.41	0.58
1426		-1.05	-6.72	-1.78	-8.54	-35.57	-0.12
1427		-1.05	-6.42	-1.63	-6.93	-32.94	-0.69
1428		-1.03	-6.12	-1.49	-5.45	-30.46	-1.17
1429		-1.01	-5.82	-1.35	-4.13	-28.13	-1.55
1430		-0.97	-5.51	-1.22	-2.95	-25.96	-1.86
1431		-0.93	-5.21	-1.10	-1.91	-23.92	-2.11
1432		-0.89	-4.90	-0.99	-0.99	-22.04	-2.31
1433		-0.84	-4.58	-0.88	-0.18	-20.29	-2.45
1434		-0.79	-4.25	-0.78	0.52	-18.66	-2.53
1435		-0.74	-3.92	-0.69	1.11	-17.16	-2.56
1436		-0.69	-3.57	-0.61	1.60	-15.77	-2.54
1437		-0.64	-3.21	-0.54	1.98	-14.48	-2.48
1438		-0.59	-2.84	-0.47	2.27	-13.30	-2.37
1439		-0.55	-2.45	-0.40	2.46	-12.21	-2.23
1440		-0.50	-2.06	-0.34	2.57	-11.21	-2.06
1441		-0.46	-1.66	-0.28	2.60	-10.29	-1.87
1442		-0.40	-1.27	-0.21	2.56	-9.46	-1.65
1443		-0.35	-0.87	-0.15	2.46	-8.70	-1.42
1444		-0.28	-0.49	-0.07	2.32	-8.02	-1.17
1445		-0.20	-0.12	0.02	2.15	-7.41	-0.92
1446		-0.10	0.24	0.12	1.96	-6.86	-0.68
1447		0.00	0.58	0.24	1.73	-6.35	-0.46
1448		0.13	0.91	0.40	1.38	-5.76	-0.37
1449		0.28	1.22	0.58	0.36	-4.53	-0.85

Tren de cargas más desfavorable

Load case	52	Combinación de cargas = $1.47 \cdot 1.50 \cdot (LC6)$					
Elem		NX	NY	NXY	MX	MY	MX Y
1387		-0.02	-0.11	-0.05	0.28	-6.94	-1.42
1388		-0.07	-0.32	-0.15	1.53	-8.94	-0.56
1389		-0.11	-0.55	-0.25	1.81	-10.01	-0.37
1390		-0.14	-0.78	-0.34	1.88	-10.97	-0.33
1391		-0.16	-1.03	-0.43	1.88	-11.99	-0.31
1392		-0.17	-1.30	-0.51	1.80	-13.14	-0.27
1393		-0.18	-1.58	-0.58	1.60	-14.43	-0.21
1394		-0.17	-1.87	-0.65	1.25	-15.89	-0.12
1395		-0.15	-2.16	-0.70	0.68	-17.54	0.01
1396		-0.13	-2.47	-0.73	-0.17	-19.40	0.17
1397		-0.11	-2.77	-0.76	-1.40	-21.53	0.36
1398		-0.09	-3.06	-0.76	-3.14	-23.95	0.60
1399		-0.06	-3.34	-0.76	-5.60	-26.71	0.88
1400		-0.05	-3.60	-0.75	-9.22	-29.86	1.15
1401		-0.04	-3.85	-0.73	-13.83	-33.07	1.26
1402		-0.03	-4.06	-0.70	-17.84	-35.81	1.31
1403		-0.03	-4.26	-0.67	-20.46	-37.66	1.34
1404		-0.04	-4.43	-0.64	-21.66	-38.83	1.29
1405		-0.05	-4.57	-0.61	-21.48	-39.36	1.06
1406		-0.07	-4.69	-0.58	-20.04	-39.26	0.61
1407		-0.09	-4.79	-0.55	-17.45	-38.45	-0.07
1408		-0.11	-4.86	-0.52	-14.35	-37.29	-0.87
1409		-0.13	-4.92	-0.49	-10.95	-36.00	-1.38
1410		-0.15	-4.96	-0.47	-7.71	-34.74	-1.35
1411		-0.16	-4.99	-0.44	-5.54	-33.83	-0.99
1412		-0.18	-5.00	-0.42	-4.36	-33.32	-0.56
1413		-0.19	-5.00	-0.40	-4.06	-33.23	-0.11
1414		-0.20	-4.99	-0.37	-4.62	-33.56	0.36
1415		-0.20	-4.96	-0.35	-6.12	-34.34	0.84
1416		-0.20	-4.92	-0.33	-8.86	-35.58	1.29
1417		-0.20	-4.87	-0.30	-12.62	-36.96	1.36
1418		-0.20	-4.80	-0.27	-16.57	-38.24	1.22
1419		-0.20	-4.71	-0.24	-19.83	-39.02	1.14
1420		-0.20	-4.60	-0.21	-21.64	-38.96	1.02
1421		-0.20	-4.48	-0.18	-21.95	-38.26	0.76
1422		-0.21	-4.33	-0.15	-20.95	-36.93	0.25
1423		-0.22	-4.17	-0.12	-18.65	-34.85	-0.53
1424		-0.23	-3.99	-0.09	-15.67	-32.28	-1.48
1425		-0.24	-3.79	-0.07	-12.21	-29.50	-2.29
1426		-0.26	-3.58	-0.05	-8.43	-26.72	-2.59
1427		-0.28	-3.36	-0.03	-5.26	-24.08	-2.48
1428		-0.30	-3.12	-0.02	-2.80	-21.62	-2.21
1429		-0.31	-2.89	-0.01	-0.93	-19.37	-1.93
1430		-0.33	-2.65	-0.01	0.46	-17.32	-1.66
1431		-0.34	-2.41	-0.01	1.49	-15.47	-1.43
1432		-0.35	-2.18	-0.02	2.23	-13.81	-1.22
1433		-0.35	-1.95	-0.04	2.74	-12.31	-1.04
1434		-0.35	-1.72	-0.06	3.07	-10.97	-0.89
1435		-0.35	-1.51	-0.08	3.25	-9.76	-0.76
1436		-0.34	-1.29	-0.10	3.30	-8.69	-0.64
1437		-0.33	-1.09	-0.12	3.27	-7.72	-0.54
1438		-0.31	-0.89	-0.13	3.16	-6.86	-0.44
1439		-0.30	-0.71	-0.15	2.99	-6.10	-0.35
1440		-0.28	-0.53	-0.15	2.79	-5.43	-0.26
1441		-0.26	-0.36	-0.15	2.56	-4.83	-0.18
1442		-0.24	-0.20	-0.14	2.32	-4.31	-0.09
1443		-0.21	-0.06	-0.12	2.08	-3.85	-0.01
1444		-0.18	0.07	-0.09	1.85	-3.46	0.08
1445		-0.14	0.18	-0.06	1.63	-3.12	0.17
1446		-0.10	0.28	-0.01	1.43	-2.83	0.25
1447		-0.05	0.35	0.05	1.25	-2.57	0.33
1448		0.01	0.40	0.11	1.03	-2.27	0.33
1449		0.08	0.43	0.19	0.45	-1.60	0.01

Tren de cargas más desfavorable

Load case	53	Combinación de cargas = 1.34 * 1.45 * (LC7)					
Elem	NX	NY	NXY	MX	MY	MX Y	
1387	-0.64	-2.64	-1.29	-1.54	-20.02	-6.40	
1388	-0.63	-2.96	-1.37	0.55	-23.11	-4.67	
1389	-0.62	-3.28	-1.46	0.76	-24.48	-4.12	
1390	-0.62	-3.60	-1.55	0.51	-25.59	-3.82	
1391	-0.61	-3.91	-1.65	0.09	-26.77	-3.53	
1392	-0.60	-4.23	-1.75	-0.47	-28.10	-3.21	
1393	-0.59	-4.55	-1.84	-1.17	-29.60	-2.84	
1394	-0.58	-4.88	-1.93	-2.04	-31.32	-2.43	
1395	-0.55	-5.20	-2.02	-3.17	-33.25	-1.97	
1396	-0.53	-5.52	-2.09	-4.58	-35.41	-1.44	
1397	-0.50	-5.84	-2.16	-6.40	-37.85	-0.81	
1398	-0.48	-6.15	-2.22	-8.72	-40.55	-0.11	
1399	-0.45	-6.44	-2.28	-11.30	-43.17	0.51	
1400	-0.43	-6.71	-2.33	-13.61	-45.44	1.15	
1401	-0.42	-6.96	-2.37	-15.61	-47.23	1.76	
1402	-0.41	-7.18	-2.41	-17.24	-48.68	2.27	
1403	-0.41	-7.38	-2.45	-18.41	-49.76	2.61	
1404	-0.42	-7.55	-2.48	-19.09	-50.47	2.79	
1405	-0.43	-7.69	-2.50	-19.27	-50.81	2.78	
1406	-0.44	-7.81	-2.52	-19.02	-50.77	2.59	
1407	-0.46	-7.90	-2.54	-18.35	-50.31	2.19	
1408	-0.48	-7.96	-2.54	-17.57	-49.61	1.62	
1409	-0.50	-8.01	-2.54	-16.67	-48.86	1.09	
1410	-0.52	-8.03	-2.52	-15.70	-48.26	0.77	
1411	-0.54	-8.03	-2.49	-14.96	-47.96	0.72	
1412	-0.55	-8.01	-2.46	-14.50	-47.94	0.87	
1413	-0.57	-7.97	-2.41	-14.61	-48.21	1.18	
1414	-0.59	-7.90	-2.34	-15.30	-48.77	1.61	
1415	-0.61	-7.82	-2.27	-16.31	-49.30	1.95	
1416	-0.62	-7.72	-2.19	-17.36	-49.60	2.29	
1417	-0.64	-7.60	-2.10	-18.31	-49.55	2.67	
1418	-0.65	-7.46	-2.00	-18.89	-49.14	2.93	
1419	-0.66	-7.29	-1.89	-19.09	-48.36	3.01	
1420	-0.68	-7.11	-1.78	-18.87	-47.16	2.92	
1421	-0.69	-6.91	-1.67	-18.14	-45.57	2.66	
1422	-0.71	-6.69	-1.55	-16.95	-43.59	2.20	
1423	-0.72	-6.45	-1.44	-15.29	-41.15	1.53	
1424	-0.74	-6.20	-1.32	-13.43	-38.42	0.67	
1425	-0.75	-5.94	-1.21	-11.39	-35.57	-0.20	
1426	-0.75	-5.67	-1.11	-9.15	-32.78	-0.91	
1427	-0.75	-5.39	-1.01	-7.04	-30.22	-1.42	
1428	-0.75	-5.11	-0.91	-5.09	-27.82	-1.75	
1429	-0.74	-4.82	-0.82	-3.39	-25.54	-1.94	
1430	-0.73	-4.53	-0.74	-1.96	-23.41	-2.04	
1431	-0.71	-4.24	-0.67	-0.78	-21.41	-2.09	
1432	-0.69	-3.94	-0.60	0.18	-19.56	-2.10	
1433	-0.66	-3.65	-0.54	0.96	-17.85	-2.08	
1434	-0.63	-3.35	-0.49	1.58	-16.28	-2.04	
1435	-0.60	-3.05	-0.45	2.05	-14.83	-1.98	
1436	-0.57	-2.74	-0.41	2.40	-13.50	-1.90	
1437	-0.53	-2.43	-0.37	2.64	-12.29	-1.80	
1438	-0.50	-2.11	-0.34	2.77	-11.19	-1.68	
1439	-0.47	-1.80	-0.30	2.83	-10.18	-1.55	
1440	-0.43	-1.48	-0.27	2.81	-9.27	-1.39	
1441	-0.39	-1.16	-0.23	2.73	-8.44	-1.23	
1442	-0.35	-0.85	-0.19	2.60	-7.69	-1.06	
1443	-0.31	-0.55	-0.14	2.43	-7.03	-0.87	
1444	-0.25	-0.26	-0.09	2.24	-6.43	-0.68	
1445	-0.19	0.01	-0.02	2.04	-5.91	-0.49	
1446	-0.11	0.27	0.07	1.83	-5.45	-0.30	
1447	-0.02	0.51	0.17	1.62	-5.02	-0.14	
1448	0.08	0.73	0.29	1.30	-4.53	-0.08	
1449	0.20	0.92	0.43	0.42	-3.48	-0.51	

Tren de cargas más desfavorable

Load case	54	Combinación de cargas = 1.34 * 1.45 * (LC7)					
	Elem	NX	NY	NXY	MX	MY	MX Y
	1387	-1.02	-4.22	-2.07	-2.65	-27.06	-9.20
	1388	-0.98	-4.57	-2.13	-0.18	-30.54	-7.02
	1389	-0.94	-4.91	-2.20	-0.05	-31.93	-6.25
	1390	-0.91	-5.24	-2.28	-0.49	-32.97	-5.77
	1391	-0.88	-5.56	-2.37	-1.15	-34.07	-5.31
	1392	-0.86	-5.87	-2.46	-1.94	-35.32	-4.79
	1393	-0.84	-6.18	-2.56	-2.85	-36.74	-4.20
	1394	-0.82	-6.49	-2.66	-3.90	-38.36	-3.56
	1395	-0.79	-6.79	-2.75	-5.16	-40.16	-2.86
	1396	-0.77	-7.09	-2.85	-6.61	-42.15	-2.07
	1397	-0.74	-7.38	-2.94	-8.31	-44.39	-1.15
	1398	-0.71	-7.66	-3.03	-10.17	-46.75	-0.15
	1399	-0.69	-7.93	-3.11	-11.86	-48.90	0.71
	1400	-0.67	-8.17	-3.20	-13.26	-50.69	1.44
	1401	-0.65	-8.40	-3.28	-14.57	-52.13	2.05
	1402	-0.64	-8.60	-3.36	-15.77	-53.28	2.52
	1403	-0.64	-8.77	-3.44	-16.77	-54.13	2.86
	1404	-0.64	-8.92	-3.51	-17.57	-54.69	3.06
	1405	-0.65	-9.05	-3.58	-18.13	-54.95	3.13
	1406	-0.66	-9.15	-3.63	-18.48	-54.92	3.09
	1407	-0.67	-9.22	-3.67	-18.61	-54.56	2.88
	1408	-0.69	-9.27	-3.70	-18.72	-54.01	2.54
	1409	-0.70	-9.30	-3.72	-18.79	-53.40	2.22
	1410	-0.72	-9.30	-3.71	-18.77	-52.91	2.07
	1411	-0.74	-9.29	-3.69	-18.81	-52.64	2.11
	1412	-0.76	-9.24	-3.64	-18.87	-52.60	2.28
	1413	-0.78	-9.18	-3.58	-19.18	-52.82	2.56
	1414	-0.80	-9.09	-3.50	-19.56	-53.19	2.98
	1415	-0.82	-8.98	-3.40	-19.69	-53.35	3.31
	1416	-0.85	-8.85	-3.28	-19.46	-53.16	3.58
	1417	-0.87	-8.69	-3.15	-19.10	-52.62	3.76
	1418	-0.89	-8.52	-3.00	-18.61	-51.80	3.82
	1419	-0.92	-8.32	-2.85	-17.96	-50.66	3.73
	1420	-0.94	-8.10	-2.69	-17.12	-49.17	3.52
	1421	-0.96	-7.87	-2.53	-16.03	-47.37	3.20
	1422	-0.98	-7.61	-2.36	-14.73	-45.26	2.74
	1423	-1.00	-7.35	-2.20	-13.18	-42.77	2.12
	1424	-1.02	-7.08	-2.03	-11.61	-40.05	1.35
	1425	-1.02	-6.80	-1.88	-9.98	-37.23	0.56
	1426	-1.02	-6.51	-1.73	-8.28	-34.48	-0.12
	1427	-1.01	-6.22	-1.58	-6.72	-31.93	-0.67
	1428	-1.00	-5.93	-1.44	-5.29	-29.52	-1.13
	1429	-0.97	-5.64	-1.31	-4.01	-27.27	-1.50
	1430	-0.94	-5.34	-1.19	-2.86	-25.16	-1.80
	1431	-0.91	-5.05	-1.07	-1.85	-23.19	-2.05
	1432	-0.86	-4.75	-0.96	-0.96	-21.36	-2.24
	1433	-0.82	-4.44	-0.86	-0.18	-19.66	-2.37
	1434	-0.77	-4.12	-0.76	0.50	-18.09	-2.45
	1435	-0.72	-3.80	-0.67	1.08	-16.63	-2.48
	1436	-0.67	-3.46	-0.59	1.55	-15.29	-2.46
	1437	-0.62	-3.11	-0.52	1.92	-14.04	-2.40
	1438	-0.58	-2.75	-0.45	2.20	-12.89	-2.30
	1439	-0.53	-2.38	-0.39	2.39	-11.84	-2.17
	1440	-0.49	-2.00	-0.33	2.49	-10.87	-2.00
	1441	-0.44	-1.61	-0.27	2.52	-9.98	-1.81
	1442	-0.39	-1.23	-0.21	2.48	-9.17	-1.60
	1443	-0.34	-0.85	-0.14	2.39	-8.44	-1.37
	1444	-0.27	-0.47	-0.07	2.25	-7.77	-1.14
	1445	-0.19	-0.11	0.02	2.08	-7.18	-0.90
	1446	-0.10	0.23	0.12	1.90	-6.65	-0.66
	1447	0.00	0.56	0.24	1.68	-6.16	-0.45
	1448	0.13	0.88	0.38	1.34	-5.59	-0.36
	1449	0.27	1.18	0.57	0.35	-4.39	-0.82

Load case 55

Combinación de cargas = 1.47 * (LC5)

Node	UY mm	Node	UY mm	Node	UY mm
1409	-1.666	1473	-1.752	1537	-1.781
1410	-1.684	1474	-1.768	1538	-1.790
1411	-1.707	1475	-1.785	1539	-1.804
1412	-1.734	1476	-1.808	1540	-1.823
1413	-1.765	1477	-1.836	1541	-1.847
1414	-1.800	1478	-1.868	1542	-1.875
1415	-1.838	1479	-1.904	1543	-1.907
1416	-1.879	1480	-1.943	1544	-1.943
1417	-1.923	1481	-1.985	1545	-1.983
1418	-1.967	1482	-2.029	1546	-2.025
1419	-2.014	1483	-2.075	1547	-2.069
1420	-2.059	1484	-2.122	1548	-2.114
1421	-2.104	1485	-2.168	1549	-2.160
1422	-2.147	1486	-2.213	1550	-2.205
1423	-2.187	1487	-2.255	1551	-2.247
1424	-2.225	1488	-2.295	1552	-2.287
1425	-2.260	1489	-2.330	1553	-2.324
1426	-2.290	1490	-2.362	1554	-2.357
1427	-2.316	1491	-2.390	1555	-2.384
1428	-2.338	1492	-2.412	1556	-2.407
1429	-2.355	1493	-2.429	1557	-2.424
1430	-2.368	1494	-2.440	1558	-2.436
1431	-2.376	1495	-2.447	1559	-2.441
1432	-2.379	1496	-2.448	1560	-2.440
1433	-2.377	1497	-2.444	1561	-2.434
1434	-2.370	1498	-2.434	1562	-2.422
1435	-2.357	1499	-2.419	1563	-2.405
1436	-2.337	1500	-2.398	1564	-2.382
1437	-2.310	1501	-2.370	1565	-2.354
1438	-2.276	1502	-2.335	1566	-2.319
1439	-2.236	1503	-2.294	1567	-2.277
1440	-2.189	1504	-2.246	1568	-2.230
1441	-2.135	1505	-2.192	1569	-2.177
1442	-2.076	1506	-2.132	1570	-2.117
1443	-2.012	1507	-2.066	1571	-2.053
1444	-1.943	1508	-1.996	1572	-1.983
1445	-1.869	1509	-1.920	1573	-1.908
1446	-1.793	1510	-1.841	1574	-1.830
1447	-1.714	1511	-1.759	1575	-1.748
1448	-1.635	1512	-1.676	1576	-1.663
1449	-1.554	1513	-1.591	1577	-1.578
1450	-1.473	1514	-1.507	1578	-1.492
1451	-1.392	1515	-1.422	1579	-1.406
1452	-1.312	1516	-1.338	1580	-1.320
1453	-1.234	1517	-1.256	1581	-1.237
1454	-1.157	1518	-1.175	1582	-1.155
1455	-1.082	1519	-1.097	1583	-1.076
1456	-1.010	1520	-1.021	1584	-0.999
1457	-0.940	1521	-0.948	1585	-0.925
1458	-0.873	1522	-0.878	1586	-0.854
1459	-0.809	1523	-0.811	1587	-0.786
1460	-0.748	1524	-0.748	1588	-0.722
1461	-0.690	1525	-0.688	1589	-0.662
1462	-0.635	1526	-0.631	1590	-0.605
1463	-0.583	1527	-0.577	1591	-0.551
1464	-0.535	1528	-0.527	1592	-0.501
1465	-0.489	1529	-0.480	1593	-0.454
1466	-0.446	1530	-0.435	1594	-0.410
1467	-0.405	1531	-0.394	1595	-0.369
1468	-0.366	1532	-0.355	1596	-0.330
1469	-0.330	1533	-0.318	1597	-0.295
1470	-0.295	1534	-0.283	1598	-0.261
1471	-0.262	1535	-0.251	1599	-0.229
1472	-0.231	1536	-0.220	1600	-0.200

Cálculo de la deformación vertical instantánea

$$f_1 = (2,49 \text{ mm}) \times \frac{I_b}{I_e}$$

$$I_e = \left(\frac{M_f}{M_a} \right)^3 I_b + \left[1 - \left(\frac{M_f}{M_a} \right)^3 \right] I_f$$

$$M_f = \frac{f_{cf} I_b}{\gamma_1} = \frac{31,7 \times 0,0833}{0,5} = 52,8 \text{ Tm}$$

$$f_{cf} = 0,8 \sqrt[3]{(250)^2} = 31,7 \text{ Kg/cm}^2$$

$$I_b = 0,0833 \text{ m}^4$$

$$M_a = 96 \text{ Tm} \quad I_f = 0,0222 \text{ m}^4$$

$$I_e = \left(\frac{52,8}{96,0} \right)^3 0,0833 \text{ m}^4 + \left[1 - \left(\frac{52,8}{96,0} \right)^3 \right] 0,0222 \text{ m}^4$$

$$I_e = 0,01386 + 0,01851 = 0,0324 \text{ m}^4$$

$$\therefore f_1 = (2,49 \text{ mm}) \times \frac{0,0833}{0,0324} = 6,40 \text{ mm}$$

$$\frac{f_1}{L} = \frac{1}{2234} < \left(\frac{\gamma}{L} \right)_{\text{limite}} = \frac{1}{\frac{1500}{1,1}} = \frac{1}{1364}$$

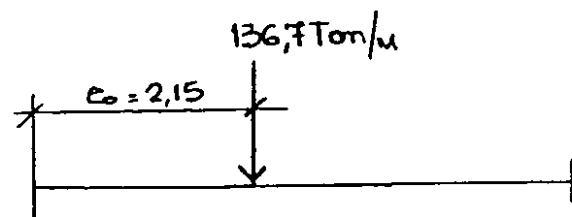
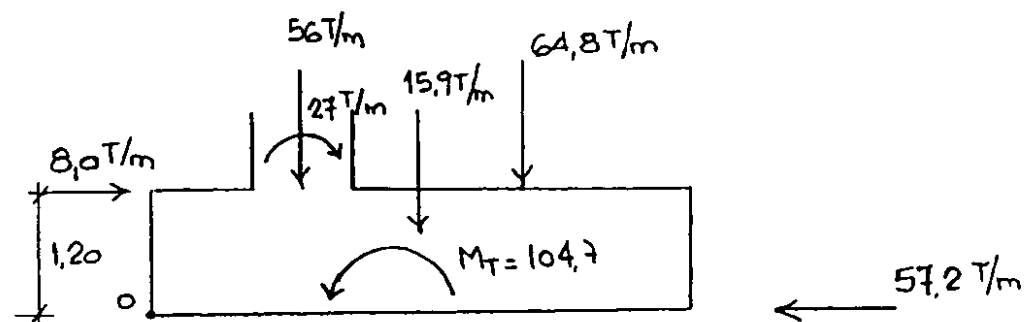
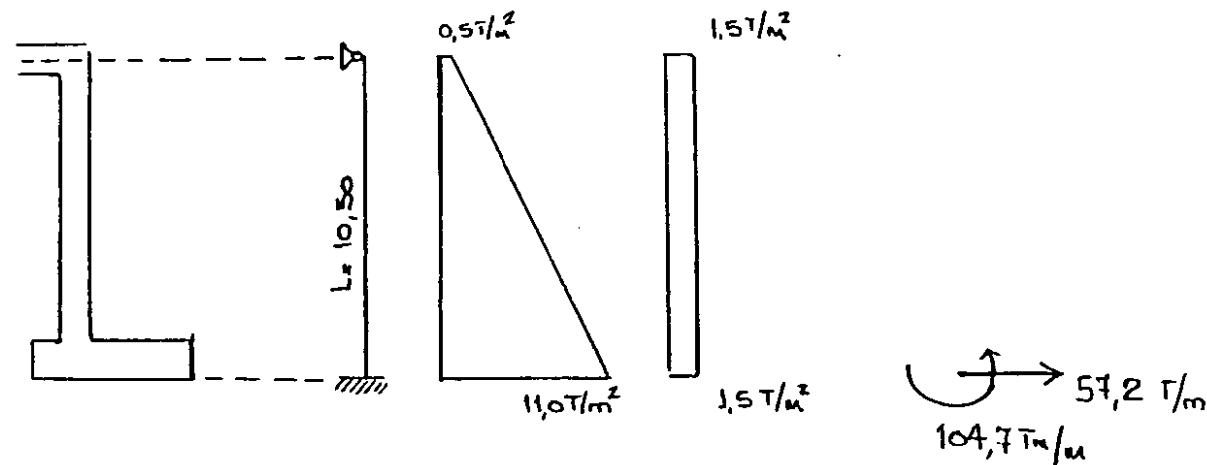
$\therefore$ Verifica

Load case 57 Combinación de cargas = 1.00 * (LC1) + 1.00 * (LC2) + 1.00 * (LC3) + 1.00 * (LC4)

REACCION SOBRE ZAPATA S.

Node	RFX	RFY	RFZ	RFY (T/m)	RFZ (T/m)	Node	RMX	RMY	RMZ	RMX (Tm/m)	Node	RFX	RFY	RFZ	RFY (T/m)	RFZ (T/m)	Node	RMX	RMY	RMZ	RMX (Tm/m)
1	3.37	13.27	-3.48	26.38	-6.92	1	-12.25	2.78	0.72	-24.35	2113	6.84	23.88	0.94	47.48	1.87	2113	-11.73	2.98	1.24	-23.32
2	2.01	22.23	-11.18	44.19	-22.23	2	-23.43	1.33	-0.09	-46.58	2114	5.25	33.94	-3.30	67.48	-6.55	2114	-22.22	1.61	-0.16	-44.17
3	1.41	22.10	-13.49	43.94	-26.82	3	-24.87	0.79	-0.07	-49.44	2115	5.57	29.59	-6.26	58.83	-12.44	2115	-23.99	0.99	-0.07	-47.69
4	0.76	22.48	-13.87	44.69	-27.57	4	-25.70	0.42	-0.06	-51.09	2116	5.43	27.73	-6.79	55.13	-13.49	2116	-25.02	0.51	-0.02	-49.74
5	0.21	22.85	-13.85	45.43	-27.53	5	-26.14	0.25	-0.06	-51.97	2117	5.32	26.67	-6.75	53.02	-13.41	2117	-25.54	0.28	0.00	-50.78
6	-0.25	23.16	-13.77	46.04	-27.38	6	-26.41	0.17	-0.06	-52.50	2118	5.21	26.04	-6.59	51.77	-13.10	2118	-25.83	0.17	0.01	-51.35
7	-0.65	23.39	-13.71	46.50	-27.26	7	-26.61	0.13	-0.05	-52.90	2119	5.11	25.66	-6.46	51.01	-12.83	2119	-26.02	0.13	0.02	-51.73
8	-0.99	23.56	-13.67	46.84	-27.18	8	-26.76	0.11	-0.05	-53.20	2120	5.01	25.44	-6.37	50.58	-12.66	2120	-26.17	0.12	0.02	-52.03
9	-1.28	23.68	-13.65	47.08	-27.14	9	-26.90	0.10	-0.04	-53.48	2121	4.91	25.32	-6.33	50.34	-12.58	2121	-26.33	0.12	0.03	-52.35
10	-1.52	23.75	-13.65	47.22	-27.14	10	-27.02	0.09	-0.04	-53.72	2122	4.81	25.27	-6.33	50.24	-12.58	2122	-26.49	0.12	0.02	-52.66
11	-1.73	23.79	-13.65	47.30	-27.14	11	-27.13	0.08	-0.03	-53.94	2123	4.70	25.27	-6.35	50.24	-12.62	2123	-26.65	0.12	0.02	-52.98
12	-1.90	23.81	-13.66	47.34	-27.16	12	-27.23	0.07	-0.03	-54.14	2124	4.59	25.30	-6.39	50.30	-12.70	2124	-26.83	0.13	0.02	-53.34
13	-2.04	23.81	-13.67	47.34	-27.18	13	-27.33	0.07	-0.02	-54.33	2125	4.48	25.35	-6.43	50.40	-12.79	2125	-27.00	0.12	0.02	-53.68
14	-2.16	23.80	-13.68	47.32	-27.20	14	-27.41	0.06	-0.02	-54.49	2126	4.37	25.41	-6.48	50.52	-12.89	2126	-27.17	0.12	0.02	-54.02
15	-2.27	23.79	-13.70	47.30	-27.24	15	-27.49	0.06	-0.02	-54.65	2127	4.26	25.47	-6.53	50.64	-12.99	2127	-27.33	0.12	0.02	-54.33
16	-2.35	23.77	-13.71	47.26	-27.26	16	-27.56	0.05	-0.01	-54.79	2128	4.16	25.54	-6.58	50.78	-13.08	2128	-27.49	0.11	0.01	-54.65
17	-2.43	23.75	-13.72	47.22	-27.28	17	-27.63	0.05	-0.01	-54.93	2129	4.06	25.60	-6.62	50.89	-13.17	2129	-27.64	0.10	0.01	-54.95
18	-2.50	23.73	-13.73	47.18	-27.30	18	-27.69	0.04	-0.01	-55.05	2130	3.96	25.66	-6.66	51.01	-13.25	2130	-27.77	0.10	0.01	-55.21
19	-2.56	23.71	-13.73	47.14	-27.30	19	-27.74	0.04	-0.01	-55.15	2131	3.87	25.72	-6.70	51.13	-13.32	2131	-27.90	0.09	0.01	-55.47
20	-2.61	23.69	-13.74	47.10	-27.32	20	-27.79	0.03	0.00	-55.25	2132	3.78	25.77	-6.73	51.23	-13.38	2132	-28.02	0.08	0.01	-55.71
21	-2.66	23.67	-13.75	47.06	-27.34	21	-27.83	0.03	0.00	-55.33	2133	3.70	25.82	-6.76	51.33	-13.44	2133	-28.12	0.07	0.01	-55.90
22	-2.71	23.65	-13.75	47.02	-27.34	22	-27.87	0.03	0.00	-55.41	2134	3.62	25.86	-6.78	51.41	-13.48	2134	-28.22	0.07	0.01	-56.10
23	-2.75	23.64	-13.75	47.00	-27.34	23	-27.90	0.02	0.00	-55.47	2135	3.55	25.90	-6.80	51.49	-13.52	2135	-28.31	0.06	0.00	-56.28
24	-2.80	23.62	-13.76	46.96	-27.36	24	-27.93	0.02	0.00	-55.53	2136	3.48	25.94	-6.82	51.57	-13.56	2136	-28.39	0.06	0.00	-56.44
25	-2.84	23.61	-13.76	46.94	-27.36	25	-27.96	0.02	0.00	-55.59	2137	3.41	25.97	-6.84	51.63	-13.59	2137	-28.47	0.05	0.00	-56.60
26	-2.88	23.60	-13.76	46.92	-27.36	26	-27.99	0.02	0.00	-55.65	2138	3.35	26.00	-6.85	51.69	-13.61	2138	-28.53	0.05	0.00	-56.72
27	-2.92	23.59	-13.76	46.90	-27.36	27	-28.01	0.02	0.00	-55.69	2139	3.29	26.03	-6.86	51.75	-13.64	2139	-28.60	0.04	0.00	-56.86
28	-2.96	23.58	-13.76	46.88	-27.36	28	-28.03	0.01	0.00	-55.73	2140	3.24	26.05	-6.87	51.79	-13.66	2140	-28.66	0.04	0.00	-56.98
29	-3.00	23.57	-13.76	46.86	-27.36	29	-28.04	0.01	0.00	-55.75	2141	3.18	26.07	-6.88	51.83	-13.67	2141	-28.71	0.04	0.00	-57.08
30	-3.04	23.56	-13.76	46.84	-27.36	30	-28.06	0.01	0.00	-55.79	2142	3.14	26.10	-6.89	51.89	-13.69	2142	-28.76	0.04	0.00	-57.18
31	-3.08	23.55	-13.76	46.82	-27.36	31	-28.07	0.01	0.00	-55.81	2143	3.09	26.11	-6.89	51.91	-13.71	2143	-28.82	0.04	0.00	-57.30
32	-3.12	23.55	-13.75	46.82	-27.34	32	-28.08	0.01	0.01	-55.83	2144	3.05	26.13	-6.90	51.95	-13.72	2144	-28.87	0.04	0.00	-57.40
33	-3.16	23.54	-13.75	46.80	-27.34	33	-28.09	0.01	0.01	-55.84	2145	3.00	26.15	-6.91	51.99	-13.74	2145	-28.91	0.04	0.00	-57.48
34	-3.20	23.54	-13.74	46.80	-27.32	34	-28.10	0.00	0.01	-55.86	2146	2.96	26.17	-6.92	52.03	-13.75	2146	-28.96	0.04	0.00	-57.57
35	-3.24	23.54	-13.74	46.80	-27.32	35	-28.10	0.00	0.01	-55.86	2147	2.93	26.19	-6.92	52.07	-13.76	2147	-29.01	0.04	0.00	-57.67
36	-3.28	23.53	-13.73	46.78	-27.30	36	-28.10	0.00	0.01	-55.86	2148	2.89	26.20	-6.93	52.09	-13.78	2148	-29.06	0.04	0.00	-57.77
37	-3.33	23.53	-13.72	46.78	-27.28	37	-28.10	0.00	0.01	-55.86	2149	2.85	26.22	-6.94	52.13	-13.79	2149	-29.11	0.04	0.00	-57.87
38	-3.37	23.53	-13.72	46.78	-27.28	38	-28.10	0.00	0.01	-55.86	2150	2.82	26.24	-6.95	52.17	-13.81	2150	-29.16	0.04	0.00	-57.97
39	-3.42	23.53	-13.71	46.78	-27.26	39	-28.10	0.00	0.01	-55.86	2151	2.79	26.27	-6.95	52.23	-13.83	2151	-29.22	0.04	0.01	-58.09
40	-3.47	23.54	-13.70	46.80	-27.24	40	-28.10	0.00	0.01	-55.86	2152	2.75	26.29	-6.96	52.27	-13.84	2152	-29.28	0.05	0.01	-58.21
41	-3.52	23.54	-13.69	46.80	-27.22	41	-28.11	0.00	0.01	-55.88	2153	2.72	26.32	-6.97	52.33	-13.86	2153	-29.34	0.05	0.01	-58.33
42	-3.58	23.55	-13.68	46.82	-27.20	42	-28.11	0.00	0.01	-55.88	2154	2.69	26.35	-6.99	52.39	-13.89	2154	-29.41	0.05	0.01	-58.47
43	-3.63	23.56	-13.67	46.84	-27.18	43	-28.11	0.01	0.01	-55.88	2155	2.65	26.38	-7.00	52.45	-13.91	2155	-29.49	0.06	0.01	-58.63
44	-3.69	23.57	-13.67	46.86	-27.18	44	-28.12	0.01	0.01	-55.90	2156	2.61	26.42	-7.01	52.52	-13.94	2156	-29.57	0.06	0.01	-58.79
45	-3.75	23.58	-13.66	46.88	-27.16	45	-28.13	0.01	0.01	-55.92	2157	2.58	26.47	-7.03	52.62	-13.97	2157	-29.66	0.07	0.01	-58.97
46	-3.81	23.60	-13.66	46.92	-27.16	46	-28.15	0.02	0.01	-55.96	2158	2.53	26.52	-7.05	52.72	-14.01	2158	-29.76	0.08	0.02	-59.17
47	-3.88	23.62	-13.66	46.96	-27.16	47	-28.18	0.02	0.01	-56.02	2159	2.48	26.57	-7.07	52.82	-14.06	2159	-29.87	0.08	0.02	-59.38
48	-3.95	23.65	-13.66	47.02	-27.16	48	-28.21	0.03	0.01	-56.08	2160	2.42	26.63	-7.10	52.94	-14.11	2160	-29.99	0.09	0.02	-59.62
49	-4.02	23.68	-13.67	47.08	-27.18	49	-28.25	0.03	0.01	-56.16	2161	2.35	26.69	-7.13	53.06	-14.17	2161	-30.13	0.11	0.03	-59.90
50	-4.09	23.72	-13.68	47.16	-27.20	50	-28.30	0.04	0.01	-56.26	2162	2.27	26.76	-7.17	53.20	-14.25	2162	-30.28	0.12	0.03	-60.20
51	-4.17	23.77	-13.70	47.26	-27.24	51	-28.36	0.05	0.01	-56.38	2163	2.17	26.82	-7.21	53.32	-14.34	2163	-30.46	0.14	0.04	-60.56
52	-4.25	23.84	-13.73	47.40	-27.30	52	-28.44	0.06	0.01	-56.54	2164	2.04	26.89	-7.27	53.46	-14.48	2164	-30.66	0.15	0.04	-60.95
53	-4.32	23.94	-13.76	47.59	-27.36	53	-28.52	0.07	0.01	-56.70	2165	1.89	26.94	-7.35	53.56	-14.60	2165	-30.88	0.17	0.05	-61.39
54	-4.41	24.08	-13.81	47.83	-27.46	54	-28.62	0.07	0.01	-56.90	2166	1.71	26.98	-7.44	53.64	-14.80	2166	-31.14	0.20	0.06	-61.91
55	-4.49	24.21	-13.88	48.13	-27.59	55	-28.73	0.08	0.01	-57.12	2167	1.49	27.00	-7.57	53.68	-15.05	2167	-31.44	0.23	0.06	-62.50
56	-4.57	24.43	-13.96	48.57	-27.75	56	-28.85	0.09	0.01	-57.36	2168	1.22	26.99	-7.74	53.66	-15.39	2168	-31.77	0.25	0.07	-63.16
57	-4.66	24.71	-14.08	49.13	-27.99	57	-28.99	0.09	0.01	-57.63	2169	0.90	26.94	-7.98	53.56	-15.86	2169	-32.15	0.28	0.08	-63.92
58	-4.75	25.11	-14.23	49.92	-28.29	58	-29.12	0.09	0.01												

CALCULO DE ZAPATAS ($\kappa_0 = 0,50$)



$$\sigma_{ob} = \frac{136,7 \text{ Tm}}{2 \times 2,15 \text{ m}} = 31,8 \text{ T/m}^2$$

CON SOBRECARGA.

$$\begin{array}{rcl} 136,7 \times 2,15 & = & 293,9 \\ 18,0 \times 1,50 & = & 27,0 \\ \hline 154,7 \text{ Tm} & & 320,9 \text{ Tm} \end{array}$$

$$e_0 = 2,07 \text{ m}$$

$$\sigma_{ob} = \frac{154,7}{2 \times 2,07} = 37,3 \text{ T/m}^2$$

$$y_D = \frac{(56 + 64,8 + 15,9) 0,58 + 8,0}{57,2}$$

$$y_D = 1,53$$

$$\begin{array}{rcl} 56,0 \times 1,50 & = & 84,0 \\ 15,9 \times 2,65 & = & 42,1 \\ 64,8 \times 3,65 & = & 236,5 \\ 8,0 \times 1,20 & = & 9,6 \\ & & 27,0 \\ & & - 104,7 \\ \hline \end{array}$$

$$\Sigma M_0 = 294,5 \text{ Tm}$$

$$\Sigma N = 136,7 \text{ Tm}$$

$$e_0 = 2,15 \text{ m}$$

ARMADURA SUPERIOR

$$\sigma_{min} = \frac{154,7}{5,3} - \frac{154,7(2,65 - 2,07)}{(5,3)^2} = 29,2 - 19,2 = 10,0 \text{ T/m}^2$$

$$M_{sup} = (9,8 \times 2 + 1,2 \times 2,5 - 10,0) \frac{3,3^2}{2} = 68,6 \text{ Tm/m}$$

$$A_{sUP} = 20,8 \text{ cm}^2/\text{m} \quad \phi 25/0,20$$

ARMADURA INFERIOR

$$\sigma_{max} = 29,2 + 19,2 = 48,4 \text{ T/m}^2$$

$$M_{inf} = \frac{(48,4 - 1,2 \times 2,5)(3,0)^2}{2} = 22,7 \text{ Tm/m}$$

$$A_{sINF} = 6,8 \text{ cm}^2/\text{m} \quad \text{Se Adopta } \phi 16/0,15.$$

CALCULO DEL DINTEL
SOLICITACIONES

Load Case 58 Combinación de Cargas = 1.50*(LC1) + 1.50*(LC2) + 1.50*(LC3) + 1.50*(LC4) + 1.50*1.47*(LC5) + 1.50*(LC10)

Elem	MY	VY	Elem	MY	VY	Elem	MY	Elem	MY	Elem	MY	VY	Elem	MY	VY		
820	74.78	-31.49	883	69.66	-45.14	1324	-65.02	1387	-77.45	1450	-86.18	1891	8.41	74.12	1954	84.27	107.50
821	90.41	-34.35	884	73.59	-34.58	1325	-73.95	1388	-86.70	1451	-95.43	1892	21.53	61.69	1955	90.38	90.04
822	99.05	-43.89	885	74.28	-37.39	1326	-79.43	1389	-91.36	1452	-99.09	1893	30.69	61.14	1956	91.40	74.36
823	105.30	-51.68	886	74.57	-42.54	1327	-83.88	1390	-94.81	1453	-101.40	1894	36.79	58.92	1957	91.41	65.51
824	110.20	-57.41	887	74.97	-47.16	1328	-87.93	1391	-97.88	1454	-103.30	1895	40.81	56.40	1958	91.01	60.53
825	114.20	-61.59	888	75.52	-50.96	1329	-91.77	1392	-100.80	1455	-105.10	1896	43.43	54.40	1959	90.65	57.88
826	117.60	-64.70	889	76.19	-54.20	1330	-95.48	1393	-103.60	1456	-106.90	1897	45.19	53.08	1960	90.51	56.64
827	120.50	-67.09	890	76.96	-57.03	1331	-99.06	1394	-106.40	1457	-108.70	1898	46.43	52.40	1961	90.62	56.31
828	123.10	-69.55	891	77.86	-59.45	1332	-102.60	1395	-109.20	1458	-110.60	1899	47.35	52.21	1962	90.96	56.54
829	125.60	-70.46	892	78.96	-62.33	1333	-106.20	1396	-112.00	1459	-112.50	1900	48.08	52.41	1963	91.49	57.14
830	127.70	-70.01	893	80.14	-64.06	1334	-109.70	1397	-114.90	1460	-114.50	1901	48.67	52.89	1964	92.15	57.98
831	129.40	-70.31	894	81.25	-64.50	1335	-112.70	1398	-117.70	1461	-116.60	1902	49.17	53.58	1965	92.89	58.98
832	130.80	-70.72	895	82.16	-63.69	1336	-115.20	1399	-120.30	1462	-118.80	1903	49.57	54.44	1966	93.66	60.09
833	131.90	-70.37	896	82.70	-63.58	1337	-117.30	1400	-122.40	1463	-120.90	1904	49.87	55.42	1967	94.44	61.28
834	132.60	-71.39	897	82.88	-62.63	1338	-118.90	1401	-124.00	1464	-122.70	1905	50.08	56.50	1968	95.17	62.53
835	133.40	-73.64	898	82.84	-62.69	1339	-120.10	1402	-125.30	1465	-124.20	1906	50.16	57.65	1969	95.82	63.82
836	134.30	-75.13	899	82.71	-63.84	1340	-120.90	1403	-126.30	1466	-125.40	1907	50.10	58.85	1970	96.35	65.13
837	135.30	-76.51	900	82.65	-66.00	1341	-121.30	1404	-126.90	1467	-126.30	1908	49.87	60.02	1971	96.75	66.49
838	136.30	-78.07	901	82.76	-67.34	1342	-121.30	1405	-127.20	1468	-126.80	1909	49.44	61.27	1972	96.98	67.90
839	137.30	-79.42	902	82.97	-68.63	1343	-121.00	1406	-127.20	1469	-127.10	1910	48.80	62.64	1973	97.03	69.33
840	138.30	-80.60	903	83.30	-69.66	1344	-120.40	1407	-126.90	1470	-127.20	1911	47.95	63.92	1974	96.85	70.84
841	139.30	-81.53	904	83.77	-70.49	1345	-119.90	1408	-126.30	1471	-126.90	1912	46.80	65.94	1975	96.46	72.08
842	140.30	-82.16	905	84.36	-71.26	1346	-119.70	1409	-125.70	1472	-126.30	1913	45.47	66.85	1976	95.76	73.33
843	141.20	-82.50	906	85.08	-71.97	1347	-119.80	1410	-125.20	1473	-125.50	1914	44.07	66.58	1977	94.70	75.29
844	142.10	-83.13	907	85.97	-72.49	1348	-120.00	1411	-124.90	1474	-124.80	1915	42.76	65.29	1978	93.39	75.90
845	143.00	-82.29	908	87.09	-73.52	1349	-120.40	1412	-124.90	1475	-124.40	1916	41.66	64.64	1979	92.14	75.08
846	143.70	-80.09	909	88.35	-73.15	1350	-120.70	1413	-125.20	1476	-124.30	1917	40.70	63.82	1980	90.86	74.58
847	143.90	-78.60	910	89.42	-71.34	1351	-120.80	1414	-125.60	1477	-124.50	1918	39.83	62.93	1981	89.53	73.81
848	144.00	-77.02	911	90.19	-70.17	1352	-120.50	1415	-125.80	1478	-124.70	1919	39.04	61.94	1982	88.17	72.80
849	143.80	-75.58	912	90.68	-69.01	1353	-120.00	1416	-125.60	1479	-124.90	1920	38.35	60.74	1983	86.79	71.64
850	143.30	-74.22	913	91.00	-67.57	1354	-119.20	1417	-125.10	1480	-124.90	1921	37.73	59.70	1984	85.45	70.27
851	142.70	-72.82	914	91.14	-66.23	1355	-118.00	1418	-124.30	1481	-124.50	1922	37.27	58.54	1985	84.14	68.64
852	142.00	-71.44	915	91.12	-64.90	1356	-116.50	1419	-123.20	1482	-123.80	1923	37.00	56.64	1986	82.87	66.99
853	141.00	-70.08	916	90.97	-63.63	1357	-114.70	1420	-121.80	1483	-122.80	1924	36.79	56.00	1987	81.77	64.58
854	140.00	-68.76	917	90.67	-62.41	1358	-112.50	1421	-120.00	1484	-121.50	1925	36.31	56.72	1988	80.73	63.25
855	138.90	-67.48	918	90.25	-61.20	1359	-109.90	1422	-117.90	1485	-119.90	1926	35.46	56.95	1989	79.56	62.99
856	137.60	-66.23	919	89.73	-60.02	1360	-107.10	1423	-115.40	1486	-117.90	1927	34.26	57.03	1990	78.20	63.85
857	136.30	-65.02	920	89.12	-58.88	1361	-104.40	1424	-112.80	1487	-115.70	1928	32.74	57.97	1991	76.67	64.11
858	135.00	-63.84	921	88.44	-57.78	1362	-101.90	1425	-110.00	1488	-113.00	1929	31.02	57.48	1992	74.89	65.20
859	133.50	-62.70	922	87.71	-56.72	1363	-99.67	1426	-107.40	1489	-110.10	1930	29.46	55.58	1993	72.99	65.30
860	132.10	-61.60	923	86.92	-55.70	1364	-97.56	1427	-104.90	1490	-107.30	1931	28.21	54.21	1994	71.14	64.37
861	130.70	-60.54	924	86.10	-54.73	1365	-95.62	1428	-102.70	1491	-104.80	1932	27.25	52.84	1995	69.40	62.41
862	129.20	-59.53	925	85.24	-53.81	1366	-93.85	1429	-100.60	1492	-102.40	1933	26.53	51.16	1996	67.74	60.89
863	127.80	-58.57	926	84.37	-52.93	1367	-92.26	1430	-98.70	1493	-100.30	1934	26.01	49.40	1997	66.17	59.15
864	126.30	-57.65	927	83.50	-52.11	1368	-90.84	1431	-96.97	1494	-98.27	1935	25.71	47.52	1998	64.69	57.14
865	124.90	-56.78	928	82.62	-51.34	1369	-89.59	1432	-95.41	1495	-96.43	1936	25.66	45.38	1999	63.35	54.93
866	123.60	-55.95	929	81.76	-50.63	1370	-88.51	1433	-94.01	1496	-94.71	1937	25.87	43.19	2000	62.18	52.47
867	122.40	-55.19	930	80.92	-49.99	1371	-87.59	1434	-92.74	1497	-93.11	1938	26.42	40.16	2001	61.16	50.17
868	121.20	-54.48	931	80.10	-49.42	1372	-86.83	1435	-91.59	1498	-91.59	1939	27.19	38.11	2002	60.40	47.71
869	120.10	-53.85	932	79.33	-48.95	1373	-86.21	1436	-90.54	1499	-90.14	1940	28.06	37.13	2003	59.94	44.43
870	119.20	-53.30	933	78.59	-48.60	1374	-85.70	1437	-89.56	1500	-88.73	1941	28.89	37.05	2004	59.68	42.36
871	118.40	-52.87	934	77.89	-48.38	1375	-85.30	1438	-88.64	1501	-87.35	1942	29.57	36.20	2005	59.29	41.56
872	117.80	-52.58	935	77.23	-48.35	1376	-84.97	1439	-87.75	1502	-85.95	1943	30.17	35.34	2006	58.85	40.27
873	117.40	-52.49</															

APOYO HASTIAL 2

CENTO DE VANO

APOYO HASTIAL 1

CALCULO DEL DINTEL
SOLICITACIONES

Load Case 59 Combinación de Cargas = 1.50*(LC1) + 1.50*(LC2) + 1.50*1.47*(LC5) + 1.50*(LC10)

Elem	MY	VY	Elem	MY	VY	Elem	MY	Elem	MY	Elem	MY	Elem	MY	VY	Elem	MY	VY
820	62.15	-31.65	883	54.68	-41.66	1324	-77.72	1387	-88.51	1450	-95.35	1891	21.71	77.57	1954	106.00	113.10
821	75.11	-34.24	884	56.86	-33.36	1325	-87.57	1388	-98.56	1451	-105.30	1892	36.99	67.15	1955	113.00	98.62
822	82.07	-43.04	885	56.46	-36.38	1326	-92.86	1389	-103.00	1452	-108.60	1893	47.14	67.55	1956	114.40	82.20
823	86.98	-50.33	886	55.89	-41.31	1327	-96.92	1390	-105.90	1453	-110.30	1894	53.88	65.32	1957	114.40	72.45
824	90.78	-55.74	887	55.53	-45.66	1328	-100.60	1391	-108.50	1454	-111.70	1895	58.30	62.47	1958	113.90	66.70
825	93.81	-59.69	888	55.40	-49.24	1329	-104.00	1392	-110.90	1455	-113.00	1896	61.15	60.06	1959	113.20	63.42
826	96.31	-62.62	889	55.44	-52.27	1330	-107.30	1393	-113.30	1456	-114.30	1897	63.00	58.37	1960	112.70	61.70
827	98.45	-64.87	890	55.64	-54.92	1331	-110.60	1394	-115.70	1457	-115.60	1898	64.23	57.34	1961	112.40	60.98
828	100.30	-67.19	891	56.00	-57.19	1332	-113.80	1395	-118.10	1458	-117.00	1899	65.10	56.87	1962	112.40	60.92
829	102.20	-67.98	892	56.61	-59.92	1333	-117.10	1396	-120.50	1459	-118.50	1900	65.75	56.84	1963	112.60	61.31
830	103.70	-67.41	893	57.33	-61.52	1334	-120.30	1397	-123.10	1460	-120.10	1901	66.25	57.13	1964	113.00	61.99
831	104.80	-67.59	894	58.02	-61.84	1335	-123.10	1398	-125.70	1461	-121.90	1902	66.66	57.68	1965	113.60	62.87
832	105.70	-67.90	895	58.53	-60.91	1336	-125.30	1399	-127.90	1462	-123.80	1903	66.97	58.43	1966	114.20	63.90
833	106.30	-67.45	896	58.70	-60.70	1337	-127.20	1400	-129.80	1463	-125.50	1904	67.20	59.32	1967	114.80	65.04
834	106.60	-68.37	897	58.55	-59.65	1338	-128.60	1401	-131.20	1464	-127.10	1905	67.34	60.34	1968	115.40	66.25
835	107.00	-70.54	898	58.19	-59.63	1339	-129.60	1402	-132.30	1465	-128.30	1906	67.37	61.44	1969	115.90	67.51
836	107.50	-71.95	899	57.77	-60.70	1340	-130.20	1403	-133.00	1466	-129.30	1907	67.27	62.60	1970	116.40	68.81
837	108.10	-73.25	900	57.44	-62.79	1341	-130.50	1404	-133.40	1467	-130.00	1908	67.00	63.75	1971	116.70	70.16
838	108.80	-74.75	901	57.31	-64.06	1342	-130.40	1405	-133.60	1468	-130.40	1909	66.54	64.98	1972	116.90	71.56
839	109.50	-76.04	902	57.29	-65.28	1343	-129.90	1406	-133.40	1469	-130.50	1910	65.88	66.34	1973	116.90	72.99
840	110.20	-77.17	903	57.41	-66.26	1344	-129.20	1407	-132.90	1470	-130.40	1911	65.02	67.61	1974	116.70	74.50
841	111.00	-78.05	904	57.69	-67.04	1345	-128.60	1408	-132.20	1471	-130.00	1912	63.86	69.63	1975	116.30	75.74
842	111.70	-78.64	905	58.11	-67.77	1346	-128.30	1409	-131.50	1472	-129.30	1913	62.51	70.54	1976	115.60	77.00
843	112.40	-78.94	906	58.67	-68.44	1347	-128.30	1410	-130.90	1473	-128.40	1914	61.12	70.26	1977	114.50	78.96
844	113.10	-79.54	907	59.41	-68.93	1348	-128.40	1411	-130.60	1474	-127.60	1915	59.80	68.97	1978	113.20	79.57
845	113.80	-78.67	908	60.40	-69.93	1349	-128.70	1412	-130.50	1475	-127.20	1916	58.69	68.32	1979	111.90	78.76
846	114.30	-76.45	909	61.54	-69.53	1350	-129.00	1413	-130.70	1476	-127.00	1917	57.73	67.50	1980	110.60	78.26
847	114.50	-74.93	910	62.49	-67.70	1351	-129.00	1414	-131.00	1477	-127.10	1918	56.85	66.61	1981	109.30	77.50
848	114.40	-73.33	911	63.16	-66.51	1352	-128.70	1415	-131.10	1478	-127.20	1919	56.06	65.61	1982	107.90	76.49
849	114.00	-71.88	912	63.56	-65.33	1353	-128.10	1416	-130.90	1479	-127.40	1920	55.35	64.41	1983	106.50	75.33
850	113.50	-70.51	913	63.79	-63.88	1354	-127.20	1417	-130.40	1480	-127.30	1921	54.72	63.36	1984	105.10	73.95
851	112.80	-69.10	914	63.85	-62.52	1355	-126.00	1418	-129.50	1481	-126.80	1922	54.25	62.20	1985	103.80	72.31
852	111.90	-67.71	915	63.75	-61.19	1356	-124.40	1419	-128.30	1482	-126.10	1923	53.95	60.29	1986	102.50	70.66
853	110.90	-66.35	916	63.52	-59.90	1357	-122.60	1420	-126.80	1483	-125.00	1924	53.72	59.64	1987	101.30	68.24
854	109.80	-65.02	917	63.16	-58.67	1358	-120.30	1421	-125.00	1484	-123.60	1925	53.20	60.33	1988	100.20	66.89
855	108.50	-63.73	918	62.67	-57.45	1359	-117.70	1422	-122.80	1485	-122.00	1926	52.31	60.55	1989	98.99	66.61
856	107.20	-62.48	919	62.09	-56.26	1360	-114.80	1423	-120.30	1486	-119.90	1927	51.07	60.60	1990	97.55	67.45
857	105.80	-61.25	920	61.41	-55.11	1361	-112.00	1424	-117.50	1487	-117.60	1928	49.49	61.52	1991	95.93	67.68
858	104.40	-60.07	921	60.67	-54.00	1362	-109.50	1425	-114.70	1488	-114.80	1929	47.70	61.00	1992	94.04	68.73
859	102.90	-58.92	922	59.87	-52.92	1363	-107.10	1426	-111.90	1489	-111.80	1930	46.07	59.06	1993	92.02	68.79
860	101.40	-57.81	923	59.02	-51.89	1364	-104.90	1427	-109.40	1490	-108.90	1931	44.74	57.64	1994	90.03	67.82
861	99.82	-56.75	924	58.13	-50.90	1365	-102.80	1428	-107.00	1491	-106.30	1932	43.69	56.22	1995	88.15	65.81
862	98.28	-55.72	925	57.21	-49.96	1366	-100.90	1429	-104.80	1492	-103.80	1933	42.85	54.49	1996	86.33	64.23
863	96.73	-54.74	926	56.27	-49.06	1367	-99.18	1430	-102.70	1493	-101.40	1934	42.22	52.67	1997	84.57	62.42
864	95.21	-53.80	927	55.31	-48.21	1368	-97.59	1431	-100.80	1494	-99.29	1935	41.79	50.72	1998	82.90	60.34
865	93.71	-52.91	928	54.35	-47.40	1369	-96.15	1432	-99.06	1495	-97.27	1936	41.60	48.51	1999	81.35	58.05
866	92.25	-52.06	929	53.40	-46.65	1370	-94.86	1433	-97.45	1496	-95.36	1937	41.65	46.24	2000	79.95	55.52
867	90.85	-51.25	930	52.46	-45.95	1371	-93.71	1434	-95.95	1497	-93.55	1938	42.03	43.12	2001	78.69	53.12
868	89.51	-50.50	931	51.54	-45.32	1372	-92.69	1435	-94.56	1498	-91.81	1939	42.63	40.98	2002	77.67	50.58
869	88.26	-49.80	932	50.64	-44.77	1373	-91.78	1436	-93.24	1499	-90.12	1940	43.30	39.91	2003	76.94	47.20
870	87.11	-49.17	933	49.77	-44.30	1374	-90.97	1437	-91.97	1500	-88.46	1941	43.93	39.72	2004	76.38	45.03
871	86.08	-48.62	934	48.93	-43.95	1375	-90.23	1438	-90.74	1501	-86.79	1942	44.39	38.77	2005	75.67	44.13
872	85.20	-48.18	935	48.11	-43.75	1376	-89.55	1439	-89.51	1502	-85.10	1943	44.74	37.80	2006	74.90	42.75
873	84.50	-47.88	936	47.29	-43.73	1377	-88.88	1440	-88.26	1503	-83.36	1944	45.04	36.68	2007	74.06	41.44
874	84.01	-47.81	937	46.44	-43.97	1378	-88.21	1441	-86.96	1504	-81.53	1945	45.28	35.45	2008	73.12	40.17
875	83.76	-48.06	938	45.48	-44.53	1379	-87.52	1442	-85.59	1505	-79.59	1946	45.48	34.10	2009	72.02	38.84
876	83.77	-48.81	939	44.29	-45.51	1380	-86.78	1443	-84.12	1506	-77.51	1947	45.64	32.57	2010	70.70	37.32
877	84.03	-50.33	940	42.66	-47.01	1381	-85.96	1444	-82.52	1507	-75.27	1948	45.77	30.76	2011	69.06	35.46
878	84.46	-53.06	941	40.29	-49.05	1382	-85.03	1445	-80.76	1508	-72.82	1949	45.89	28.57	2012	66.97	33.02
879	84.85	-57.75	942	36.68	-51.44	1383	-83.93	1446	-78.77	1509	-70.10	1950	46.02	25.92	2013	64.25	29.66
880	84.75	-65.69	943	31.26	-53.43	1384	-82.43	1447	-76.37	1510	-66.95	1951	46.13	23.04	2014	60.62	25.01
881	83.64	-79.42	944	23.23	-53.73	1385	-79.65	1448	-72.82	1511	-62.81	1952	45.87	21.69	2015	55.35	19.40
882	78.31	-93.82	945	11.67	-64.01	1386	-71.89	1449	-65.13	1512	-55.45	1953	43.14	29.77	2016	45.52	17.95

APOYO HASTIAL 2

CENTRO DE VANO

APOYO HASTIAL 1

CALCULO DEL DINTEL
SOLICITACIONES

Load Case 60

Combinación de Cargas = $1.50\{LC1\} + 1.50\{LC2\} + 1.50 \cdot 1.47\{LC5\} + 1.50\{LC9\} + 1.50\{LC10\}$

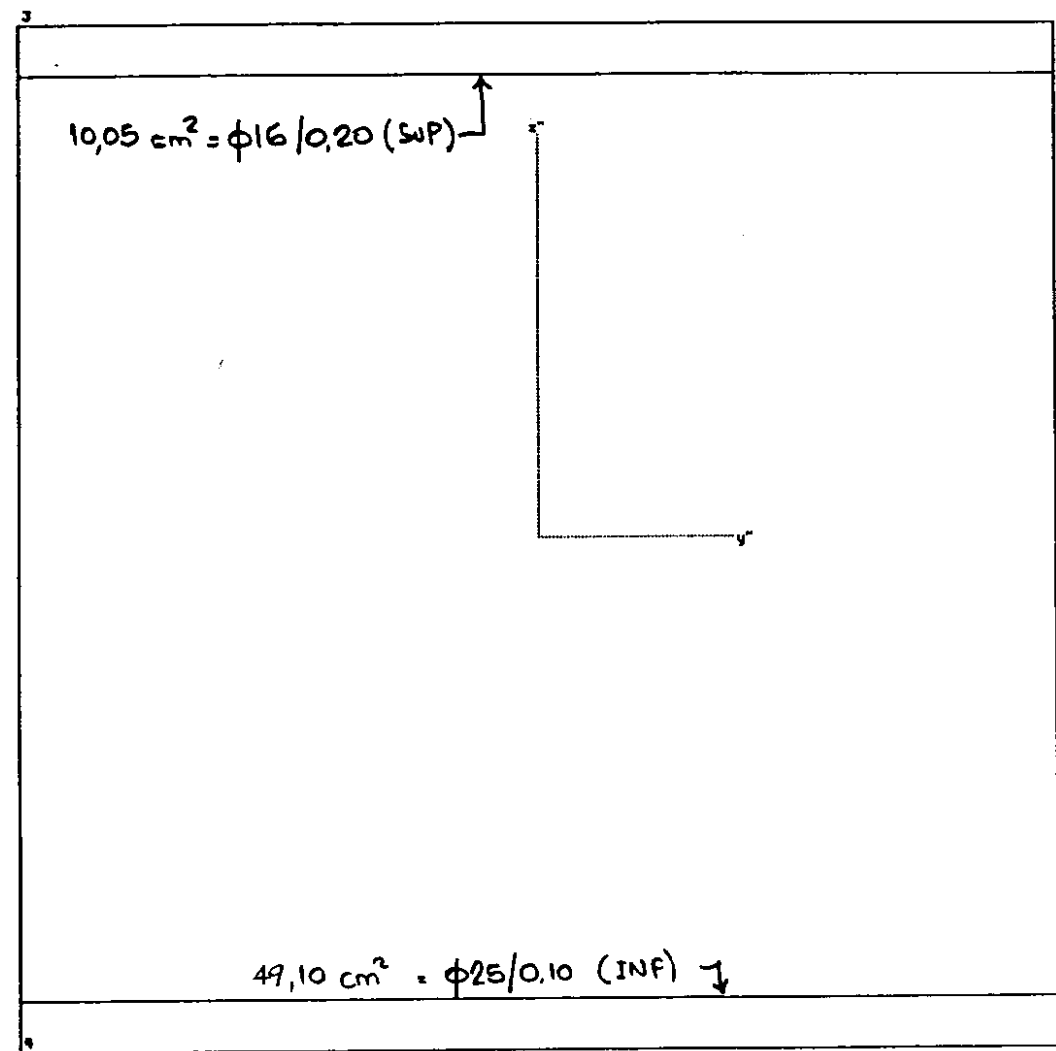
Elem	MY	VY	Elem	MY	VY	Elem	MY	Elem	MY	Elem	MY	VY	Elem	MY	VY		
820	70.17	-31.25	883	63.49	-43.65	1324	-65.53	1387	-75.97	1450	-82.46	1891	38.48	63.07	1954	126.00	97.39
821	83.96	-34.84	884	66.31	-33.97	1325	-73.92	1388	-84.45	1451	-90.71	1892	56.96	65.32	1955	134.80	97.41
822	91.26	-43.59	885	66.30	-36.56	1326	-78.80	1389	-88.42	1452	-93.56	1893	67.30	68.79	1956	135.10	83.83
823	96.44	-50.63	886	66.06	-41.34	1327	-82.68	1390	-91.22	1453	-95.12	1894	73.42	66.92	1957	134.20	74.22
824	100.50	-55.87	887	66.03	-45.64	1328	-86.21	1391	-93.69	1454	-96.40	1895	77.24	63.84	1958	133.00	68.22
825	103.90	-59.76	888	66.25	-49.22	1329	-89.55	1392	-96.04	1455	-97.62	1896	79.64	61.17	1959	131.90	64.68
826	106.80	-62.69	889	66.63	-52.27	1330	-92.80	1393	-98.35	1456	-98.88	1897	81.16	59.28	1960	131.00	62.75
827	109.40	-64.96	890	67.16	-54.96	1331	-95.95	1394	-100.70	1457	-100.20	1898	82.16	58.12	1961	130.60	61.87
828	111.70	-67.32	891	67.86	-57.26	1332	-99.12	1395	-103.00	1458	-101.60	1899	82.85	57.55	1962	130.40	61.68
829	113.90	-68.15	892	68.79	-60.01	1333	-102.30	1396	-105.40	1459	-103.10	1900	83.35	57.44	1963	130.50	61.97
830	115.80	-67.60	893	69.80	-61.64	1334	-105.50	1397	-107.90	1460	-104.60	1901	83.74	57.68	1964	130.80	62.58
831	117.20	-67.80	894	70.77	-61.98	1335	-108.20	1398	-110.50	1461	-106.40	1902	84.04	58.18	1965	131.20	63.40
832	118.40	-68.12	895	71.55	-61.06	1336	-110.40	1399	-112.70	1462	-108.30	1903	84.26	58.89	1966	131.70	64.38
833	119.30	-67.67	896	71.96	-60.86	1337	-112.20	1400	-114.50	1463	-110.00	1904	84.41	59.75	1967	132.20	65.48
834	119.90	-68.60	897	72.03	-59.81	1338	-113.50	1401	-115.90	1464	-111.60	1905	84.46	60.73	1968	132.70	66.65
835	120.50	-70.76	898	71.87	-59.78	1339	-114.50	1402	-116.90	1465	-112.80	1906	84.41	61.80	1969	133.20	67.88
836	121.20	-72.15	899	71.64	-60.84	1340	-115.10	1403	-117.60	1466	-113.70	1907	84.22	62.94	1970	133.50	69.14
837	122.00	-73.44	900	71.48	-62.92	1341	-115.30	1404	-118.00	1467	-114.40	1908	83.88	64.06	1971	133.80	70.47
838	122.90	-74.92	901	71.51	-64.18	1342	-115.10	1405	-118.10	1468	-114.80	1909	83.33	65.26	1972	133.90	71.84
839	123.80	-76.20	902	71.64	-65.40	1343	-114.60	1406	-118.00	1469	-114.90	1910	82.59	66.60	1973	133.80	73.24
840	124.60	-77.31	903	71.90	-66.36	1344	-113.90	1407	-117.40	1470	-114.80	1911	81.64	67.85	1974	133.50	74.73
841	125.50	-78.18	904	72.30	-67.14	1345	-113.20	1408	-116.70	1471	-114.40	1912	80.39	69.84	1975	132.90	75.95
842	126.40	-78.75	905	72.84	-67.85	1346	-112.90	1409	-116.00	1472	-113.60	1913	78.95	70.73	1976	132.10	77.18
843	127.20	-79.04	906	73.51	-68.52	1347	-112.80	1410	-115.40	1473	-112.70	1914	77.47	70.43	1977	130.90	79.12
844	128.00	-79.63	907	74.36	-69.00	1348	-112.90	1411	-115.00	1474	-111.90	1915	76.06	69.13	1978	129.50	79.72
845	128.80	-78.75	908	75.46	-69.99	1349	-113.20	1412	-114.90	1475	-111.50	1916	74.86	68.46	1979	128.10	78.88
846	129.40	-76.52	909	76.70	-69.59	1350	-113.40	1413	-115.00	1476	-111.30	1917	73.81	67.62	1980	126.70	78.37
847	129.70	-75.00	910	77.75	-67.76	1351	-113.40	1414	-115.40	1477	-111.40	1918	72.84	66.72	1981	125.30	77.60
848	129.70	-73.40	911	78.51	-66.57	1352	-113.10	1415	-115.50	1478	-111.50	1919	71.96	65.71	1982	123.80	76.57
849	129.40	-71.94	912	79.00	-65.39	1353	-112.50	1416	-115.30	1479	-111.70	1920	71.16	64.49	1983	122.30	75.40
850	129.00	-70.57	913	79.33	-63.94	1354	-111.60	1417	-114.70	1480	-111.60	1921	70.44	63.44	1984	120.80	74.02
851	128.40	-69.16	914	79.47	-62.59	1355	-110.30	1418	-113.80	1481	-111.20	1922	69.88	62.27	1985	119.40	72.38
852	127.60	-67.78	915	79.47	-61.26	1356	-108.70	1419	-112.70	1482	-110.40	1923	69.49	60.35	1986	118.00	70.72
853	126.70	-66.42	916	79.33	-59.99	1357	-106.90	1420	-111.10	1483	-109.40	1924	69.17	59.70	1987	116.80	68.30
854	125.70	-65.11	917	79.06	-58.77	1358	-104.60	1421	-109.30	1484	-108.00	1925	68.55	60.39	1988	115.50	66.95
855	124.50	-63.83	918	78.66	-57.56	1359	-102.00	1422	-107.20	1485	-106.40	1926	67.57	60.61	1989	114.20	66.67
856	123.30	-62.59	919	78.17	-56.39	1360	-99.13	1423	-104.70	1486	-104.40	1927	66.23	60.66	1990	112.70	67.52
857	122.00	-61.38	920	77.59	-55.25	1361	-96.35	1424	-101.90	1487	-102.00	1928	64.55	61.59	1991	110.90	67.76
858	120.70	-60.21	921	76.94	-54.15	1362	-93.79	1425	-99.09	1488	-99.31	1929	62.66	61.07	1992	108.90	68.82
859	119.30	-59.08	922	76.22	-53.10	1363	-91.44	1426	-96.35	1489	-96.34	1930	60.92	59.14	1993	106.80	68.90
860	117.90	-58.00	923	75.46	-52.09	1364	-89.23	1427	-93.83	1490	-93.49	1931	59.47	57.73	1994	104.70	67.93
861	116.50	-56.95	924	74.66	-51.12	1365	-87.18	1428	-91.47	1491	-90.88	1932	58.30	56.32	1995	102.70	65.93
862	115.00	-55.95	925	73.82	-50.20	1366	-85.30	1429	-89.28	1492	-88.43	1933	57.34	54.60	1996	100.70	64.37
863	113.60	-55.00	926	72.97	-49.32	1367	-83.56	1430	-87.25	1493	-86.14	1934	56.56	52.79	1997	98.83	62.58
864	112.10	-54.08	927	72.10	-48.49	1368	-81.99	1431	-85.38	1494	-84.03	1935	55.99	50.84	1998	97.00	60.52
865	110.70	-53.22	928	71.22	-47.71	1369	-80.56	1432	-83.66	1495	-82.06	1936	55.64	48.64	1999	95.27	58.24
866	109.40	-52.40	929	70.35	-46.98	1370	-79.29	1433	-82.08	1496	-80.20	1937	55.52	46.38	2000	93.67	55.72
867	108.10	-51.62	930	69.49	-46.32	1371	-78.16	1434	-80.62	1497	-78.43	1938	55.72	43.27	2001	92.20	53.34
868	106.80	-50.90	931	68.65	-45.71	1372	-77.15	1435	-79.26	1498	-76.74	1939	56.11	41.14	2002	90.94	50.80
869	105.70	-50.24	932	67.84	-45.19	1373	-76.27	1436	-77.97	1499	-75.10	1940	56.56	40.06	2003	89.95	47.43
870	104.60	-49.65	933	67.06	-44.76	1374	-75.47	1437	-76.74	1500	-73.50	1941	56.95	39.87	2004	89.10	45.25
871	103.70	-49.15	934	66.31	-44.45	1375	-74.75	1438	-75.54	1501	-71.89	1942	57.14	38.90	2005	88.08	44.35
872	102.90	-48.76	935	65.59	-44.29	1376	-74.07	1439	-74.35	1502	-70.26	1943	57.22	37.92	2006	86.97	

APOYO HASTIAL 2

CENTRO DE VANO

APOYO HASTIAL 1

Mstb. 1 : 7.0



Sección : "SECC1"
Tipo : tipo viga/ Rectángulo
Material : "H250"

Armadura : "B1"
Unidades : [cm]

Ancho = 100.00 cm Canto = 100.00 cm

Características mecánicas de la sección:

Area : Ax= 1.000 [m²]
Momentos de inercia : Iy= 0.083333 [m⁴] Iz= 0.083333 [m⁴]
Inercia a torsión : Ix= 0.140667 [m⁴]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.500000 [m]

I: R=dist.borde [m] W=I/R [m³] W/Ax [m]
izq. Iz -0.500 -0.166667 0.167
dch. Iz 0.500 0.166667 -0.167
abajo Iy -0.500 -0.166667 0.167
arriba Iy 0.500 0.166667 -0.167

Armadura: "B1"

Nº	Nom.mat	Cod.dim.	Area [cm²]	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]
1	AEH500	(2)	49.10	-50.00	5.00	50.00	5.00
2	AEH500	(2)	10.05	-50.00	95.00	50.00	95.00

Total: 59.15 Cuantía de armadura: 0.591 [o/o]

Cód. dimensionamiento: (0) = As constante
Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada
Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero"AEH500"/Hormigón"H250")

Cortante	Area mín.cercos	Ancho alma ideal	Canto útil	Incl.bielas
Vz	0.00 [cm²/m]	100.00 [cm]	96.00 [cm]	0.00
Vy	0.00 [cm²/m]	100.00 [cm]	96.00 [cm]	0.00

Características del material:

Nom.Mat.	Módulo E	0.85*fcd,fyd	eps-fc	fct	fcv	fcw,mín
[kp/cm²]	[kp/cm²]	[o/oo]	[kp/cm²]	[kp/cm²]	[kp/cm²]	[kp/cm²]
"H250"	300000.0	-141.600	-2.000	0.0	6.460	250.000
"AEH500"	2.10E+06	4434.700				

Leyenda:

fcd,fyd resistencia de cálculo del hormigón, acero
eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)
fct resistencia de cálculo a tracción del hormigón
fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Dimensionamiento : Viga "SECC1"/"B1"

Esfuerzos (Rotura)						Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	Alpha
					133.600	45.0

La armadura mínima entrada es suficiente !

Armadura mínima definida con las áreas entradas ..

Factor actual de minoración de la resistencia de la sección 1.44 > 1.00

Factor necesario de minoración de la resistencia de la sección .. 1.00

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	(As-min)	[cm²]	[cm²]
1 "AEH500"	-50.0	5.0	50.0	5.0	49.10	-	49.10
2 "AEH500"	-50.0	95.0	50.0	95.0	10.05	-	10.05

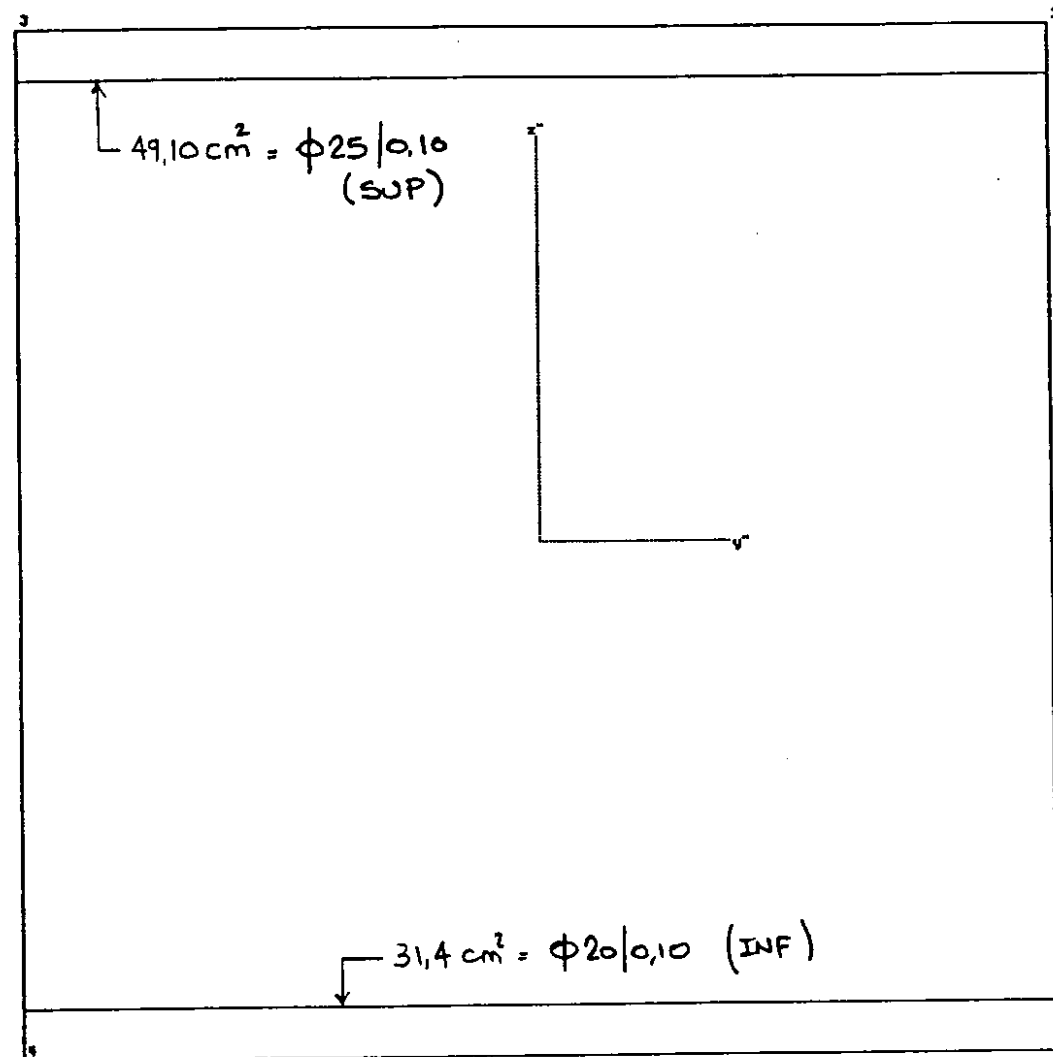
Cuantía arm. 0.59 [o/o] Suma 59.15

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas		Eps	Estado-II	
	y [cm]	z [cm]	[o/oo]	[kp/cm²]	
Hormigón-Min	-50.00	100.00	-2.337	-141.600	"H250"
Armadura-Min	-50.00	95.00	-1.688	-3544.202	"AEH500"
Hormigón-Max	50.00	0.00	10.649	0.000	"H250"
Armadura-Max	50.00	5.00	10.000	4434.700	"AEH500"

Fibra neutra zn 82.00 cm yn -0.00 cm Angulo 0.0
Ancho zona comprim. 18.00 cm Zona comprimida/Canto útil 0.19

Mstb. 1 : 7.0



Sección : "SECC2" Armadura : "B1"
Tipo : tipo viga/ Rectángulo Unidades : [cm]
Material : "H250"

Ancho = 100.00 cm Canto = 100.00 cm

Características mecánicas de la sección:
Area : Ax= 1.000 [m2]
Momentos de inercia : Iy= 0.083333 [m4] Iz= 0.083333 [m4]
Inercia a torsión : Ix= 0.140667 [m4]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.500000 [m]

I: R=dist.borde [m] W=1/R [m3] W/Ax [m]
izq. Iz -0.500 -0.166667 0.167
dch. Iz 0.500 0.166667 -0.167
abajo Iy -0.500 -0.166667 0.167
arriba Iy 0.500 0.166667 -0.167

Armadura: "B1"

Nº	Nom.mat	Cod.dim.	Area [cm2]	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]
1	AEH500	(2)	31.40	-50.00	5.00	50.00	5.00
2	AEH500	(2)	49.10	-50.00	95.00	50.00	95.00

Total: 80.50 Cuantía de armadura: 0.805 [o/o]

Cód. dimensionamiento: (0) = As constante
Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada
Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero"AEH500"/Hormigón"H250")
Cortante Area mín.cercos Ancho alma ideal Canto útil Incl.bielas

Vz	0.00 [cm2/m]	100.00 [cm]	96.00 [cm]	0.00
Vy	0.00 [cm2/m]	100.00 [cm]	96.00 [cm]	0.00

Características del material:

Nom.Mat.	Módulo E [kp/cm2]	0.85*fcd,fyd [kp/cm2]	eps-fc [o/oo]	fct [kp/cm2]	fcv [kp/cm2]	fcw,mín [kp/cm2]
"H250"	300000.0	-141.600	-2.000	0.0	6.460	250.000
"AEH500"	2.10E+06	4434.700				

Leyenda:

fcd,fyd resistencia de cálculo del hormigón,acero
eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)
fct resistencia de cálculo a tracción del hormigón
fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Dimensionamiento : Viga "SECC2"/"B1"

Esfuerzos (Rotura)							Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	Alpha	
					-144.000		45.0

La armadura mínima entrada es suficiente !
Armadura mínima definida con las áreas entradas ..
Factor actual de minoración de la resistencia de la sección 1.36
Factor necesario de minoración de la resistencia de la sección .. 1.00

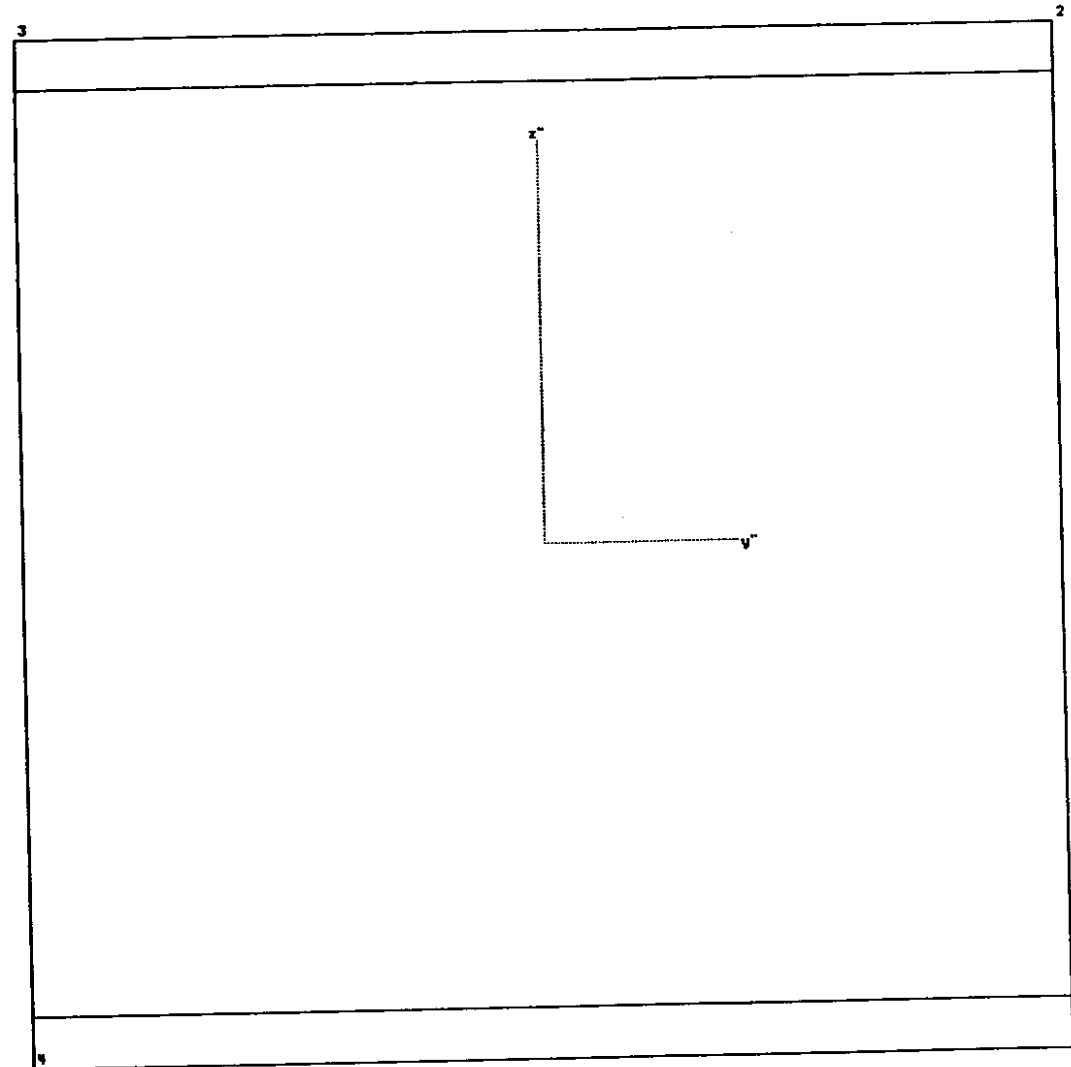
Armadura	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]	dado dimens. (As-min)	As-nuevo [cm2]
Longitudinal:						
1 "AEH500"	-50.0	5.0	50.0	5.0	31.40	31.40
2 "AEH500"	-50.0	95.0	50.0	95.0	49.10	49.10
Cuantía arm. 0.80 [o/o]						Suma 80.50

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas y [cm] z [cm]		Eps [o/oo]	Estado-II [kp/cm2]	
Hormigón-Min	-50.00	0.00	-1.865	-140.958	"H250"
Armadura-Min	-50.00	5.00	-1.241	-2605.798	"AEH500"
Hormigón-Max	50.00	100.00	10.624	0.000	"H250"
Armadura-Max	50.00	95.00	10.000	4434.700	"AEH500"

Fibra neutra zn 14.93 cm yn -0.00 cm Angulo 0.0
Ancho zona comprim. 14.93 cm Zona comprimida/Canto útil 0.16

Mstb. 1 : 7.0



Sección : "SECC2"
Tipo : tipo viga/ Rectángulo
Material : "H250"

Armadura : "B1"

Ancho = 100.00 cm Canto = 100.00 cm

Características mecánicas de la sección:

Area : Ax= 1.000 [m2]
Momentos de inercia : Iy= 0.083333 [m4] Iz= 0.083333 [m4]
Inercia a torsión : Ix= 0.140667 [m4]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.500000 [m]

I: R=dist.borde [m] W=I/R [m3] W/Ax [m]
izq. Iz -0.500 -0.166667 0.167
dch. Iz 0.500 0.166667 -0.167
abajo Iy -0.500 -0.166667 0.167
arriba Iy 0.500 0.166667 -0.167

Armadura: "B1"

Nº	Nom.mat	Cod.dim.	Area [cm2]	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]
1	AEH500	(2)	10.05	-50.00	5.00	50.00	5.00
2	AEH500	(2)	49.10	-50.00	95.00	50.00	95.00

Total: 59.15 Cuantía de armadura: 0.591 [o/o]

Cód. dimensionamiento: (0) = As constante
Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada
Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero"AEH500"/Hormigón"H250")

Cortante	Area mín.cercos	Ancho alma ideal	Canto útil	Incl.bielas
Vz	0.00 [cm2/m]	100.00 [cm]	96.00 [cm]	0.00
Vy	0.00 [cm2/m]	100.00 [cm]	96.00 [cm]	0.00

Características del material:

Nom.Mat.	Módulo E	0.85*fcd,fyd	eps-fc	fct	fcv	fcw,mín
[kp/cm2]	[kp/cm2]	[o/oo]	[kp/cm2]	[kp/cm2]	[kp/cm2]	[kp/cm2]
"H250"	300000.0	-141.600	-2.000	0.0	6.460	250.000
"AEH500"	2.10E+06	4434.700				

Leyenda:

fcd,fyd resistencia de cálculo del hormigón,acero
eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)
fct resistencia de cálculo a tracción del hormigón
fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Dimensionamiento : Viga "SECC2"/"B1"

Esfuerzos (Rotura)						Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	Alpha
					-144.000	45.0

La armadura mínima entrada es suficiente !

Armadura mínima definida con las áreas entradas ..

Factor actual de minoración de la resistencia de la sección 1.34

Factor necesario de minoración de la resistencia de la sección .. 1.00

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	(As-min)	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	10.05	-	10.05
2 "AEH500"	-50.0	95.0	50.0	95.0	49.10	-	49.10

Cuantía arm. 0.59 [o/o] Suma 59.15

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas		Eps	Estado-II	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	
Hormigón-Min	50.00	0.00	-2.337	-141.600	"H250"
Armadura-Min	50.00	5.00	-1.688	-3544.202	"AEH500"
Hormigón-Max	-50.00	100.00	10.649	0.000	"H250"
Armadura-Max	-50.00	95.00	10.000	4434.700	"AEH500"

Fibra neutra zn 18.00 cm yn 0.00 cm Angulo 0.0
Ancho zona comprim. 18.00 cm Zona comprimida/Canto útil 0.19

PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA F1

Obra : L.A.V. MADRID - ZARAGOZA
Fecha: 21/11/1998
Hora : 15:10

COMPROBACION DEL ESTADO LIMITE DE FISURACION DEBIDO
A SOLICITACIONES NORMALES

1. Datos

- Materiales

f_{ck} [kp/cm²] = 250
 f_{yk} [kp/cm²] = 5100

- Sección

b [cm] = 100.0
 h [cm] = 100.0
 i [mm] = 25.0
 c [cm] = 3.5
 n° de capas = 1
 n° de diámetros capa 1 = 10

- Solicitación de servicio

M_k [m.Mp] = 89.07

2. Resultados

ABERTURA DE FISURA CARACTERISTICA

w_k [mm]	S_m [cm]	ϵ_m ú1.E-3	σ_{sr} [kp/cm ²]	σ_s [kp/cm ²]
0.21	15.0	0.83	1147	2067

ABERTURA DE FISURA MAXIMA ADMITIDA

AMBIENTE I (interior)	0.560 [mm]
AMBIENTE II (exterior no agresivo)	0.280 [mm]
AMBIENTE III (agresivo)	0.140 [mm]

El número de capas consideradas en el cálculo es 1

CALCULO DE HASTIALES
SOLICITACIONES

Load Case 58

Combinación de Cargas = 1.50*(LC1) + 1.50*(LC2) + 1.50*(LC3) + 1.50*(LC4) + 1.50*1.47*(LC5) + 1.50*(LC10)

Elem	NY	MY	Elem	NY	MY	Elem	NY	MY	Elem	NY	MY	Elem	NY	MY	Elem	NY	MY	Elem	NY	MY
1	-92.86	-32.41	64	-80.63	-19.08	694	-122.60	-98.35	757	-162.80	-128.00	2017	-165.80	-79.40	2080	-131.70	-66.03	2710	-11.16	84.50
2	-87.58	-33.28	65	-88.10	-19.70	695	-101.40	-95.38	758	-90.61	-117.10	2018	-135.80	-80.88	2081	-129.30	-67.30	2711	-37.53	87.70
3	-87.82	-34.91	66	-87.27	-20.00	696	-79.85	-90.94	759	-71.12	-112.00	2019	-123.90	-83.84	2082	-120.70	-67.23	2712	-56.51	92.18
4	-89.01	-36.19	67	-88.50	-20.59	697	-69.25	-88.11	760	-61.96	-108.20	2020	-117.50	-85.76	2083	-115.20	-67.89	2713	-66.54	96.73
5	-90.40	-37.18	68	-89.70	-21.20	698	-63.84	-86.22	761	-57.94	-105.70	2021	-113.90	-87.07	2084	-111.70	-68.71	2714	-72.81	101.10
6	-91.78	-37.95	69	-90.82	-21.76	699	-61.42	-85.00	762	-56.53	-104.10	2022	-111.70	-88.08	2085	-109.70	-69.55	2715	-76.95	105.30
7	-93.00	-38.56	70	-91.84	-22.23	700	-60.70	-84.28	763	-56.51	-103.30	2023	-110.50	-88.97	2086	-108.60	-70.36	2716	-79.64	109.00
8	-94.14	-39.03	71	-92.77	-22.62	701	-60.98	-83.95	764	-57.24	-103.10	2024	-110.00	-89.84	2087	-108.00	-71.15	2717	-81.04	112.30
9	-95.18	-39.39	72	-93.63	-22.94	702	-61.82	-83.93	765	-58.38	-103.20	2025	-109.80	-90.73	2088	-107.90	-71.92	2718	-81.42	115.20
10	-96.15	-39.67	73	-94.44	-23.20	703	-62.99	-84.14	766	-59.74	-103.70	2026	-110.00	-91.66	2089	-108.10	-72.68	2719	-81.26	117.80
11	-97.06	-39.87	74	-95.22	-23.41	704	-64.34	-84.52	767	-61.21	-104.40	2027	-110.30	-92.60	2090	-108.40	-73.43	2720	-81.09	120.10
12	-97.93	-40.03	75	-95.98	-23.58	705	-65.79	-85.02	768	-62.74	-105.20	2028	-110.70	-93.56	2091	-108.80	-74.17	2721	-81.28	122.10
13	-98.77	-40.15	76	-96.75	-23.72	706	-67.30	-85.59	769	-64.30	-106.10	2029	-111.10	-94.51	2092	-109.30	-74.90	2722	-82.08	123.90
14	-99.59	-40.24	77	-97.52	-23.83	707	-68.83	-86.20	770	-65.88	-107.10	2030	-111.60	-95.45	2093	-109.80	-75.60	2723	-83.51	125.50
15	-100.40	-40.33	78	-98.29	-23.94	708	-70.38	-86.81	771	-67.46	-108.00	2031	-112.10	-96.36	2094	-110.30	-76.27	2724	-85.25	126.90
16	-101.20	-40.41	79	-99.06	-24.04	709	-71.93	-87.38	772	-69.04	-108.80	2032	-112.50	-97.23	2095	-110.70	-76.92	2725	-86.98	128.30
17	-102.00	-40.49	80	-99.83	-24.15	710	-73.48	-87.90	773	-70.62	-109.60	2033	-112.90	-98.05	2096	-111.10	-77.53	2726	-88.51	129.60
18	-102.70	-40.60	81	-100.60	-24.27	711	-75.03	-88.33	774	-72.21	-110.30	2034	-113.20	-98.82	2097	-111.40	-78.10	2727	-89.95	130.90
19	-103.40	-40.73	82	-101.30	-24.40	712	-76.58	-88.85	775	-73.81	-110.80	2035	-113.40	-99.53	2098	-111.70	-78.82	2728	-91.30	132.00
20	-104.00	-40.89	83	-102.00	-24.55	713	-78.10	-88.84	776	-75.41	-111.10	2036	-113.60	-100.20	2099	-111.80	-79.11	2729	-92.54	133.20
21	-104.60	-41.09	84	-102.60	-24.72	714	-79.58	-88.87	777	-76.91	-111.30	2037	-113.60	-100.80	2100	-111.90	-79.55	2730	-93.60	134.20
22	-105.10	-41.32	85	-103.10	-24.92	715	-81.05	-88.74	778	-78.34	-111.20	2038	-113.60	-101.30	2101	-111.80	-79.94	2731	-94.37	135.10
23	-105.60	-41.60	86	-103.60	-25.15	716	-82.51	-88.43	779	-79.97	-110.80	2039	-113.50	-101.70	2102	-111.60	-80.28	2732	-94.70	136.00
24	-105.90	-41.93	87	-104.00	-25.42	717	-84.07	-87.93	780	-81.43	-110.20	2040	-113.20	-102.10	2103	-111.40	-80.58	2733	-94.27	136.60
25	-106.20	-42.30	88	-104.20	-25.71	718	-85.53	-87.25	781	-83.71	-109.30	2041	-112.90	-102.40	2104	-111.00	-80.83	2734	-93.06	137.20
26	-106.40	-42.72	89	-104.40	-26.04	719	-86.51	-86.40	782	-85.50	-108.20	2042	-112.40	-102.70	2105	-110.50	-81.02	2735	-91.36	137.50
27	-106.40	-43.18	90	-104.50	-26.39	720	-86.74	-85.41	783	-85.25	-106.90	2043	-111.80	-102.80	2106	-109.90	-81.17	2736	-89.57	137.60
28	-106.40	-43.69	91	-104.40	-26.78	721	-86.23	-84.31	784	-84.43	-105.50	2044	-111.20	-103.00	2107	-109.20	-81.27	2737	-87.87	137.60
29	-106.20	-44.24	92	-104.20	-27.20	722	-85.30	-83.12	785	-83.28	-104.00	2045	-110.50	-103.00	2108	-108.40	-81.33	2738	-86.21	137.40
30	-105.90	-44.82	93	-104.00	-27.64	723	-84.06	-81.86	786	-81.89	-102.40	2046	-109.70	-103.00	2109	-107.60	-81.34	2739	-84.62	136.90
31	-105.60	-45.44	94	-103.60	-28.11	724	-82.61	-80.55	787	-80.27	-100.70	2047	-108.80	-102.90	2110	-106.70	-81.30	2740	-83.07	136.40
32	-105.10	-46.10	95	-103.10	-28.60	725	-80.99	-79.21	788	-78.50	-99.08	2048	-107.90	-102.70	2111	-105.70	-81.23	2741	-81.56	135.70
33	-104.60	-46.78	96	-102.50	-29.11	726	-79.32	-77.86	789	-76.50	-97.43	2049	-106.90	-102.60	2112	-104.70	-81.11	2742	-80.06	134.80
34	-103.90	-47.49	97	-101.90	-29.64	727	-77.71	-76.52	790	-74.73	-95.82	2050	-105.90	-102.30	2113	-103.70	-80.96	2743	-78.58	133.90
35	-103.20	-48.22	98	-101.10	-30.19	728	-76.09	-75.20	791	-73.46	-94.31	2051	-104.90	-102.00	2114	-102.60	-80.78	2744	-77.12	132.80
36	-102.40	-48.97	99	-100.30	-30.75	729	-74.55	-73.89	792	-71.16	-92.93	2052	-103.90	-101.70	2115	-101.50	-80.57	2745	-75.69	131.70
37	-101.60	-49.74	100	-99.47	-31.32	730	-73.38	-72.58	793	-69.30	-91.56	2053	-102.80	-101.30	2116	-100.40	-80.34	2746	-74.29	130.50
38	-100.70	-50.53	101	-98.55	-31.91	731	-72.78	-71.23	794	-69.42	-90.11	2054	-101.80	-100.90	2117	-99.36	-80.09	2747	-72.93	129.20
39	-99.73	-51.33	102	-97.57	-32.50	732	-72.64	-69.83	795	-69.68	-88.56	2055	-100.80	-100.50	2118	-98.29	-79.82	2748	-71.60	127.90
40	-98.72	-52.14	103	-96.54	-33.11	733	-72.75	-68.34	796	-69.82	-86.84	2056	-99.73	-100.10	2119	-97.24	-79.54	2749	-70.31	126.50
41	-97.65	-52.95	104	-95.46	-33.72	734	-72.89	-66.79	797	-70.70	-84.93	2057	-98.73	-99.68	2120	-96.23	-79.26	2750	-69.06	125.20
42	-96.55	-53.77	105	-94.34	-34.33	735	-72.70	-65.19	798	-71.34	-82.94	2058	-97.76	-99.24	2121	-95.24	-78.98	2751	-67.84	123.80
43	-95.40	-54.80	106	-93.17	-34.94	736	-71.83	-63.57	799	-70.05	-80.95	2059	-96.82	-98.81	2122	-94.29	-78.70	2752	-66.67	122.40
44	-94.22	-55.43	107	-91.98	-35.56	737	-70.30	-61.95	800	-68.24	-78.98	2060	-95.92	-98.40	2123	-93.39	-78.43	2753	-65.54	121.10
45	-93.02	-56.25	108	-90.75	-36.18	738	-68.38	-60.36	801	-66.10	-77.04	2061	-95.06	-98.01	2124	-92.53	-78.18	2754	-64.45	119.80
46	-91.80	-57.08	109	-89.51	-36.79	739	-66.23	-58.81	802	-63.73	-75.16	2062	-94.23	-97.64	2125	-91.73	-77.95	2755	-63.39	118.50
47	-90.58	-57.90	110	-88.28	-37.40	740	-63.92	-57.32	803	-61.30	-73.37	2063	-93.45	-97.32	2126	-90.98	-77.75	2756	-62.38	117.30
48	-89.36	-58.72	111	-87.02	-38.01	741	-61.47	-55.91	804	-58.80	-71.72	2064	-92.72	-97.04	2127	-90.28	-77.58	2757	-61.40	116.20
49	-88.18	-59.53	112	-85.80	-38.61	742	-58.89	-54.58	805	-55.97	-70.22	2065	-92.01	-96.83	2128	-89.63	-77.45	2758	-60.46	115.20
50	-87.04	-60.34	113	-84.64	-39.20	743	-56.08	-53.35	806	-53.19	-68.88	2066	-91.34	-96.68	2129	-89.04	-77.36	2759	-59.57	114.30
51	-85.96	-61.14	114	-83.54	-39.78	744	-53.24	-52.18	807	-49.45	-67.70	2067	-90.70	-96.61	2130	-88.48	-77.33	2760	-58.73	113.50
52	-84.99	-61.92	115	-82.53	-40.35	745	-50.72	-51.07	808	-46.05	-66.66	2068	-90.06	-96.63	2131	-87.85	-77.35	2761	-57.95	112.90
53	-84.13	-62.70	116	-81.66	-40.91	746	-48.80	-49.98	809	-44.53	-65.63	2069	-89.41	-96.75	2132	-87.44	-77.43	2762	-57.28	112.50
54	-83.45	-63.46	117	-80.95	-41.44	747	-47.43	-48.86	810	-43.41	-64.57	2070	-88.73	-97.00	2133	-86.91	-77.56	2763	-56.76	112.30
55	-82.98	-64.20	118	-80.47	-41.94	748	-46.28	-47.67	811	-42.42	-63.42	2071	-87.98	-97.36	2134	-86.36	-77.75	2764	-56.47	112.40
56	-82.82	-64.92	119	-80.29	-42.41	749	-45.15	-46.38	812	-41.42	-62.12	2072	-87.15	-97.86	2135	-85.73	-77.98	2765	-56.56	112.80
57	-83.05	-65.59	120	-80.52	-42.82	750	-43.86	-44.94	813	-40.26	-60.60	2073	-86.19	-98.46	2136	-85.00	-78.24	2766	-57.25	113.50
58	-83.84	-66.20	121	-81.29	-43.15	751	-42.25	-43.32	814	-38.80	-58.76	2074	-85.07	-99.13	2137	-84.12	-78.50	2767	-58.90	114.70
59	-85.44	-66.70	122	-82.86	-43.40	752														

CALCULO DE HASTIALES
SOLICITACIONES

Load Case 60

Combinación de Cargas = 1.50*(LC1) + 1.50*(LC2) + 1.50*1.47*(LC5) + 1.50*(LC9) + 1.50*(LC10)

Elem	NY	MY	Elem	NY	MY	Elem	NY	MY	Elem	NY	MY	Elem	NY	MY	Elem	NY	MY	Elem	NY	MY	Elem	NY	MY
1	-66.96	-11.54	64	-60.69	9.89	694	-117.50	-126.40	757	-158.40	-172.60	2017	-198.10	49.13	2080	-157.50	18.94	2710	-21.10	59.17	2773	3.83	66.76
2	-69.37	-11.79	65	-69.02	9.85	695	-102.30	-122.60	758	-95.19	-157.50	2018	-159.60	48.82	2081	-152.10	19.16	2711	-42.30	62.31	2774	-43.01	81.01
3	-73.82	-11.97	66	-73.82	9.37	696	-84.07	-116.90	759	-78.36	-151.40	2019	-143.10	47.67	2082	-139.40	18.22	2712	-58.57	66.43	2775	-56.03	90.43
4	-78.03	-12.40	67	-77.93	8.96	697	-74.61	-113.20	760	-69.31	-146.80	2020	-133.30	46.27	2083	-130.60	17.41	2713	-67.20	70.61	2776	-63.81	97.67
5	-81.79	-12.99	68	-81.48	8.51	698	-69.29	-110.70	761	-64.65	-143.40	2021	-126.90	44.89	2084	-124.50	16.60	2714	-72.64	74.62	2777	-66.95	103.50
6	-85.09	-13.68	69	-84.54	8.03	699	-66.58	-108.90	762	-62.52	-141.00	2022	-122.50	43.58	2085	-120.10	15.78	2715	-76.24	78.31	2778	-72.60	108.30
7	-87.97	-14.38	70	-87.20	7.56	700	-65.50	-107.70	763	-61.88	-139.40	2023	-119.30	42.35	2086	-117.00	14.94	2716	-78.57	81.62	2779	-75.18	112.30
8	-90.50	-15.06	71	-89.53	7.10	701	-65.45	-106.90	764	-62.13	-138.50	2024	-117.10	41.18	2087	-114.80	14.10	2717	-79.70	84.56	2780	-76.79	115.80
9	-92.74	-15.68	72	-91.57	6.66	702	-66.05	-106.40	765	-62.92	-138.10	2025	-115.50	40.05	2088	-113.20	13.26	2718	-79.86	87.16	2781	-76.18	118.70
10	-94.74	-16.25	73	-93.40	6.24	703	-67.04	-106.30	766	-64.03	-138.10	2026	-114.30	38.97	2089	-112.00	12.44	2719	-79.50	89.43	2782	-75.02	121.20
11	-96.53	-16.76	74	-95.05	5.86	704	-68.28	-106.30	767	-65.33	-138.40	2027	-113.40	37.92	2090	-111.20	11.64	2720	-79.14	91.40	2783	-74.73	123.30
12	-98.16	-17.22	75	-96.56	5.51	705	-69.66	-106.50	768	-66.75	-138.90	2028	-112.80	36.90	2091	-110.60	10.86	2721	-79.16	93.12	2784	-74.46	125.10
13	-99.66	-17.63	76	-97.95	5.18	706	-71.13	-106.80	769	-68.23	-139.50	2029	-112.40	35.93	2092	-110.30	10.11	2722	-79.79	94.63	2785	-74.83	126.60
14	-101.00	-18.00	77	-99.25	4.87	707	-72.64	-107.10	770	-69.76	-140.10	2030	-112.10	34.99	2093	-110.00	9.39	2723	-81.05	95.98	2786	-77.05	127.80
15	-102.30	-18.35	78	-100.50	4.57	708	-74.18	-107.50	771	-71.31	-140.80	2031	-111.90	34.09	2094	-109.80	8.70	2724	-82.64	97.21	2787	-79.53	129.00
16	-103.50	-18.68	79	-101.60	4.29	709	-75.73	-107.90	772	-72.86	-141.50	2032	-111.70	33.25	2095	-109.70	8.05	2725	-84.21	98.37	2788	-81.09	130.20
17	-104.60	-19.00	80	-102.70	4.01	710	-77.28	-108.20	773	-74.43	-142.00	2033	-111.60	32.45	2096	-109.60	7.44	2726	-85.61	99.47	2789	-82.76	131.40
18	-105.60	-19.33	81	-103.70	3.72	711	-78.84	-108.50	774	-76.01	-142.50	2034	-111.50	31.71	2097	-109.50	6.87	2727	-86.92	100.50	2790	-84.15	132.60
19	-106.80	-19.67	82	-104.60	3.43	712	-80.40	-108.60	775	-77.61	-142.90	2035	-111.40	31.02	2098	-109.40	6.34	2728	-88.15	101.50	2791	-85.54	133.80
20	-107.40	-20.03	83	-105.50	3.12	713	-81.92	-108.70	776	-79.21	-143.10	2036	-111.20	30.39	2099	-109.30	5.85	2729	-89.28	102.50	2792	-86.92	135.00
21	-108.10	-20.42	84	-106.20	2.79	714	-83.41	-108.60	777	-80.70	-143.10	2037	-111.00	29.82	2100	-109.10	5.40	2730	-90.24	103.40	2793	-88.13	136.10
22	-108.80	-20.84	85	-106.90	2.44	715	-84.88	-108.30	778	-82.13	-142.90	2038	-110.70	29.31	2101	-108.80	4.99	2731	-90.93	104.20	2794	-89.11	137.20
23	-109.30	-21.29	86	-107.40	2.07	716	-86.35	-107.90	779	-83.76	-142.40	2039	-110.40	28.86	2102	-108.50	4.63	2732	-91.19	104.90	2795	-89.72	138.10
24	-109.80	-21.79	87	-107.80	1.67	717	-87.90	-107.30	780	-85.22	-141.70	2040	-110.00	28.48	2103	-108.10	4.32	2733	-90.69	105.40	2796	-89.72	138.90
25	-110.10	-22.32	88	-108.20	1.24	718	-89.36	-106.50	781	-87.50	-140.70	2041	-109.50	28.15	2104	-107.60	4.04	2734	-89.43	105.90	2797	-87.67	139.50
26	-110.30	-22.90	89	-108.40	0.78	719	-90.34	-105.50	782	-89.29	-139.40	2042	-108.90	27.89	2105	-107.00	3.82	2735	-87.69	106.10	2798	-85.12	139.90
27	-110.40	-23.52	90	-108.40	0.30	720	-90.57	-104.40	783	-89.04	-138.00	2043	-108.30	27.69	2106	-106.30	3.64	2736	-85.86	106.20	2799	-83.36	140.00
28	-110.30	-24.18	91	-108.40	-0.22	721	-90.06	-103.20	784	-88.22	-136.40	2044	-107.60	27.55	2107	-105.60	3.50	2737	-84.14	106.10	2800	-81.47	139.90
29	-110.20	-24.89	92	-108.20	-0.77	722	-89.12	-101.90	785	-87.07	-134.80	2045	-106.80	27.47	2108	-104.70	3.41	2738	-82.46	105.80	2801	-79.78	139.50
30	-109.90	-25.63	93	-107.90	-1.34	723	-87.89	-100.50	786	-85.69	-133.10	2046	-106.00	27.45	2109	-103.90	3.35	2739	-80.86	105.30	2802	-78.14	138.90
31	-109.50	-26.40	94	-107.60	-1.94	724	-86.43	-99.10	787	-84.06	-131.30	2047	-105.10	27.49	2110	-102.90	3.34	2740	-79.31	104.70	2803	-76.60	138.10
32	-109.10	-27.22	95	-107.10	-2.56	725	-84.81	-97.63	788	-82.29	-129.50	2048	-104.10	27.58	2111	-101.90	3.37	2741	-77.79	104.00	2804	-75.09	137.20
33	-108.50	-28.06	96	-106.50	-3.21	726	-83.14	-96.15	789	-80.30	-127.70	2049	-103.10	27.72	2112	-100.90	3.43	2742	-76.30	103.10	2805	-73.59	136.10
34	-107.90	-28.94	97	-105.80	-3.87	727	-81.52	-94.67	790	-78.53	-125.90	2050	-102.10	27.91	2113	-99.85	3.53	2743	-74.83	102.10	2806	-72.10	134.90
35	-107.20	-29.84	98	-105.10	-4.56	728	-79.90	-93.20	791	-77.26	-124.30	2051	-101.00	28.14	2114	-98.77	3.65	2744	-73.39	101.00	2807	-70.65	133.60
36	-106.40	-30.76	99	-104.30	-5.26	729	-78.36	-91.73	792	-74.95	-122.70	2052	-99.97	28.40	2115	-97.67	3.80	2745	-71.98	99.89	2808	-69.23	132.20
37	-105.60	-31.71	100	-103.40	-5.99	730	-77.18	-90.25	793	-73.09	-121.10	2053	-98.88	28.70	2116	-96.55	3.98	2746	-70.60	98.67	2809	-67.84	130.70
38	-104.70	-32.68	101	-102.50	-6.72	731	-76.57	-88.72	794	-73.21	-119.50	2054	-97.78	29.02	2117	-95.43	4.17	2747	-69.25	97.40	2810	-66.50	129.20
39	-103.70	-33.67	102	-101.50	-7.47	732	-76.43	-87.11	795	-73.45	-117.70	2055	-96.67	29.36	2118	-94.30	4.37	2748	-67.95	96.08	2811	-65.18	127.60
40	-102.70	-34.68	103	-100.50	-8.24	733	-76.53	-85.41	796	-73.38	-115.70	2056	-95.55	29.72	2119	-93.18	4.59	2749	-66.67	94.73	2812	-63.91	126.00
41	-101.70	-35.70	104	-99.47	-9.01	734	-76.66	-83.62	797	-74.45	-113.60	2057	-94.43	30.08	2120	-92.06	4.81	2750	-65.44	93.37	2813	-62.67	124.30
42	-100.70	-36.73	105	-98.39	-9.80	735	-76.45	-81.76	798	-75.06	-111.30	2058	-93.31	30.45	2121	-90.94	5.03	2751	-64.25	92.00	2814	-61.48	122.70
43	-99.61	-37.78	106	-97.30	-10.59	736	-75.58	-79.86	799	-73.75	-109.00	2059	-92.18	30.81	2122	-89.83	5.25	2752	-63.09	90.63	2815	-60.33	121.00
44	-98.53	-38.83	107	-96.19	-11.39	737	-74.03	-77.95	800	-71.90	-106.70	2060	-91.06	31.15	2123	-88.72	5.46	2753	-61.97	89.28	2816	-59.22	119.40
45	-97.45	-39.89	108	-95.07	-12.19	738	-72.10	-76.03	801	-69.73	-104.40	2061	-89.92	31.48	2124	-87.61	5.65	2754	-60.89	87.95	2817	-58.14	117.80
46	-96.39	-40.96	109	-93.97	-13.01	739	-69.93	-74.12	802	-67.33	-102.10	2062	-88.77	31.77	2125	-86.50	5.83	2755	-59.84	86.67	2818	-57.11	116.20
47	-95.36	-42.03	110	-92.90	-13.82	740	-67.60	-72.25	803	-64.86	-99.85	2063	-87.60	32.04	2126	-85.38	5.98	2756	-58.82	85.44	2819	-56.11	114.70
48	-94.38	-43.10	111	-91.88	-14.64	741	-65.13	-70.42	804	-62.31	-97.72	2064	-86.41	32.26	2127	-84.24	6.10	2757	-57.82	84.28	2820	-55.13	113.30
49	-93.47	-44.17	112	-90.93	-15.46	742	-62.53	-68.65	805	-59.43	-95.70	2065	-85.17	32.43	2128	-83.07	6.19	2758	-56.66	83.19	2821	-54.19	111.90
50	-92.67	-45.24	113	-90.08	-16.28	743	-59.71	-66.93	806	-56.59	-93.79	2066	-83.88	32.55	2129	-81.87	6.25	2759	-55.92	82.21	2822	-53.29	110.70
51	-92.00	-46.31	114	-89.37	-17.11	744	-56.85	-65.24	807	-52.80	-92.02	2067	-82.51	32.60	2130	-80.60	6.26	2760	-55.02	81.34	2823	-52.41	109.60
52	-91.50	-47.38	115	-8																			

CALCULO DE HASTIALES
SOLICITACIONES

Load Case 61

Combinación de Cargas = 1.50*(LC1) + 1.50*(LC2) + 1.50*(LC3) + 1.50*(LC4)

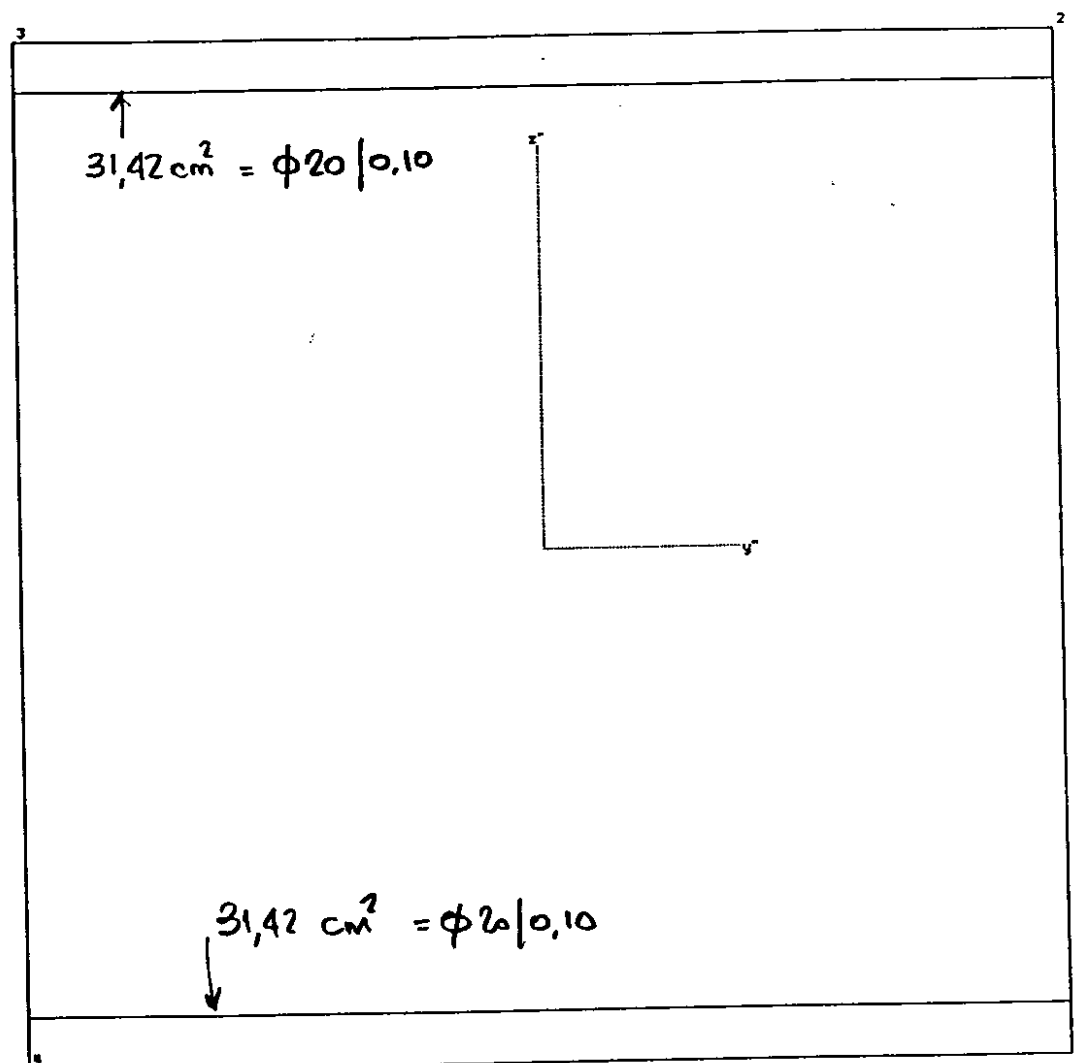
Elem	NY	MY	Elem	NY	MY	Elem	NY	MY	Elem	NY	MY	Elem	NY	MY	Elem	NY	MY	Elem	NY	MY
1	-87.97	-80.03	64	-60.19	-39.98	694	-95.87	-49.25	757	-128.00	-71.51	2017	-111.10	-63.57	2080	-87.96	-54.43	2710	-1.82	55.33
2	-65.69	-61.10	65	-64.56	-40.90	695	-75.75	-47.13	758	-65.39	-64.18	2018	-81.82	-64.79	2081	-88.61	-55.44	2711	-18.59	57.50
3	-66.38	-63.05	66	-65.70	-40.81	696	-56.59	-43.87	759	-48.31	-59.46	2019	-83.96	-67.24	2082	-81.04	-55.38	2712	-30.81	60.48
4	-67.34	-64.35	67	-66.58	-41.40	697	-47.24	-41.42	760	-40.64	-55.77	2020	-79.79	-68.79	2083	-77.41	-55.88	2713	-36.85	63.44
5	-68.19	-65.24	68	-67.22	-41.97	698	-42.49	-39.51	761	-37.35	-53.06	2021	-77.35	-69.78	2084	-75.09	-56.48	2714	-40.37	66.23
6	-68.85	-65.90	69	-67.66	-42.50	699	-40.23	-38.02	762	-36.08	-51.11	2022	-75.88	-70.47	2085	-73.66	-57.07	2715	-42.55	68.73
7	-69.33	-66.42	70	-67.93	-42.97	700	-39.29	-36.86	763	-35.76	-49.71	2023	-75.01	-71.02	2086	-72.80	-57.80	2716	-43.98	70.91
8	-69.65	-66.86	71	-68.06	-43.37	701	-39.02	-35.96	764	-35.88	-48.71	2024	-74.52	-71.51	2087	-72.32	-58.09	2717	-44.96	72.78
9	-69.84	-67.24	72	-68.07	-43.72	702	-39.09	-35.26	765	-36.17	-48.00	2025	-74.29	-71.98	2088	-72.10	-58.54	2718	-45.67	74.38
10	-69.93	-67.58	73	-68.02	-44.03	703	-39.31	-34.71	766	-36.51	-47.50	2026	-74.23	-72.45	2089	-72.05	-58.97	2719	-46.20	75.72
11	-69.95	-67.88	74	-67.92	-44.30	704	-39.57	-34.30	767	-36.84	-47.14	2027	-74.28	-72.93	2090	-72.10	-59.38	2720	-46.61	76.86
12	-69.92	-68.16	75	-67.79	-44.55	705	-39.82	-33.97	768	-37.13	-46.88	2028	-74.40	-73.40	2091	-72.21	-59.76	2721	-46.93	77.82
13	-69.87	-68.42	76	-67.65	-44.77	706	-40.05	-33.72	769	-37.37	-46.89	2029	-74.56	-73.86	2092	-72.35	-60.14	2722	-47.20	78.63
14	-69.80	-68.65	77	-67.51	-44.97	707	-40.24	-33.53	770	-37.57	-46.54	2030	-74.74	-74.31	2093	-72.52	-60.49	2723	-47.41	79.32
15	-69.71	-68.86	78	-67.37	-45.15	708	-40.40	-33.37	771	-37.73	-46.43	2031	-74.92	-74.74	2094	-72.69	-60.82	2724	-47.59	79.89
16	-69.63	-69.05	79	-67.25	-45.31	709	-40.53	-33.25	772	-37.85	-46.35	2032	-75.10	-75.15	2095	-72.85	-61.14	2725	-47.73	80.38
17	-69.55	-69.22	80	-67.13	-45.45	710	-40.62	-33.16	773	-37.95	-46.28	2033	-75.28	-75.53	2096	-73.00	-61.43	2726	-47.84	80.79
18	-69.48	-69.37	81	-67.03	-45.59	711	-40.69	-33.08	774	-38.02	-46.22	2034	-75.44	-75.88	2097	-73.14	-61.70	2727	-47.93	81.14
19	-69.41	-69.51	82	-66.94	-45.71	712	-40.75	-33.02	775	-38.07	-46.16	2035	-75.59	-76.21	2098	-73.28	-61.96	2728	-48.00	81.43
20	-69.34	-69.64	83	-66.87	-45.82	713	-40.78	-32.97	776	-38.11	-46.12	2036	-75.73	-76.51	2099	-73.39	-62.19	2729	-48.06	81.68
21	-69.29	-69.75	84	-66.80	-45.92	714	-40.80	-32.92	777	-38.14	-46.08	2037	-75.88	-76.79	2100	-73.50	-62.41	2730	-48.11	81.89
22	-69.24	-69.86	85	-66.74	-46.01	715	-40.82	-32.89	778	-38.15	-46.04	2038	-75.97	-77.04	2101	-73.60	-62.61	2731	-48.14	82.08
23	-69.19	-69.95	86	-66.68	-46.10	716	-40.82	-32.87	779	-38.16	-46.01	2039	-76.08	-77.27	2102	-73.68	-62.79	2732	-48.17	82.24
24	-69.15	-70.04	87	-66.64	-46.17	717	-40.82	-32.85	780	-38.16	-45.98	2040	-76.17	-77.48	2103	-73.76	-62.96	2733	-48.19	82.38
25	-69.11	-70.11	88	-66.60	-46.24	718	-40.81	-32.84	781	-38.15	-45.97	2041	-76.25	-77.68	2104	-73.83	-63.12	2734	-48.21	82.51
26	-69.08	-70.18	89	-66.56	-46.31	719	-40.80	-32.84	782	-38.14	-45.95	2042	-76.33	-77.86	2105	-73.89	-63.27	2735	-48.23	82.62
27	-69.04	-70.24	90	-66.53	-46.37	720	-40.79	-32.85	783	-38.13	-45.95	2043	-76.40	-78.03	2106	-73.94	-63.42	2736	-48.25	82.72
28	-69.02	-70.30	91	-66.50	-46.42	721	-40.77	-32.86	784	-38.11	-45.95	2044	-76.46	-78.19	2107	-74.00	-63.55	2737	-48.26	82.82
29	-68.99	-70.34	92	-66.48	-46.47	722	-40.76	-32.89	785	-38.10	-45.97	2045	-76.52	-78.34	2108	-74.04	-63.68	2738	-48.27	82.91
30	-68.97	-70.39	93	-66.45	-46.52	723	-40.74	-32.93	786	-38.08	-46.00	2046	-76.58	-78.48	2109	-74.09	-63.80	2739	-48.28	83.00
31	-68.95	-70.42	94	-66.44	-46.56	724	-40.73	-32.98	787	-38.07	-46.04	2047	-76.63	-78.62	2110	-74.13	-63.92	2740	-48.29	83.09
32	-68.93	-70.45	95	-66.42	-46.59	725	-40.72	-33.04	788	-38.06	-46.10	2048	-76.68	-78.76	2111	-74.17	-64.04	2741	-48.30	83.18
33	-68.92	-70.48	96	-66.41	-46.63	726	-40.71	-33.12	789	-38.05	-46.17	2049	-76.73	-78.90	2112	-74.21	-64.15	2742	-48.31	83.27
34	-68.91	-70.50	97	-66.41	-46.66	727	-40.71	-33.21	790	-38.04	-46.27	2050	-76.78	-79.03	2113	-74.25	-64.27	2743	-48.31	83.35
35	-68.90	-70.51	98	-66.40	-46.68	728	-40.71	-33.32	791	-38.04	-46.38	2051	-76.83	-79.17	2114	-74.30	-64.39	2744	-48.31	83.45
36	-68.90	-70.53	99	-66.41	-46.71	729	-40.72	-33.44	792	-38.05	-46.52	2052	-76.88	-79.31	2115	-74.34	-64.51	2745	-48.31	83.54
37	-68.90	-70.54	100	-66.41	-46.73	730	-40.74	-33.59	793	-38.06	-46.68	2053	-76.93	-79.46	2116	-74.40	-64.64	2746	-48.31	83.64
38	-68.91	-70.54	101	-66.43	-46.75	731	-40.76	-33.75	794	-38.08	-46.86	2054	-76.99	-79.61	2117	-74.45	-64.77	2747	-48.31	83.75
39	-68.92	-70.55	102	-66.44	-46.78	732	-40.80	-33.93	795	-38.11	-47.07	2055	-77.06	-79.77	2118	-74.52	-64.90	2748	-48.30	83.86
40	-68.94	-70.56	103	-66.47	-46.80	733	-40.84	-34.12	796	-38.15	-47.30	2056	-77.14	-79.94	2119	-74.59	-65.05	2749	-48.29	83.98
41	-68.96	-70.58	104	-66.50	-46.83	734	-40.89	-34.33	797	-38.19	-47.55	2057	-77.22	-80.12	2120	-74.68	-65.20	2750	-48.27	84.12
42	-68.99	-70.59	105	-66.54	-46.86	735	-40.95	-34.55	798	-38.24	-47.83	2058	-77.32	-80.32	2121	-74.78	-65.36	2751	-48.24	84.27
43	-69.02	-70.62	106	-66.58	-46.89	736	-41.01	-34.79	799	-38.29	-48.12	2059	-77.43	-80.54	2122	-74.90	-65.54	2752	-48.21	84.44
44	-69.06	-70.66	107	-66.64	-46.93	737	-41.07	-35.02	800	-38.35	-48.43	2060	-77.56	-80.77	2123	-75.04	-65.73	2753	-48.17	84.62
45	-69.12	-70.70	108	-66.70	-46.99	738	-41.14	-35.26	801	-38.40	-48.76	2061	-77.71	-81.03	2124	-75.20	-65.94	2754	-48.13	84.84
46	-69.18	-70.77	109	-66.78	-47.05	739	-41.20	-35.50	802	-38.45	-49.08	2062	-77.87	-81.31	2125	-75.39	-66.17	2755	-48.07	85.08
47	-69.26	-70.85	110	-66.87	-47.12	740	-41.26	-35.72	803	-38.48	-49.41	2063	-78.06	-81.63	2126	-75.60	-66.43	2756	-47.99	85.37
48	-69.35	-70.95	111	-66.98	-47.20	741	-41.30	-35.93	804	-38.50	-49.72	2064	-78.26	-81.98	2127	-75.84	-66.70	2757	-47.91	85.70
49	-69.47	-71.08	112	-67.11	-47.30	742	-41.33	-36.10	805	-38.50	-50.01	2065	-78.47	-82.38	2128	-76.11	-67.01	2758	-47.81	86.09
50	-69.62	-71.23	113	-67.27	-47.42	743	-41.33	-36.24	806	-38.46	-50.27	2066	-78.70	-82.82	2129	-76.41	-67.35	2759	-47.70	86.55
51	-69.80	-71.40	114	-67.47	-47.55	744	-41.30	-36.32	807	-38.38	-50.47	2067	-78.94	-83.31	2130	-76.73	-67.71	2760	-47.59	87.10
52	-70.05	-71.61	115	-67.72	-47.89	745	-41.22	-36.33	808	-38.26	-50.61	2068	-79.17	-83.87	2131	-77.06	-68.12	2761	-47.49	87.75
53	-70.36	-71.84	116	-68.05	-47.84	746	-41.08	-36.25	809	-38.07	-50.86	2069	-79.38	-84.50	2132	-77.39	-68.56	2762	-47.42	88.54
54	-70.77	-72.09	117	-68.48	-48.00	747	-40.87	-36.06	810	-37.80	-50.58	2070	-79.55	-85.20	2133	-77.71	-69.03	2763	-47.44	89.48
55	-71.33	-72.37	118	-69.04	-48.15	748	-40.55	-35.74	811	-37.43	-50.36	2071	-79.65	-85.99	2134	-77.99	-69.52	2764	-47.62	90.61
56	-72.07	-72.66	119	-69.80	-48.29	749	-40.08	-35.25	812	-36.93	-49.93	2072	-79.67	-86.85	2135	-78.20	-70.03	2765	-48.10	91.98
57	-73.08	-72.94	120	-70.83	-48.40	750	-39.41	-34.57	813	-36.24	-49.24	2073	-79.56	-87.79	2136	-78.31	-70.54	2766	-49.10	93.64
58	-74.48	-73.20	121	-72.25	-48.46	751	-38.43	-33.66	814	-35.27	-48.20	2074	-79.29	-88.74	2137	-78.28	-71.02	2767	-51.00	95.64
59	-76.45	-73.35	122	-74.23	-48.46	752	-36.95	-32.51	815	-33.87	-46.72	2075	-78.84	-89.82	2138	-78.09	-71.45	2768	-54.42	98.07
60	-79.36	-73.28	123	-77.06	-48.42	753	-34.63	-31.11	816	-31.77	-44.62									

CALCULO DE HASTIALES
SOLICITACIONES

Load Case 62 Combinación de Cargas = 0.90*(LC1) + 0.90*(LC2) + 1.50*(LC3) + 1.50*(LC4)

Elem	NY	MY	Elem	NY	MY	Elem	NY	MY	Elem	NY	MY	Elem	NY	MY	Elem	NY	MY	Elem	NY	MY
1	-31.75	-78.18	64	-28.70	-51.81	694	-51.93	-15.63	757	-70.08	-30.31	2017	-73.06	-52.90	2080	-57.85	-48.50	2710	0.61	38.80
2	-32.32	-77.22	65	-31.84	-52.84	695	-40.91	-14.71	758	-35.57	-26.87	2018	-59.63	-53.99	2081	-56.33	-47.37	2711	-10.68	38.38
3	-33.72	-79.06	66	-33.35	-52.55	696	-30.48	-13.18	759	-26.06	-24.22	2019	-54.17	-56.22	2082	-52.29	-47.38	2712	-18.89	40.46
4	-34.98	-80.06	67	-34.54	-52.82	697	-25.45	-11.99	760	-21.93	-22.20	2020	-51.11	-57.66	2083	-49.59	-47.86	2713	-22.90	42.57
5	-36.04	-80.61	68	-35.47	-53.18	698	-23.01	-11.05	761	-20.28	-20.79	2021	-49.24	-58.59	2084	-47.82	-48.41	2714	-25.21	44.57
6	-36.88	-80.92	69	-36.19	-53.52	699	-21.94	-10.33	762	-19.74	-19.84	2022	-48.06	-59.23	2085	-46.67	-48.93	2715	-26.63	46.39
7	-37.56	-81.12	70	-36.75	-53.80	700	-21.59	-9.78	763	-19.72	-19.20	2023	-47.31	-59.71	2086	-45.93	-49.39	2716	-27.54	48.00
8	-38.08	-81.28	71	-37.17	-54.02	701	-21.59	-9.37	764	-19.90	-18.78	2024	-46.85	-60.12	2087	-45.48	-49.81	2717	-28.17	49.41
9	-38.49	-81.41	72	-37.48	-54.21	702	-21.74	-9.06	765	-20.16	-18.51	2025	-46.57	-60.51	2088	-45.21	-50.19	2718	-28.62	50.62
10	-38.81	-81.54	73	-37.72	-54.37	703	-21.96	-8.84	766	-20.42	-18.35	2026	-46.42	-60.88	2089	-45.07	-50.54	2719	-28.96	51.67
11	-39.05	-81.67	74	-37.89	-54.51	704	-22.17	-8.68	767	-20.65	-18.24	2027	-46.37	-61.25	2090	-45.02	-50.87	2720	-29.23	52.58
12	-39.24	-81.79	75	-38.02	-54.63	705	-22.37	-8.56	768	-20.85	-18.18	2028	-46.37	-61.62	2091	-45.02	-51.18	2721	-29.45	53.37
13	-39.39	-81.91	76	-38.12	-54.75	706	-22.53	-8.47	769	-21.01	-18.15	2029	-46.41	-61.98	2092	-45.06	-51.48	2722	-29.63	54.05
14	-39.50	-82.02	77	-38.19	-54.85	707	-22.67	-8.41	770	-21.13	-18.12	2030	-46.47	-62.33	2093	-45.12	-51.76	2723	-29.78	54.84
15	-39.59	-82.13	78	-38.24	-54.95	708	-22.78	-8.37	771	-21.23	-18.11	2031	-46.55	-62.67	2094	-45.19	-52.03	2724	-29.90	55.15
16	-39.66	-82.23	79	-38.29	-55.04	709	-22.86	-8.33	772	-21.30	-18.10	2032	-46.63	-62.99	2095	-45.26	-52.28	2725	-30.01	55.60
17	-39.72	-82.33	80	-38.32	-55.12	710	-22.92	-8.31	773	-21.35	-18.09	2033	-46.72	-63.30	2096	-45.34	-52.52	2726	-30.10	55.99
18	-39.76	-82.42	81	-38.34	-55.20	711	-22.97	-8.29	774	-21.39	-18.08	2034	-46.80	-63.59	2097	-45.41	-52.74	2727	-30.17	56.33
19	-39.79	-82.50	82	-38.36	-55.27	712	-23.00	-8.28	775	-21.42	-18.07	2035	-46.89	-63.86	2098	-45.48	-52.95	2728	-30.23	56.63
20	-39.81	-82.58	83	-38.37	-55.34	713	-23.02	-8.27	776	-21.43	-18.06	2036	-46.96	-64.11	2099	-45.55	-53.15	2729	-30.28	56.89
21	-39.83	-82.65	84	-38.38	-55.40	714	-23.03	-8.26	777	-21.44	-18.05	2037	-47.04	-64.34	2100	-45.61	-53.33	2730	-30.32	57.13
22	-39.84	-82.71	85	-38.38	-55.46	715	-23.03	-8.26	778	-21.44	-18.04	2038	-47.11	-64.56	2101	-45.67	-53.51	2731	-30.36	57.33
23	-39.85	-82.77	86	-38.38	-55.52	716	-23.02	-8.25	779	-21.43	-18.03	2039	-47.17	-64.76	2102	-45.73	-53.67	2732	-30.38	57.52
24	-39.85	-82.83	87	-38.37	-55.57	717	-23.02	-8.26	780	-21.43	-18.03	2040	-47.23	-64.95	2103	-45.78	-53.82	2733	-30.41	57.69
25	-39.85	-82.88	88	-38.37	-55.62	718	-23.01	-8.26	781	-21.42	-18.02	2041	-47.28	-65.12	2104	-45.82	-53.96	2734	-30.43	57.84
26	-39.85	-82.92	89	-38.36	-55.66	719	-22.99	-8.27	782	-21.40	-18.02	2042	-47.33	-65.29	2105	-45.87	-54.09	2735	-30.44	57.98
27	-39.85	-82.96	90	-38.35	-55.70	720	-22.98	-8.29	783	-21.39	-18.03	2043	-47.38	-65.44	2106	-45.91	-54.22	2736	-30.46	58.10
28	-39.84	-83.00	91	-38.35	-55.74	721	-22.96	-8.31	784	-21.38	-18.04	2044	-47.43	-65.59	2107	-45.94	-54.34	2737	-30.47	58.22
29	-39.84	-83.03	92	-38.34	-55.77	722	-22.95	-8.34	785	-21.36	-18.06	2045	-47.47	-65.73	2108	-45.98	-54.45	2738	-30.48	58.33
30	-39.83	-83.06	93	-38.33	-55.80	723	-22.94	-8.38	786	-21.35	-18.09	2046	-47.50	-65.86	2109	-46.01	-54.57	2739	-30.49	58.43
31	-39.83	-83.08	94	-38.33	-55.83	724	-22.93	-8.43	787	-21.34	-18.13	2047	-47.54	-65.99	2110	-46.04	-54.67	2740	-30.50	58.53
32	-39.83	-83.10	95	-38.32	-55.85	725	-22.92	-8.49	788	-21.33	-18.19	2048	-47.57	-66.12	2111	-46.07	-54.78	2741	-30.50	58.62
33	-39.83	-83.11	96	-38.32	-55.87	726	-22.92	-8.56	789	-21.32	-18.25	2049	-47.61	-66.24	2112	-46.10	-54.88	2742	-30.51	58.72
34	-39.84	-83.12	97	-38.33	-55.89	727	-22.92	-8.64	790	-21.32	-18.34	2050	-47.64	-66.36	2113	-46.13	-54.99	2743	-30.51	58.81
35	-39.85	-83.12	98	-38.34	-55.91	728	-22.92	-8.73	791	-21.33	-18.43	2051	-47.67	-66.49	2114	-46.16	-55.09	2744	-30.51	58.90
36	-39.86	-83.12	99	-38.35	-55.92	729	-22.93	-8.84	792	-21.34	-18.55	2052	-47.70	-66.61	2115	-46.19	-55.20	2745	-30.51	58.99
37	-39.88	-83.12	100	-38.37	-55.93	730	-22.95	-8.97	793	-21.35	-18.68	2053	-47.74	-66.74	2116	-46.22	-55.30	2746	-30.51	59.08
38	-39.91	-83.11	101	-38.40	-55.94	731	-22.98	-9.11	794	-21.37	-18.84	2054	-47.77	-66.87	2117	-46.25	-55.41	2747	-30.50	59.18
39	-39.95	-83.11	102	-38.44	-55.94	732	-23.01	-9.26	795	-21.40	-19.01	2055	-47.81	-67.01	2118	-46.29	-55.53	2748	-30.49	59.28
40	-39.99	-83.09	103	-38.49	-55.95	733	-23.05	-9.43	796	-21.44	-19.21	2056	-47.84	-67.15	2119	-46.33	-55.65	2749	-30.48	59.39
41	-40.05	-83.08	104	-38.55	-55.95	734	-23.10	-9.61	797	-21.49	-19.42	2057	-47.89	-67.30	2120	-46.37	-55.78	2750	-30.47	59.51
42	-40.12	-83.07	105	-38.61	-55.96	735	-23.16	-9.81	798	-21.54	-19.66	2058	-47.93	-67.47	2121	-46.42	-55.91	2751	-30.45	59.63
43	-40.20	-83.06	106	-38.70	-55.97	736	-23.22	-10.02	799	-21.59	-19.91	2059	-47.98	-67.64	2122	-46.48	-56.06	2752	-30.43	59.77
44	-40.30	-83.06	107	-38.80	-55.98	737	-23.29	-10.24	800	-21.66	-20.18	2060	-48.03	-67.83	2123	-46.54	-56.21	2753	-30.41	59.93
45	-40.41	-83.06	108	-38.91	-55.99	738	-23.37	-10.46	801	-21.72	-20.46	2061	-48.09	-68.04	2124	-46.62	-56.38	2754	-30.38	60.10
46	-40.54	-83.07	109	-39.05	-56.01	739	-23.44	-10.69	802	-21.78	-20.75	2062	-48.15	-68.27	2125	-46.70	-56.56	2755	-30.34	60.30
47	-40.70	-83.08	110	-39.21	-56.03	740	-23.52	-10.92	803	-21.84	-21.05	2063	-48.22	-68.52	2126	-46.78	-56.78	2756	-30.29	60.52
48	-40.88	-83.11	111	-39.39	-56.06	741	-23.59	-11.15	804	-21.89	-21.34	2064	-48.29	-68.80	2127	-46.88	-56.97	2757	-30.24	60.78
49	-41.10	-83.15	112	-39.61	-56.10	742	-23.65	-11.36	805	-21.93	-21.63	2065	-48.35	-69.10	2128	-46.98	-57.20	2758	-30.19	61.08
50	-41.35	-83.21	113	-39.87	-56.15	743	-23.70	-11.56	806	-21.95	-21.91	2066	-48.41	-69.44	2129	-47.09	-57.46	2759	-30.13	61.43
51	-41.65	-83.29	114	-40.17	-56.21	744	-23.73	-11.73	807	-21.94	-22.17	2067	-48.46	-69.82	2130	-47.19	-57.74	2760	-30.07	61.85
52	-42.01	-83.39	115	-40.54	-56.27	745	-23.73	-11.87	808	-21.91	-22.39	2068	-48.48	-70.24	2131	-47.29	-58.03	2761	-30.03	62.34
53	-42.44	-83.51	116	-40.97	-56.35	746	-23.70	-11.97	809	-21.84	-22.57	2069	-48.48	-70.71	2132	-47.36	-58.35	2762	-30.03	62.91
54	-42.96	-83.67	117	-41.50	-56.43	747	-23.63	-12.01	810	-21.73	-22.69	2070	-48.43	-71.24	2133	-47.40	-58.69	2763	-30.09	63.60
55	-43.60	-83.84	118	-42.15	-56.50	748	-23.50	-11.99	811	-21.55	-22.74	2071	-48.31	-71.81	2134	-47.39	-59.04	2764	-30.27	64.42
56	-44.39	-84.04	119	-42.95	-56.57	749	-23.29	-11.88	812	-21.30	-22.68	2072	-48.10	-72.43	2135	-47.31	-59.38	2765	-30.66	65.39
57	-45.39	-84.25	120	-43.96	-56.61	750	-22.97	-11.67	813	-20.95	-22.50	2073	-47.78	-73.08	2136	-47.12	-59.71	2766	-31.40	66.55
58	-46.66	-84.44	121	-45.26	-56.60	751	-22.50	-11.33	814	-20.46	-22.14	2074	-47.32	-73.72	2137	-46.81	-60.00	2767	-32.71	67.94
59	-48.35	-84.54	122	-46.96	-56.54	752	-21.79	-10.86	815	-19.75	-21.57	2075	-46.69	-74.25	2138	-46.34	-60.23	2768	-34.94	69.61
60	-50.67	-84.40	123	-49.24	-56.44	753	-20.68	-10.24	816	-18.70	-20.69	2076	-45.88	-74.50	2139	-45.68	-60.41	2769	-38.67	

Mstb. 1 : 7.0



Sección : "SECC3" Armadura : "B1"
Tipo : tipo viga/ Rectángulo Unidades : [cm]
Material : "H250"

Ancho = 100.00 cm Canto = 100.00 cm

Características mecánicas de la sección:
Area : Ax= 1.000 [m²]
Momentos de inercia : Iy= 0.083333 [m⁴] Iz= 0.083333 [m⁴]
Inercia a torsión : Ix= 0.140667 [m⁴]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.500000 [m]

I: R=dist.borde [m] W=I/R [m³] W/Ax [m]
izq. Iz -0.500 -0.166667 0.167
dch. Iz 0.500 0.166667 -0.167
abajo Iy -0.500 -0.166667 0.167
arriba Iy 0.500 0.166667 -0.167

Armadura: "B1"

Nº	Nom.mat	Cod.dim.	Area [cm²]	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]
1	AEH500	(2)	31.42	-50.00	5.00	50.00	5.00
2	AEH500	(2)	31.42	-50.00	95.00	50.00	95.00
Total:			62.83	Cuantía de armadura: 0.628 [o/o]			

Cód. dimensionamiento: (0) = As constante
Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada
Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero"AEH500"/Hormigón"H250")					
Cortante	Area mín.cercos	Ancho alma ideal	Canto útil	Incl.bielas	
Vz	0.00 [cm²/m]	100.00 [cm]	96.00 [cm]	0.00	
Vy	0.00 [cm²/m]	100.00 [cm]	96.00 [cm]	0.00	

Características del material:					
Nom.Mat.	Módulo E	0.85*fcd,fyd	eps-fc	fct	fcv
"H250"	300000.0	-141.600	-2.000	0.0	6.460
"AEH500"	2.10E+06	4434.700			

Leyenda:
fcd,fyd resistencia de cálculo del hormigón,acero
eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)
fct resistencia de cálculo a tracción del hormigón
fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Dimensionamiento : Viga "SECC3"/"B1"

Esfuerzos (Rotura)					
N	Vy	Vz	Mx	My	Mz
-88.320				-66.970	45.0

La armadura mínima entrada es suficiente !
Armadura mínima definida con las áreas entradas ..
Factor actual de minoración de la resistencia de la sección 3.75
Factor necesario de minoración de la resistencia de la sección .. 1.00

Armadura	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]	dado	dimens.	As-nuevo
Longitudinal:					(As-min)	[cm²]	[cm²]
1 "AEH500"	-50.0	5.0	50.0	5.0	31.42	-	31.42
2 "AEH500"	-50.0	95.0	50.0	95.0	31.42	-	31.42
Cuantía arm. 0.63 [o/o]						Suma	62.83

Deformaciones y tensiones extremas (Rotura):				
1	Coordenadas y [cm]	Eps [o/o]	Estado-II [kp/cm²]	
Hormigón-Min	50.00	0.00	-3.500	-141.600
Armadura-Min	50.00	5.00	-2.895	-4434.700
Hormigón-Max	-50.00	100.00	8.609	0.000
Armadura-Max	-50.00	95.00	8.004	4434.700

Fibra neutra zn 28.90 cm yn 0.00 cm Angulo 0.0
Ancho zona comprim. 28.90 cm Zona comprimida/Canto útil 0.30

Dimensionamiento : Viga "SECC3"/"B1"

Esfuerzos (Rotura)					
N	Vy	Vz	Mx	My	Mz
-76.910				-111.300	45.0

La armadura mínima entrada es suficiente !
Armadura mínima definida con las áreas entradas ..
Factor actual de minoración de la resistencia de la sección 1.61
Factor necesario de minoración de la resistencia de la sección .. 1.00

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	(As-min)	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	-50.0	5.0	31.42	-	31.42
2 "AEH500"	-50.0	95.0	50.0	95.0	31.42	-	31.42
Cuantía arm. 0.63 [o/o] Suma							62.83
=====							

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas		Eps	Estado-II	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	
Hormigón-Min	50.00	0.00	-2.144	-141.600	"H250"
Armadura-Min	50.00	5.00	-1.505	-3159.515	"AEH500"
Hormigón-Max	-50.00	100.00	10.639	0.000	"H250"
Armadura-Max	-50.00	95.00	10.000	4434.700	"AEH500"

Fibra neutra	zn	16.77 cm	yn	0.00 cm	Angulo	0.0
Ancho zona comprim.		16.77 cm	Zona comprimida/Canto útil			0.18

Dimensionamiento : Viga "SECC3"/"B1"

Esfuerzos (Rotura)						Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	Alpha
-110.500				-103.000		45.0

La armadura mínima entrada es suficiente !

Armadura mínima definida con las áreas entradas ..

Factor actual de minoración de la resistencia de la sección 2.18

Factor necesario de minoración de la resistencia de la sección .. 1.00

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	(As-min)	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	31.42	-	31.42
2 "AEH500"	-50.0	95.0	50.0	95.0	31.42	-	31.42
Cuantía arm. 0.63 [o/o] Suma							62.83
=====							

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas		Eps	Estado-II	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	
Hormigón-Min	50.00	0.00	-2.993	-141.600	"H250"
Armadura-Min	50.00	5.00	-2.309	-4434.700	"AEH500"
Hormigón-Max	-50.00	100.00	10.684	0.000	"H250"
Armadura-Max	-50.00	95.00	10.000	4434.700	"AEH500"

Fibra neutra	zn	21.88 cm	yn	0.00 cm	Angulo	0.0
Ancho zona comprim.		21.88 cm	Zona comprimida/Canto útil			0.23

Dimensionamiento : Viga "SECC3"/"B1"

Esfuerzos (Rotura)						Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	Alpha
-87.050				161.200		45.0

La armadura mínima entrada es suficiente !

Armadura mínima definida con las áreas entradas ..

Factor actual de minoración de la resistencia de la sección 1.02

Factor necesario de minoración de la resistencia de la sección .. 1.00

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	(As-min)	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	31.42	-	31.42
2 "AEH500"	-50.0	95.0	50.0	95.0	31.42	-	31.42
Cuantía arm. 0.63 [o/o] Suma							62.83
=====							

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas		Eps	Estado-II	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	
Hormigón-Min	-50.00	100.00	-1.928	-141.417	"H250"
Armadura-Min	-50.00	95.00	-1.300	-2730.536	"AEH500"
Hormigón-Max	50.00	0.00	10.628	0.000	"H250"
Armadura-Max	50.00	5.00	10.000	4434.700	"AEH500"

Fibra neutra	zn	84.64 cm	yn	-0.00 cm	Angulo	0.0
Ancho zona comprim.		15.36 cm	Zona comprimida/Canto útil			0.16

Dimensionamiento : Viga "SECC3"/"B1"

Esfuerzos (Rotura)						Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	Alpha
-69.310				-146.800		45.0

La armadura mínima entrada es suficiente !

Armadura mínima definida con las áreas entradas ..

Factor actual de minoración de la resistencia de la sección 1.08

Factor necesario de minoración de la resistencia de la sección .. 1.00

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	(As-min)	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	31.42	-	31.42
2 "AEH500"	-50.0	95.0	50.0	95.0	31.42	-	31.42
Cuantía arm. 0.63 [o/o] Suma							62.83
=====							

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas		Eps	Estado-II	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	
Hormigón-Min	50.00	0.00	-1.843	-140.731	"H250"
Armadura-Min	50.00	5.00	-1.220	-2562.051	"AEH500"
Hormigón-Max	-50.00	100.00	10.623	0.000	"H250"
Armadura-Max	-50.00	95.00	10.000	4434.700	"AEH500"

Fibra neutra	zn	14.79 cm	yn	0.00 cm	Angulo	0.0
Ancho zona comprim.		14.79 cm	Zona comprimida/Canto útil			0.16

Dimensionamiento : Viga "SECC3"/"B1"

Esfuerzos (Rotura)						Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	Alpha
-48.350				-84.540		45.0

La armadura mínima entrada es suficiente !

Armadura mínima definida con las áreas entradas ..

Factor actual de minoración de la resistencia de la sección 1.98

Factor necesario de minoración de la resistencia de la sección .. 1.00

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	(As-min)	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	31.42	-	31.42
2 "AEH500"	-50.0	95.0	50.0	95.0	31.42	-	31.42
Cuantía arm. 0.63 [o/o] Suma							62.83
=====							

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas		Eps	Estado-II	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	
Hormigón-Min	50.00	0.00	-1.970	-141.569	"H250"
Armadura-Min	50.00	5.00	-1.340	-2814.735	"AEH500"
Hormigón-Max	-50.00	100.00	10.630	0.000	"H250"
Armadura-Max	-50.00	95.00	10.000	4434.700	"AEH500"

Fibra neutra	zn	15.64 cm	yn	0.00 cm	Angulo	0.0
Ancho zona comprim.		15.64 cm	Zona comprimida/Canto útil			0.16

CALCULO DE MUROS.

NOMBRE PROYECTO :	L.A.V. MADRID - BARCELONA - FRONTERA FRANCESA.
NOMBRE OBRA :	E-1508.1 - MURO 1 -

DATOS

GEOMETRIA DE CALCULO DEL MURO

C. Canto del muro en coronación (m) :	0.500
ST. Sobreespesor muro en trasdós (m) :	0.750
SI. Sobreespesor muro en intradós (m) :	0.000
P. Puntera zapata (m) :	1.000
T. Talón zapata (m) :	4.450
H. Altura muro (m) :	9.100
H _z . Canto zapata (m) :	1.500
Anchura total cimentación (m) :	6.700
Angulo trasdós muro (°) :	85.288

DEFINICION TERRENO

	X	Y
0. Coordenadas base trasdós (m) :	0.000	0.000
1. Coordenadas coronación trasdós (m) :	-0.750	9.100
2. Coordenadas fin tramo 1 terreno (m) :	0.100	9.100
3. Coordenadas fin tramo 2 terreno (m) :	10.000	9.100
4. Coordenadas fin tramo 3 terreno (m) :	20.000	9.100

COEFICIENTES DE SEGURIDAD

Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
γ _c (coeficiente combinación variables) :	1.00

Estado Límite Último	
Favorable	Desfavorable

Acciones permanentes (G)	
Peso propio, cargas muertas :	0.90 1.50
Acciones permanentes de valor no constante (G*)	
Terreno (peso propio y empujes) :	0.00 1.50
Acciones variables (Q)	
Sobrecargas :	0.00 1.500

CARACTERISTICAS DEL TERRENO

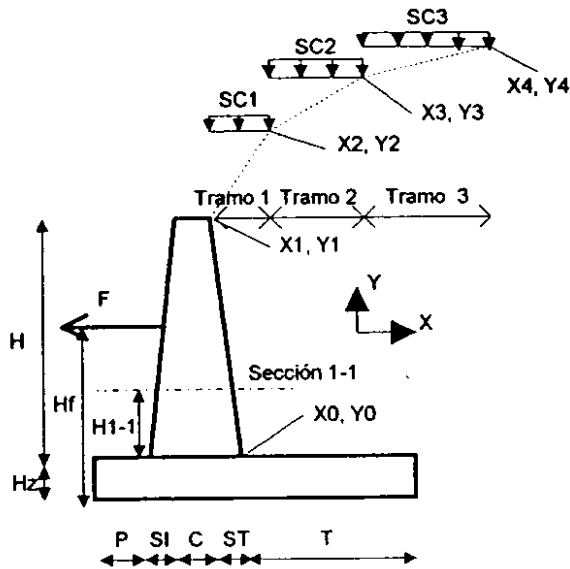
γ. Peso específico (T/m³) :	2.00
φ. Angulo rozamiento interno (°) :	30.000
δ _{mt} . Angulo rozamiento muro-terras (°) :	0.000
δ _{tt} . Angulo rozamiento tierras-terras (°) :	0.000
μ. Coeficiente rozamiento zapata-terras :	0.580
Tensión admisible cimentación (T/m²) :	40.000

ARMADO

H1-1. Dist. sección 1 a sup. zapata (m) :	2.700
Recubrimiento alzado (m) :	0.050
Recubrimiento cimentación (m) :	0.050

Cuantías mínimas

Vertical muros (1/3 mín. cara)(o/oo) :	0.900
Horizontal muros (1/3 mín. cara)(o/oo) :	1.600
Cortante o montaje alzado (cm²/m²) :	4.500
Transversal zapata (sup+inf)(o/oo) :	1.447
Longitudinal zapata (sup+inf)(o/oo) :	1.447
Cortante zapata (cm²/m²) :	0.000
Perimetral zapata (en canto)(cm²/m) :	10.853

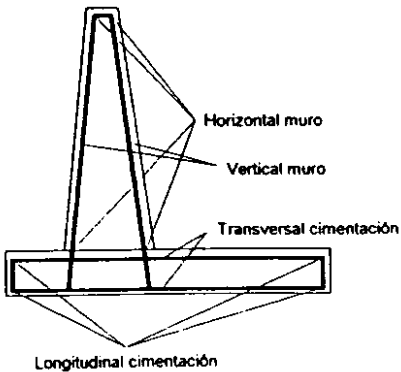


CARGAS (sin mayorar)

Acciones permanentes (G)	
Peso propio barrera coronación (T/m) :	0.000
Acciones permanentes de valor no constante (G*)	
Fg. Carga horizontal sobre muro (T/m) :	0.000
Hfg. Posición Fg a inferior zapata (m) :	0.000
Acciones variables (Q)	
SC1. Sobrecarga en tramo 1 (T/m) :	3.000
SC2. Sobrecarga en tramo 2 (T/m) :	3.000
SC3. Sobrecarga en tramo 3 (T/m) :	3.000
Fq. Carga horizontal sobre muro (T/m) :	0.000
Hfq. Posición Fq a inferior zapata (m) :	0.000

CARACTERISTICAS MATERIALES

Peso específico hormigón (T/m³) :	2.500
Hormigón alzado (T/m²) :	H - 250
Hormigón cimentación (T/m²) :	H - 250
Acero (T/P) :	AEH - 500



RESUMEN ACCIONES SOBRE EL MURO

		F. vertical (T / m)	X (m)	F. Horizontal (T / m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 (ΣP _i , i=1..3)	12.220	1.397	---	---
	Sobre sección base muro (ΣP _i , i=1..3)	19.906	1.464	---	---
	Total peso propio (ΣP _i , i=1..6)	45.031	2.516	---	---
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E1'i)	1.231	1.852	14.930	6.333
	Sobre sección base muro (E1'i)	2.488	2.000	30.185	4.533
	Total tierras (E2'i + ΣT _i)	87.815	4.283	37.283	3.533
	Verticales sobre talón (ΣT _i)	80.990	4.475	---	---
	Verticales sobre talón (cortante) (ΣT _i)	54.600	5.200	---	---
Fuerza Fg	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fg	---	---	0.000	0.000
Acciones variables (Q)					
Sobrecargas sobre terreno	Sección 1 (E1'sc)	0.577	1.764	6.999	7.400
	Base muro (E1'sc)	0.820	1.875	9.951	6.050
	Inf. cimentación (E2'sc + ΣS)	32.250	4.319	10.552	5.300
	Verticales sobre talón (ΣS _i , i=1..3)	30.000	4.503	---	---
	Verticales sobre talón (cortante) (ΣS _i)	9.000	5.200	---	---
Fuerza Fq	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fq	---	---	0.000	0.000

ARMADO

Secciones

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	1.25	1.00	1.25
	1-1	1.00	1.03	1.00	1.03
PUNTERA	2-2 f	1.00	1.50	1.00	1.50
	2-2 c	1.00	1.50	1.00	0.46
TALON	3-3 f	1.00	1.50	1.00	1.50
	3-3 c	1.00	1.50	1.00	1.50

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	22.878	206.433	60.205
	0-0 (-)	17.916	2.879	0.000
	1-1 (+)	13.709	81.814	32.894
	1-1 (-)	10.998	1.283	0.000
PUNTERA	2-2 f (+)	0.000	36.061	---
	2-2 f (-)	0.000	4.693	---
	2-2 c (+)	---	---	14.541
	2-2 c (-)	---	---	1.926
TALON	3-3 f (+)	0.000	4.339	---
	3-3 f (-)	-40.634	-197.736	---
	3-3 c (+)	---	---	0.902
	3-3 c (-)	---	---	-38.962

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm2/m	Mínima cm2/m	Control cálculo	Adoptada cm2/m
ALZADO	Vert. trasdós	0-0 (+)	38.601	7.500	Vale	38.601
		0-0 (-)	0.000	3.750	Vale	---
		1-1 (+)	17.958	6.165	Vale	17.958
		1-1 (-)	0.000	3.082	Vale	---
	Vert. intradós	0-0 (+)	0.000	3.750	Vale	3.750
		0-0 (-)	0.000	3.750	Vale	---
		1-1 (+)	0.000	3.082	Vale	---
		1-1 (-)	0.000	3.082	Vale	---
	Hor. trasdós (*)	---	7.720	13.333	Vale	13.333
	Hor. intradós (*)	---	0.000	6.667	Vale	6.667
	Cortante	0-0 (+)	0.000	4.500	Vale	4.500
		0-0 (-)	0.000	4.500	Vale	(cm²/m²)
		1-1 (+)	0.000	4.500	Vale	---
		1-1 (-)	0.000	4.500	Vale	---
PUNTERA	Trans. inferior	2-2 f (+)	5.642	10.853	Vale	10.853
		2-2 f (-)	0.730	10.853	Vale	---
	Long. inf. (*)	---	1.128	10.853	Vale	10.853
		2-2 f (+)	0.000	10.853	Vale	41.007
	Trans. superior	2-2 f (-)	0.000	10.853	Vale	---
		---	0.000	10.853	Vale	10.853
	Long. sup. (*)	---	0.000	0.000	Vale	0.000
		2-2 c (-)	0.000	0.000	Vale	(cm²/m²)
TALON	Trans. inferior	3-3 f (+)	0.675	10.853	Vale	10.853
		3-3 f (-)	0.000	10.853	Vale	---
	Long. inf. (*)	---	0.135	10.853	Vale	10.853
		3-3 f (+)	0.000	10.853	Vale	41.007
	Trans. superior	3-3 f (-)	41.007	10.853	Vale	---
		---	8.201	10.853	Vale	10.853
	Long. sup. (*)	---	0.000	0.000	Vale	0.000
		3-3 c (-)	0.000	0.000	Vale	(cm²/m²)
ZAPATA	Perimetral	---	0.000	10.853	Vale	10.853

(*) Calculada como el 20% de la armadura perpendicular a ella

COMPROBACIONES

SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	26.118	---
Acciones permanentes de valor no constante (G*)		
Tierras	50.933	37.283
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	---	---
Fuerza Fq	---	0.000
TOTAL	77.051	37.283

Csd= 2.067 Vale

SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	113.317	---
Acciones permanentes de valor no constante (G*)		
Tierras	376.080	131.733
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	---	---
Fuerza Fq	---	0.000
TOTAL	489.397	131.733

Csv= 3.715 Vale

TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	45.031	37.538
Acciones permanentes de valor no constante (G*)		
Tierras	87.815	49.833
Fuerza Fg	0.000	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	32.250	24.661
Fuerza Fq	0.000	0.000
TOTAL	165.096	112.032

D (m) = 6.70
 σ talón (T / m²) = 9.67
 σ puntera (T / m²) = 39.62
 σ med (T / m²) = 24.64
 σ cob (T / m²) = 30.90
 Vale

CALCULO DE MUROS.

NOMBRE PROYECTO : L.A.V. MADRID - BARCELONA - FRONTERA FRANCESA.
 NOMBRE OBRA : E-1608.1 - MURO 2 -

DATOS

GEOMETRIA DE CALCULO DEL MURO

C. Canto del muro en coronación (m) :	0.500
ST. Sobreespesor muro en trasdós (m) :	0.850
St. Sobreespesor muro en intradós (m) :	0.000
P. Puntera zapata (m) :	1.000
T. Talón zapata (m) :	4.900
H. Altura muro (m) :	10.000
H _z . Canto zapata (m) :	1.750
Anchura total cimentación (m) :	7.250
Angulo trasdós muro (°) :	85.142

DEFINICION TERRENO

	X	Y
0. Coordenadas base trasdós (m) :	0.000	0.000
1. Coordenadas coronación trasdós (m) :	-0.850	10.000
2. Coordenadas fin tramo 1 terreno (m) :	0.100	10.100
3. Coordenadas fin tramo 2 terreno (m) :	10.000	10.100
4. Coordenadas fin tramo 3 terreno (m) :	20.000	10.100

COEFICIENTES DE SEGURIDAD

Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
γ _o (coeficiente combinación variables) :	1.00

Estado Límite Último	
Favorable	Desfavorable

Acciones permanentes (G)

Peso propio, cargas muertas :	0.90	1.50
Acciones permanentes de valor no constante (G*)		
Terreno (peso propio y empujes) :	0.00	1.50
Acciones variables (Q)		
Sobrecargas :	0.00	1.500

CARACTERISTICAS DEL TERRENO

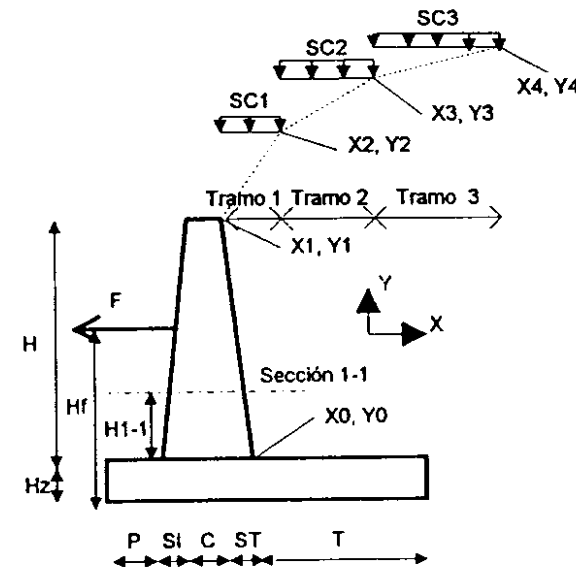
γ. Peso específico (T/m³) :	2.00
φ. Angulo rozamiento interno (°) :	30.000
δ _{mt} . Angulo rozamiento muro-tierras (°) :	0.000
δ _{tt} . Angulo rozamiento tierras-tierras (°) :	0.000
μ. Coeficiente rozamiento zapata-tierras :	0.580
Tensión admisible cimentación (T/m²) :	40.000

ARMADO

H1-1. Dist. sección 1 a sup. zapata (m) :	2.700
Recubrimiento alzado (m) :	0.050
Recubrimiento cimentación (m) :	0.050

Cuantías mínimas

Vertical muros (1/3 min. cara)(o/o) :	0.900
Horizontal muros (1/3 min. cara)(o/o) :	1.600
Cortante o montaje alzado (cm²/m²) :	4.500
Transversal zapata (sup+inf)(o/o) :	1.447
Longitudinal zapata (sup+inf)(o/o) :	1.447
Cortante zapata (cm²/m²) :	0.000
Perimetral zapata (en canto)(cm²/m) :	12.662



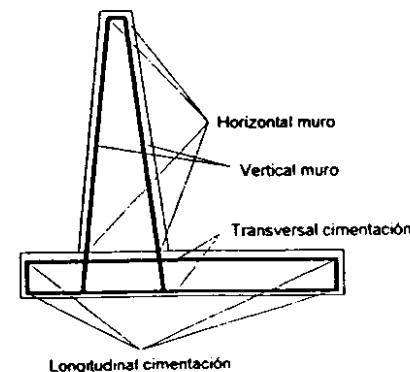
CARGAS (sin mayorar)

Acciones permanentes (G)	
Peso propio barrera coronación (T/m) :	0.000
Acciones permanentes de valor no constante (G*)	
Fg. Carga horizontal sobre muro (T/m) :	0.000
Hf. Posición Fg a inferior zapata (m) :	0.000

Acciones variables (Q)	
SC1. Sobrecarga en tramo 1 (T/m) :	3.000
SC2. Sobrecarga en tramo 2 (T/m) :	3.000
SC3. Sobrecarga en tramo 3 (T/m) :	3.000
Fg. Carga horizontal sobre muro (T/m) :	0.000
Hf. Posición Fg a inferior zapata (m) :	0.000

CARACTERISTICAS MATERIALES

Peso específico hormigón (T/m³) :	2.500
Hormigón alzado (T/m³) :	H - 250
Hormigón cimentación (T/m³) :	H - 250
Acero (T/°) :	AEH - 500



RESUMEN ACCIONES SOBRE EL MURO

		F.vertical (T / m)	X (m)	F. Horizontal (T / m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 (ΣP _i , i=1..3)	14.787	1.425	---	---
	Sobre sección base muro (ΣP _i , i=1..3)	23.125	1.495	---	---
	Total peso propio (ΣP _i , i=1..6)	54.844	2.727	---	---
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E1 ₁)	1.687	1.914	19.849	6.883
	Sobre sección base muro (E1 ₁)	3.166	2.067	37.248	5.083
	Total tierras (E2 ₁ + ΣT ₁)	107.555	4.582	46.535	3.950
	Verticales sobre talón (ΣT ₁ i)	98.979	4.800	---	---
	Verticales sobre talón (cortante) (ΣT ₁ i)	64.640	5.650	---	---
Fuerza Fg	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fg	---	---	0.000	0.000
Acciones variables (Q)					
Sobrecargas sobre terreno	Sección 1 (E1 ₁ sc)	0.687	1.810	8.078	8.100
	Base muro (E1 ₁ sc)	0.941	1.925	11.065	6.750
	Inf. cimentación (E2 ₁ sc + ΣS)	32.550	4.598	11.781	5.925
	Verticales sobre talón (ΣS ₁ i, i=1..3)	30.000	4.826	---	---
	Verticales sobre talón (cortante) (ΣS ₁ i)	9.600	5.650	---	---
Fuerza Fq	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fq	---	---	0.000	0.000

COMPROBACIONES

SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	31.809	---
Acciones permanentes de valor no constante (G*)		
Tierras	62.382	46.535
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	---	0.000
Fuerza Fq	---	---
TOTAL	94.191	46.535

Csd=	2.024	Vale
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SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	149.553	---
Acciones permanentes de valor no constante (G*)		
Tierras	492.825	183.813
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	---	---
Fuerza Fq	---	0.000
TOTAL	642.379	183.813

Csv=	3.496	Vale
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TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	54.844	49.255
Acciones permanentes de valor no constante (G*)		
Tierras	107.555	80.875
Fuerza Fg	0.000	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	32.550	38.123
Fuerza Fq	0.000	0.000
TOTAL	194.949	168.253

D (m) =	7.25
σ talón (T / m²) =	7.68
σ puntera (T / m²) =	46.10
σ med (T / m²) =	26.89
σ cob (T / m²) =	35.29
Vale	

ARMADO

Secciones

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	1.35	1.00	1.35
	1-1	1.00	1.12	1.00	1.12
PUNTERA	2-2 f	1.00	1.75	1.00	1.55
	2-2 c	1.00	1.75	1.00	0.28
TALON	3-3 f	1.00	1.75	1.00	1.75
	3-3 c	1.00	1.75	1.00	1.75

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	26.972	270.761	72.470
	0-0 (-)	20.813	3.745	0.000
	1-1 (+)	16.869	117.325	41.891
	1-1 (-)	13.308	1.801	0.000
PUNTERA	2-2 f (+)	0.000	42.943	---
	2-2 f (-)	0.000	5.330	---
	2-2 c (+)	---	---	9.298
	2-2 c (-)	---	---	1.174
TALON	3-3 f (+)	0.000	4.007	---
	3-3 f (-)	-48.606	-275.364	---
	3-3 c (+)	---	---	0.234
	3-3 c (-)	---	---	-54.883

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm2/m	Minima cm2/m	Control cálculo	Adoptada cm2/m
ALZADO	Vert. trasdós	0-0 (+)	47.228	8.100	Vale	47.228
		0-0 (-)	0.000	4.050	Vale	
		1-1 (+)	23.840	6.723	Vale	23.840
		1-1 (-)	0.000	3.362	Vale	
	Vert. intradós	0-0 (+)	0.000	4.050	Vale	4.050
		0-0 (-)	0.000	4.050	Vale	
		1-1 (+)	0.000	3.362	Vale	
		1-1 (-)	0.000	3.362	Vale	
	Hor. trasdós (*)	---	9.446	14.400	Vale	14.400
	Hor. intradós (*)	---	0.000	7.200	Vale	7.200
	Cortante	0-0 (+)	0.000	4.500	Vale	4.500 (cm²/m²)
		0-0 (-)	0.000	4.500	Vale	
		1-1 (+)	0.000	4.500	Vale	
		1-1 (-)	0.000	4.500	Vale	
PUNTERA	Trans. inferior	2-2 f (+)	6.500	12.662	Vale	12.662
		2-2 f (-)	0.802	12.662	Vale	
	Long. inf. (*)	---	1.300	12.662	Vale	12.662
	Trans. superior	2-2 f (+)	0.000	12.662	Vale	48.803
		2-2 f (-)	0.000	12.662	Vale	
	Long. sup. (*)	---	0.000	12.662	Vale	12.662
	Cortante	2-2 c (+)	0.000	0.000	Vale	0.000
		2-2 c (-)	0.000	0.000	Vale	(cm²/m²)
TALON	Trans. inferior	3-3 f (+)	0.532	12.662	Vale	12.662
		3-3 f (-)	0.000	12.662	Vale	
	Long. inf. (*)	---	0.106	12.662	Vale	12.662
	Trans. superior	3-3 f (+)	0.000	12.662	Vale	48.803
		3-3 f (-)	48.803	12.662	Vale	
	Long. sup. (*)	---	9.761	12.662	Vale	12.662
	Cortante	3-3 c (+)	0.000	0.000	Vale	0.000
		3-3 c (-)	0.000	0.000	Vale	(cm²/m²)
ZAPATA	Perimetral	---	0.000	12.662	Vale	12.662

(*) Calculada como el 20% de la armadura perpendicular a ella

4.4.5 Pasos inferiores EVN2-1.7 Y EVN3-1.6

PASOS INFERIORES EVN2-1.7 Y EVN3-1.6

INDICE

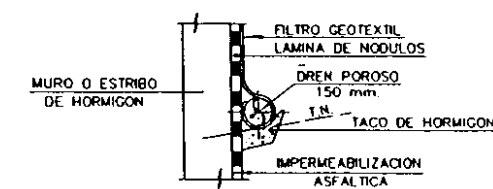
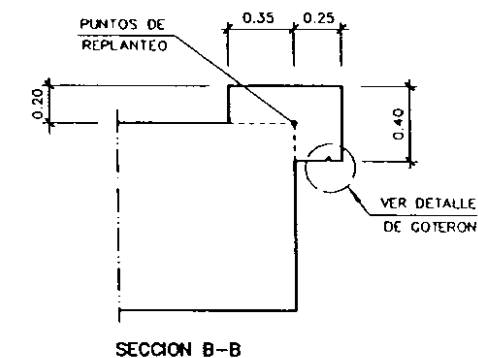
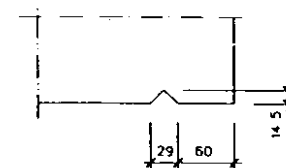
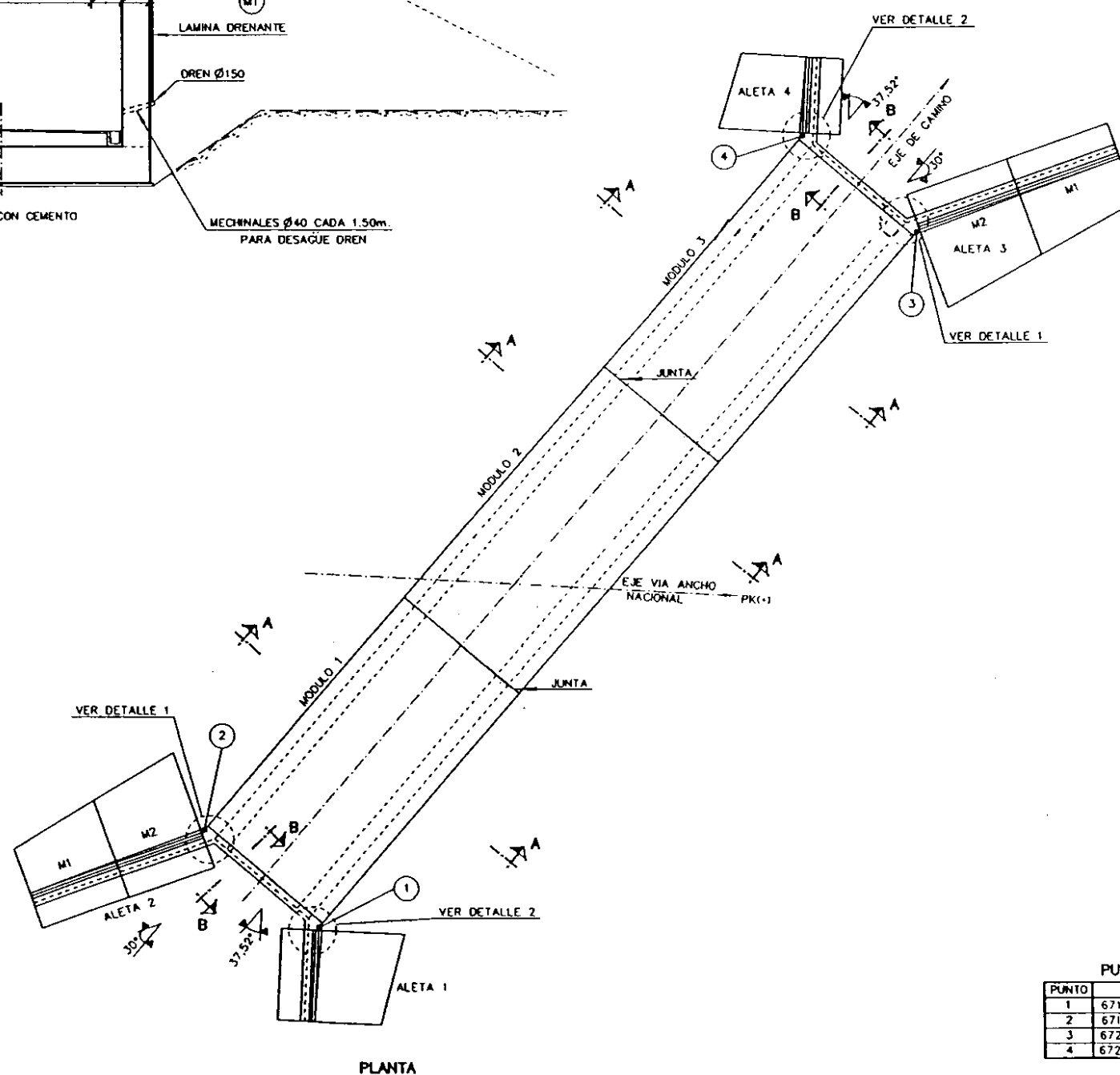
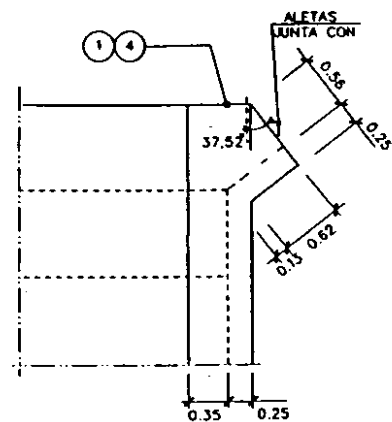
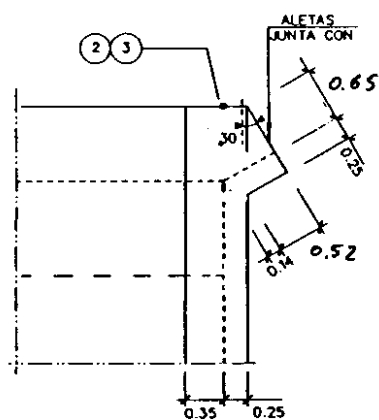
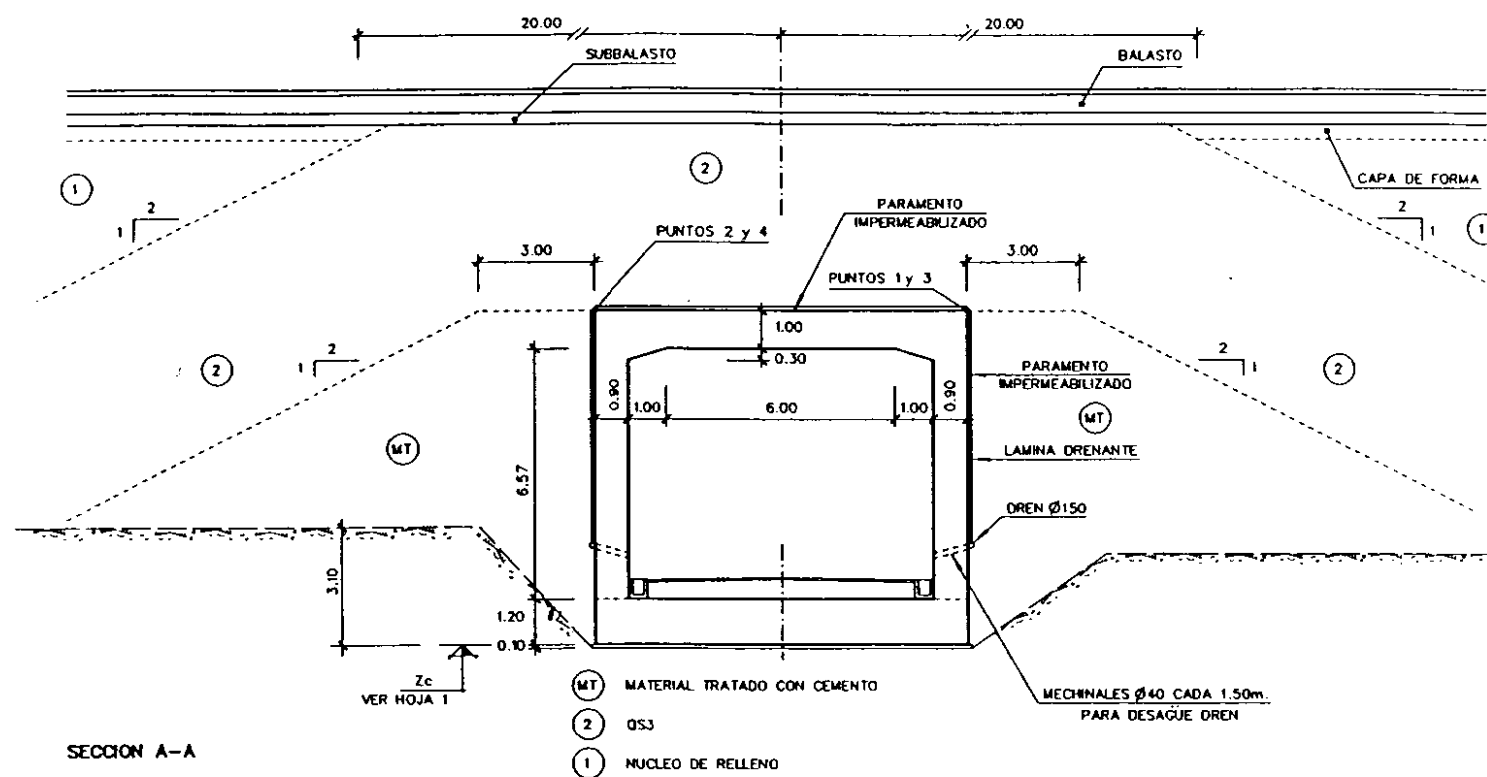
1º DEFINICION GEOMETRICA

2º CALCULOS

PASOS INFERIORES EVN2-1.7 Y EVN3-1.6

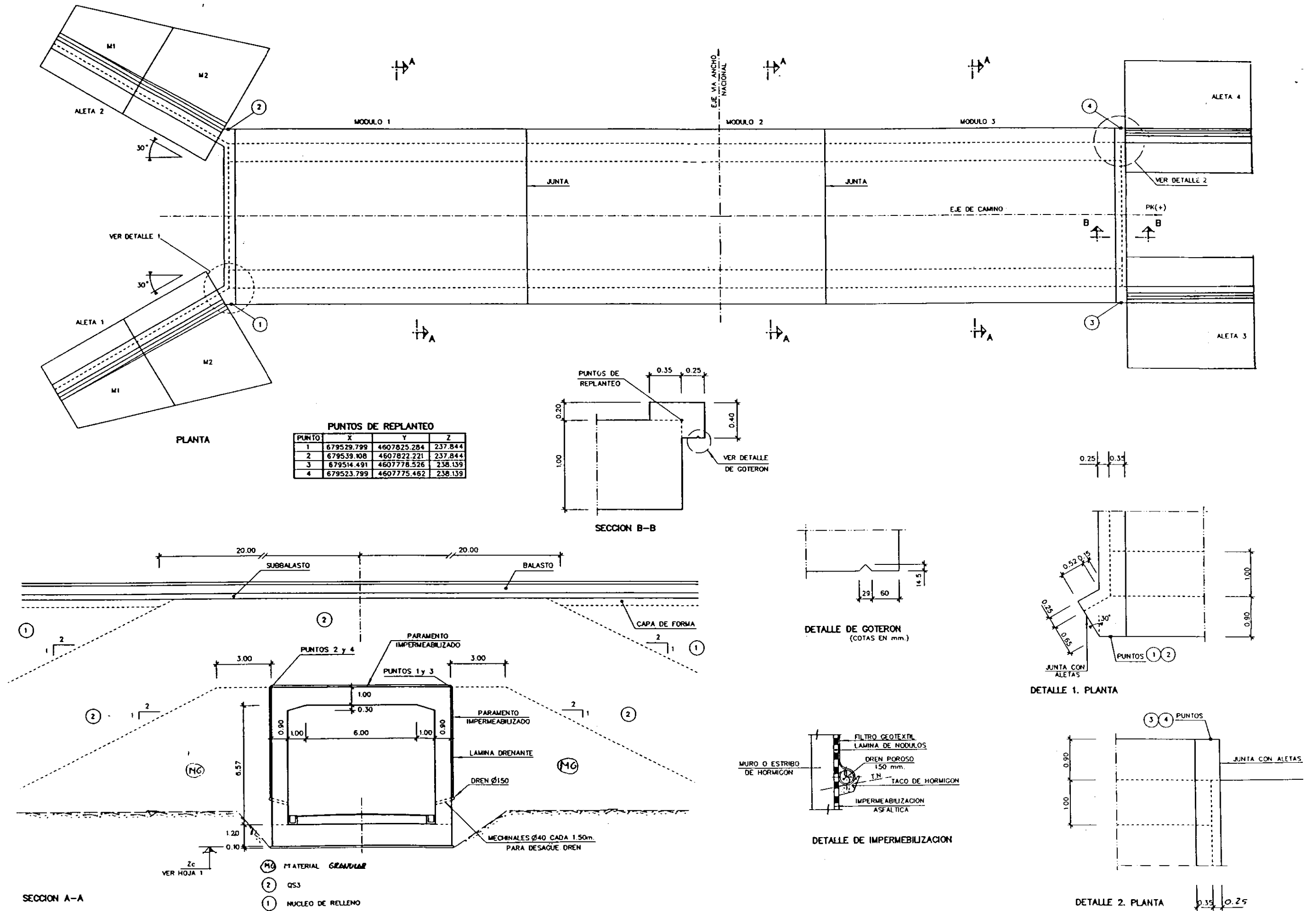
1º DEFINICION GEOMETRICA

DEFINICION GEOMETRICA ESTRUCTURA EVN2-1.7

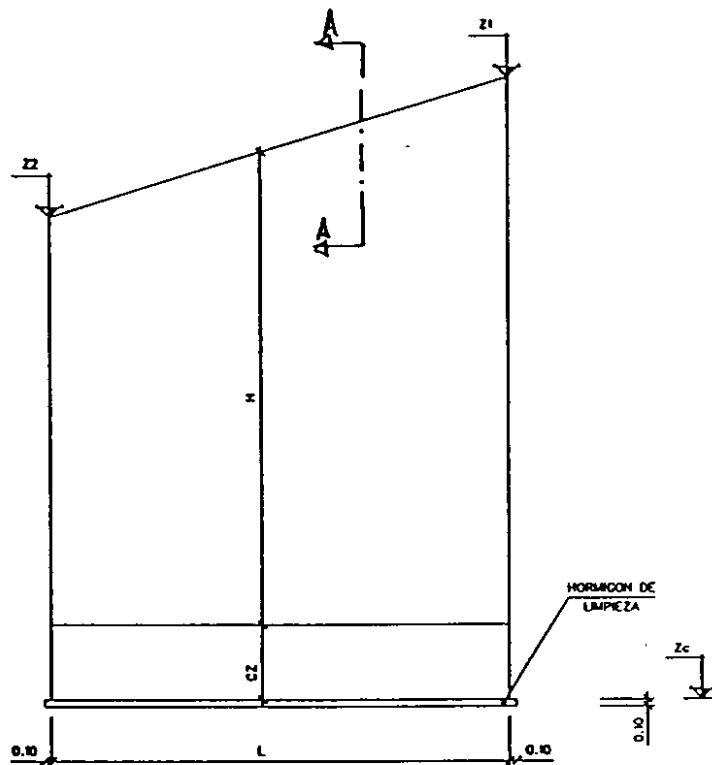


PUNTOS DE REPLANTEO			
PUNTO	X	Y	Z
1	671980.201	4608228.087	285.303
2	671986.581	4608235.527	285.303
3	672026.204	4608188.638	282.770
4	672032.583	4608196.077	282.770

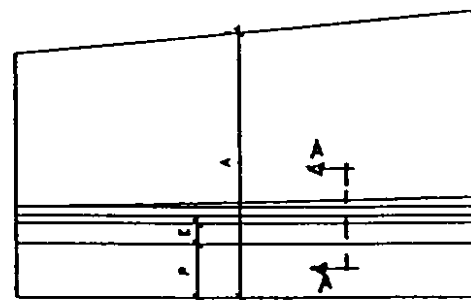
DEFINICION GEOMETRICA ESTRUCTURA EVN3-1.6



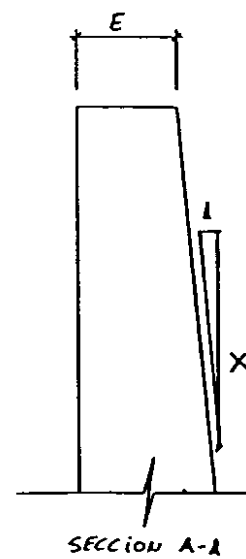
DEFINICION GEOMETRICA ALETAS



ALZADO TIPO DE MURO



PLANTA TIPO DE MURO



EVN2-1.7

DEFINICION GEOMETRICA

	Aleta 1	Aleta 2. M1	Aleta 2. M2	Aleta 3. M1	Aleta 3. M2	Aleta 4
Z1	285.503	284.252	285.503	281.360	282.970	282.970
Z2	279.300	283.000	284.252	279.750	281.360	278.000
ZC	276.633	276.633	276.633	274.100	274.100	274.100
H	De 7.77 a 1.57	De 6.52 a 5.27	De 7.77 a 6.52	De 6.16 a 4.55	De 7.77 a 6.16	De 7.77 a 2.80
CZ	1.10	1.10	1.10	1.10	1.10	1.10
L	6.00	6.00	6.00	7.00	7.00	5.00
A	De 8.00 a 6.75	De 6.75 a 5.50	De 8.00 a 6.75	De 6.75 a 5.50	De 8.00 a 6.75	De 8.00 a 6.75
P	1.75	1.75	1.75	1.75	1.75	1.75
E	0.30	0.30	0.30	0.30	0.30	0.30
X	12.0	12.0	12.0	12.0	12.0	12.0

EVN3-1.6

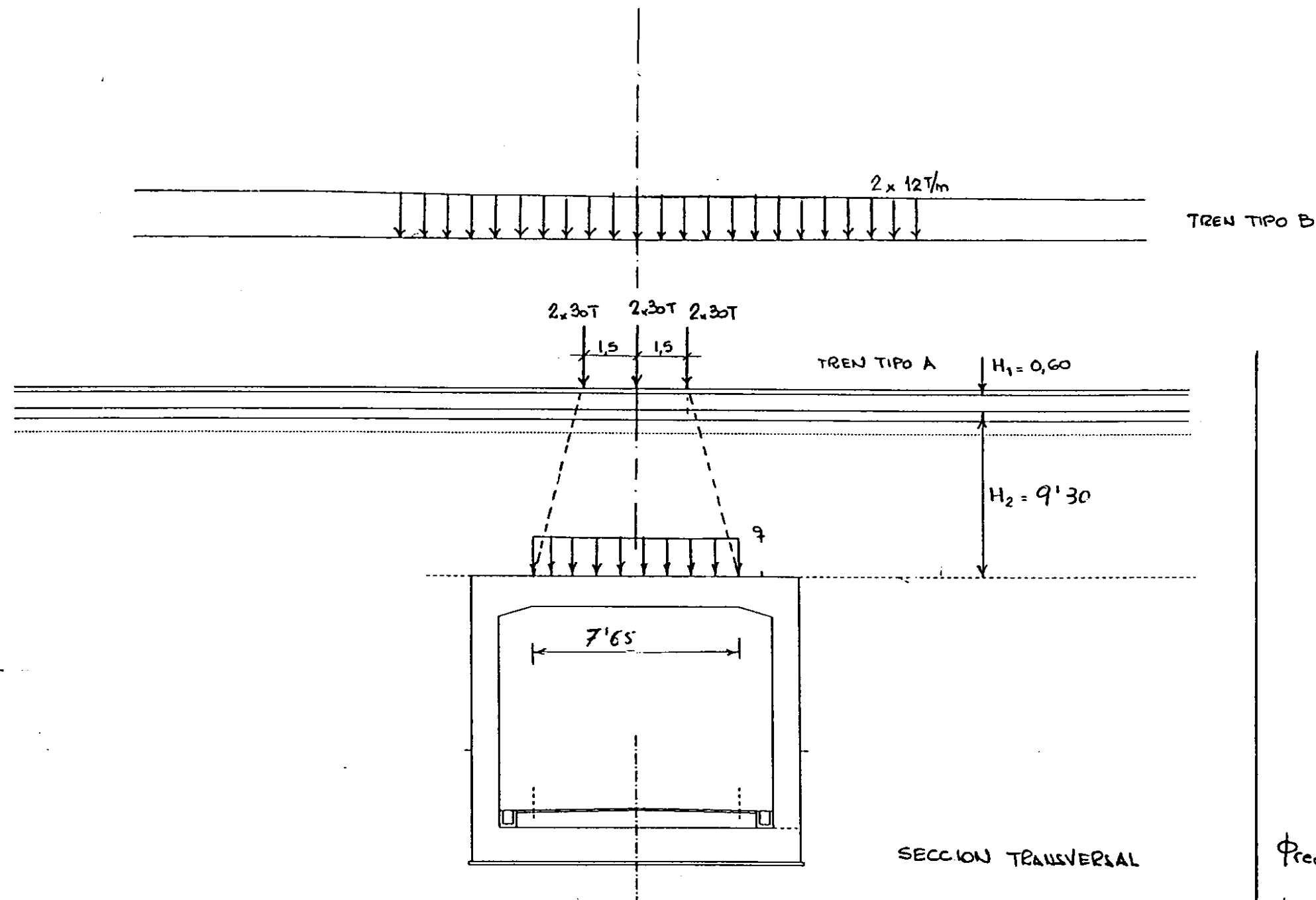
DEFINICION GEOMETRICA

	Aletas 1 y 2. M1	Aletas 1 y 2. M2	Aletas 3 y 4. M1
Z1	235.522	238.044	238.339
Z2	233.000	235.522	234.750
ZC	229.174	229.174	229.569
H	De 5.25 a 2.73	De 7.77 a 5.25	De 7.77 a 4.18
CZ	1.10	1.10	1.00
L	5.25	5.25	7.00
A	De 5.60 a 4.00	De 7.20 a 5.60	De 6.20 a 6.20
P	1.50	1.50	1.30
E	0.30	0.30	0.35
X	12.0	12.0	De 14.1 a 7.6

PASOS INFERIORES EVN2-1.7 Y EVN3-1.6

2º CALCULOS

ENV3-1.6
Cálculo 1



Coef. Impacto

$$V = 200 \text{ km/h}$$

$$T = 0,05 \text{ seg.}$$

$$L = 8,80 \text{ m}$$

$$M = \frac{VT}{2L} = 0,57$$

$$I = 65 \frac{M}{1-M+M^2} = 50$$

$$\phi_0 = 1,50$$

$$\phi_{red} = \phi_0 - \frac{h-1,0}{10,0} \quad \text{Para } h=6 \text{ m:}$$

$$\phi_{red} = 1,50 - \frac{6-1}{10} = 1,00$$

CARGA PERMANENTE

$$g: \text{Riel + Traveses} = \frac{0,12 \text{ T/m} + 0,52 \text{ T/m}}{2,4 \text{ m}} = 0,27 \text{ T/m}^2$$

$$\text{Ballasto} = 0,60 \text{ m} \cdot 1,6 \text{ T/m}^3 = 0,96 \text{ T/m}^2$$

$$\text{Relleno} = 9,30 \text{ m} \cdot 2,0 \text{ T/m}^3 = 18,60 \text{ T/m}^2$$

$$g = 19,83 \text{ T/m}^2 + \text{PESO PROPIO MARCO}$$

SOBRECARGA DE TREN

$$q_A = \frac{2 \times 90 \text{ T}}{10,0 \text{ m} \times 7,65 \text{ m}} = 2,35 \text{ T/m}^2$$

$$q_B = \frac{2 \times 12 \text{ T/m}}{10,0 \text{ m}} = 2,4 \text{ T/m}^2$$

$$S_d = 1,5 g + 1,5 q$$

ESTADO LÍMITE ULTIMO

$$S_k = 1,0 g + 1,0 q$$

ESTADOS LÍMITES DE SERVICIO

$3 \times 30T = 90T$



$12T/m$



$3 \times 30T = 90T$



$12T/m$

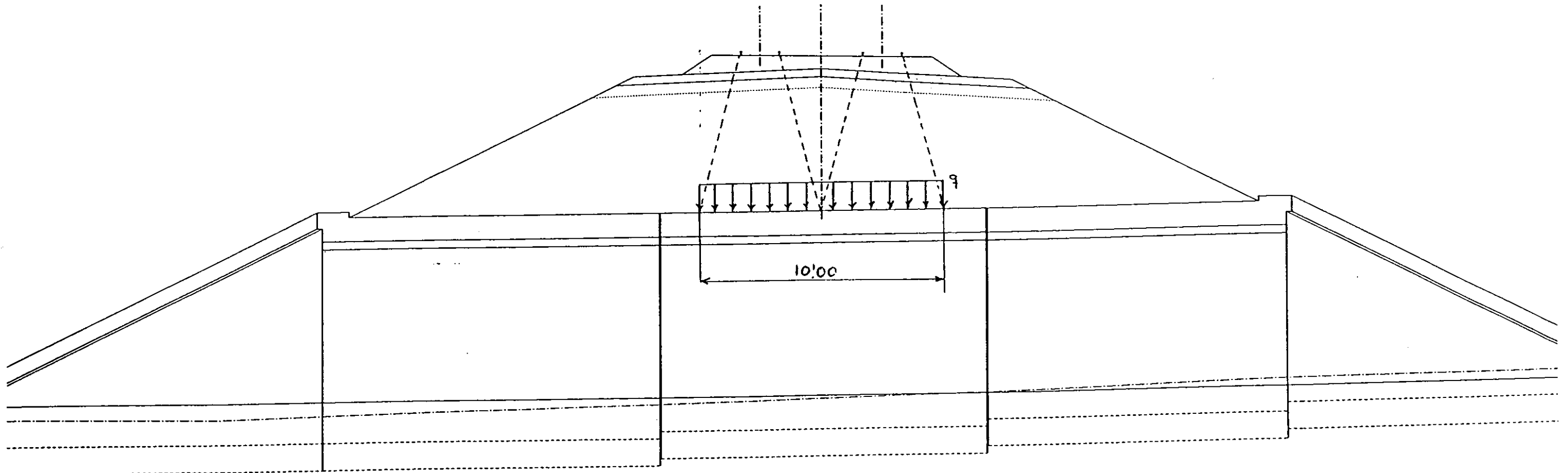


TREN TIPO A

TREN TIPO B

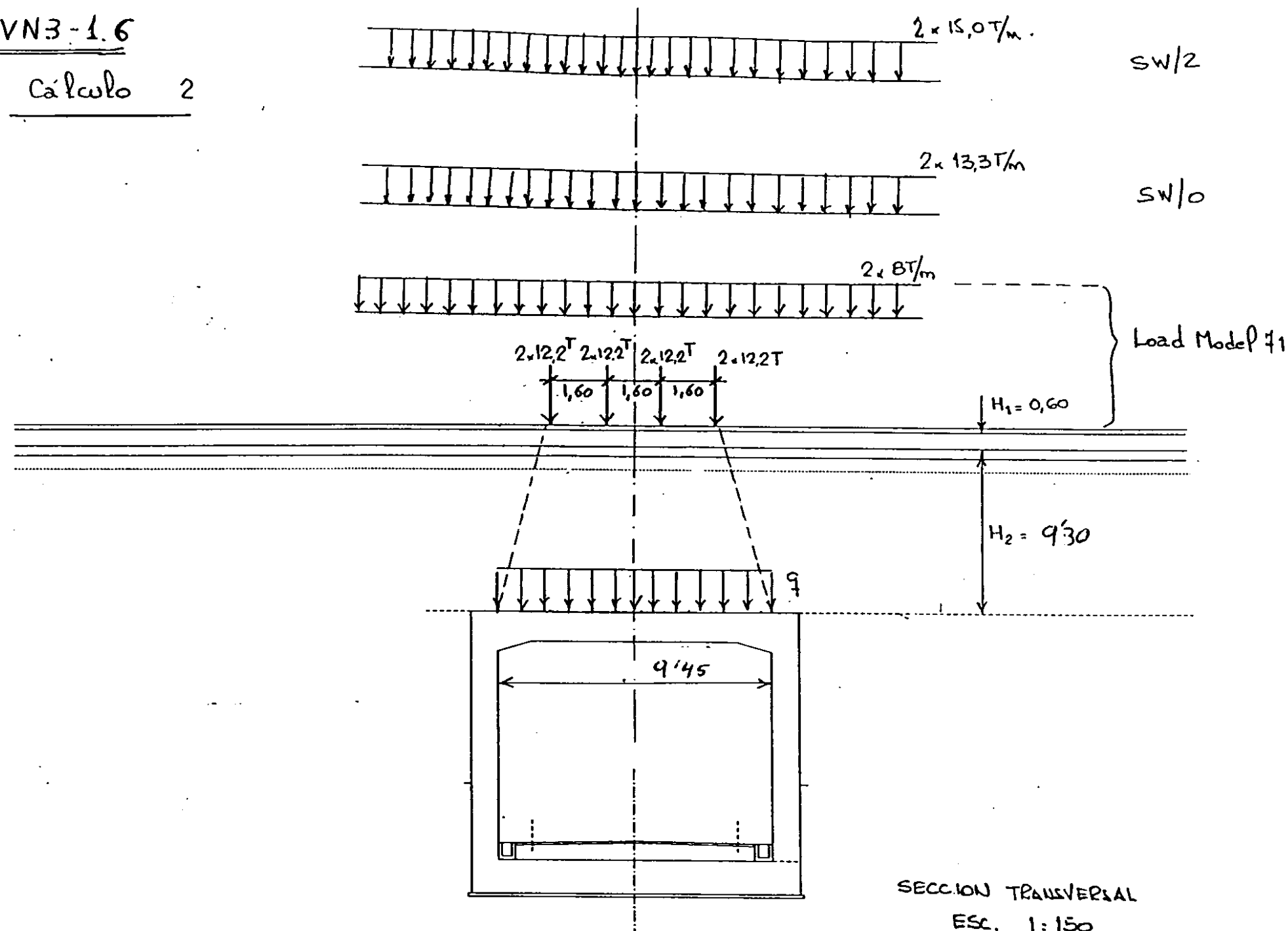
EVN3-1.6

Cálculo 1



EVN3-1.6

Cálculo 2



CARGA PERMANENTE

$$g: \text{Riel + Traveses} = \frac{0,12 \text{ T/m} + 0,52 \text{ T/m}}{2,4 \text{ m}} = 0,27 \text{ T/m}^2$$

$$\text{Balasto} = 0,60 \text{ m} \times 1,6 \text{ T/m}^3 = 0,96 \text{ T/m}^2$$

$$\text{Relleno} = 9,30 \text{ m} \times 2,0 \text{ T/m}^3 = 18,60 \text{ T/m}^2$$

$$g = 19,83 \text{ T/m}^2 + \text{PESO PROPIO MARCO}$$

SOBRECARGA TREN

$$q_{LM71} = \frac{8 \times 12,2 \text{ T}}{9,45 \text{ m} \times 10 \text{ m}} + \frac{2 \times 8 \text{ T/m}}{10 \text{ m}} = 2,6 \text{ T/m}^2$$

$$q_{SW/0} = \frac{2 \times 13,3 \text{ T/m}}{10 \text{ m}} = 2,7 \text{ T/m}^2$$

$$q_{SW/2} = \frac{2 \times 15,0 \text{ T/m}}{10 \text{ m}} = 3,0 \text{ T/m}^2$$

Coef. de Impacto

$$L_m = \frac{1}{3}(7 + 8,8 + 7) = 7,6 \text{ m}$$

$$L_\phi = K L_m = 1,3 \times 7,6 \text{ m} = 9,9 \text{ m}$$

$$\phi_3 = \frac{2,16}{\sqrt{L_\phi} - 0,2} + 0,73 = 1,5$$

$$V = 1,2 \times 350 \text{ km/h} = 420 \text{ km/h} = 117 \text{ m/s}$$

$$L = 8,8 \text{ m}$$

$$T_1 = 0,05 \text{ seg} \quad \beta = \frac{T_1}{T_v} = 0,33$$

$$T_v = \frac{2 \times 8,8}{117} = 0,15 \text{ seg}$$

$$\frac{f_{din}}{f_{est}} = \frac{1 + \beta}{1 - \beta^2} = 1,5$$

$$\therefore \text{Adoptando } \phi_0 = 1,50$$

$$\phi_{red} = \phi_0 - \frac{h - 1}{10} \quad \text{Para } h = 6 \text{ m}$$

$$\phi_{red} = 1,50 - \frac{6 - 1}{10} = 1,00$$

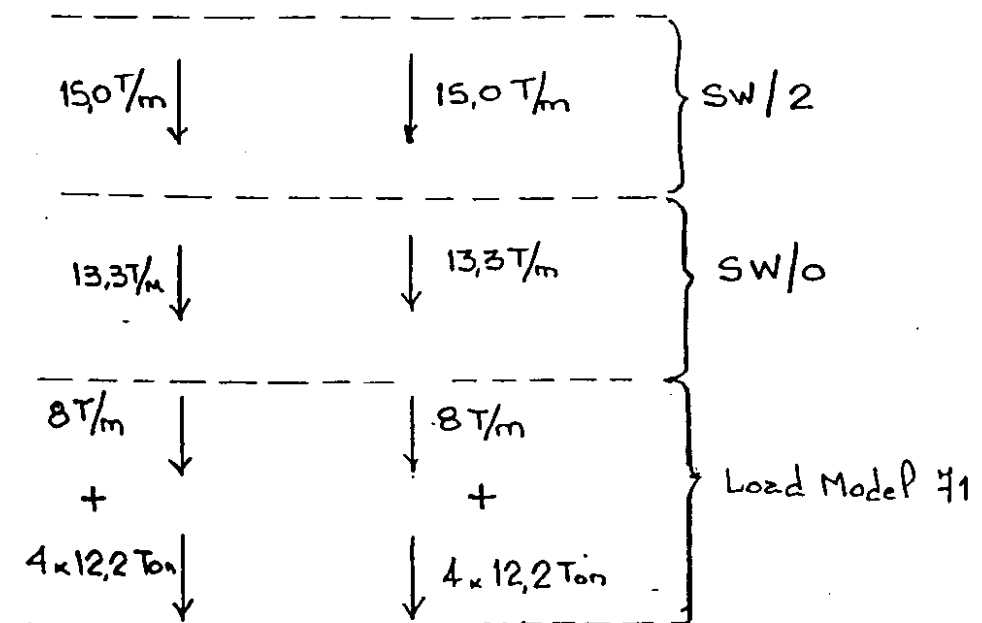
ESTADO LIMITE ULTIMO

$$S_d = 1,35 g + 1,45 q_{LM71}$$

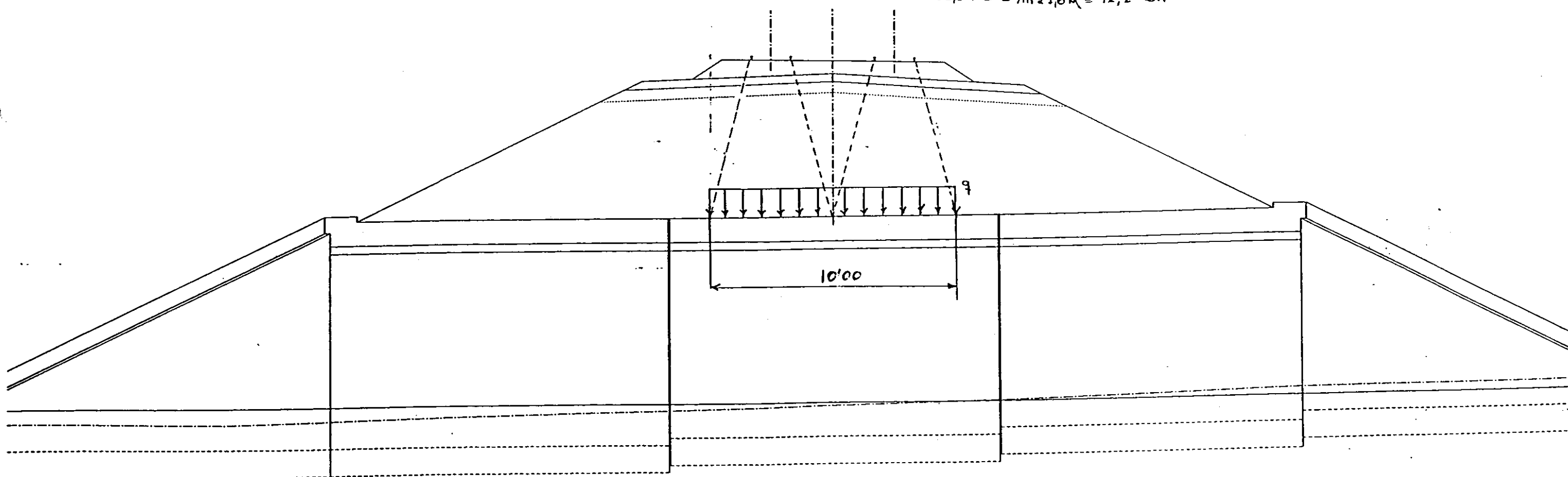
$$S_d = 1,35 g + 1,45 q_{SW/0}$$

$$S_d = 1,35 g + 1,20 q_{SW/2}$$

EVN3-1.6
Cálculo 2



$$25,0 \text{ T} - 8 \text{ T/m} \times 1,6 \text{ m} = 12,2 \text{ Ton}$$



IBM

Ordenador Personal

P R O G R A M A A R C O

CALCULO DE ARCOS, PASOS INFERIORES Y GALERIAS ENTERRADAS

(C) Copyright J.Diaz del Valle, 1988

P R O Y E C T O : L.A.V. MADRID-ZARAGOZA. Subtramo XV.

Referencia : EVN3-1.6

Fecha : 10-23-1998

EVN3-1.6

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

NUMERO DE SEGMENTOS = 40
 SALTO = 1

TIPO DE GEOMETRIA :

TIPO 0 : POLIGONAL ARBITRARIA DADA POR COORDENADAS
 TIPO 1 : ARCO CIRCULAR DEFINIDO POR : f,a
 TIPO 2 : PARABOLA CON $y'(0)=0$, DEFINIDA POR : f,a
 TIPO 3 : PARABOLA CON $y'(0)=0$, DEFINIDA POR : a,c,b
 TIPO 4 : PARABOLA CON $y'(0)<0$ DEFINIDA POR : f,a,c,b
 TIPO 5 : CUBICA CON $y'(0)=0$ DEFINIDA POR : f,a,c,b
 TIPO 6 : PORTICO CIRCULAR DEFINIDO POR : f,a,H,B
 TIPO 7 : CURVA GENERAL DEFINIDA POR PUNTOS DE PASO
 TIPO 8 : GEOMETRIA ANTERIOR ALMACENADA EN FICHERO DE DATOS

2a = CUERDA , f = FLECHA , (c,b) = COORDENADAS DE UN PUNTO

TIPO = 9

CUERDA 2a = 8.900 m
 ALTURA H = 7.070 m

TIPO DE CONDICIONES DE APOYO :

TIPO 0 : TRIARTICULADO (EN APOYOS Y CLAVE)
 TIPO 1 : BIARTICULADO (EN APOYOS)
 TIPO 2 : EMPOTRADO EN EXTREMOS
 TIPO 3 : EMPOTRADO EN EXTREMOS CON ROTULA EN CLAVE
 TIPO 4 : EMPOTRADO ELASTICAMENTE
 TIPO 5 : ATIRANTADO EN EXTREMOS

TIPO = 2

PESO ESPECIFICO DEL HORMIGON = 2.50 t/m³
 RESISTENCIA CARACTERISTICA DEL HORMIGON f_{ck} = 250 Kp/cm²
 COEFICIENTE DE MINORACION DE f_{ck} γ_c = 1.50
 LIMITE ELASTICO CARACTERISTICO DEL ACERO f_{yk} = 5100 Kp/cm²
 COEFICIENTE DE MINORACION DE f_{yk} γ_s = 1.15
 RECUBRIMIENTO DE LAS ARMADURAS c = 5 cm
 SE DISPONEN ARMADURAS MINIMAS DE FLEXOCOMPRESION

ALTURA DE TIERRAS DESDE LA BASE = 17.40 m
 PESO ESPECIFICO DE LAS TIERRAS = 2.00 t/m³
 COEFICIENTE EMPUJE TIERRAS = 0.50

SOBRECARGA q = 2.40 t/m²

CARGAS CONCENTRADAS EN LOS MUJOS : NINGUNA

COEFICIENTE DE MAYORACION DE LAS CARGAS γ_f = 1.50

GALIBO GX = 8.00 m

GALIBO GY = 6.00 m

EXISTE LOSA DE CIMENTACION :

SOBRECARGA DE LA LOSA DE CIMENTACION q = 0.40 t/m²

CANTO DE LA LOSA DE CIMENTACION t = 1.20 m

COEFICIENTE DE BALASTO DEL TERRENO K = 500 t/m³

ESFUERZOS EN EL ARCO

SEC	X (m)	Y (m)	AXIL (t/m)	CORTANTE (t/m)	FLECTOR (txm/m)	ESPESOR (m)
1	4.450	0.000	195.542	-74.606	-149.944	0.900
2	4.450	0.532	194.644	-67.730	-113.890	0.900
3	4.450	1.065	192.848	-54.262	-85.006	0.900
4	4.450	1.597	191.051	-41.219	-63.065	0.900
5	4.450	2.129	189.255	-28.601	-47.841	0.900
6	4.450	2.662	187.458	-16.408	-39.107	0.900
7	4.450	3.194	185.661	-4.639	-36.637	0.900
8	4.450	3.726	183.865	6.704	-40.206	0.900
9	4.450	4.258	182.068	17.622	-49.586	0.900
10	4.450	4.791	180.272	28.115	-64.552	0.900
11	4.450	5.323	178.475	38.183	-84.877	0.900
12	4.450	5.855	176.679	47.826	-110.334	0.900
13	4.450	6.388	174.882	57.044	-140.699	0.900
14	4.450	6.920	83.277	-165.194	-175.744	1.300
15	4.338	6.932	87.257	-161.442	-157.641	1.277
16	4.227	6.943	86.981	-157.006	-140.036	1.254
17	4.115	6.955	86.705	-152.583	-122.926	1.231
18	4.004	6.966	86.431	-148.173	-106.311	1.208
19	3.892	6.978	86.157	-143.777	-90.189	1.185
20	3.781	6.989	85.885	-139.395	-74.558	1.162
21	3.669	7.001	85.615	-135.026	-59.417	1.138
22	3.558	7.012	85.345	-130.671	-44.764	1.115
23	3.446	7.024	85.077	-126.329	-30.598	1.092
24	3.335	7.035	84.809	-122.000	-16.918	1.069
25	3.223	7.047	84.543	-117.686	-3.722	1.046
26	3.112	7.058	84.278	-113.384	8.993	1.023
27	3.000	7.070	72.343	-117.162	21.226	1.000
28	2.786	7.070	72.432	-110.912	44.993	1.000
29	2.571	7.070	72.432	-102.696	66.999	1.000
30	2.357	7.070	72.432	-94.481	87.245	1.000

31	2.143	7.070	72.432	-86.265	105.731	1.000
32	1.929	7.070	72.432	-78.049	122.455	1.000
33	1.714	7.070	72.432	-69.834	137.420	1.000
34	1.500	7.070	72.432	-61.618	150.623	1.000
35	1.286	7.070	72.432	-53.402	162.067	1.000
36	1.071	7.070	72.432	-45.186	171.750	1.000
37	0.857	7.070	72.432	-36.971	179.672	1.000
38	0.643	7.070	72.432	-28.755	185.834	1.000
39	0.429	7.070	72.432	-20.539	190.235	1.000
40	0.214	7.070	72.432	-12.324	192.876	1.000
41	0.000	7.070	72.432	-4.108	193.756	1.000

R = 0.19554E+03 M = -.14994E+03 H = -.74606E+02 V = 0.57011E-02m

LONGITUD DEL SEMIARCO = 11.378 LONGITUD DE TRANSPORTE = 8.354

LOSA DE CIMENTACION SOBRE TERRENO ELASTICO

X (m)	W (mm)	GIRO (1000xrad)	FLECTOR (txm/m)	CORTANTE (t/m)	REACCION (t/m ²)
4.450	101.064	-1.418	149.944	195.542	50.532
4.005	100.405	-1.530	67.415	175.398	50.202
3.560	99.714	-1.560	-6.183	155.404	49.857
3.115	99.027	-1.520	-70.917	135.564	49.513
2.670	98.371	-1.417	-126.856	115.874	49.185
2.225	97.773	-1.262	-174.065	96.323	48.886
1.780	97.254	-1.062	-212.603	76.898	48.627
1.335	96.833	-0.827	-242.520	57.577	48.416
0.890	96.522	-0.566	-263.858	38.338	48.261
0.445	96.331	-0.288	-276.649	19.155	48.166
0.000	96.267	0.000	-280.910	-0.000	48.134

ARMADURAS EN EL ARCO

SEC	X (m)	Y (m)	Ainterior (cm ² /m)	Aexterior (cm ² /m)	Acortante (cm ² /m)
1	4.450	0.000	6.750	25.640	6.143
2	4.450	0.532	6.750	13.853	4.003
3	4.450	1.065	6.750	6.750	0.000
4	4.450	1.597	6.750	6.750	0.000
5	4.450	2.129	6.750	6.750	0.000
6	4.450	2.662	6.750	6.750	0.000
7	4.450	3.194	6.750	6.750	0.000
8	4.450	3.726	6.750	6.750	0.000
9	4.450	4.258	6.750	6.750	0.000
10	4.450	4.791	6.750	6.750	0.000

11	4.450	5.323	6.750	7.124	0.000
12	4.450	5.855	6.750	14.368	0.000
13	4.450	6.388	6.750	25.447	0.677
14	4.450	6.920	9.750	25.977	17.885
15	4.338	6.932	9.577	22.345	17.734
16	4.227	6.943	9.404	19.182	17.426
17	4.115	6.955	9.231	17.094	17.109
18	4.004	6.966	9.058	14.732	16.783
19	3.892	6.978	8.885	11.901	16.447
20	3.781	6.989	8.712	8.712	16.100
21	3.669	7.001	8.538	8.538	15.741
22	3.558	7.012	8.365	8.365	15.371
23	3.446	7.024	8.192	8.192	14.987
24	3.335	7.035	8.019	8.019	14.590
25	3.223	7.047	7.846	7.846	14.177
26	3.112	7.058	7.673	7.673	13.749
27	3.000	7.070	7.500	7.500	13.310
28	2.786	7.070	7.500	7.500	11.522
29	2.571	7.070	10.834	7.500	9.234
30	2.357	7.070	14.620	7.500	6.946
31	2.143	7.070	19.810	7.500	4.658
32	1.929	7.070	24.586	7.500	2.370
33	1.714	7.070	28.926	7.500	0.082
34	1.500	7.070	32.813	7.500	0.000
35	1.286	7.070	36.225	7.500	0.000
36	1.071	7.070	39.146	7.500	0.000
37	0.857	7.070	41.560	7.500	0.000
38	0.643	7.070	43.452	7.500	0.000
39	0.429	7.070	44.812	7.500	0.000
40	0.214	7.070	45.631	7.500	0.000
41	0.000	7.070	45.905	7.500	0.000

ARMADURAS EN LA LOSA

SEC	X (m)	Y (m)	Ainferior (cm ² /m)	Asuperior (cm ² /m)	Acortante (cm ² /m)
1	4.450	-0.600	32.715	9.000	27.907
2	4.005	-0.600	15.868	9.000	23.272
3	3.560	-0.600	9.000	9.000	18.673
4	3.115	-0.600	9.000	16.385	14.109
5	2.670	-0.600	9.000	27.518	9.579
6	2.225	-0.600	9.000	38.219	5.082
7	1.780	-0.600	9.000	47.182	0.613
8	1.335	-0.600	9.000	54.299	0.000
9	0.890	-0.600	9.000	59.467	0.000
10	0.445	-0.600	9.000	62.602	0.000
11	0.000	-0.600	9.000	63.654	0.000

PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA F1

Obra : L.A.V. MADRID ZARAGOZA. Subtramo XV. EVN3-1.6.
Fecha: 23/10/1998
Hora : 18:34

COMPROBACION DEL ESTADO LIMITE DE FISURACION DEBIDO A SOLICITACIONES NORMALES

1. Datos

- Materiales

fck [kp/cm²] = 250
fyk [kp/cm²] = 5100

- Sección

b [cm] = 100.0
h [cm] = 120.0
φ [mm] = 25.0
c [cm] = 3.5
n^o de capas = 2
n^o de diámetros capa 1 = 10
n^o de diámetros capa 2 = 5
Sv [cm] = 5.0

- Solicitación de servicio

Mk [m·Mp] = 187.27

2. Resultados

ABERTURA DE FISURA CARACTERISTICA

wk [mm]	Sm [cm]	εsm ·1.E-3	σ, sr [kp/cm ²]	σ, s [kp/cm ²]
0.25	13.8	1.08	950	2451

ABERTURA DE FISURA MAXIMA ADMITIDA

AMBIENTE I (interior)	0.560 [mm]
AMBIENTE II (exterior no agresivo)	0.280 [mm]
AMBIENTE III (agresivo)	0.140 [mm]

El número de capas consideradas en el cálculo es 2

PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA F1

Obra : L.A.V. MADRID-ZARAGOZA. Subtramo XV.
Fecha: 23/10/1998
Hora : 19:43

COMPROBACION DEL ESTADO LIMITE DE FISURACION DEBIDO A SOLICITACIONES NORMALES

1. Datos

- Materiales

fck [kp/cm²] = 250
fyk [kp/cm²] = 5100

- Sección

b [cm] = 100.0
h [cm] = 100.0
φ [mm] = 25.0
c [cm] = 2.5
n^o de capas = 2
n^o de diámetros capa 1 = 10
n^o de diámetros capa 2 = 5
Sv [cm] = 5.0

- Solicitación de servicio

Mk [m·Mp] = 129.17

2. Resultados

ABERTURA DE FISURA CARACTERISTICA

wk [mm]	Sm [cm]	εsm ·1.E-3	σ, sr [kp/cm ²]	σ, s [kp/cm ²]
0.18	11.7	0.90	815	2046

ABERTURA DE FISURA MAXIMA ADMITIDA

AMBIENTE I (interior)	0.400 [mm]
AMBIENTE II (exterior no agresivo)	0.200 [mm]
AMBIENTE III (agresivo)	0.100 [mm]

El número de capas consideradas en el cálculo es 2

CALCULO DE MUROS.

NOMBRE PROYECTO :	L.A.V. MADRID - ZARAGOZA. Subtramo XV.
NOMBRE OBRA :	Aléas marcos con cobertura. Altura máxima.

DATOS

GEOMETRIA DE CALCULO DEL MURO

C. Canto del muro en coronación (m) :	0.300
ST. Sobreepesor muro en trasdós (m) :	0.625
SI. Sobreepesor muro en intradós (m) :	0.000
P. Puntera zapata (m) :	1.500
T. Talón zapata (m) :	4.575
H. Altura muro (m) :	7.500
H _z . Canto zapata (m) :	1.100
Anchura total cimentación (m) :	7.000
Angulo trasdós muro (°) :	85.236

DEFINICION TERRENO

	X	Y
0. Coordenadas base trasdós (m) :	0.000	0.000
1. Coordenadas coronación trasdós (m) :	-0.625	7.500
2. Coordenadas fin tramo 1 terreno (m) :	4.825	8.863
3. Coordenadas fin tramo 2 terreno (m) :	9.825	8.863
4. Coordenadas fin tramo 3 terreno (m) :	14.825	8.863

COEFICIENTES DE SEGURIDAD

Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
γ _o (coeficiente combinación variables) :	1.00

Estado Límite Ultimo	
Favorable	Desfavorable

Acciones permanentes (G)		
Peso propio, cargas muertas :	0.90	1.50
Acciones permanentes de valor no constante (G*)		
Terreno (peso propio y empujes) :	0.00	1.50
Acciones variables (Q)		
Sobrecargas :	0.00	1.50

CARACTERISTICAS DEL TERRENO

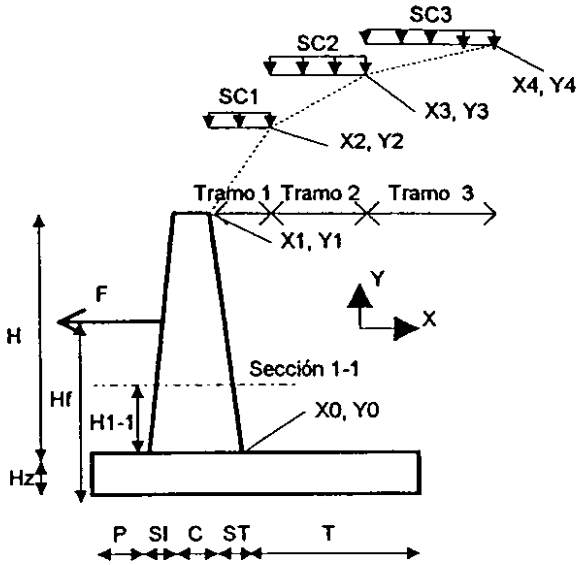
γ. Peso específico (T/m³) :	2.00
φ. Angulo rozamiento interno (°) :	30.000
δ _{mt} . Angulo rozamiento muro-terras (°) :	0.000
φ _{tt} . Angulo rozamiento tierras-terras (°) :	0.000
μ. Coeficiente rozamiento zapata-terras :	0.580
Tensión admisible cimentación (T/m²) :	20.000

ARMADO

H1-1. Dist. sección 1 a sup. zapata (m) :	1.500
Recubrimiento alzado (m) :	0.050
Recubrimiento cimentación (m) :	0.050

Cuantías mínimas

Vertical muros (1/3 mín cara)(o/o) :	0.900
Horizontal muros (1/3 mín. cara)(o/o) :	1.600
Cortante o montaje alzado (cm²/m²) :	4.500
Transversal zapata (sup+inf)(o/o) :	1.447
Longitudinal zapata (sup+inf)(o/o) :	1.447
Cortante zapata (cm²/m²) :	0.000
Perimetral zapata (en canto)(cm²/m) :	7.959

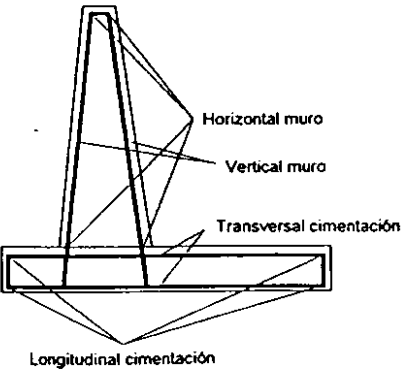


CARGAS (sin mayorar)

Acciones permanentes (G)	
Peso propio barrera coronación (T/m) :	0.000
Acciones permanentes de valor no constante (G*)	
Fg. Carga horizontal sobre muro (T/m) :	0.000
Hf _g . Posición Fg a inferior zapata (m) :	0.000
Acciones variables (Q)	
SC1. Sobrecarga en tramo 1 (T/m) :	0.000
SC2. Sobrecarga en tramo 2 (T/m) :	3.000
SC3. Sobrecarga en tramo 3 (T/m) :	3.000
Fq. Carga horizontal sobre muro (T/m) :	0.000
Hf _q . Posición Fq a inferior zapata (m) :	0.000

CARACTERISTICAS MATERIALES

Peso específico hormigón (T/m³) :	2.500
Hormigón alzado (T/m²) :	H - 250
Hormigón cimentación (T/m²) :	H - 250
Acero (T/m) :	AEH - 500



RESUMEN ACCIONES SOBRE EL MURO

		F.vertical (T / m)	X (m)	F. Horizontal (T / m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 (ΣP _i i, i=1..3)	8.250	1.794	---	---
	Sobre sección base muro (ΣP _i i, i=1..3)	11.484	1.833	---	---
	Total peso propio (ΣP _i i, i=1..6)	30.734	2.877	---	---
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E1'i)	1.296	2.133	15.550	4.600
	Sobre sección base muro (E1i)	2.025	2.217	24.297	3.600
	Total tierras (E2t + ΣT)	80.073	4.613	32.942	3.300
	Verticales sobre talón (ΣT' ij)	75.287	4.765	---	---
	Verticales sobre talón (cortante) (ΣT'' ij)	58.934	5.268	---	---
Fuerza Fg	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fg	---	---	0.000	0.000
Acciones variables (Q)					
Sobrecargas sobre terreno	Sección 1 (E1'sc)	0.115	2.050	1.380	5.600
	Base muro (E1sc)	0.144	2.113	1.726	4.850
	Inf. cimentación (E2sc + ΣS)	0.000	0.000	9.450	4.950
	Verticales sobre talón (ΣS' i, i=1..3)	0.000	0.000	---	---
	Verticales sobre talón (cortante) (ΣS'' i)	0.000	0.000	---	---
Fuerza Fq	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fq	---	---	0.000	0.000

COMPROBACIONES

SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	17.826	---
Acciones permanentes de valor no constante (G*)		
Tierras	46.442	32.942
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	9.450
Fuerza Fq	---	0.000
TOTAL	64.268	42.393

Csd=	1.516	Vale
------	-------	------

SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	88.424	---
Acciones permanentes de valor no constante (G*)		
Tierras	369.389	108.710
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	46.779
Fuerza Fq	---	0.000
TOTAL	457.812	155.489

Csv=	2.944	Vale
------	-------	------

TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	30.734	19.146
Acciones permanentes de valor no constante (G*)		
Tierras	80.073	19.575
Fuerza Fg	0.000	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	46.779
Fuerza Fq	0.000	0.000
TOTAL	110.807	85.500

D (m) =	7.00
σ puntera (T / m²) =	26.30
σ talón (T / m²) =	5.36
σ med (T / m²) =	15.83
σ cob (T / m²) =	20
Vale	

ARMADO

Secciones

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	0.93	1.00	0.93
	1-1	1.00	0.80	1.00	0.80
PUNTERA	2-2 f	1.00	1.10	1.00	1.10
	2-2 c	1.00	1.10	1.00	1.10
TALON	3-3 f	1.00	1.10	1.00	1.10
	3-3 c	1.00	1.10	1.00	1.10

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	13.589	101.357	39.034
	0-0 (-)	10.336	1.340	0.000
	1-1 (+)	9.541	53.171	25.396
	1-1 (-)	7.425	0.787	0.000
PUNTERA	2-2 f (+)	0.000	44.140	---
	2-2 f (-)	0.000	4.374	---
	2-2 c (+)	---	---	32.308
	2-2 c (-)	---	---	3.210
TALON	3-3 f (+)	0.000	5.810	---
	3-3 f (-)	-33.348	-160.487	---
	3-3 c (+)	---	---	2.521
	3-3 c (-)	---	---	-47.731

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm2/m	Minima cm2/m	Control cálculo	Adoptada cm2/m
ALZADO	Vert. trasdós	0-0 (+)	26.013	5.550	Vale	26.013
		0-0 (-)	0.000	2.775	Vale	
		1-1 (+)	15.488	4.800	Vale	15.488
		1-1 (-)	0.000	2.400	Vale	
	Vert. intrados	0-0 (+)	0.000	2.775	Vale	2.775
		0-0 (-)	0.000	2.775	Vale	
		1-1 (+)	0.000	2.400	Vale	
		1-1 (-)	0.000	2.400	Vale	
	Hor. trasdós (*)	---	5.203	9.867	Vale	9.867
	Hor. intrados (*)	---	0.000	4.933	Vale	4.933
	Cortante	0-0 (+)	0.000	4.500	Vale	4.500 (cm²/m²)
		0-0 (-)	0.000	4.500	Vale	
		1-1 (+)	0.000	4.500	Vale	
		1-1 (-)	0.000	4.500	Vale	
PUNTERA	Trans. inferior	2-2 f (+)	9.617	7.959	Vale	9.617
		2-2 f (-)	0.941	7.959	Vale	
	Long. inf. (*)	---	1.923	7.959	Vale	7.959
		---	---	---	---	---
	Trans. superior	2-2 f (+)	0.000	7.959	Vale	43.965
		2-2 f (-)	0.000	7.959	Vale	
	Long. sup. (*)	---	0.000	7.959	Vale	8.793
		---	---	---	---	---
TALON	Cortante	2-2 c (+)	0.000	0.000	Vale	0.000 (cm²/m²)
		2-2 c (-)	0.000	0.000	Vale	
	Trans. inferior	3-3 f (+)	1.250	7.959	Vale	9.617
		3-3 f (-)	0.000	7.959	Vale	
	Long. inf. (*)	---	0.250	7.959	Vale	7.959
		---	---	---	---	---
	Trans. superior	3-3 f (+)	0.000	7.959	Vale	43.965
		3-3 f (-)	43.965	7.959	Vale	
ZAPATA	Long. sup. (*)	---	8.793	7.959	Vale	8.793
		---	---	---	---	---
	Cortante	3-3 c (+)	0.000	0.000	Vale	0.000 (cm²/m²)
		3-3 c (-)	0.000	0.000	Vale	
ZAPATA	Perimetral	---	0.000	7.959	Vale	7.959
		---	---	---	---	---

(*) Calculada como el 20% de la armadura perpendicular a ella

CALCULO DE MUROS.

NOMBRE PROYECTO : L.A.V. MADRID - ZARAGOZA. Subtramo XV.
 NOMBRE OBRA : Aletas marcos con cobertura. Altura media.

DATOS

GEOMETRIA DE CALCULO DEL MURO

C. Canto del muro en coronación (m) :	0.300
ST. Sobreepesor muro en trasdós (m) :	0.500
SI. Sobreepesor muro en intradós (m) :	0.000
P. Puntera zapata (m) :	1.500
T. Talón zapata (m) :	3.300
H. Altura muro (m) :	6.000
Ht. Canto zapata (m) :	1.100
Anchura total cimentación (m) :	5.600
Angulo trasdós muro (°) :	85.236

DEFINICION TERRENO

	X	Y
0. Coordenadas base trasdós (m) :	0.000	0.000
1. Coordenadas coronación trasdós (m) :	-0.500	6.000
2. Coordenadas fin tramo 1 terreno (m) :	3.550	7.013
3. Coordenadas fin tramo 2 terreno (m) :	7.550	8.013
4. Coordenadas fin tramo 3 terreno (m) :	11.550	9.013

COEFICIENTES DE SEGURIDAD

Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
γo (coeficiente combinación variables) :	1.00

Estado Límite Último	
Favorable	Desfavorable

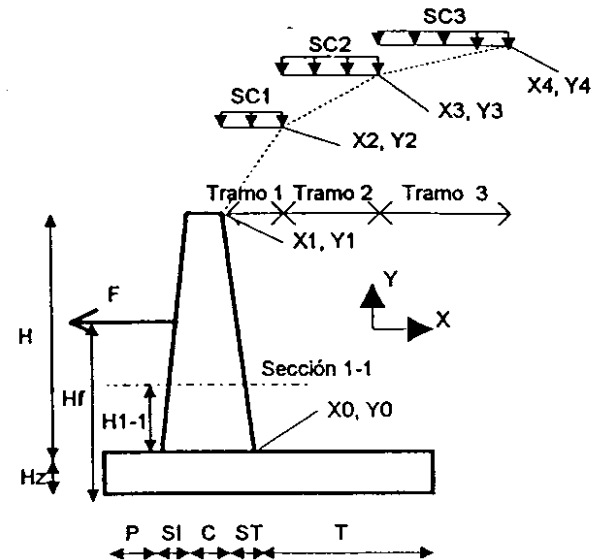
Acciones permanentes (G)		
Peso propio, cargas muertas :	0.90	1.50
Acciones permanentes de valor no constante (G*)		
Tierras (peso propio y empujes) :	0.00	1.50
Acciones variables (Q)		
Sobrecargas :	0.00	1.50

CARACTERISTICAS DEL TERRENO

γ. Peso específico (T/m³) :	2.00
φ. Angulo rozamiento interno (°) :	30.000
δmt. Angulo rozamiento muro-tierras (°) :	0.000
φlt. Angulo rozamiento tierras-tierras (°) :	0.000
μ. Coeficiente rozamiento zapata-tierras :	0.580
Tensión admisible cimentación (T/m²) :	20.000

ARMADO

H1-1. Dist. sección 1 a sup. zapata (m) :	0.000
Recubrimiento alzado (m) :	0.050
Recubrimiento cimentación (m) :	0.050
Cuantías mínimas	
Vertical muros (1/3 min. cara)(o/o) :	0.900
Horizontal muros (1/3 min. cara)(o/o) :	1.600
Cortante o montaje alzado (cm²/m³) :	4.500
Transversal zapata (sup+inf)(o/o) :	1.447
Longitudinal zapata (sup+inf)(o/o) :	1.447
Cortante zapata (cm²/m³) :	0.000
Perimetral zapata (en canto)(cm²/m) :	7.959

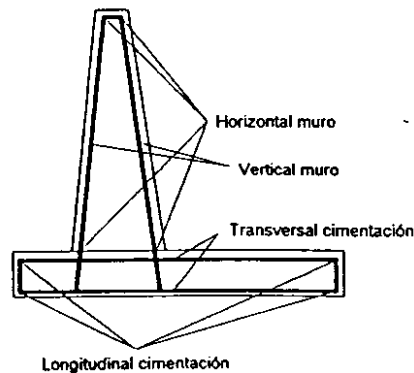


CARGAS (sin mayorar)

Acciones permanentes (G)	
Peso propio barrera coronación (T/m) :	0.000
Acciones permanentes de valor no constante (G*)	
Fg. Carga horizontal sobre muro (T/m) :	0.000
Hfg. Posición Fg a inferior zapata (m) :	0.000
Acciones variables (Q)	
SC1. Sobrecarga en tramo 1 (T/m) :	0.000
SC2. Sobrecarga en tramo 2 (T/m) :	0.000
SC3. Sobrecarga en tramo 3 (T/m) :	0.000
Fq. Carga horizontal sobre muro (T/m) :	0.000
Hfq. Posición Fq a inferior zapata (m) :	0.000

CARACTERISTICAS MATERIALES

Peso específico hormigón (T/m³) :	2.500
Hormigón alzado (T/m³) :	H - 250
Hormigón cimentación (T/m³) :	H - 250
Acero (T/°) :	AEH - 500



RESUMEN ACCIONES SOBRE EL MURO

		F. vertical (T / m)	X (m)	F. Horizontal (T / m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 (ΣP i, i=1..3)	8.250	1.794	---	---
	Sobre sección base muro (ΣP i, i=1..3)	8.250	1.794	---	---
	Total peso propio (ΣP i, i=1..6)	23.650	2.449	---	---
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E1t)	1.309	2.133	15.706	3.100
	Sobre sección base muro (E1t)	1.309	2.133	15.706	3.100
	Total tierras (E2t + ΣT)	46.210	3.862	25.600	2.683
	Verticales sobre talón (ΣT* ij)	43.148	3.985	---	---
	Verticales sobre talón (cortante) (ΣT* ij)	30.009	4.491	---	---
Fuerza Fg	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fg	---	---	0.000	0.000
Acciones variables (Q)					
Sobrecargas sobre terreno	Sección 1 (E1sc)	0.000	2.050	0.000	4.100
	Base muro (E1sc)	0.000	2.050	0.000	4.100
	Inf. cimentación (E2sc + ΣS)	0.000	0.000	0.000	4.025
	Verticales sobre talón (ΣS* i, i=1..3)	0.000	0.000	---	---
	Verticales sobre talón (cortante) (ΣS* i)	0.000	0.000	---	---
Fuerza Fq	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fq	---	---	0.000	0.000

COMPROBACIONES**SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)**

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	13.717	---
Acciones permanentes de valor no constante (G*)		
Tierras	26.802	25.600
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	---	0.000
TOTAL	40.519	25.600

Csd= 1.583 Vale

SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	57.920	---
Acciones permanentes de valor no constante (G*)		
Tierras	178.463	68.694
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	---	0.000
TOTAL	236.383	68.694

Csv= 3.441 Vale

TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	23.650	8.300
Acciones permanentes de valor no constante (G*)		
Tierras	46.210	19.619
Fuerza Fg	0.000	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	0.000	0.000
TOTAL	69.860	27.919

D (m) = 5.60
 σ puntera (T / m²) = 17.82
 σ talón (T / m²) = 7.13
 σ med (T / m²) = 12.48
 σ cob (T / m²) = 14.55
Vale

ARMADO**Secciones**

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	0.80	1.00	0.80
	1-1	1.00	0.80	1.00	0.80
PUNTERA	2-2 f	1.00	1.10	1.00	1.10
	2-2 c	1.00	1.10	1.00	1.10
TALON	3-3 f	1.00	1.10	1.00	1.10
	3-3 c	1.00	1.10	1.00	1.10

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	9.388	47.447	23.559
	0-0 (-)	7.425	0.787	0.000
	1-1 (+)	9.388	47.447	23.559
	1-1 (-)	7.425	0.787	0.000
PUNTERA	2-2 f (+)	0.000	27.628	---
	2-2 f (-)	0.000	3.254	---
	2-2 c (+)	---	---	20.675
	2-2 c (-)	---	---	2.444
TALON	3-3 f (+)	0.000	4.665	---
	3-3 f (-)	-19.468	-61.138	---
	3-3 c (+)	---	---	1.766
	3-3 c (-)	---	---	-23.683

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm2/m	Minima cm2/m	Control cálculo	Adoptada cm2/m
ALZADO	Vert. trasdós	0-0 (+)	13.655	4.800	Vale	13.655
		0-0 (-)	0.000	2.400	Vale	
		1-1 (+)	13.655	4.800	Vale	13.655
		1-1 (-)	0.000	2.400	Vale	
	Vert. intrados	0-0 (+)	0.000	2.400	Vale	2.400
		0-0 (-)	0.000	2.400	Vale	
		1-1 (+)	0.000	2.400	Vale	
		1-1 (-)	0.000	2.400	Vale	
	Hor. trasdós (*)	---	2.731	8.533	Vale	8.533
		---	0.000	4.267	Vale	4.267
	Cortante	0-0 (+)	0.000	4.500	Vale	4.500
		0-0 (-)	0.000	4.500	Vale	(cm²/m²)
		1-1 (+)	0.000	4.500	Vale	
		1-1 (-)	0.000	4.500	Vale	
PUNTERA	Trans. inferior	2-2 f (+)	5.987	7.959	Vale	7.959
		2-2 f (-)	0.699	7.959	Vale	
	Long. inf. (*)	---	1.197	7.959	Vale	7.959
		---	---	---	---	---
	Trans. superior	2-2 f (+)	0.000	7.959	Vale	17.787
		2-2 f (-)	0.000	7.959	Vale	
	Long. sup. (*)	---	0.000	7.959	Vale	7.959
		---	---	---	---	---
TALON	Cortante	2-2 c (+)	0.000	0.000	Vale	0.000
		2-2 c (-)	0.000	0.000	Vale	(cm²/m²)
	Trans. inferior	3-3 f (+)	1.003	7.959	Vale	7.959
		3-3 f (-)	0.000	7.959	Vale	
	Long. inf. (*)	---	0.201	7.959	Vale	7.959
		---	---	---	---	---
	Trans. superior	3-3 f (+)	0.000	7.959	Vale	17.787
		3-3 f (-)	17.787	7.959	Vale	
ZAPATA	Long. sup. (*)	---	3.557	7.959	Vale	7.959
		---	---	---	---	---
	Cortante	3-3 c (+)	0.000	0.000	Vale	0.000
		3-3 c (-)	0.000	0.000	Vale	(cm²/m²)

(*) Calculada como el 20% de la armadura perpendicular a ella

CALCULO DE MUROS.

NOMBRE PROYECTO :
NOMBRE OBRA :

L.A.V. MADRID - ZARAGOZA. Subtramo XV.
Aletas marcos con cobertura. Altura mínima.

DATOS

GEOMETRIA DE CALCULO DEL MURO

C. Canto del muro en coronación (m) :	0.300
ST. Sobreespesor muro en trasdós (m) :	0.333
SI. Sobreespesor muro en intradós (m) :	0.000
P. Puntera zapata (m) :	1.500
T. Talón zapata (m) :	1.867
H. Altura muro (m) :	4.000
H _z . Canto zapata (m) :	1.100
Anchura total cimentación (m) :	4.000
Angulo trasdós muro (°) :	85.236

DEFINICION TERRENO

	X	Y
0. Coordenadas base trasdós (m) :	0.000	0.000
1. Coordenadas coronación trasdós (m) :	-0.333	4.000
2. Coordenadas fin tramo 1 terreno (m) :	3.667	5.000
3. Coordenadas fin tramo 2 terreno (m) :	6.333	5.667
4. Coordenadas fin tramo 3 terreno (m) :	9.000	6.333

COEFICIENTES DE SEGURIDAD

Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
γ _o (coeficiente combinación variables) :	1.00

Estado Límite Último	
Favorable	Desfavorable

Acciones permanentes (G)		
Peso propio, cargas muertas :	0.90	1.50
Acciones permanentes de valor no constante (G*)		
Terreno (peso propio y empujes) :	0.00	1.50
Acciones variables (Q)		
Sobrecargas :	0.00	1.50

CARACTERISTICAS DEL TERRENO

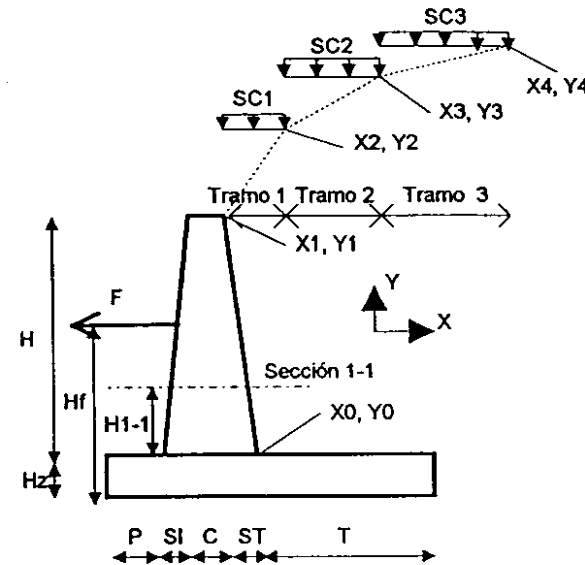
γ. Peso específico (T/m³) :	2.00
φ. Angulo rozamiento interno (°) :	30.000
δ _{mt} . Angulo rozamiento muro-tierras (°) :	0.000
δ _{tt} . Angulo rozamiento tierras-tierras (°) :	0.000
μ. Coeficiente rozamiento zapata-tierras :	0.580
Tensión admisible cimentación (T/m²) :	20.000

ARMADO

H1-1. Dist. sección 1 a sup. zapata (m) :	0.000
Recubrimiento alzado (m) :	0.050
Recubrimiento cimentación (m) :	0.050

Cuantías mínimas

Vertical muros (1/3 mín. cara)(o/o) :	0.900
Horizontal muros (1/3 mín. cara)(o/o) :	1.600
Cortante o montaje alzado (cm²/m²) :	4.500
Transversal zapata (sup+inf)(o/o) :	1.447
Longitudinal zapata (sup+inf)(o/o) :	1.447
Cortante zapata (cm²/m²) :	0.000
Perimetral zapata (en canto)(cm²/m) :	7.959

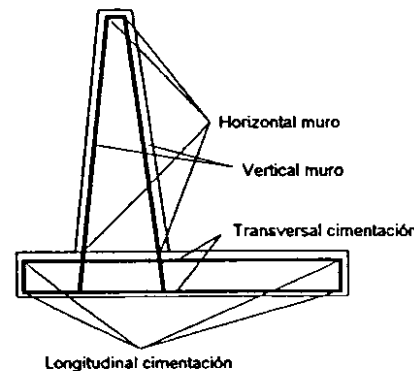


CARGAS (sin mayorar)

Acciones permanentes (G)	
Peso propio barrera coronación (T/m) :	0.000
Acciones permanentes de valor no constante (G*)	
Fg. Carga horizontal sobre muro (T/m) :	0.000
Hfg. Posición Fg a inferior zapata (m) :	0.000
Acciones variables (Q)	
SC1. Sobrecarga en tramo 1 (T/m) :	0.000
SC2. Sobrecarga en tramo 2 (T/m) :	0.000
SC3. Sobrecarga en tramo 3 (T/m) :	0.000
Fq. Carga horizontal sobre muro (T/m) :	0.000
Hfq. Posición Fq a inferior zapata (m) :	0.000

CARACTERISTICAS MATERIALES

Peso específico hormigón (T/m³) :	2.500
Hormigón alzado (T/m³) :	H-250
Hormigón cimentación (T/m³) :	H-250
Acero (T/°) :	AEH-500



RESUMEN ACCIONES SOBRE EL MURO

		F.vertical (T / m)	X (m)	F. Horizontal (T / m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 (ΣP _i , i=1..3)	4.667	1.743	---	---
	Sobre sección base muro (ΣP _i , i=1..3)	4.667	1.743	---	---
	Total peso propio (ΣP _i , i=1..6)	15.667	1.924	---	---
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E1 ₁)	0.578	2.022	6.931	2.433
	Sobre sección base muro (E1 ₁)	0.578	2.022	6.931	2.433
	Total tierras (E2 ₁ + ΣT)	17.477	3.001	12.622	1.883
	Verticales sobre talón (ΣT _i , i)	16.116	3.083	---	---
	Verticales sobre talón (cortante) (ΣT _i , i)	11.759	3.338	---	---
Fuerza Fg	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fg	---	---	0.000	0.000
Acciones variables (Q)					
Sobrecargas sobre terreno	Sección 1 (E1 ₁ sc)	0.000	1.967	0.000	3.100
	Base muro (E1 ₁ sc)	0.000	1.967	0.000	3.100
	Inf. cimentación (E2 ₁ sc + ΣS)	0.000	0.000	0.000	2.825
	Verticales sobre talón (ΣS _i , i=1..3)	0.000	0.000	---	---
	Verticales sobre talón (cortante) (ΣS _i , i)	0.000	0.000	---	---
Fuerza Fq	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fq	---	---	0.000	0.000

COMPROBACIONES**SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)**

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	9.087	---
Acciones permanentes de valor no constante (G*)		
Tierras	10.136	12.622
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	---	0.000
TOTAL	19.223	12.622

Csd=	1.523	Vale
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SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	30.135	---
Acciones permanentes de valor no constante (G*)		
Tierras	52.445	23.771
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	---	0.000
TOTAL	82.580	23.771

Csv=	3.474	Vale
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TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	15.667	1.198
Acciones permanentes de valor no constante (G*)		
Tierras	17.477	6.280
Fuerza Fg	0.000	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	0.000	0.000
TOTAL	33.143	7.478

D (m) =	4.00
σ puntera (T / m ²) =	11.09
σ talón (T / m ²) =	5.48
σ med (T / m ²) =	8.29
σ cob (T / m ²) =	9.34
Vale	

ARMADO**Secciones**

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	0.63	1.00	0.63
	1-1	1.00	0.63	1.00	0.63
PUNTERA	2-2 f	1.00	1.10	1.00	1.10
	2-2 c	1.00	1.10	1.00	1.10
TALON	3-3 f	1.00	1.10	1.00	1.10
	3-3 c	1.00	1.10	1.00	1.10

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	5.066	13.993	10.397
	0-0 (-)	4.200	0.308	0.000
	1-1 (+)	5.066	13.993	10.397
	1-1 (-)	4.200	0.308	0.000
PUNTERA	2-2 f (+)	0.000	14.491	---
	2-2 f (-)	0.000	1.713	---
	2-2 c (+)	---	---	11.198
	2-2 c (-)	---	---	1.322
TALON	3-3 f (+)	0.000	2.494	---
	3-3 f (-)	-7.437	-15.733	---
	3-3 c (+)	---	---	1.747
	3-3 c (-)	---	---	-10.947

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm ² /m	Minima cm ² /m	Control cálculo	Adoptada cm ² /m
ALZADO	Vert. trasdós	0-0 (+)	4.886	3.800	Vale	4.886
		0-0 (-)	0.000	1.900	Vale	
		1-1 (+)	4.886	3.800	Vale	
		1-1 (-)	0.000	1.900	Vale	
	Vert. intradós	0-0 (+)	0.000	1.900	Vale	1.900
		0-0 (-)	0.000	1.900	Vale	
		1-1 (+)	0.000	1.900	Vale	
		1-1 (-)	0.000	1.900	Vale	
	Hor. trasdós (*)	---	0.977	6.756	Vale	6.756
	Hor. intradós (*)	---	0.000	3.378	Vale	3.378
	Cortante	0-0 (+)	0.000	4.500	Vale	4.500 (cm ² /m ²)
		0-0 (-)	0.000	4.500	Vale	
		1-1 (+)	0.000	4.500	Vale	
		1-1 (-)	0.000	4.500	Vale	
PUNTERA	Trans. inferior	2-2 f (+)	3.126	7.959	Vale	7.959
		2-2 f (-)	0.368	7.959	Vale	
	Long. inf. (*)	---	0.625	7.959	Vale	7.959
		---	---	---	---	
	Trans. superior	2-2 f (+)	0.000	7.959	Vale	7.959
		2-2 f (-)	0.000	7.959	Vale	
TALON	Long. sup. (*)	---	0.000	7.959	Vale	7.959
		---	---	---	---	
	Cortante	2-2 c (+)	0.000	0.000	Vale	0.000 (cm ² /m ²)
		2-2 c (-)	0.000	0.000	Vale	
	Trans. inferior	3-3 f (+)	0.536	7.959	Vale	7.959
		3-3 f (-)	0.000	7.959	Vale	
	Long. inf. (*)	---	0.107	7.959	Vale	7.959
		---	---	---	---	
	Trans. superior	3-3 f (+)	0.000	7.959	Vale	7.959
		3-3 f (-)	5.073	7.959	Vale	
ZAPATA	Long. sup. (*)	---	1.015	7.959	Vale	7.959
		---	---	---	---	
	Cortante	3-3 c (+)	0.000	0.000	Vale	0.000 (cm ² /m ²)
		3-3 c (-)	0.000	0.000	Vale	
ZAPATA	Perimetral	---	0.000	7.959	Vale	7.959
		---	---	---	---	

(*) Calculada como el 20% de la armadura perpendicular a ella

CALCULO DE MUROS.

NOMBRE PROYECTO :	L.A.V. MADRID - ZARAGOZA. Subtramo XV.
NOMBRE OBRA :	Aleas de marcos sin cobertura.

DATOS

GEOMETRIA DE CALCULO DEL MURO

C. Canto del muro en coronación (m) :	0.350
ST. Sobreepesor muro en trasdós (m) :	0.550
SI. Sobreepesor muro en intradós (m) :	0.000
P. Puntal zapata (m) :	1.300
T. Talón zapata (m) :	4.000
H. Altura muro (m) :	7.300
Hx. Canto zapata (m) :	1.000
Anchura total cimentación (m) :	6.200
Angulo trasdós muro (°) :	85.691

DEFINICION TERRENO

	X	Y
0. Coordenadas base trasdós (m) :	0.000	0.000
1. Coordenadas coronación trasdós (m) :	-0.550	7.300
2. Coordenadas fin tramo 1 terreno (m) :	3.650	7.300
3. Coordenadas fin tramo 2 terreno (m) :	7.300	7.300
4. Coordenadas fin tramo 3 terreno (m) :	10.950	7.300

COEFICIENTES DE SEGURIDAD

Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
γo (coeficiente combinación variables) :	1.00

Estado Límite Último	
Favorable	Desfavorable

Acciones permanentes (G)	
Peso propio, cargas muertas :	0.90 1.50
Acciones permanentes de valor no constante (G*)	
Terrazo (peso propio y empujes) :	0.00 1.50
Acciones variables (Q)	
Sobrecargas :	0.00 1.50

CARACTERISTICAS DEL TERRENO

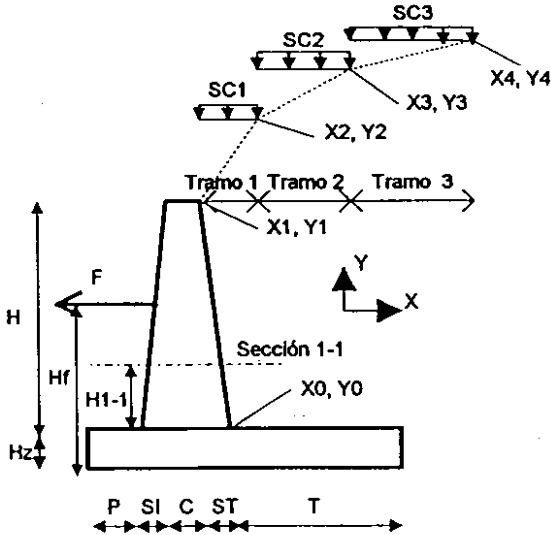
γ. Peso específico (T/m³) :	2.00
φ. Angulo rozamiento interno (°) :	30.000
δmt. Angulo rozamiento muro-terrazas (°) :	0.000
φRt. Angulo rozamiento tierras-terrazas (°) :	0.000
μ. Coeficiente rozamiento zapata-terrazas :	0.580
Tensión admisible cimentación (T/m²) :	20.000

ARMADO

H1-1. Dist. sección 1 a sup. zapata (m) :	1.700
Recubrimiento alzado (m) :	0.050
Recubrimiento cimentación (m) :	0.050

Cuantías mínimas

Vertical muros (1/3 min. cara)(o/oo) :	0.900
Horizontal muros (1/3 min. cara)(o/oo) :	1.600
Cortante o montaje alzado (cm²/m²) :	4.500
Transversal zapata (sup+inf)(o/oo) :	1.447
Longitudinal zapata (sup+inf)(o/oo) :	1.447
Cortante zapata (cm²/m²) :	0.000
Perimetral zapata (en canto)(cm²/m) :	7.235

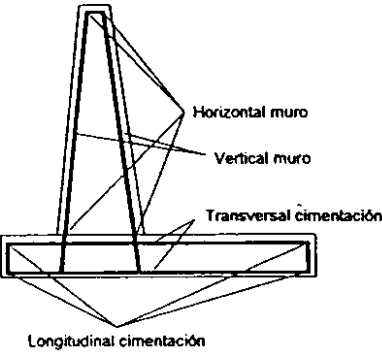


CARGAS (sin mayorar)

Acciones permanentes (G)	
Peso propio barrera coronación (T/m) :	0.750
Acciones permanentes de valor no constante (G*)	
Fg. Carga horizontal sobre muro (T/m) :	1.321
Hfg. Posición Fg a inferior zapata (m) :	6.710
Acciones variables (Q)	
SC1. Sobrecarga en tramo 1 (T/m) :	3.000
SC2. Sobrecarga en tramo 2 (T/m) :	3.000
SC3. Sobrecarga en tramo 3 (T/m) :	3.000
Fq. Carga horizontal sobre muro (T/m) :	1.606
Hfq. Posición Fq a inferior zapata (m) :	7.221

CARACTERISTICAS MATERIALES

Peso específico hormigón (T/m³) :	2.500
Hormigón alzado (T/m³) :	H - 250
Hormigón cimentación (T/m³) :	H - 250
Acero (T/P) :	AEH - 500



RESUMEN ACCIONES SOBRE EL MURO

		F.vertical (T / m)	X (m)	F. Horizontal (T / m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 (ΣP i, i=1..3)	8.603	1.583	---	---
	Sobre sección base muro (ΣP i, i=1..3)	12.156	1.623	---	---
	Total peso propio (ΣP i, i=1..6)	27.656	2.451	---	---
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E1i)	0.855	1.931	11.348	4.567
	Sobre sección base muro (E1i)	1.453	2.017	19.284	3.433
	Total tierras (E2i + ΣT)	62.415	4.060	22.910	2.767
	Verticales sobre talón (ΣT* i)	58.400	4.200	---	---
	Verticales sobre talón (cortante) (ΣT* i)	44.530	4.675	---	---
Fuerza Fg	Sobre sección 1	---	---	1.321	6.710
	Sobre sección base muro	---	---	1.321	6.710
	Total Fg	---	---	1.321	6.710
Acciones variables (Q)					
Sobrecargas sobre terreno	Sección 1 (E1'sc)	0.458	1.861	6.079	5.500
	Base muro (E1'sc)	0.597	1.925	7.925	4.650
	Inf. cimentación (E2'sc + ΣS)	23.550	4.808	8.281	4.150
	Verticales sobre talón (ΣS' i, i=1..3)	21.900	5.025	---	---
	Verticales sobre talón (cortante) (ΣS' i)	9.150	4.675	---	---
Fuerza Fq	Sobre sección 1	---	---	1.606	7.221
	Sobre sección base muro	---	---	1.606	7.221
	Total Fq	---	---	1.606	7.221

COMPROBACIONES

SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	16.041	—
Acciones permanentes de valor no constante (G*)		
Tierras	36.201	22.910
Fuerza Fg	—	1.321
Acciones variables (Q)		
Sobrecargas sobre terreno	—	—
Fuerza Fq	—	1.606
TOTAL	52.241	25.836
Csd=	2.022	Vale

SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	67.779	—
Acciones permanentes de valor no constante (G*)		
Tierras	253.377	63.384
Fuerza Fg	—	8.861
Acciones variables (Q)		
Sobrecargas sobre terreno	—	—
Fuerza Fq	—	11.595
TOTAL	321.156	83.839
Csv=	3.831	Vale

TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	27.656	17.956
Acciones permanentes de valor no constante (G*)		
Tierras	62.415	3.493
Fuerza Fg	0.000	8.861
Acciones variables (Q)		
Sobrecargas sobre terreno	23.550	-5.854
Fuerza Fq	0.000	11.595
TOTAL	113.621	36.050
D (m) =	6.20	
σ puntera (T / m²) =	23.95	
σ talón (T / m²) =	12.70	
σ_{med} (T / m²) =	18.33	
σ_{cob} (T / m²) =	20	
Vale		

ARMADO

Secciones

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	0.90	1.00	0.90
	1-1	1.00	0.77	1.00	0.77
PUNTERA	2-2 f	1.00	1.00	1.00	1.00
	2-2 c	1.00	1.00	1.00	1.00
TALON	3-3 f	1.00	1.00	1.00	1.00
	3-3 c	1.00	1.00	1.00	1.00

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	14.016	140.723	45.203
	0-0 (-)	10.941	1.390	0.000
	1-1 (+)	9.713	76.501	30.531
	1-1 (-)	7.743	0.794	0.000
PUNTERA	2-2 f (+)	0.000	31.791	—
	2-2 f (-)	0.000	4.013	—
	2-2 c (+)	—	—	25.622
	2-2 c (-)	—	—	3.260
TALON	3-3 f (+)	-0.830	-16.742	—
	3-3 f (-)	-30.378	-100.723	—
	3-3 c (+)	—	—	0.811
	3-3 c (-)	—	—	-20.533

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm2/m	Minima cm2/m	Control cálculo	Adoptada cm2/m
ALZADO	Vert. trasdós	0-0 (+)	38.919	5.400	Vale	38.919
		0-0 (-)	0.000	2.700	Vale	
		1-1 (+)	24.238	4.632	Vale	24.238
		1-1 (-)	0.000	2.316	Vale	
	Vert. intradós	0-0 (+)	0.000	2.700	Vale	2.700
		0-0 (-)	0.000	2.700	Vale	
		1-1 (+)	0.000	2.316	Vale	
		1-1 (-)	0.000	2.316	Vale	
	Hor. trasdós (*)	—	7.784	9.600	Vale	9.600
	Hor. intradós (*)	—	0.000	4.800	Vale	4.800
	Cortante	0-0 (+)	0.000	4.500	Vale	4.500
		0-0 (-)	0.000	4.500	Vale	(cm²/m²)
		1-1 (+)	0.000	4.500	Vale	
PUNTERA	Trans. inferior	2-2 f (+)	7.642	7.235	Vale	7.642
		2-2 f (-)	0.954	7.235	Vale	
	Long. inf. (*)	—	1.528	7.235	Vale	7.235
	Trans. superior	2-2 f (+)	0.000	7.235	Vale	31.782
		2-2 f (-)	0.000	7.235	Vale	
	Long. sup. (*)	—	0.000	7.235	Vale	7.235
	Cortante	2-2 c (+)	0.000	0.000	Vale	0.000
		2-2 c (-)	0.000	0.000	Vale	(cm²/m²)
TALON	Trans. inferior	3-3 f (+)	0.000	7.235	Vale	7.642
		3-3 f (-)	0.000	7.235	Vale	
	Long. inf. (*)	—	0.000	7.235	Vale	7.235
	Trans. superior	3-3 f (+)	4.187	7.235	Vale	31.782
		3-3 f (-)	31.782	7.235	Vale	
	Long. sup. (*)	—	6.356	7.235	Vale	7.235
	Cortante	3-3 c (+)	0.000	0.000	Vale	0.000
		3-3 c (-)	0.000	0.000	Vale	(cm²/m²)
ZAPATA	Perimetral	—	0.000	7.235	Vale	7.235

(*) Calculada como el 20% de la armadura perpendicular a ella

CALCULO DE SECUENCIA DE MUROS . Resultados.

PROYECTO :	L.A.V. MADRID - ZARAGOZA. Subtramo XV
OBRA :	EVN3-2.5. Aletas.

	Sección 1	Sección 2	Sección 3	Sección 4	Sección 5	Sección 6	Sección 7	Sección 8	Sección 9	Sección 10	Sección 11	Sección 12	Sección 13	Sección 14	Sección 15	Sección 16
GEOMETRIA SECCION																
C. Canto del muro en coronación (m) :	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300
ST. Sobreepesor muro en trasdós (m) :	0.642	0.621	0.601	0.580	0.560	0.539	0.518	0.508	0.498	0.477	0.457	0.436	0.416	0.395	0.375	0.354
Sl. Sobreepesor muro en intradós (m) :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
P. Puntera zapata (m) :	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750
T. Talón zapata (m) :	5.308	5.150	4.992	4.834	4.676	4.518	4.360	4.281	4.202	4.044	3.886	3.728	3.570	3.412	3.254	3.096
H. Altura muro (m) :	7.700	7.454	7.207	6.961	6.714	6.468	6.221	6.098	5.975	5.729	5.482	5.236	4.989	4.743	4.496	4.250
Hz. Canto zapata (m) :	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100
H1-1. Dist. sección 1 a sup. zapata (m) :	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750	1.750
Cota cimentación :	-1.100	-1.100	-1.100	-1.100	-1.100	-1.100	-1.100	-1.100	-1.100	-1.100	-1.100	-1.100	-1.100	-1.100	-1.100	-1.100
TERRENO																
X0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X1																
X2	4.669	4.931	5.193	5.454	5.716	5.978	6.240	6.371	6.502	6.764	7.026	7.288	7.550	7.812	8.074	8.335
X3	9.979	10.482	10.986	11.489	11.992	12.495	12.999	13.250	13.502	14.005	14.509	15.012	15.515	16.019	16.522	17.025
X4	24.479	24.982	25.486	25.989	26.492	26.995	27.499	27.750	28.002	28.505	29.009	29.512	30.015	30.519	31.022	31.525
Y0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Y1																
Y2	10.084	9.946	9.808	9.670	9.532	9.394	9.256	9.187	9.118	8.980	8.842	8.704	8.566	8.428	8.290	8.152
Y3	12.469	12.439	12.410	12.380	12.350	12.321	12.291	12.276	12.261	12.232	12.202	12.172	12.143	12.113	12.083	12.054
Y4	12.469	12.439	12.410	12.380	12.350	12.321	12.291	12.276	12.261	12.232	12.202	12.172	12.143	12.113	12.083	12.054
Vale terreno	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
COMPROBACIONES																
Coefficiente seguridad deslizamiento :	1.622	1.582	1.552	1.529	1.514	1.507	1.506	1.508	1.512	1.526	1.549	1.560	1.557	1.561	1.575	1.588
	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Coefficiente seguridad al vuelco :	3.576	3.530	3.502	3.491	3.496	3.518	3.556	3.581	3.612	3.687	3.786	4.000	4.046	4.116	4.211	4.311
	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Tensión máxima (T/m²) :	23.256	22.665	21.972	21.191	20.332	19.404	18.417	17.904	17.379	16.299	15.184	13.747	12.931	12.082	11.209	10.376
Tensión media (T/m²) :	18.875	18.325	17.764	17.193	16.615	16.029	15.437	15.139	14.840	14.238	13.632	13.044	12.472	11.899	11.323	10.754
Tensión cobaricentrica (T/m²) :	20	20	19	19	18	17	16	16	16	15	14	13	13	12	11	11
	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
ARMADO																
1. Inferior transversal cimentación (cm²/m) :	11.617	11.222	10.779	10.295	9.777	9.229	8.659	8.366	8.070	7.959	7.959	7.959	7.959	7.959	7.959	7.959
2. Superior transversal cimentación (cm²/m) :	39.041	36.658	34.144	31.558	28.949	26.358	23.818	22.575	21.354	18.989	16.737	14.271	12.750	11.286	9.894	8.643
3. Inferior longitudinal cimentación (cm²/m) :	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959
4. Superior longitudinal cimentación (cm²/m) :	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959
5. Perimetral cimentación (cm²/m) :	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959	7.959
6a. Espera 6b (cm²/m) :	16.889	15.255	13.670	12.191	10.791	9.504	8.293	7.717	7.181	6.160	5.209	4.369	3.602	3.296	3.173	3.050
6b. Vertical trasdós con solape (cm²/m) :	16.889	15.255	13.670	12.191	10.791	9.504	8.293	7.717	7.181	6.160	5.209	4.369	3.602	3.296	3.173	3.050
7. Vertical trasdós sin solape (cm²/m) :	14.848	14.147	13.413	12.699	11.979	11.292	10.597	10.247	9.924	9.263	8.587	7.963	7.333	6.301	5.228	4.245
8a. Espera 8b (cm²/m) :	2.825	2.763	2.702	2.640	2.579	2.517	2.455	2.425	2.394	2.332	2.271	2.209	2.147	2.086	2.024	1.963
8b. Vertical intradós (cm²/m) :	2.825	2.763	2.702	2.640	2.579	2.517	2.455	2.425	2.394	2.332	2.271	2.209	2.147	2.086	2.024	1.963
9. Horquilla coronación (cm²/m) :	5.650	5.650	5.650	5.650	5.650	5.650	5.650	5.650	5.650	5.650	5.650	5.650	5.650	5.650	5.650	5.650
10. Horizontal trasdós (cm²/m) :	10.044	9.825	9.606	9.387	9.168	8.949	8.730	8.621	8.511	8.292	8.073	7.854	7.635	7.416	7.197	6.978
11. Horizontal intradós (cm²/m) :	5.022	4.913	4.803	4.694	4.584	4.475	4.365	4.310	4.256	4.146	4.037	3.927	3.817	3.708	3.598	3.489
12. Montaje muro y cortante (cm²/m²) :	4.500	4.500	4.500	4.500	4.500	4.500	4.500	4.500	4.500	4.500	4.500	4.500	4.500	4.500	4.500	4.500
13. Horquillas horizontales bordes (cm²/m) :	10.044	9.825	9.606	9.387	9.168	8.949	8.730	8.621	8.511	8.292	8.073	7.854	7.635	7.416	7.197	6.978

4.4.6 Paso inferior E-1516.3

PASO INFERIOR E-1516.3

INDICE

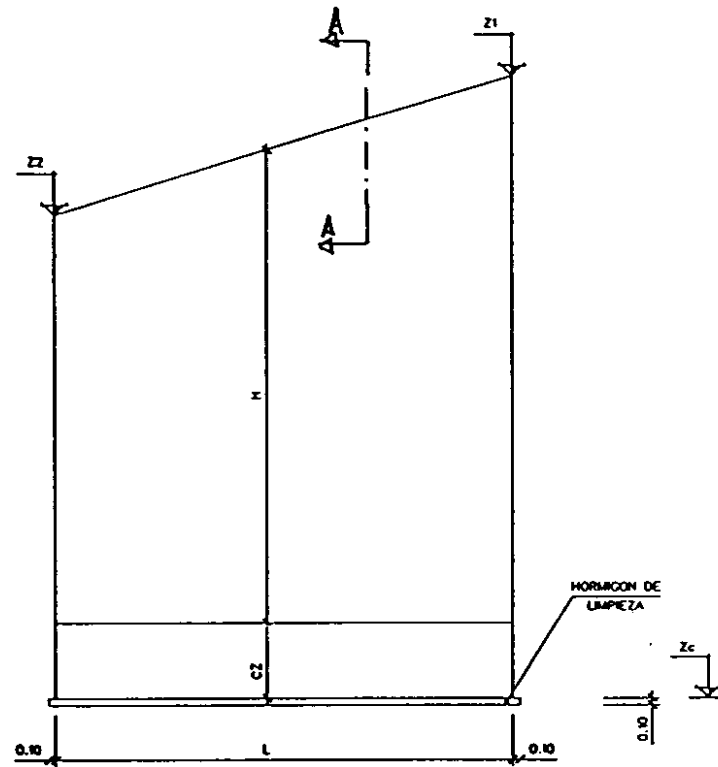
1º DEFINICION GEOMETRICA

2º CALCULOS

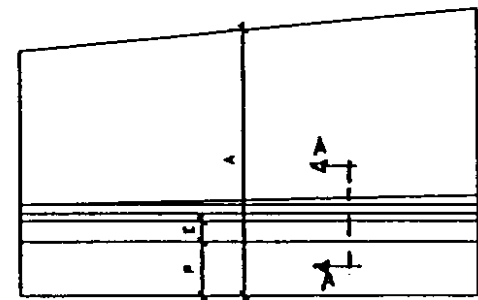
PASO INFERIOR E-1516.3

1º DEFINICION GEOMETRICA

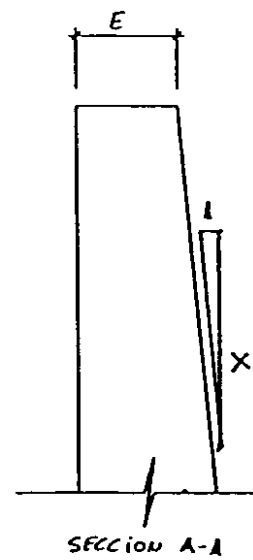
DEFINICION GEOMETRICA ALETAS



ALZADO TIPO DE MURO



PLANTA TIPO DE MURO



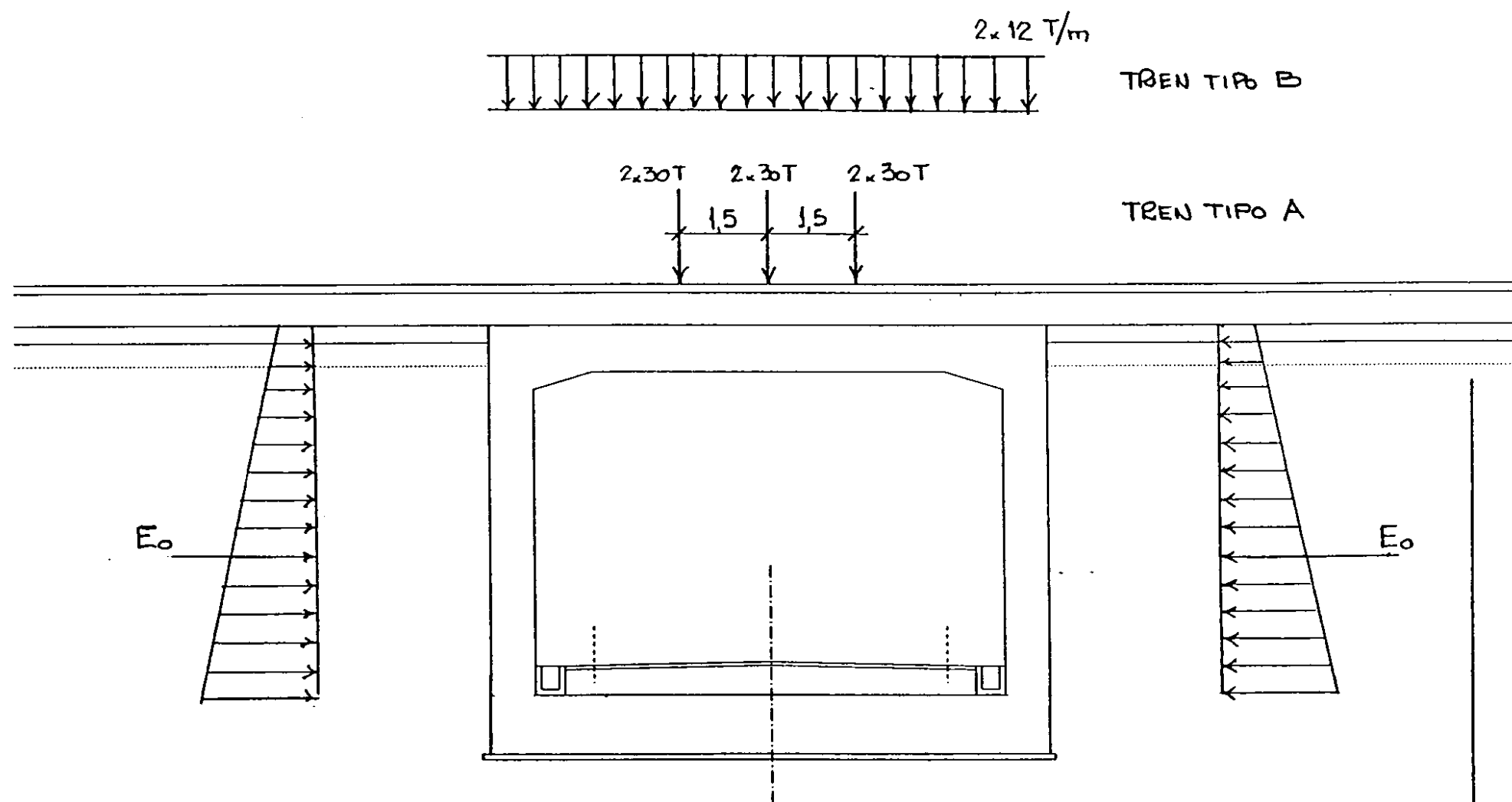
E-1516.3

DEFINICION GEOMETRICA

	Aletas 1 y 2	Aletas 3 y 4. M1	Aletas 3 y 4. M2
Z1	231.011	228.521	231.011
Z2	228.927	226.031	228.521
ZC	224.170	224.460	224.460
H	De 5.74 a 3.66	De 2.96 a 0.47	De 5.45 a 2.96
CZ	1.10	1.10	1.10
L	4.25	5.75	5.75
A	De 7.20 a 5.35	De 5.35 a 3.50	De 7.20 a 5.35
P	1.50	1.50	1.50
E	0.30	0.30	0.30
X	12.0	12.0	12

PASO INFERIOR E-1516.3

2º CALCULOS



Coef. Impacto

$$V = 200 \text{ km/h}$$

$$T = 0,05 \text{ seg.}$$

$$L = 8,80 \text{ m}$$

$$\mu = \frac{VT}{2L} = 0,57$$

$$I = 65 \frac{\mu}{1 - \mu + \mu^2} = 50$$

$$\phi_0 = 1,50$$

CARGAS PERMANENTES (g)

$$g: \text{Riel + Travesaños: } \frac{0,12 \text{ T/m} + 0,52 \text{ T/m}}{2,4 \text{ m}} = 0,27 \text{ T/m}^2$$

$$\text{Balasto: } 0,8 \text{ m} \times 1,6 \text{ T/m}^3 = \frac{1,28 \text{ T/m}^2}{1,55 \text{ T/m}^2 + \text{Peso Propio Pórtico}}$$

SOBRECARGAS (CARGAS VARIABLES). Tren: TREN TIPO A (Q_A)TREN TIPO B (Q_B). Empuje Terreno: (E_0)

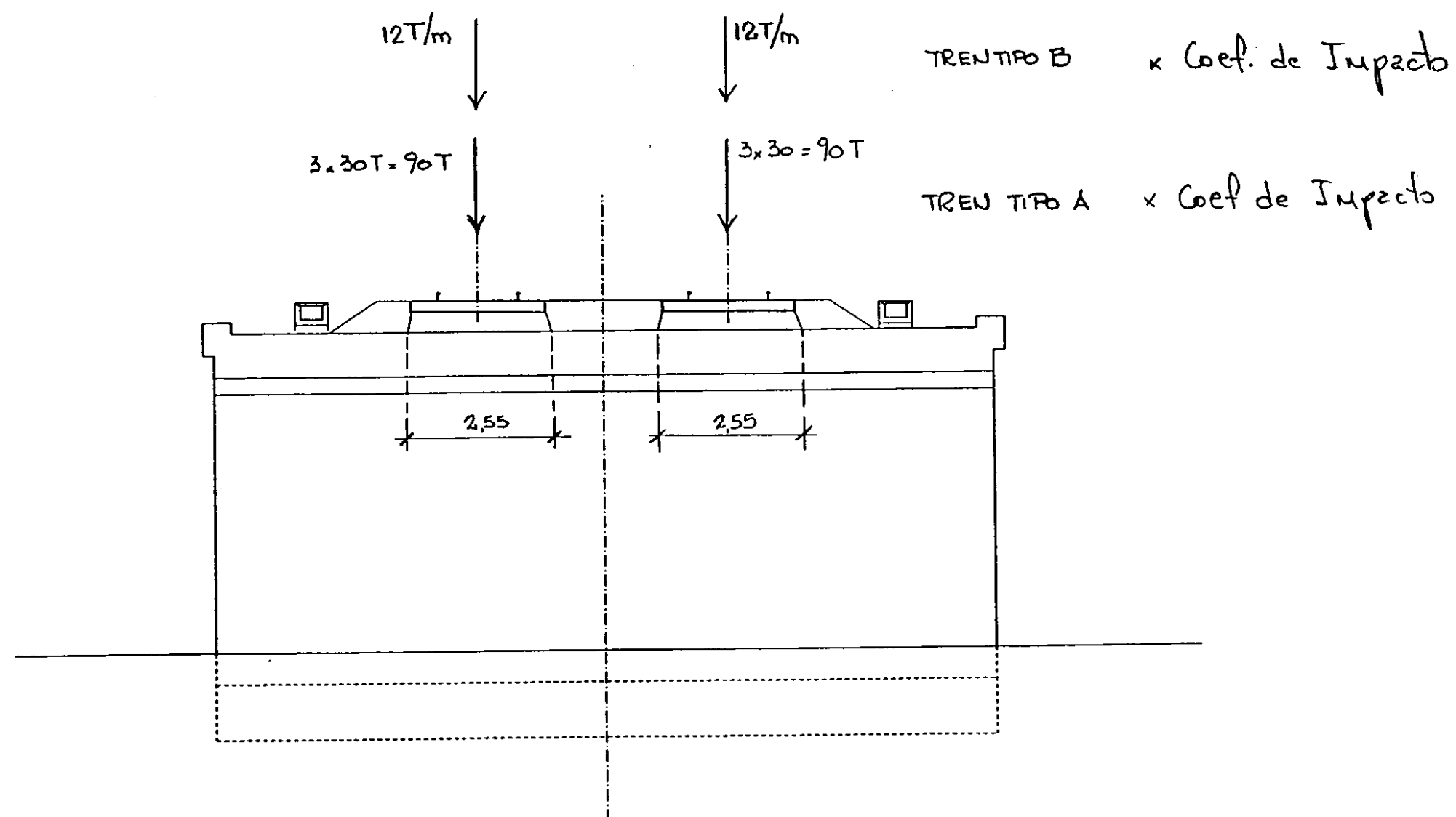
ESTADO LIMITE ULTIMO

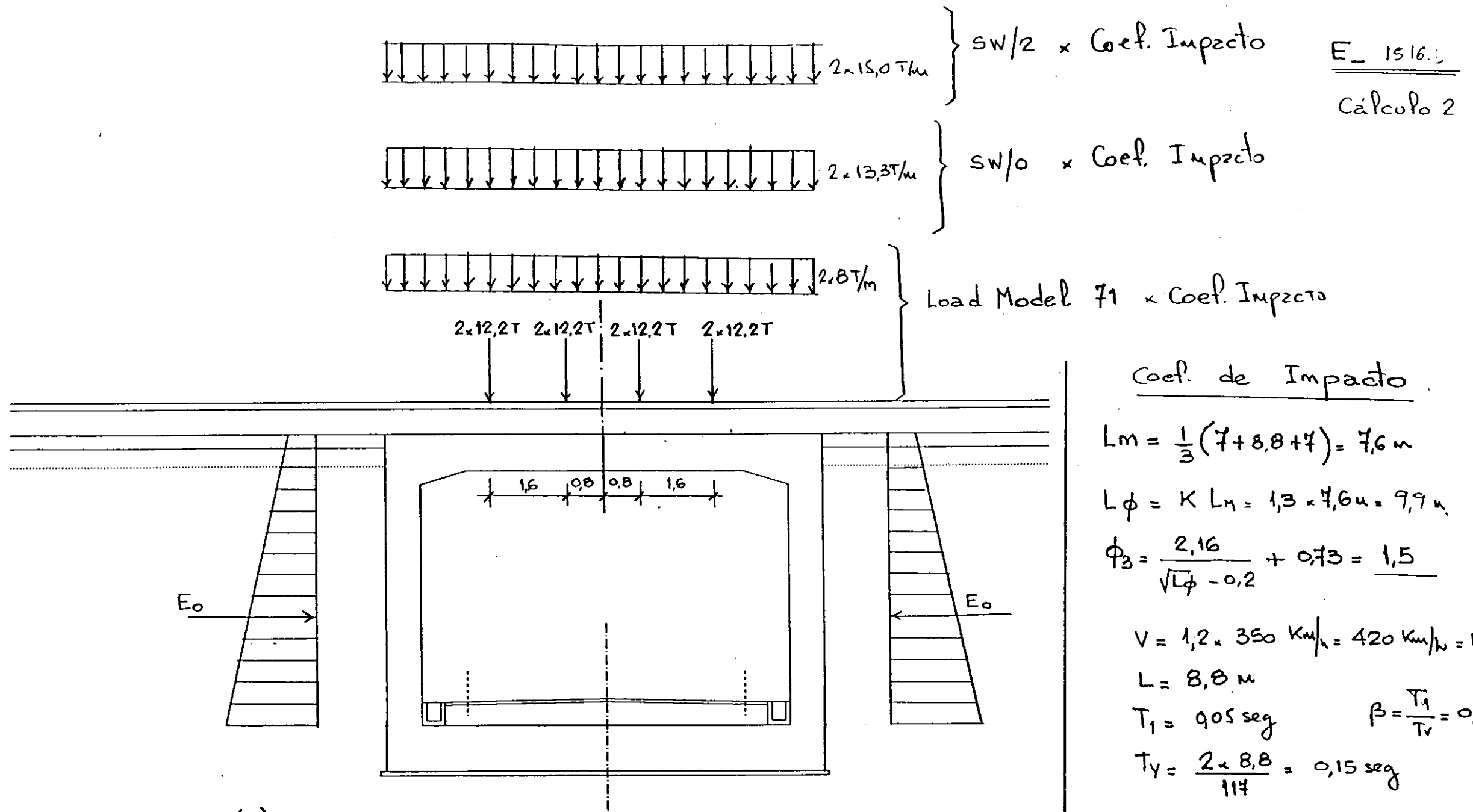
$$S_d = 1,5 [g] + 1,5 \text{ ó } 0,0 [Q_A \text{ ó } Q_B] + 1,5 \text{ ó } 0,0 [E_0]$$

ESTADOS LIMITES DE SERVICIO

$$S_k = 1,0 [g] + 1,0 \text{ ó } 0,0 [Q_A \text{ ó } Q_B] + 1,0 \text{ ó } 0,0 [E_0]$$

E - 1516.3
Cálculo 1





CARGAS PERMANENTES (g)

- Peso propio y elementos no estructurales

RIEL Y TRAVESAS $\frac{0.12 \text{ T/m} + 0.52 \text{ T/m}}{2.4 \text{ m}} = 0.27 \text{ T/m}^2$

BALASTA $0.8 \text{ m} \times 1.6 \text{ T/m}^3 = 1.28 \text{ T/m}^2$

$1.55 \text{ T/m}^2 + \text{Peso propio p\acute{o}rtico}$

- Empuje del Terreno: (Eo)

SOBRECARGAS (Q)

LOAD Model 71 $[Q_{LM71}]$

SW/0 $[Q_{SW/0}]$

SW/2 $[Q_{SW/2}]$

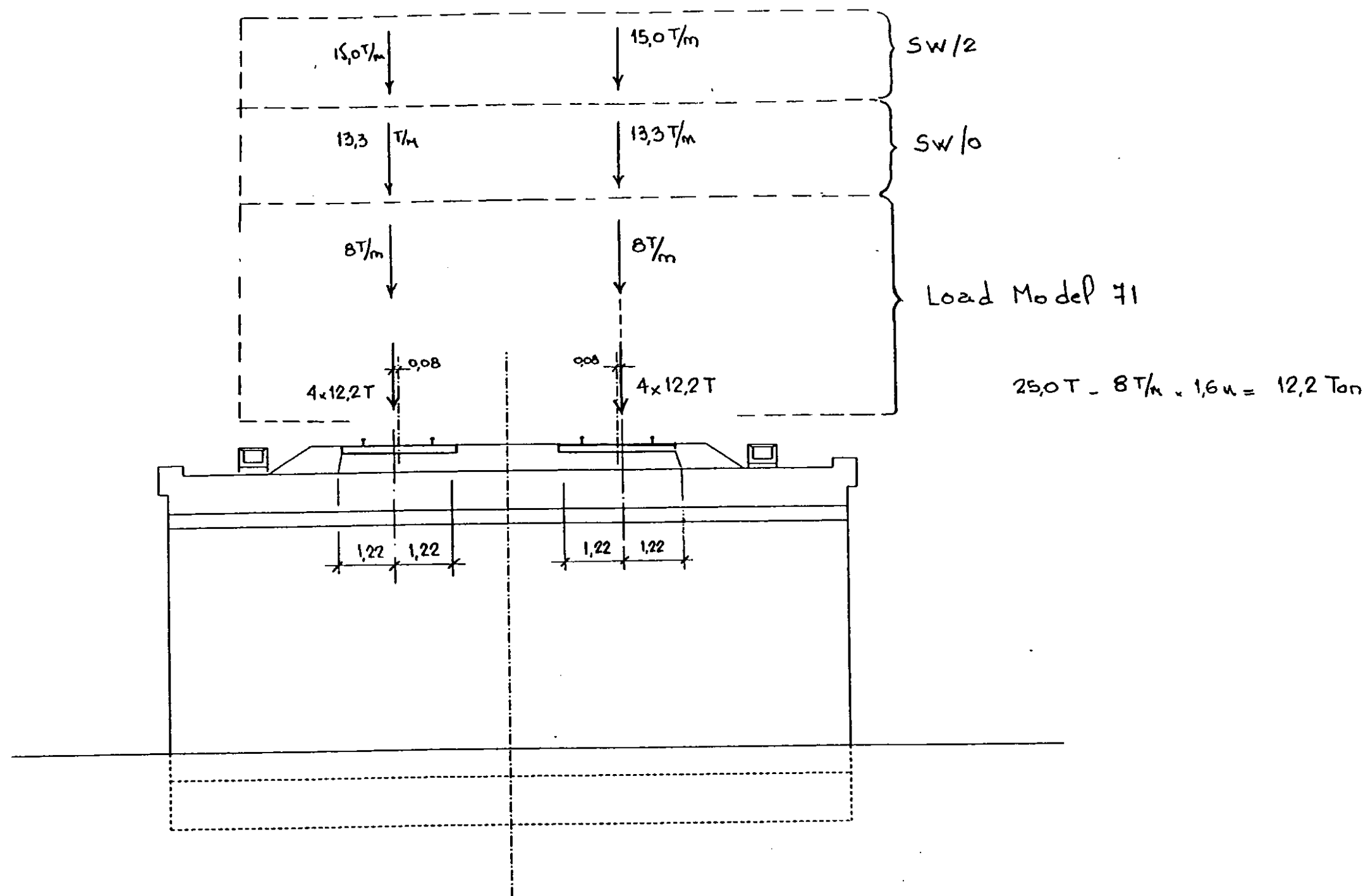
ESTADO LIMITE \u00daLTIMO

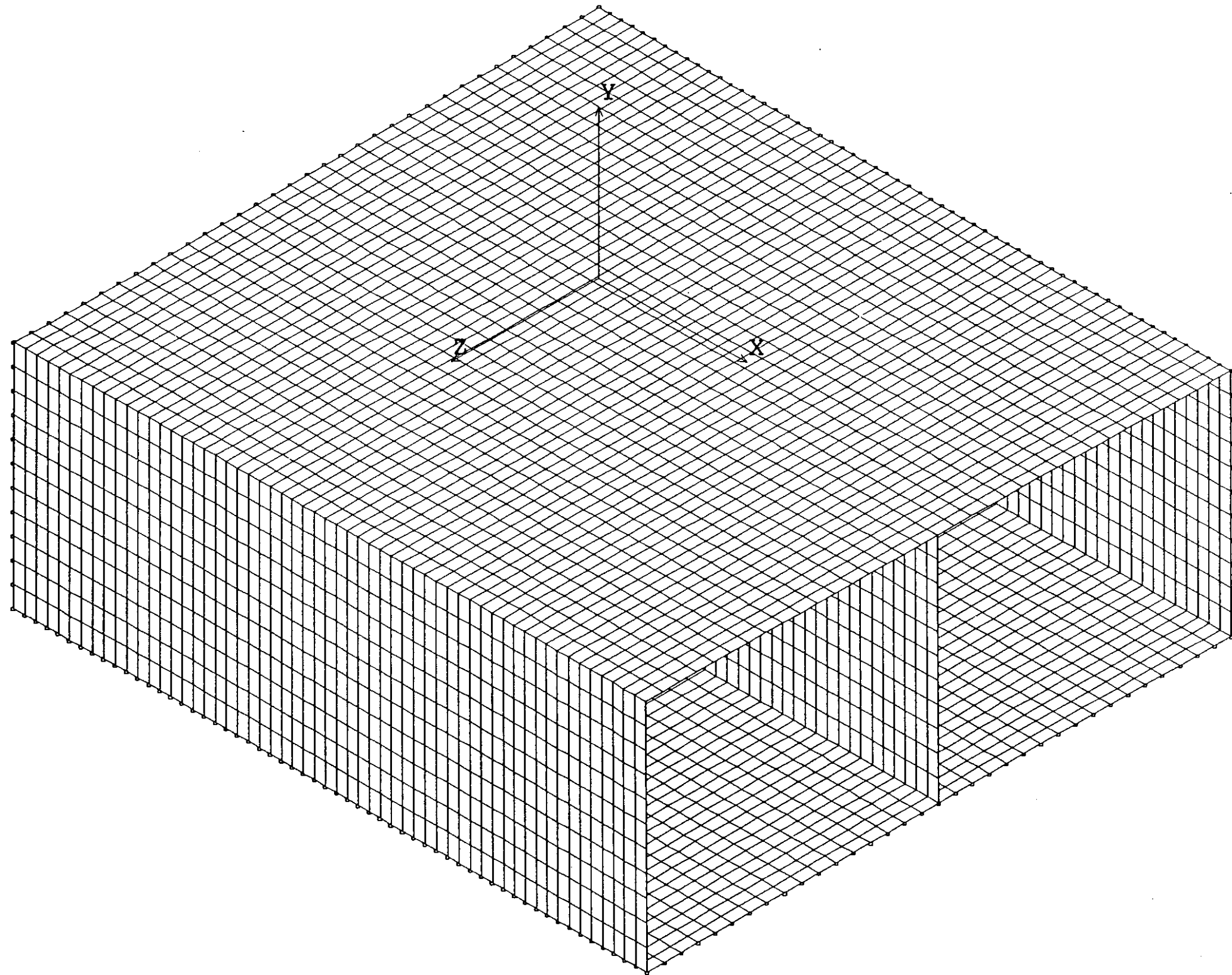
$$S_d = 1.35 [g] + \frac{1.00}{1.35} [E_o] + \begin{cases} 1.45 [Q_{LM71}] \\ 1.45 [Q_{SW/0}] \\ 1.20 [Q_{SW/2}] \end{cases}$$

ESTADOS LIMITES DE SERVICIO

$$S_k = 1.00 [g] + 1.00 [E_o] + 1.00 [Q_{LM71}]$$

E-1516.3
 Cálculo 2





Element group data

Element group number= 1

Element name:

SHELL4T Four node thick shell elements

Type of Shell element= 2

EQ. 0; QUAD 2 element

EQ. 1; QUAD 4 element

Real constant data

Real constant set 1

Associated with:

SHELL4T Four node thick shell elements

Thickness of the plate = .60000

Temperature Gradient = .00000

Real constant set 2

Associated with:

SHELL4T Four node thick shell elements

Thickness of the plate = .85000

Temperature Gradient = .00000

Real constant set 3

Associated with:

SHELL4T Four node thick shell elements

Thickness of the plate = .79412

Temperature Gradient = .00000

Real constant set 4

Associated with:

SHELL4T Four node thick shell elements

Thickness of the plate = .66471

Temperature Gradient = .00000

Real constant set 5

Associated with:

SHELL4T Four node thick shell elements

Thickness of the plate = .60000

Temperature Gradient = .00000

Real constant set 6

Associated with:

SHELL4T Four node thick shell elements

Thickness of the plate = .70000

Temperature Gradient = .00000

Foundation stiffness = 500.00

Material property data

Material property set 1

	Value	Temp curve no.
EX : X Elastic Modulus	.35000E+07	0
NUXY : Poisson Ratio	.20000	0
DENS : Mass Density	2.5000	0

Nodal input data

NODE BOUNDARY CONDITION CODES NODAL
POINT COORDINATES
(0 = FREE ; 1 = FIXED)

	X	Y	Z	XX	YY	ZZ	X	Y	Z
1	1	0	0	0	0	0	.00000	.00000	.00000
2	1	0	0	0	0	0	.48182	.00000	.00000
3	1	0	0	0	0	0	.96364	.00000	.00000
4	1	0	0	0	0	0	1.4455	.00000	.00000
5	1	0	0	0	0	0	1.9273	.00000	.00000
6	1	0	0	0	0	0	2.4091	.00000	.00000
7	1	0	0	0	0	0	2.8909	.00000	.00000
8	1	0	0	0	0	0	3.3727	.00000	.00000
9	1	0	0	0	0	0	3.8545	.00000	.00000
10	1	0	0	0	0	0	4.3364	.00000	.00000
11	1	0	0	0	0	0	4.8182	.00000	.00000
12	1	0	0	0	0	0	5.3000	.00000	.00000
13	1	0	0	0	0	0	.25000	.00000	.00000
14	1	0	0	0	0	0	.48182	.00000	.00000
15	1	0	0	0	0	0	.96364	.00000	.00000
16	1	0	0	0	0	0	1.4455	.00000	.00000
17	1	0	0	0	0	0	1.9273	.00000	.00000
18	1	0	0	0	0	0	2.4091	.00000	.00000
19	1	0	0	0	0	0	2.8909	.00000	.00000
20	1	0	0	0	0	0	3.3727	.00000	.00000
21	1	0	0	0	0	0	3.8545	.00000	.00000
22	1	0	0	0	0	0	4.3364	.00000	.00000
23	1	0	0	0	0	0	4.8182	.00000	.00000
24	1	0	0	0	0	0	5.3000	.00000	.00000
25	1	0	0	0	0	0	.50000	.00000	.00000
26	1	0	0	0	0	0	.48182	.00000	.00000
27	1	0	0	0	0	0	.96364	.00000	.00000
28	1	0	0	0	0	0	1.4455	.00000	.00000
29	1	0	0	0	0	0	1.9273	.00000	.00000
30	1	0	0	0	0	0	2.4091	.00000	.00000
31	1	0	0	0	0	0	2.8909	.00000	.00000
32	1	0	0	0	0	0	3.3727	.00000	.00000
33	1	0	0	0	0	0	3.8545	.00000	.00000
34	1	0	0	0	0	0	4.3364	.00000	.00000
35	1	0	0	0	0	0	4.8182	.00000	.00000
36	1	0	0	0	0	0	5.3000	.00000	.00000
37	1	0	0	0	0	0	.75000	.00000	.00000
38	1	0	0	0	0	0	.48182	.00000	.00000
39	1	0	0	0	0	0	.96364	.00000	.00000
40	1	0	0	0	0	0	1.4455	.00000	.00000
41	1	0	0	0	0	0	1.9273	.00000	.00000
42	1	0	0	0	0	0	2.4091	.00000	.00000
43	1	0	0	0	0	0	2.8909	.00000	.00000
44	1	0	0	0	0	0	3.3727	.00000	.00000
45	1	0	0	0	0	0	3.8545	.00000	.00000
46	1	0	0	0	0	0	4.3364	.00000	.00000
47	1	0	0	0	0	0	4.8182	.00000	.00000
48	1	0	0	0	0	0	5.3000	.00000	.00000
49	1	0	0	0	0	0	1.0000	.00000	.00000
50	1	0	0	0	0	0	.48182	.00000	.00000
51	1	0	0	0	0	0	.96364	.00000	.00000
52	1	0	0	0	0	0	1.4455	.00000	.00000
53	1	0	0	0	0	0	1.9273	.00000	.00000
54	1	0	0	0	0	0	2.4091	.00000	.00000
55	1	0	0	0	0	0	2.8909	.00000	.00000
56	1	0	0	0	0	0	3.3727	.00000	.00000
57	1	0	0	0	0	0	3.8545	.00000	.00000
58	1	0	0	0	0	0	4.3364	.00000	.00000
59	1	0	0	0	0	0	4.8182	.00000	.00000
60	1	0	0	0	0	0	5.3000	.00000	.00000
61	1	0	0	0	0	0	1.2500	.00000	.00000
62	1	0	0	0	0	0	.48182	.00000	.00000
63	1	0	0	0	0	0	1.2500	.96364	.00000
64	1	0	0	0	0	0	1.2500	1.4455	.00000
65	1	0	0	0	0	0	1.2500	1.9273	.00000
66	1	0	0	0	0	0	1.2500	2.4091	.00000
67	1	0	0	0	0	0	1.2500	2.8909	.00000
68	1	0	0	0	0	0	1.2500	3.3727	.00000
69	1	0	0	0	0	0	1.2500	3.8545	.00000
70	1	0	0	0	0	0	1.2500	4.3364	.00000
71	1	0	0	0	0	0	1.2500	4.8182	.00000
72	1	0	0	0	0	0	1.2500	5.3000	.00000
73	1	0	0	0	0	0	1.5000	.00000	.00000
74	1	0	0	0	0	0	1.5000	.48182	.00000
75	1	0	0	0	0	0	1.5000	.96364	.00000
76	1	0	0	0	0	0	1.5000	1.4455	.00000
77	1	0	0	0	0	0	1.5000	1.9273	.00000
78	1	0	0	0	0	0	1.5000	2.4091	.00000
79	1	0	0	0	0	0	1.5000	2.8909	.00000
80	1	0	0	0	0	0	1.5000	3.3727	.00000
81	1	0	0	0	0	0	1.5000	3.8545	.00000
82	1	0	0	0	0	0	1.5000	4.3364	.00000
83	1	0	0	0	0	0	1.5000	4.8182	.00000
84	1	0	0	0	0	0	1.5000	5.3000	.00000
85	1	0	0	0	0	0	1.7500	.00000	.00000
86	1	0	0	0	0	0	1.7500	.48182	.00000
87	1	0	0	0	0	0	1.7500	.96364	.00000
88	1	0	0	0	0	0	1.7500	1.4455	.00000
89	1	0	0	0	0	0	1.7500	1.9273	.00000
90	1	0	0	0	0	0	1.7500	2.4091	.00000
91	1	0	0	0	0	0	1.7500	2.8909	.00000
92	1	0	0	0	0	0	1.7500	3.3727	.00000
93	1	0	0	0	0	0	1.7500	3.8545	.00000
94	1	0	0	0	0	0	1.7500	4.3364	.00000
95	1	0	0	0	0	0	1.7500	4.8182	.00000
96	1	0	0	0	0	0	1.7500	5.3000	.00000
97	1	0	0	0	0	0	2.0000	.00000	.00000
98	1	0	0	0	0	0	2.0000	.48182	.00000
99	1	0	0	0	0	0	2.0000	.96364	.00000
100	1	0	0	0	0	0	2.0000	1.4455	.00000
101	1	0	0	0	0	0	2.0000	1.9273	.00000
102	1	0	0	0	0	0	2.0000	2.4091	.00000
103	1	0	0	0	0	0	2.0000	2.8909	.00000
104	1	0	0	0	0	0	2.0000	3.3727	.00000
105	1	0	0	0	0	0	2.0000	3.8545	.00000
106	1	0	0	0	0	0	2.0000	4.3364	.00000
107	1	0	0	0	0	0	2.0000	4.8182	.00000
108	1	0	0	0	0	0	2.0000	5.3000	.00000
109	1	0	0	0	0	0	2.2500	.00000	.00000
110	1	0	0	0	0	0	2.2500	.48182	.00000
111	1	0	0	0	0	0	2.2500	.96364	.00000
112	1	0	0	0	0	0	2.2500	1.4455	.00000
113	1	0	0	0	0	0	2.2500	1.9273	.00000
114	1	0	0	0	0	0	2.2500	2.4091	.00000
115	1	0	0	0	0	0	2.2500	2.8909	.00000
116	1	0	0	0	0	0	2.2500	3.3727	.00000
117	1	0	0	0	0	0	2.2500	3.8545	.00000
118	1	0	0	0	0	0	2.2500	4.3364	.00000
119	1	0	0	0	0	0	2.2500	4.8182	.00000
120	1	0	0	0	0	0	2.2500	5.3000	.00000
121	1	0	0	0	0	0	2.5000	.00000	.00000
122	1	0	0	0	0	0	2.5000	.48182	.00000
123	1	0	0	0	0	0	2.5000	.96364	.00000
124	1	0	0	0	0	0	2.5000	1.4455	.00000
125	1	0	0	0	0	0	2.5000	1.9273	.00000
126	1	0	0	0	0	0	2.5000	2.4091	.00000
127	1	0	0	0	0	0	2.5000	2.8909	.00000
128	1	0	0	0	0	0	2.5000	3.3727	.00000
129	1	0	0	0	0				

471	1	0	0	0	0	9.7500	.96364	.00000	539	1	0	0	0	0	11.000	4.8182	.00000	607	1	0	0	0	0	12.500	2.8909	.00000	675	1	0	0	0	0	14.000	.96364	.00000
472	1	0	0	0	0	9.7500	1.4455	.00000	540	1	0	0	0	0	11.000	5.3000	.00000	608	1	0	0	0	0	12.500	3.3727	.00000	676	1	0	0	0	0	14.000	1.4455	.00000
473	1	0	0	0	0	9.7500	1.9273	.00000	541	1	0	0	0	0	11.250	.00000	.00000	609	1	0	0	0	0	12.500	3.8545	.00000	677	1	0	0	0	0	14.000	1.9273	.00000
474	1	0	0	0	0	9.7500	2.4091	.00000	542	1	0	0	0	0	11.250	.48182	.00000	610	1	0	0	0	0	12.500	4.3364	.00000	678	1	0	0	0	0	14.000	2.4091	.00000
475	1	0	0	0	0	9.7500	2.8909	.00000	543	1	0	0	0	0	11.250	.96364	.00000	611	1	0	0	0	0	12.500	4.8182	.00000	679	1	0	0	0	0	14.000	2.8909	.00000
476	1	0	0	0	0	9.7500	3.3727	.00000	544	1	0	0	0	0	11.250	1.4455	.00000	612	1	0	0	0	0	12.500	5.3000	.00000	680	1	0	0	0	0	14.000	3.3727	.00000
477	1	0	0	0	0	9.7500	3.8545	.00000	545	1	0	0	0	0	11.250	1.9273	.00000	613	1	0	0	0	0	12.750	.00000	.00000	681	1	0	0	0	0	14.000	3.8545	.00000
478	1	0	0	0	0	9.7500	4.3364	.00000	546	1	0	0	0	0	11.250	2.4091	.00000	614	1	0	0	0	0	12.750	.48182	.00000	682	1	0	0	0	0	14.000	4.3364	.00000
479	1	0	0	0	0	9.7500	4.8182	.00000	547	1	0	0	0	0	11.250	2.8909	.00000	615	1	0	0	0	0	12.750	.96364	.00000	683	1	0	0	0	0	14.000	4.8182	.00000
480	1	0	0	0	0	9.7500	5.3000	.00000	548	1	0	0	0	0	11.250	3.3727	.00000	616	1	0	0	0	0	12.750	1.4455	.00000	684	1	0	0	0	0	14.000	5.3000	.00000
481	1	0	0	0	0	10.000	.00000	.00000	549	1	0	0	0	0	11.250	3.8545	.00000	617	1	0	0	0	0	12.750	1.9273	.00000	685	1	0	0	0	0	14.250	.00000	.00000
482	1	0	0	0	0	10.000	.48182	.00000	550	1	0	0	0	0	11.250	4.3364	.00000	618	1	0	0	0	0	12.750	2.4091	.00000	686	1	0	0	0	0	14.250	.48182	.00000
483	1	0	0	0	0	10.000	.96364	.00000	551	1	0	0	0	0	11.250	4.8182	.00000	619	1	0	0	0	0	12.750	2.8909	.00000	687	1	0	0	0	0	14.250	.96364	.00000
484	1	0	0	0	0	10.000	1.4455	.00000	552	1	0	0	0	0	11.250	5.3000	.00000	620	1	0	0	0	0	12.750	3.3727	.00000	688	1	0	0	0	0	14.250	1.4455	.00000
485	1	0	0	0	0	10.000	1.9273	.00000	553	1	0	0	0	0	11.500	.00000	.00000	621	1	0	0	0	0	12.750	3.8545	.00000	689	1	0	0	0	0	14.250	1.9273	.00000
486	1	0	0	0	0	10.000	2.4091	.00000	554	1	0	0	0	0	11.500	.48182	.00000	622	1	0	0	0	0	12.750	4.3364	.00000	690	1	0	0	0	0	14.250	2.4091	.00000
487	1	0	0	0	0	10.000	2.8909	.00000	555	1	0	0	0	0	11.500	.96364	.00000	623	1	0	0	0	0	12.750	4.8182	.00000	691	1	0	0	0	0	14.250	2.8909	.00000
488	1	0	0	0	0	10.000	3.3727	.00000	556	1	0	0	0	0	11.500	1.4455	.00000	624	1	0	0	0	0	12.750	5.3000	.00000	692	1	0	0	0	0	14.250	3.3727	.00000
489	1	0	0	0	0	10.000	3.8545	.00000	557	1	0	0	0	0	11.500	1.9273	.00000	625	1	0	0	0	0	13.000	.00000	.00000	693	1	0	0	0	0	14.250	3.8545	.00000
490	1	0	0	0	0	10.000	4.3364	.00000	558	1	0	0	0	0	11.500	2.4091	.00000	626	1	0	0	0	0	13.000	.48182	.00000	694	1	0	0	0	0	14.250	4.3364	.00000
491	1	0	0	0	0	10.000	4.8182	.00000	559	1	0	0	0	0	11.500	2.8909	.00000	627	1	0	0	0	0	13.000	.96364	.00000	695	1	0	0	0	0	14.250	4.8182	.00000
492	1	0	0	0	0	10.000	5.3000	.00000	560	1	0	0	0	0	11.500	3.3727	.00000	628	1	0	0	0	0	13.000	1.4455	.00000	696	1	0	0	0	0	14.250	5.3000	.00000
493	1	0	0	0	0	10.250	.00000	.00000	561	1	0	0	0	0	11.500	3.8545	.00000	629	1	0	0	0	0	13.000	1.9273	.00000	697	0	0	0	0	0	-1.6970E-07	5.3000	.38824
494	1	0	0	0	0	10.250	.48182	.00000	562	1	0	0	0	0	11.500	4.3364	.00000	630	1	0	0	0	0	13.000	2.4091	.00000	698	0	0	0	0	0	-3.3941E-07	5.3000	.77647
495	1	0	0	0	0	10.250	.96364	.00000	563	1	0	0	0	0	11.500	4.8182	.00000	631	1	0	0	0	0	13.000	2.8909	.00000	699	0	0	0	0	0	-5.0911E-07	5.3000	1.1647
496	1	0	0	0	0	10.250	1.4455	.00000	564	1	0	0	0	0	11.500	5.3000	.00000	632	1	0	0	0	0	13.000	3.3727	.00000	700	0	0	0	0	0	-6.7881E-07	5.3000	1.5529
497	1	0	0	0	0	10.250	1.9273	.00000	565	1	0	0	0	0	11.750	.00000	.00000	633	1	0	0	0	0	13.000	3.8545	.00000	701	0	0	0	0	0	-8.4852E-07	5.3000	1.9412
498	1	0	0	0	0	10.250	2.4091	.00000	566	1	0	0	0	0	11.750	.48182	.00000	634	1	0	0	0	0	13.000	4.3364	.00000	702	0	0	0	0	0	-1.0182E-06	5.3000	2.3294
499	1	0	0	0	0	10.250	2.8909	.00000	567	1	0	0	0	0	11.750	.96364	.00000	635	1	0	0	0	0	13.000	4.8182	.00000	703	0	0	0	0	0	-1.1879E-06	5.3000	2.7176
500	1	0	0	0	0	10.250	3.3727	.00000	568	1	0	0	0	0	11.750	1.4455	.00000	636	1	0	0	0	0	13.000	5.3000	.00000	704	0	0	0	0	0	-1.3576E-06	5.3000	3.1059
501	1	0	0	0	0	10.250	3.8545	.00000	569	1	0	0	0	0	11.750	1.9273	.00000	637	1	0	0	0	0	13.250	.00000	.00000	705	0	0	0	0	0	-1.5273E-06	5.3000	3.4941
502	1	0	0	0	0	10.250	4.3364	.00000	570	1	0	0	0	0	11.750	2.4091	.00000	638	1	0	0	0	0	13.250	.48182	.00000	706	0	0	0	0	0	-1.6970E-06	5.3000	3.8824
503	1	0	0	0	0	10.250	4.8182	.00000	571	1	0	0	0	0	11.750	2.8909	.00000	639	1	0	0	0	0	13.250	.96364	.00000	707	0	0	0	0	0	-1.8667E-06	5.3000	4.2706
504	1	0	0	0	0	10.250	5.3000	.00000	572	1	0	0	0	0	11.750	3.3727	.00000	640	1	0	0	0	0	13.250	1.4455	.00000	708	0	0	0	0	0	-2.0364E-06	5.3000	4.6588
505	1	0	0	0	0	10.500	.00000	.00000	573	1	0	0	0	0	11.750	3.8545	.00000	641	1	0	0	0	0	13.250	1.9273	.00000	709	0	0	0	0	0	-2.2061E-06	5.3000	5.0471
506	1	0	0	0	0	10.500	.48182	.00000	574	1	0	0	0	0	11.750	4.3364	.00000	642	1	0	0	0	0	13.250	2.4091	.00000	710	0	0	0	0	0	-2.3758E-06	5.3000	5.4353
507	1	0	0	0	0	10.500	.96364	.00000	575	1	0	0	0	0	11.750	4.8182	.00000	643	1	0	0	0	0	13.250	2.8909	.00000	711	0	0	0	0	0	-2.5455E-06	5.3000	5.8235
508	1	0	0	0	0	10.500	1.4455	.00000	576	1	0	0	0	0	11.750	5.3000	.00000	644	1	0	0	0	0	13.250	3.3727	.00000	712	0	0	0	0	0	-2.7152E-06	5.3000	6.2118
509	1	0	0	0	0	10.500	1.9273	.00000	577	1	0	0	0	0	12.000	.00000	.00000	645	1	0	0	0	0	13.250	3.8545	.00000	713	0	0	0	0	0	-2.8850E-06	5.3000	6.6000
510	1	0	0	0	0	10.500	2.4091	.00000	578	1	0	0	0	0	12.000	.48182	.00000	646	1	0	0	0	0	13.250	4.3364	.00000	714	0	0	0	0	0	-3.0547E-06	5.3000	6.9882
511	1	0	0	0	0	10.500	2.8909	.00000	579	1	0	0	0	0	12.000	.96364	.00000	647	1	0	0	0	0	13.250	4.8182	.00000	715	0	0	0	0	0	-3.2244E-06	5.3000	7.3765
512	1	0	0	0	0	10.500	3.3727	.00000	580	1	0	0	0	0	12.000	1.4455	.00000	648	1	0	0	0	0	13.250	5.3000	.00000	716	0	0	0	0	0	-3.3941E-06	5.3000	7.7647
513	1	0	0	0	0	10.500	3.8545	.00000	581	1	0	0	0	0	12.000	1.9273	.00000	649	1	0	0	0	0	13.500	.00000	.00000	717	0	0	0	0	0	-3.5638E-06	5.3000	8.1529
514	1	0	0	0																															

743	0	0	0	0	0	0	.25000	5.3000	5.0471	811	0	0	0	0	0	0	.75000	5.3000	5.0471	879	0	0	0	0	0	0	1.2500	5.3000	5.0471	947	0	0	0	0	0	0	1.7500	5.3000	5.0471
744	0	0	0	0	0	0	.25000	5.3000	5.4353	812	0	0	0	0	0	0	.75000	5.3000	5.4353	880	0	0	0	0	0	0	1.2500	5.3000	5.4353	948	0	0	0	0	0	0	1.7500	5.3000	5.4353
745	0	0	0	0	0	0	.25000	5.3000	5.8235	813	0	0	0	0	0	0	.75000	5.3000	5.8235	881	0	0	0	0	0	0	1.2500	5.3000	5.8235	949	0	0	0	0	0	0	1.7500	5.3000	5.8235
746	0	0	0	0	0	0	.25000	5.3000	6.2118	814	0	0	0	0	0	0	.75000	5.3000	6.2118	882	0	0	0	0	0	0	1.2500	5.3000	6.2118	950	0	0	0	0	0	0	1.7500	5.3000	6.2118
747	0	0	0	0	0	0	.25000	5.3000	6.6000	815	0	0	0	0	0	0	.75000	5.3000	6.6000	883	0	0	0	0	0	0	1.2500	5.3000	6.6000	951	0	0	0	0	0	0	1.7500	5.3000	6.6000
748	0	0	0	0	0	0	.25000	5.3000	6.9882	816	0	0	0	0	0	0	.75000	5.3000	6.9882	884	0	0	0	0	0	0	1.2500	5.3000	6.9882	952	0	0	0	0	0	0	1.7500	5.3000	6.9882
749	0	0	0	0	0	0	.25000	5.3000	7.3765	817	0	0	0	0	0	0	.75000	5.3000	7.3765	885	0	0	0	0	0	0	1.2500	5.3000	7.3765	953	0	0	0	0	0	0	1.7500	5.3000	7.3765
750	0	0	0	0	0	0	.25000	5.3000	7.7647	818	0	0	0	0	0	0	.75000	5.3000	7.7647	886	0	0	0	0	0	0	1.2500	5.3000	7.7647	954	0	0	0	0	0	0	1.7500	5.3000	7.7647
751	0	0	0	0	0	0	.25000	5.3000	8.1529	819	0	0	0	0	0	0	.75000	5.3000	8.1529	887	0	0	0	0	0	0	1.2500	5.3000	8.1529	955	0	0	0	0	0	0	1.7500	5.3000	8.1529
752	0	0	0	0	0	0	.25000	5.3000	8.5412	820	0	0	0	0	0	0	.75000	5.3000	8.5412	888	0	0	0	0	0	0	1.2500	5.3000	8.5412	956	0	0	0	0	0	0	1.7500	5.3000	8.5412
753	0	0	0	0	0	0	.25000	5.3000	8.9294	821	0	0	0	0	0	0	.75000	5.3000	8.9294	889	0	0	0	0	0	0	1.2500	5.3000	8.9294	957	0	0	0	0	0	0	1.7500	5.3000	8.9294
754	0	0	0	0	0	0	.25000	5.3000	9.3176	822	0	0	0	0	0	0	.75000	5.3000	9.3176	890	0	0	0	0	0	0	1.2500	5.3000	9.3176	958	0	0	0	0	0	0	1.7500	5.3000	9.3176
755	0	0	0	0	0	0	.25000	5.3000	9.7059	823	0	0	0	0	0	0	.75000	5.3000	9.7059	891	0	0	0	0	0	0	1.2500	5.3000	9.7059	959	0	0	0	0	0	0	1.7500	5.3000	9.7059
756	0	0	0	0	0	0	.25000	5.3000	10.094	824	0	0	0	0	0	0	.75000	5.3000	10.094	892	0	0	0	0	0	0	1.2500	5.3000	10.094	960	0	0	0	0	0	0	1.7500	5.3000	10.094
757	0	0	0	0	0	0	.25000	5.3000	10.482	825	0	0	0	0	0	0	.75000	5.3000	10.482	893	0	0	0	0	0	0	1.2500	5.3000	10.482	961	0	0	0	0	0	0	1.7500	5.3000	10.482
758	0	0	0	0	0	0	.25000	5.3000	10.871	826	0	0	0	0	0	0	.75000	5.3000	10.871	894	0	0	0	0	0	0	1.2500	5.3000	10.871	962	0	0	0	0	0	0	1.7500	5.3000	10.871
759	0	0	0	0	0	0	.25000	5.3000	11.259	827	0	0	0	0	0	0	.75000	5.3000	11.259	895	0	0	0	0	0	0	1.2500	5.3000	11.259	963	0	0	0	0	0	0	1.7500	5.3000	11.259
760	0	0	0	0	0	0	.25000	5.3000	11.647	828	0	0	0	0	0	0	.75000	5.3000	11.647	896	0	0	0	0	0	0	1.2500	5.3000	11.647	964	0	0	0	0	0	0	1.7500	5.3000	11.647
761	0	0	0	0	0	0	.25000	5.3000	12.035	829	0	0	0	0	0	0	.75000	5.3000	12.035	897	0	0	0	0	0	0	1.2500	5.3000	12.035	965	0	0	0	0	0	0	1.7500	5.3000	12.035
762	0	0	0	0	0	0	.25000	5.3000	12.424	830	0	0	0	0	0	0	.75000	5.3000	12.424	898	0	0	0	0	0	0	1.2500	5.3000	12.424	966	0	0	0	0	0	0	1.7500	5.3000	12.424
763	0	0	0	0	0	0	.25000	5.3000	12.812	831	0	0	0	0	0	0	.75000	5.3000	12.812	899	0	0	0	0	0	0	1.2500	5.3000	12.812	967	0	0	0	0	0	0	1.7500	5.3000	12.812
764	1	0	0	0	0	0	.25000	5.3000	13.200	832	1	0	0	0	0	0	.75000	5.3000	13.200	900	1	0	0	0	0	0	1.2500	5.3000	13.200	968	1	0	0	0	0	0	1.7500	5.3000	13.200
765	0	0	0	0	0	0	.50000	5.3000	.38824	833	0	0	0	0	0	0	1.0000	5.3000	.38824	901	0	0	0	0	0	0	1.5000	5.3000	.38824	969	0	0	0	0	0	0	2.0000	5.3000	.38824
766	0	0	0	0	0	0	.50000	5.3000	.77647	834	0	0	0	0	0	0	1.0000	5.3000	.77647	902	0	0	0	0	0	0	1.5000	5.3000	.77647	970	0	0	0	0	0	0	2.0000	5.3000	.77647
767	0	0	0	0	0	0	.50000	5.3000	1.1647	835	0	0	0	0	0	0	1.0000	5.3000	1.1647	903	0	0	0	0	0	0	1.5000	5.3000	1.1647	971	0	0	0	0	0	0	2.0000	5.3000	1.1647
768	0	0	0	0	0	0	.50000	5.3000	1.5529	836	0	0	0	0	0	0	1.0000	5.3000	1.5529	904	0	0	0	0	0	0	1.5000	5.3000	1.5529	972	0	0	0	0	0	0	2.0000	5.3000	1.5529
769	0	0	0	0	0	0	.50000	5.3000	1.9412	837	0	0	0	0	0	0	1.0000	5.3000	1.9412	905	0	0	0	0	0	0	1.5000	5.3000	1.9412	973	0	0	0	0	0	0	2.0000	5.3000	1.9412
770	0	0	0	0	0	0	.50000	5.3000	2.3294	838	0	0	0	0	0	0	1.0000	5.3000	2.3294	906	0	0	0	0	0	0	1.5000	5.3000	2.3294	974	0	0	0	0	0	0	2.0000	5.3000	2.3294
771	0	0	0	0	0	0	.50000	5.3000	2.7176	839	0	0	0	0	0	0	1.0000	5.3000	2.7176	907	0	0	0	0	0	0	1.5000	5.3000	2.7176	975	0	0	0	0	0	0	2.0000	5.3000	2.7176
772	0	0	0	0	0	0	.50000	5.3000	3.1059	840	0	0	0	0	0	0	1.0000	5.3000	3.1059	908	0	0	0	0	0	0	1.5000	5.3000	3.1059	976	0	0	0	0	0	0	2.0000	5.3000	3.1059
773	0	0	0	0	0	0	.50000	5.3000	3.4941	841	0	0	0	0	0	0	1.0000	5.3000	3.4941	909	0	0	0	0	0	0	1.5000	5.3000	3.4941	977	0	0	0	0	0	0	2.0000	5.3000	3.4941
774	0	0	0	0	0	0	.50000	5.3000	3.8824	842	0	0	0	0	0	0	1.0000	5.3000	3.8824	910	0	0	0	0	0	0	1.5000	5.3000	3.8824	978	0	0	0	0	0	0	2.0000	5.3000	3.8824
775	0	0	0	0	0	0	.50000	5.3000	4.2706	843	0	0	0	0	0	0	1.0000	5.3000	4.2706	911	0	0	0	0	0	0	1.5000	5.3000	4.2706	979	0	0	0	0	0	0	2.0000	5.3000	4.2706
776	0	0	0	0	0	0	.50000	5.3000	4.6588	844	0	0	0	0	0	0	1.0000	5.3000	4.6588	912	0	0	0	0	0	0	1.5000	5.3000	4.6588	980	0	0	0	0	0	0	2.0000	5.3000	4.6588
777	0	0	0	0	0	0	.50000	5.3000	5.0471	845	0	0	0	0	0	0	1.0000	5.3000	5.0471	913	0	0	0	0	0	0	1.5000	5.3000	5.0471	981	0	0	0	0	0	0	2.0000	5.3000	5.0471
778	0	0	0	0	0	0	.50000	5.3000	5.4353	846	0	0	0	0	0	0	1.0000	5.3000	5.4353	914	0	0	0	0	0	0	1.5000	5.3000	5.4353	982	0	0	0	0	0	0	2.0000	5.3000	5.4353
779	0	0	0	0	0	0	.50000	5.3000	5.8235	847	0	0	0	0	0	0	1.0000	5.3000	5.8235	915	0	0	0	0	0	0	1.5000	5.3000	5.8235	983	0	0	0	0	0	0	2.0000	5.3000	5.8235
780	0	0	0	0	0	0	.50000	5.3000	6.2118	848	0	0	0	0	0	0	1.0000	5.3000	6.2118	916	0	0	0	0	0	0	1.5000	5.3000	6.2118	984	0	0	0	0	0	0	2.0000	5.3000	6.2118
781	0	0	0	0	0	0	.50000	5.3000	6.6000	849	0	0	0	0	0	0	1.0000	5.3000	6.6000	917	0	0	0	0	0	0	1.5000	5.3000	6.6000	985	0	0	0	0	0	0	2.0000	5.3000	6.6000
782	0	0	0	0	0	0	.50000	5.3000	6.9882	850	0	0	0	0	0	0	1.0000	5.3000	6.9882	918	0	0	0	0	0	0	1.5000	5.3000											

1015	0	0	0	0	0	2.2500	5.3000	5.0471	1083	0	0	0	0	0	2.7500	5.3000	5.0471	1151	0	0	0	0	0	3.2500	5.3000	5.0471	1219	0	0	0	0	0	3.7500	5.3000	5.0471
1016	0	0	0	0	0	2.2500	5.3000	5.4353	1084	0	0	0	0	0	2.7500	5.3000	5.4353	1152	0	0	0	0	0	3.2500	5.3000	5.4353	1220	0	0	0	0	0	3.7500	5.3000	5.4353
1017	0	0	0	0	0	2.2500	5.3000	5.8235	1085	0	0	0	0	0	2.7500	5.3000	5.8235	1153	0	0	0	0	0	3.2500	5.3000	5.8235	1221	0	0	0	0	0	3.7500	5.3000	5.8235
1018	0	0	0	0	0	2.2500	5.3000	6.2118	1086	0	0	0	0	0	2.7500	5.3000	6.2118	1154	0	0	0	0	0	3.2500	5.3000	6.2118	1222	0	0	0	0	0	3.7500	5.3000	6.2118
1019	0	0	0	0	0	2.2500	5.3000	6.6000	1087	0	0	0	0	0	2.7500	5.3000	6.6000	1155	0	0	0	0	0	3.2500	5.3000	6.6000	1223	0	0	0	0	0	3.7500	5.3000	6.6000
1020	0	0	0	0	0	2.2500	5.3000	6.9882	1088	0	0	0	0	0	2.7500	5.3000	6.9882	1156	0	0	0	0	0	3.2500	5.3000	6.9882	1224	0	0	0	0	0	3.7500	5.3000	6.9882
1021	0	0	0	0	0	2.2500	5.3000	7.3765	1089	0	0	0	0	0	2.7500	5.3000	7.3765	1157	0	0	0	0	0	3.2500	5.3000	7.3765	1225	0	0	0	0	0	3.7500	5.3000	7.3765
1022	0	0	0	0	0	2.2500	5.3000	7.7647	1090	0	0	0	0	0	2.7500	5.3000	7.7647	1158	0	0	0	0	0	3.2500	5.3000	7.7647	1226	0	0	0	0	0	3.7500	5.3000	7.7647
1023	0	0	0	0	0	2.2500	5.3000	8.1529	1091	0	0	0	0	0	2.7500	5.3000	8.1529	1159	0	0	0	0	0	3.2500	5.3000	8.1529	1227	0	0	0	0	0	3.7500	5.3000	8.1529
1024	0	0	0	0	0	2.2500	5.3000	8.5412	1092	0	0	0	0	0	2.7500	5.3000	8.5412	1160	0	0	0	0	0	3.2500	5.3000	8.5412	1228	0	0	0	0	0	3.7500	5.3000	8.5412
1025	0	0	0	0	0	2.2500	5.3000	8.9294	1093	0	0	0	0	0	2.7500	5.3000	8.9294	1161	0	0	0	0	0	3.2500	5.3000	8.9294	1229	0	0	0	0	0	3.7500	5.3000	8.9294
1026	0	0	0	0	0	2.2500	5.3000	9.3176	1094	0	0	0	0	0	2.7500	5.3000	9.3176	1162	0	0	0	0	0	3.2500	5.3000	9.3176	1230	0	0	0	0	0	3.7500	5.3000	9.3176
1027	0	0	0	0	0	2.2500	5.3000	9.7059	1095	0	0	0	0	0	2.7500	5.3000	9.7059	1163	0	0	0	0	0	3.2500	5.3000	9.7059	1231	0	0	0	0	0	3.7500	5.3000	9.7059
1028	0	0	0	0	0	2.2500	5.3000	10.094	1096	0	0	0	0	0	2.7500	5.3000	10.094	1164	0	0	0	0	0	3.2500	5.3000	10.094	1232	0	0	0	0	0	3.7500	5.3000	10.094
1029	0	0	0	0	0	2.2500	5.3000	10.482	1097	0	0	0	0	0	2.7500	5.3000	10.482	1165	0	0	0	0	0	3.2500	5.3000	10.482	1233	0	0	0	0	0	3.7500	5.3000	10.482
1030	0	0	0	0	0	2.2500	5.3000	10.871	1098	0	0	0	0	0	2.7500	5.3000	10.871	1166	0	0	0	0	0	3.2500	5.3000	10.871	1234	0	0	0	0	0	3.7500	5.3000	10.871
1031	0	0	0	0	0	2.2500	5.3000	11.259	1099	0	0	0	0	0	2.7500	5.3000	11.259	1167	0	0	0	0	0	3.2500	5.3000	11.259	1235	0	0	0	0	0	3.7500	5.3000	11.259
1032	0	0	0	0	0	2.2500	5.3000	11.647	1100	0	0	0	0	0	2.7500	5.3000	11.647	1168	0	0	0	0	0	3.2500	5.3000	11.647	1236	0	0	0	0	0	3.7500	5.3000	11.647
1033	0	0	0	0	0	2.2500	5.3000	12.035	1101	0	0	0	0	0	2.7500	5.3000	12.035	1169	0	0	0	0	0	3.2500	5.3000	12.035	1237	0	0	0	0	0	3.7500	5.3000	12.035
1034	0	0	0	0	0	2.2500	5.3000	12.424	1102	0	0	0	0	0	2.7500	5.3000	12.424	1170	0	0	0	0	0	3.2500	5.3000	12.424	1238	0	0	0	0	0	3.7500	5.3000	12.424
1035	0	0	0	0	0	2.2500	5.3000	12.812	1103	0	0	0	0	0	2.7500	5.3000	12.812	1171	0	0	0	0	0	3.2500	5.3000	12.812	1239	0	0	0	0	0	3.7500	5.3000	12.812
1036	1	0	0	0	0	2.2500	5.3000	13.200	1104	1	0	0	0	0	2.7500	5.3000	13.200	1172	1	0	0	0	0	3.2500	5.3000	13.200	1240	1	0	0	0	0	3.7500	5.3000	13.200
1037	0	0	0	0	0	2.5000	5.3000	.38824	1105	0	0	0	0	0	3.0000	5.3000	.38824	1173	0	0	0	0	0	3.5000	5.3000	.38824	1241	0	0	0	0	0	4.0000	5.3000	.38824
1038	0	0	0	0	0	2.5000	5.3000	.77647	1106	0	0	0	0	0	3.0000	5.3000	.77647	1174	0	0	0	0	0	3.5000	5.3000	.77647	1242	0	0	0	0	0	4.0000	5.3000	.77647
1039	0	0	0	0	0	2.5000	5.3000	1.1647	1107	0	0	0	0	0	3.0000	5.3000	1.1647	1175	0	0	0	0	0	3.5000	5.3000	1.1647	1243	0	0	0	0	0	4.0000	5.3000	1.1647
1040	0	0	0	0	0	2.5000	5.3000	1.5529	1108	0	0	0	0	0	3.0000	5.3000	1.5529	1176	0	0	0	0	0	3.5000	5.3000	1.5529	1244	0	0	0	0	0	4.0000	5.3000	1.5529
1041	0	0	0	0	0	2.5000	5.3000	1.9412	1109	0	0	0	0	0	3.0000	5.3000	1.9412	1177	0	0	0	0	0	3.5000	5.3000	1.9412	1245	0	0	0	0	0	4.0000	5.3000	1.9412
1042	0	0	0	0	0	2.5000	5.3000	2.3294	1110	0	0	0	0	0	3.0000	5.3000	2.3294	1178	0	0	0	0	0	3.5000	5.3000	2.3294	1246	0	0	0	0	0	4.0000	5.3000	2.3294
1043	0	0	0	0	0	2.5000	5.3000	2.7176	1111	0	0	0	0	0	3.0000	5.3000	2.7176	1179	0	0	0	0	0	3.5000	5.3000	2.7176	1247	0	0	0	0	0	4.0000	5.3000	2.7176
1044	0	0	0	0	0	2.5000	5.3000	3.1059	1112	0	0	0	0	0	3.0000	5.3000	3.1059	1180	0	0	0	0	0	3.5000	5.3000	3.1059	1248	0	0	0	0	0	4.0000	5.3000	3.1059
1045	0	0	0	0	0	2.5000	5.3000	3.4941	1113	0	0	0	0	0	3.0000	5.3000	3.4941	1181	0	0	0	0	0	3.5000	5.3000	3.4941	1249	0	0	0	0	0	4.0000	5.3000	3.4941
1046	0	0	0	0	0	2.5000	5.3000	3.8824	1114	0	0	0	0	0	3.0000	5.3000	3.8824	1182	0	0	0	0	0	3.5000	5.3000	3.8824	1250	0	0	0	0	0	4.0000	5.3000	3.8824
1047	0	0	0	0	0	2.5000	5.3000	4.2706	1115	0	0	0	0	0	3.0000	5.3000	4.2706	1183	0	0	0	0	0	3.5000	5.3000	4.2706	1251	0	0	0	0	0	4.0000	5.3000	4.2706
1048	0	0	0	0	0	2.5000	5.3000	4.6588	1116	0	0	0	0	0	3.0000	5.3000	4.6588	1184	0	0	0	0	0	3.5000	5.3000	4.6588	1252	0	0	0	0	0	4.0000	5.3000	4.6588
1049	0	0	0	0	0	2.5000	5.3000	5.0471	1117	0	0	0	0	0	3.0000	5.3000	5.0471	1185	0	0	0	0	0	3.5000	5.3000	5.0471	1253	0	0	0	0	0	4.0000	5.3000	5.0471
1050	0	0	0	0	0	2.5000	5.3000	5.4353	1118	0	0	0	0	0	3.0000	5.3000	5.4353	1186	0	0	0	0	0	3.5000	5.3000	5.4353	1254	0	0	0	0	0	4.0000	5.3000	5.4353
1051	0	0	0	0	0	2.5000	5.3000	5.8235	1119	0	0	0	0	0	3.0000	5.3000	5.8235	1187	0	0	0	0	0	3.5000	5.3000	5.8235	1255	0	0	0	0	0	4.0000	5.3000	5.8235
1052	0	0	0	0	0	2.5000	5.3000	6.2118	1120	0	0	0	0	0	3.0000	5.3000	6.2118	1188	0	0	0	0	0	3.5000	5.3000	6.2118	1256	0	0	0	0	0	4.0000	5.3000	6.2118
1053	0	0	0	0	0	2.5000	5.3000	6.6000	1121	0	0	0	0	0	3.0000	5.3000	6.6000	1189	0	0	0	0	0	3.5000	5.3000	6.6000	1257	0	0	0	0	0	4.0000	5.3000	6.6000
1054	0	0	0	0	0	2.5000	5.3000	6.9882	1122	0	0	0	0	0	3.0000	5.3000	6.9882	1190	0	0	0	0	0	3.5000	5.3000	6.9882	1258	0	0	0	0	0	4.0000	5.3000	6.9882
1055	0	0	0	0	0	2.5000	5.3000	7.3765	1123	0	0	0	0	0	3.0000	5.3000	7.3765	1191	0	0	0	0	0	3.5000	5.3000	7.3765	1259	0	0	0	0	0	4.0000	5.3000	7.3765
1056	0	0	0	0	0	2.5000	5.3000	7.7647	1124	0	0	0	0	0	3.0000	5.3000	7.7647	1192	0	0	0	0	0	3.5000	5.3000	7.7647	1260	0	0	0	0	0	4.0000	5.3000	7.7647
1057	0	0	0	0	0	2.5000	5.3000	8.1529	1125	0	0	0	0	0	3.0000																				

2103	0	0	0	0	0	10.250	5.3000	5.0471	2171	0	0	0	0	0	10.750	5.3000	5.0471	2239	0	0	0	0	0	11.250	5.3000	5.0471	2307	0	0	0	0	0	11.750	5.3000	5.0471
2104	0	0	0	0	0	10.250	5.3000	5.4353	2172	0	0	0	0	0	10.750	5.3000	5.4353	2240	0	0	0	0	0	11.250	5.3000	5.4353	2308	0	0	0	0	0	11.750	5.3000	5.4353
2105	0	0	0	0	0	10.250	5.3000	5.8235	2173	0	0	0	0	0	10.750	5.3000	5.8235	2241	0	0	0	0	0	11.250	5.3000	5.8235	2309	0	0	0	0	0	11.750	5.3000	5.8235
2106	0	0	0	0	0	10.250	5.3000	6.2118	2174	0	0	0	0	0	10.750	5.3000	6.2118	2242	0	0	0	0	0	11.250	5.3000	6.2118	2310	0	0	0	0	0	11.750	5.3000	6.2118
2107	0	0	0	0	0	10.250	5.3000	6.6000	2175	0	0	0	0	0	10.750	5.3000	6.6000	2243	0	0	0	0	0	11.250	5.3000	6.6000	2311	0	0	0	0	0	11.750	5.3000	6.6000
2108	0	0	0	0	0	10.250	5.3000	6.9882	2176	0	0	0	0	0	10.750	5.3000	6.9882	2244	0	0	0	0	0	11.250	5.3000	6.9882	2312	0	0	0	0	0	11.750	5.3000	6.9882
2109	0	0	0	0	0	10.250	5.3000	7.3765	2177	0	0	0	0	0	10.750	5.3000	7.3765	2245	0	0	0	0	0	11.250	5.3000	7.3765	2313	0	0	0	0	0	11.750	5.3000	7.3765
2110	0	0	0	0	0	10.250	5.3000	7.7647	2178	0	0	0	0	0	10.750	5.3000	7.7647	2246	0	0	0	0	0	11.250	5.3000	7.7647	2314	0	0	0	0	0	11.750	5.3000	7.7647
2111	0	0	0	0	0	10.250	5.3000	8.1529	2179	0	0	0	0	0	10.750	5.3000	8.1529	2247	0	0	0	0	0	11.250	5.3000	8.1529	2315	0	0	0	0	0	11.750	5.3000	8.1529
2112	0	0	0	0	0	10.250	5.3000	8.5412	2180	0	0	0	0	0	10.750	5.3000	8.5412	2248	0	0	0	0	0	11.250	5.3000	8.5412	2316	0	0	0	0	0	11.750	5.3000	8.5412
2113	0	0	0	0	0	10.250	5.3000	8.9294	2181	0	0	0	0	0	10.750	5.3000	8.9294	2249	0	0	0	0	0	11.250	5.3000	8.9294	2317	0	0	0	0	0	11.750	5.3000	8.9294
2114	0	0	0	0	0	10.250	5.3000	9.3176	2182	0	0	0	0	0	10.750	5.3000	9.3176	2250	0	0	0	0	0	11.250	5.3000	9.3176	2318	0	0	0	0	0	11.750	5.3000	9.3176
2115	0	0	0	0	0	10.250	5.3000	9.7059	2183	0	0	0	0	0	10.750	5.3000	9.7059	2251	0	0	0	0	0	11.250	5.3000	9.7059	2319	0	0	0	0	0	11.750	5.3000	9.7059
2116	0	0	0	0	0	10.250	5.3000	10.094	2184	0	0	0	0	0	10.750	5.3000	10.094	2252	0	0	0	0	0	11.250	5.3000	10.094	2320	0	0	0	0	0	11.750	5.3000	10.094
2117	0	0	0	0	0	10.250	5.3000	10.482	2185	0	0	0	0	0	10.750	5.3000	10.482	2253	0	0	0	0	0	11.250	5.3000	10.482	2321	0	0	0	0	0	11.750	5.3000	10.482
2118	0	0	0	0	0	10.250	5.3000	10.871	2186	0	0	0	0	0	10.750	5.3000	10.871	2254	0	0	0	0	0	11.250	5.3000	10.871	2322	0	0	0	0	0	11.750	5.3000	10.871
2119	0	0	0	0	0	10.250	5.3000	11.259	2187	0	0	0	0	0	10.750	5.3000	11.259	2255	0	0	0	0	0	11.250	5.3000	11.259	2323	0	0	0	0	0	11.750	5.3000	11.259
2120	0	0	0	0	0	10.250	5.3000	11.647	2188	0	0	0	0	0	10.750	5.3000	11.647	2256	0	0	0	0	0	11.250	5.3000	11.647	2324	0	0	0	0	0	11.750	5.3000	11.647
2121	0	0	0	0	0	10.250	5.3000	12.035	2189	0	0	0	0	0	10.750	5.3000	12.035	2257	0	0	0	0	0	11.250	5.3000	12.035	2325	0	0	0	0	0	11.750	5.3000	12.035
2122	0	0	0	0	0	10.250	5.3000	12.424	2190	0	0	0	0	0	10.750	5.3000	12.424	2258	0	0	0	0	0	11.250	5.3000	12.424	2326	0	0	0	0	0	11.750	5.3000	12.424
2123	0	0	0	0	0	10.250	5.3000	12.812	2191	0	0	0	0	0	10.750	5.3000	12.812	2259	0	0	0	0	0	11.250	5.3000	12.812	2327	0	0	0	0	0	11.750	5.3000	12.812
2124	1	0	0	0	0	10.250	5.3000	13.200	2192	1	0	0	0	0	10.750	5.3000	13.200	2260	1	0	0	0	0	11.250	5.3000	13.200	2328	1	0	0	0	0	11.750	5.3000	13.200
2125	0	0	0	0	0	10.500	5.3000	.38824	2193	0	0	0	0	0	11.000	5.3000	.38824	2261	0	0	0	0	0	11.500	5.3000	.38824	2329	0	0	0	0	0	12.000	5.3000	.38824
2126	0	0	0	0	0	10.500	5.3000	.77647	2194	0	0	0	0	0	11.000	5.3000	.77647	2262	0	0	0	0	0	11.500	5.3000	.77647	2330	0	0	0	0	0	12.000	5.3000	.77647
2127	0	0	0	0	0	10.500	5.3000	1.1647	2195	0	0	0	0	0	11.000	5.3000	1.1647	2263	0	0	0	0	0	11.500	5.3000	1.1647	2331	0	0	0	0	0	12.000	5.3000	1.1647
2128	0	0	0	0	0	10.500	5.3000	1.5529	2196	0	0	0	0	0	11.000	5.3000	1.5529	2264	0	0	0	0	0	11.500	5.3000	1.5529	2332	0	0	0	0	0	12.000	5.3000	1.5529
2129	0	0	0	0	0	10.500	5.3000	1.9412	2197	0	0	0	0	0	11.000	5.3000	1.9412	2265	0	0	0	0	0	11.500	5.3000	1.9412	2333	0	0	0	0	0	12.000	5.3000	1.9412
2130	0	0	0	0	0	10.500	5.3000	2.3294	2198	0	0	0	0	0	11.000	5.3000	2.3294	2266	0	0	0	0	0	11.500	5.3000	2.3294	2334	0	0	0	0	0	12.000	5.3000	2.3294
2131	0	0	0	0	0	10.500	5.3000	2.7176	2199	0	0	0	0	0	11.000	5.3000	2.7176	2267	0	0	0	0	0	11.500	5.3000	2.7176	2335	0	0	0	0	0	12.000	5.3000	2.7176
2132	0	0	0	0	0	10.500	5.3000	3.1059	2200	0	0	0	0	0	11.000	5.3000	3.1059	2268	0	0	0	0	0	11.500	5.3000	3.1059	2336	0	0	0	0	0	12.000	5.3000	3.1059
2133	0	0	0	0	0	10.500	5.3000	3.4941	2201	0	0	0	0	0	11.000	5.3000	3.4941	2269	0	0	0	0	0	11.500	5.3000	3.4941	2337	0	0	0	0	0	12.000	5.3000	3.4941
2134	0	0	0	0	0	10.500	5.3000	3.8824	2202	0	0	0	0	0	11.000	5.3000	3.8824	2270	0	0	0	0	0	11.500	5.3000	3.8824	2338	0	0	0	0	0	12.000	5.3000	3.8824
2135	0	0	0	0	0	10.500	5.3000	4.2706	2203	0	0	0	0	0	11.000	5.3000	4.2706	2271	0	0	0	0	0	11.500	5.3000	4.2706	2339	0	0	0	0	0	12.000	5.3000	4.2706
2136	0	0	0	0	0	10.500	5.3000	4.6588	2204	0	0	0	0	0	11.000	5.3000	4.6588	2272	0	0	0	0	0	11.500	5.3000	4.6588	2340	0	0	0	0	0	12.000	5.3000	4.6588
2137	0	0	0	0	0	10.500	5.3000	5.0471	2205	0	0	0	0	0	11.000	5.3000	5.0471	2273	0	0	0	0	0	11.500	5.3000	5.0471	2341	0	0	0	0	0	12.000	5.3000	5.0471
2138	0	0	0	0	0	10.500	5.3000	5.4353	2206	0	0	0	0	0	11.000	5.3000	5.4353	2274	0	0	0	0	0	11.500	5.3000	5.4353	2342	0	0	0	0	0	12.000	5.3000	5.4353
2139	0	0	0	0	0	10.500	5.3000	5.8235	2207	0	0	0	0	0	11.000	5.3000	5.8235	2275	0	0	0	0	0	11.500	5.3000	5.8235	2343	0	0	0	0	0	12.000	5.3000	5.8235
2140	0	0	0	0	0	10.500	5.3000	6.2118	2208	0	0	0	0	0	11.000	5.3000	6.2118	2276	0	0	0	0	0	11.500	5.3000	6.2118	2344	0	0	0	0	0	12.000	5.3000	6.2118
2141	0	0	0	0	0	10.500	5.3000	6.6000	2209	0	0	0	0	0	11.000	5.3000	6.6000	2277	0	0	0	0	0	11.500	5.3000	6.6000	2345	0	0	0	0	0	12.000	5.3000	6.6000
2142	0	0	0	0	0	10.500	5.3000	6.9882	2210	0	0	0	0	0	11.000	5.3000	6.9882	2278	0	0	0	0	0	11.500	5.3000	6.9882	2346	0	0	0	0	0	12.000	5.3000	6.9882
2143	0	0	0	0	0	10.500	5.3000	7.3765	2211	0	0	0	0	0	11.000	5.3000	7.3765	2279	0	0	0	0	0	11.500	5.3000	7.3765	2347	0	0	0	0	0	12.000	5.3000	7.3765
2144	0	0	0	0	0	10.500	5.3000	7.7647	2212	0	0	0	0	0	11.000	5.3000	7.7647	2280	0	0	0	0	0	11.500	5.3000	7.7647	2348	0	0	0	0	0	12.000	5.3000	7.7647
2145	0	0	0	0	0	10.500	5.3000	8.1529	2213	0	0	0	0	0	11.000																				

2375	0	0	0	0	0	12.250	5.3000	5.0471	2443	0	0	0	0	0	12.750	5.3000	5.0471	2511	0	0	0	0	0	13.250	5.3000	5.0471	2579	0	0	0	0	0	13.750	5.3000	5.0471
2376	0	0	0	0	0	12.250	5.3000	5.4353	2444	0	0	0	0	0	12.750	5.3000	5.4353	2512	0	0	0	0	0	13.250	5.3000	5.4353	2580	0	0	0	0	0	13.750	5.3000	5.4353
2377	0	0	0	0	0	12.250	5.3000	5.8235	2445	0	0	0	0	0	12.750	5.3000	5.8235	2513	0	0	0	0	0	13.250	5.3000	5.8235	2581	0	0	0	0	0	13.750	5.3000	5.8235
2378	0	0	0	0	0	12.250	5.3000	6.2118	2446	0	0	0	0	0	12.750	5.3000	6.2118	2514	0	0	0	0	0	13.250	5.3000	6.2118	2582	0	0	0	0	0	13.750	5.3000	6.2118
2379	0	0	0	0	0	12.250	5.3000	6.6000	2447	0	0	0	0	0	12.750	5.3000	6.6000	2515	0	0	0	0	0	13.250	5.3000	6.6000	2583	0	0	0	0	0	13.750	5.3000	6.6000
2380	0	0	0	0	0	12.250	5.3000	6.9882	2448	0	0	0	0	0	12.750	5.3000	6.9882	2516	0	0	0	0	0	13.250	5.3000	6.9882	2584	0	0	0	0	0	13.750	5.3000	6.9882
2381	0	0	0	0	0	12.250	5.3000	7.3765	2449	0	0	0	0	0	12.750	5.3000	7.3765	2517	0	0	0	0	0	13.250	5.3000	7.3765	2585	0	0	0	0	0	13.750	5.3000	7.3765
2382	0	0	0	0	0	12.250	5.3000	7.7647	2450	0	0	0	0	0	12.750	5.3000	7.7647	2518	0	0	0	0	0	13.250	5.3000	7.7647	2586	0	0	0	0	0	13.750	5.3000	7.7647
2383	0	0	0	0	0	12.250	5.3000	8.1529	2451	0	0	0	0	0	12.750	5.3000	8.1529	2519	0	0	0	0	0	13.250	5.3000	8.1529	2587	0	0	0	0	0	13.750	5.3000	8.1529
2384	0	0	0	0	0	12.250	5.3000	8.5412	2452	0	0	0	0	0	12.750	5.3000	8.5412	2520	0	0	0	0	0	13.250	5.3000	8.5412	2588	0	0	0	0	0	13.750	5.3000	8.5412
2385	0	0	0	0	0	12.250	5.3000	8.9294	2453	0	0	0	0	0	12.750	5.3000	8.9294	2521	0	0	0	0	0	13.250	5.3000	8.9294	2589	0	0	0	0	0	13.750	5.3000	8.9294
2386	0	0	0	0	0	12.250	5.3000	9.3176	2454	0	0	0	0	0	12.750	5.3000	9.3176	2522	0	0	0	0	0	13.250	5.3000	9.3176	2590	0	0	0	0	0	13.750	5.3000	9.3176
2387	0	0	0	0	0	12.250	5.3000	9.7059	2455	0	0	0	0	0	12.750	5.3000	9.7059	2523	0	0	0	0	0	13.250	5.3000	9.7059	2591	0	0	0	0	0	13.750	5.3000	9.7059
2388	0	0	0	0	0	12.250	5.3000	10.094	2456	0	0	0	0	0	12.750	5.3000	10.094	2524	0	0	0	0	0	13.250	5.3000	10.094	2592	0	0	0	0	0	13.750	5.3000	10.094
23																																			

2647	0	0	0	0	0	0	14.250	5.3000	5.0471	2715	1	0	0	0	0	0	1.0000	3.8545	13.200	2783	1	0	0	0	0	0	2.5000	2.8909	13.200	2851	1	0	0	0	0	0	4.0000	1.9273	13.200
2648	0	0	0	0	0	0	14.250	5.3000	5.4353	2716	1	0	0	0	0	0	1.0000	3.3727	13.200	2784	1	0	0	0	0	0	2.5000	2.4091	13.200	2852	1	0	0	0	0	0	4.0000	1.4455	13.200
2649	0	0	0	0	0	0	14.250	5.3000	5.8235	2717	1	0	0	0	0	0	1.0000	2.8909	13.200	2785	1	0	0	0	0	0	2.5000	1.9273	13.200	2853	1	0	0	0	0	0	4.0000	.96364	13.200
2650	0	0	0	0	0	0	14.250	5.3000	6.2118	2718	1	0	0	0	0	0	1.0000	2.4091	13.200	2786	1	0	0	0	0	0	2.5000	1.4455	13.200	2854	1	0	0	0	0	0	4.0000	.48182	13.200
2651	0	0	0	0	0	0	14.250	5.3000	6.6000	2719	1	0	0	0	0	0	1.0000	1.9273	13.200	2787	1	0	0	0	0	0	2.5000	.96364	13.200	2855	1	0	0	0	0	0	4.0000	-.63181E-06	13.200
2652	0	0	0	0	0	0	14.250	5.3000	6.9882	2720	1	0	0	0	0	0	1.0000	1.4455	13.200	2788	1	0	0	0	0	0	2.5000	.48182	13.200	2856	1	0	0	0	0	0	4.2500	.48182	13.200
2653	0	0	0	0	0	0	14.250	5.3000	7.3765	2721	1	0	0	0	0	0	1.0000	.96364	13.200	2789	1	0	0	0	0	0	2.5000	-.63181E-06	13.200	2857	1	0	0	0	0	0	4.2500	.43364	13.200
2654	0	0	0	0	0	0	14.250	5.3000	7.7647	2722	1	0	0	0	0	0	1.0000	.48182	13.200	2790	1	0	0	0	0	0	2.7500	.48182	13.200	2858	1	0	0	0	0	0	4.2500	3.8545	13.200
2655	0	0	0	0	0	0	14.250	5.3000	8.1529	2723	1	0	0	0	0	0	1.0000	-.63181E-06	13.200	2791	1	0	0	0	0	0	2.7500	.43364	13.200	2859	1	0	0	0	0	0	4.2500	3.3727	13.200
2656	0	0	0	0	0	0	14.250	5.3000	8.5412	2724	1	0	0	0	0	0	1.2500	.48182	13.200	2792	1	0	0	0	0	0	2.7500	3.8545	13.200	2860	1	0	0	0	0	0	4.2500	2.8909	13.200
2657	0	0	0	0	0	0	14.250	5.3000	8.9294	2725	1	0	0	0	0	0	1.2500	4.3364	13.200	2793	1	0	0	0	0	0	2.7500	3.3727	13.200	2861	1	0	0	0	0	0	4.2500	2.4091	13.200
2658	0	0	0	0	0	0	14.250	5.3000	9.3176	2726	1	0	0	0	0	0	1.2500	3.8545	13.200	2794	1	0	0	0	0	0	2.7500	2.8909	13.200	2862	1	0	0	0	0	0	4.2500	1.9273	13.200
2659	0	0	0	0	0	0	14.250	5.3000	9.7059	2727	1	0	0	0	0	0	1.2500	3.3727	13.200	2795	1	0	0	0	0	0	2.7500	2.4091	13.200	2863	1	0	0	0	0	0	4.2500	1.4455	13.200
2660	0	0	0	0	0	0	14.250	5.3000	10.094	2728	1	0	0	0	0	0	1.2500	2.8909	13.200	2796	1	0	0	0	0	0	2.7500	1.9273	13.200	2864	1	0	0	0	0	0	4.2500	.96364	13.200
2661	0	0	0	0	0	0	14.250	5.3000	10.482	2729	1	0	0	0	0	0	1.2500	2.4091	13.200	2797	1	0	0	0	0	0	2.7500	1.4455	13.200	2865	1	0	0	0	0	0	4.2500	.48182	13.200
2662	0	0	0	0	0	0	14.250	5.3000	10.871	2730	1	0	0	0	0	0	1.2500	1.9273	13.200	2798	1	0	0	0	0	0	2.7500	.96364	13.200	2866	1	0	0	0	0	0	4.2500	-.63181E-06	13.200
2663	0	0	0	0	0	0	14.250	5.3000	11.259	2731	1	0	0	0	0	0	1.2500	1.4455	13.200	2799	1	0	0	0	0	0	2.7500	.48182	13.200	2867	1	0	0	0	0	0	4.5000	.48182	13.200
2664	0	0	0	0	0	0	14.250	5.3000	11.647	2732	1	0	0	0	0	0	1.2500	.96364	13.200	2800	1	0	0	0	0	0	2.7500	-.63181E-06	13.200	2868	1	0	0	0	0	0	4.5000	.43364	13.200
2665	0	0	0	0	0	0	14.250	5.3000	12.035	2733	1	0	0	0	0	0	1.2500	.48182	13.200	2801	1	0	0	0	0	0	3.0000	.48182	13.200	2869	1	0	0	0	0	0	4.5000	3.8545	13.200
2666	0	0	0	0	0	0	14.250	5.3000	12.424	2734	1	0	0	0	0	0	1.2500	-.63181E-06	13.200	2802	1	0	0	0	0	0	3.0000	.43364	13.200	2870	1	0	0	0	0	0	4.5000	3.3727	13.200
2667	0	0	0	0	0	0	14.250	5.3000	12.812	2735	1	0	0	0	0	0	1.5000	.48182	13.200	2803	1	0	0	0	0	0	3.0000	3.8545	13.200	2871	1	0	0	0	0	0	4.5000	2.8909	13.200
2668	1	0	0	0	0	0	14.250	5.3000	13.200	2736	1	0	0	0	0	0	1.5000	4.3364	13.200	2804	1	0	0	0	0	0	3.0000	3.3727	13.200	2872	1	0	0	0	0	0	4.5000	2.4091	13.200
2669	1	0	0	0	0	0	-.57699E-06	.48182	13.200	2737	1	0	0	0	0	0	1.5000	3.8545	13.200	2805	1	0	0	0	0	0	3.0000	2.8909	13.200	2873	1	0	0	0	0	0	4.5000	1.9273	13.200
2670	1	0	0	0	0	0	-.57699E-06	.43364	13.200	2738	1	0	0	0	0	0	1.5000	3.3727	13.200	2806	1	0	0	0	0	0	3.0000	2.4091	13.200	2874	1	0	0	0	0	0	4.5000	1.4455	13.200
2671	1	0	0	0	0	0	-.57699E-06	3.8545	13.200	2739	1	0	0	0	0	0	1.5000	2.8909	13.200	2807	1	0	0	0	0	0	3.0000	1.9273	13.200	2875	1	0	0	0	0	0	4.5000	.96364	13.200
2672	1	0	0	0	0	0	-.57699E-06	3.3727	13.200	2740	1	0	0	0	0	0	1.5000	2.4091	13.200	2808	1	0	0	0	0	0	3.0000	1.4455	13.200	2876	1	0	0	0	0	0	4.5000	.48182	13.200
2673	1	0	0	0	0	0	-.57699E-06	2.8909	13.200	2741	1	0	0	0	0	0	1.5000	1.9273	13.200	2809	1	0	0	0	0	0	3.0000	.96364	13.200	2877	1	0	0	0	0	0	4.5000	-.63181E-06	13.200
2674	1	0	0	0	0	0	-.57699E-06	2.4091	13.200	2742	1	0	0	0	0	0	1.5000	1.4455	13.200	2810	1	0	0	0	0	0	3.0000	.48182	13.200	2878	1	0	0	0	0	0	4.7500	.48182	13.200
2675	1	0	0	0	0	0	-.57699E-06	1.9273	13.200	2743	1	0	0	0	0	0	1.5000	.96364	13.200	2811	1	0	0	0	0	0	3.0000	-.63181E-06	13.200	2879	1	0	0	0	0	0	4.7500	.43364	13.200
2676	1	0	0	0	0	0	-.57699E-06	1.4455	13.200	2744	1	0	0	0	0	0	1.5000	.48182	13.200	2812	1	0	0	0	0	0	3.2500	.48182	13.200	2880	1	0	0	0	0	0	4.7500	3.8545	13.200
2677	1	0	0	0	0	0	-.57699E-06	.96364	13.200	2745	1	0	0	0	0	0	1.5000	-.63181E-06	13.200	2813	1	0	0	0	0	0	3.2500	.43364	13.200	2881	1	0	0	0	0	0	4.7500	3.3727	13.200
2678	1	0	0	0	0	0	-.57699E-06	.48182	13.200	2746	1	0	0	0	0	0	1.7500	.48182	13.200	2814	1	0	0	0	0	0	3.2500	3.8545	13.200	2882	1	0	0	0	0	0	4.7500	2.8909	13.200
2679	1	0	0	0	0	0	-.57699E-06	-.63181E-06	13.200	2747	1	0	0	0	0	0	1.7500	4.3364	13.200	2815	1	0	0	0	0	0	3.2500	3.3727	13.200	2883	1	0	0	0	0	0	4.7500	2.4091	13.200
2680	1	0	0	0	0	0	.25000	.48182	13.200	2748	1	0	0	0	0	0	1.7500	3.8545	13.200	2816	1	0	0	0	0	0	3.2500	2.8909	13.200	2884	1	0	0	0	0	0	4.7500	1.9273	13.200
2681	1	0	0	0	0	0	.25000	.43364	13.200	2749	1	0	0	0	0	0	1.7500	3.3727	13.200	2817	1	0	0	0	0	0	3.2500	2.4091	13.200	2885	1	0	0	0	0	0	4.7500	1.4455	13.200
2682	1	0	0	0	0	0	.25000	3.8545	13.200	2750	1	0	0	0	0	0	1.7500	2.8909	13.200	2818	1	0	0	0	0	0	3.2500	1.9273	13.200	2886	1	0	0	0	0	0	4.7500	.96364	13.200
2683	1	0	0	0	0	0	.25000	3.3727	13.200	2751	1	0	0	0	0	0	1.7500	2.4091	13.200	2819	1	0	0	0	0	0	3.2500	1.4455	13.200	2887	1	0	0	0	0	0	4.7500	.48182	13.200
2684	1	0	0	0	0	0	.25000	2.8909	13.200	2752	1	0	0	0	0	0	1.7500	1.9273	13.200	2820	1	0	0	0	0	0	3.2500	.96364	13.200	2888	1	0	0	0	0	0	4.7500	-.63181E-06	13.200
2685	1	0	0	0	0	0	.25000	2.4091	13.200	2753	1	0	0	0	0	0	1.7500	1.4455	13.200	2821	1	0	0	0	0	0	3.2500	.48182	13.200	2889	1	0	0	0					

2919	1	0	0	0	0	5.5000	.96364	13.200	2987	1	0	0	0	0	7.0000	-.63181E-06	13.200	3055	1	0	0	0	0	8.7500	4.3364	13.200	3123	1	0	0	0	0	10.250	3.3727	13.200
2920	1	0	0	0	0	5.5000	.48182	13.200	2988	1	0	0	0	0	7.2500	4.8182	13.200	3056	1	0	0	0	0	8.7500	3.8545	13.200	3124	1	0	0	0	0	10.250	2.8909	13.200
2921	1	0	0	0	0	5.5000	-.63181E-06	13.200	2989	1	0	0	0	0	7.2500	4.3364	13.200	3057	1	0	0	0	0	8.7500	3.3727	13.200	3125	1	0	0	0	0	10.250	2.4091	13.200
2922	1	0	0	0	0	5.7500	4.8182	13.200	2990	1	0	0	0	0	7.2500	3.8545	13.200	3058	1	0	0	0	0	8.7500	2.8909	13.200	3126	1	0	0	0	0	10.250	1.9273	13.200
2923	1	0	0	0	0	5.7500	4.3364	13.200	2991	1	0	0	0	0	7.2500	3.3727	13.200	3059	1	0	0	0	0	8.7500	2.4091	13.200	3127	1	0	0	0	0	10.250	1.4455	13.200
2924	1	0	0	0	0	5.7500	3.8545	13.200	2992	1	0	0	0	0	7.2500	2.8909	13.200	3060	1	0	0	0	0	8.7500	1.9273	13.200	3128	1	0	0	0	0	10.250	.96364	13.200
2925	1	0	0	0	0	5.7500	3.3727	13.200	2993	1	0	0	0	0	7.2500	2.4091	13.200	3061	1	0	0	0	0	8.7500	1.4455	13.200	3129	1	0	0	0	0	10.250	.48182	13.200
2926	1	0	0	0	0	5.7500	2.8909	13.200	2994	1	0	0	0	0	7.2500	1.9273	13.200	3062	1	0	0	0	0	8.7500	.96364	13.200	3130	1	0	0	0	0	10.250	-.63181E-06	13.200
2927	1	0	0	0	0	5.7500	2.4091	13.200	2995	1	0	0	0	0	7.2500	1.4455	13.200	3063	1	0	0	0	0	8.7500	.48182	13.200	3131	1	0	0	0	0	10.500	4.8182	13.200
2928	1	0	0	0	0	5.7500	1.9273	13.200	2996	1	0	0	0	0	7.2500	.96364	13.200	3064	1	0	0	0	0	8.7500	-.63181E-06	13.200	3132	1	0	0	0	0	10.500	4.3364	13.200
2929	1	0	0	0	0	5.7500	1.4455	13.200	2997	1	0	0	0	0	7.2500	.48182	13.200	3065	1	0	0	0	0	9.0000	4.8182	13.200	3133	1	0	0	0	0	10.500	3.8545	13.200
2930	1	0	0	0	0	5.7500	.96364	13.200	2998	1	0	0	0	0	7.2500	-.63181E-06	13.200	3066	1	0	0	0	0	9.0000	4.3364	13.200	3134	1	0	0	0	0	10.500	3.3727	13.200
2931	1	0	0	0	0	5.7500	.48182	13.200	2999	1	0	0	0	0	7.5000	4.8182	13.200	3067	1	0	0	0	0	9.0000	3.8545	13.200	3135	1	0	0	0	0	10.500	2.8909	13.200
2932	1	0	0	0	0	5.7500	-.63181E-06	13.200	3000	1	0	0	0	0	7.5000	4.3364	13.200	3068	1	0	0	0	0	9.0000	3.3727	13.200	3136	1	0	0	0	0	10.500	2.4091	13.200
2933	1	0	0	0	0	6.0000	4.8182	13.200	3001	1	0	0	0	0	7.5000	3.8545	13.200	3069	1	0	0	0	0	9.0000	2.8909	13.200	3137	1	0	0	0	0	10.500	1.9273	13.200
2934	1	0	0	0	0	6.0000	4.3364	13.200	3002	1	0	0	0	0	7.5000	3.3727	13.200	3070	1	0	0	0	0	9.0000	2.4091	13.200	3138	1	0	0	0	0	10.500	1.4455	13.200
2935	1	0	0	0	0	6.0000	3.8545	13.200	3003	1	0	0	0	0	7.5000	2.8909	13.200	3071	1	0	0	0	0	9.0000	1.9273	13.200	3139	1	0	0	0	0	10.500	.96364	13.200
2936	1	0	0	0	0	6.0000	3.3727	13.200	3004	1	0	0	0	0	7.5000	2.4091	13.200	3072	1	0	0	0	0	9.0000	1.4455	13.200	3140	1	0	0	0	0	10.500	.48182	13.200
2937	1	0	0	0	0	6.0000	2.8909	13.200	3005	1	0	0	0	0	7.5000	1.9273	13.200	3073	1	0	0	0	0	9.0000	.96364	13.200	3141	1	0	0	0	0	10.500	-.63181E-06	13.200
2938	1	0	0	0	0	6.0000	2.4091	13.200	3006	1	0	0	0	0	7.5000	1.4455	13.200	3074	1	0	0	0	0	9.0000	.48182	13.200	3142	1	0	0	0	0	10.750	4.8182	13.200
2939	1	0	0	0	0	6.0000	1.9273	13.200	3007	1	0	0	0	0	7.5000	.96364	13.200	3075	1	0	0	0	0	9.0000	-.63181E-06	13.200	3143	1	0	0	0	0	10.750	4.3364	13.200
2940	1	0	0	0	0	6.0000	1.4455	13.200	3008	1	0	0	0	0	7.5000	.48182	13.200	3076	1	0	0	0	0	9.2500	4.8182	13.200	3144	1	0	0	0	0	10.750	3.8545	13.200
2941	1	0	0	0	0	6.0000	.96364	13.200	3009	1	0	0	0	0	7.5000	-.63181E-06	13.200	3077	1	0	0	0	0	9.2500	4.3364	13.200	3145	1	0	0	0	0	10.750	3.3727	13.200
2942	1	0	0	0	0	6.0000	.48182	13.200	3010	1	0	0	0	0	7.7500	4.8182	13.200	3078	1	0	0	0	0	9.2500	3.8545	13.200	3146	1	0	0	0	0	10.750	2.8909	13.200
2943	1	0	0	0	0	6.0000	-.63181E-06	13.200	3011	1	0	0	0	0	7.7500	4.3364	13.200	3079	1	0	0	0	0	9.2500	3.3727	13.200	3147	1	0	0	0	0	10.750	2.4091	13.200
2944	1	0	0	0	0	6.2500	4.8182	13.200	3012	1	0	0	0	0	7.7500	3.8545	13.200	3080	1	0	0	0	0	9.2500	2.8909	13.200	3148	1	0	0	0	0	10.750	1.9273	13.200
2945	1	0	0	0	0	6.2500	4.3364	13.200	3013	1	0	0	0	0	7.7500	3.3727	13.200	3081	1	0	0	0	0	9.2500	2.4091	13.200	3149	1	0	0	0	0	10.750	1.4455	13.200
2946	1	0	0	0	0	6.2500	3.8545	13.200	3014	1	0	0	0	0	7.7500	2.8909	13.200	3082	1	0	0	0	0	9.2500	1.9273	13.200	3150	1	0	0	0	0	10.750	.96364	13.200
2947	1	0	0	0	0	6.2500	3.3727	13.200	3015	1	0	0	0	0	7.7500	2.4091	13.200	3083	1	0	0	0	0	9.2500	1.4455	13.200	3151	1	0	0	0	0	10.750	.48182	13.200
2948	1	0	0	0	0	6.2500	2.8909	13.200	3016	1	0	0	0	0	7.7500	1.9273	13.200	3084	1	0	0	0	0	9.2500	.96364	13.200	3152	1	0	0	0	0	10.750	-.63181E-06	13.200
2949	1	0	0	0	0	6.2500	2.4091	13.200	3017	1	0	0	0	0	7.7500	1.4455	13.200	3085	1	0	0	0	0	9.2500	.48182	13.200	3153	1	0	0	0	0	11.000	4.8182	13.200
2950	1	0	0	0	0	6.2500	1.9273	13.200	3018	1	0	0	0	0	7.7500	.96364	13.200	3086	1	0	0	0	0	9.2500	-.63181E-06	13.200	3154	1	0	0	0	0	11.000	4.3364	13.200
2951	1	0	0	0	0	6.2500	1.4455	13.200	3019	1	0	0	0	0	7.7500	.48182	13.200	3087	1	0	0	0	0	9.5000	4.8182	13.200	3155	1	0	0	0	0	11.000	3.8545	13.200
2952	1	0	0	0	0	6.2500	.96364	13.200	3020	1	0	0	0	0	7.7500	-.63181E-06	13.200	3088	1	0	0	0	0	9.5000	4.3364	13.200	3156	1	0	0	0	0	11.000	3.3727	13.200
2953	1	0	0	0	0	6.2500	.48182	13.200	3021	1	0	0	0	0	8.0000	4.8182	13.200	3089	1	0	0	0	0	9.5000	3.8545	13.200	3157	1	0	0	0	0	11.000	2.8909	13.200
2954	1	0	0	0	0	6.2500	-.63181E-06	13.200	3022	1	0	0	0	0	8.0000	4.3364	13.200	3090	1	0	0	0	0	9.5000	3.3727	13.200	3158	1	0	0	0	0	11.000	2.4091	13.200
2955	1	0	0	0	0	6.5000	4.8182	13.200	3023	1	0	0	0	0	8.0000	3.8545	13.200	3091	1	0	0	0	0	9.5000	2.8909	13.200	3159	1	0	0	0	0	11.000	1.9273	13.200
2956	1	0	0	0	0	6.5000	4.3364	13.200	3024	1	0	0	0	0	8.0000	3.3727	13.200	3092	1	0	0	0	0	9.5000	2.4091	13.200	3160	1	0	0	0	0	11.000	1.4455	13.200
2957	1	0	0	0	0	6.5000	3.8545	13.200	3025	1	0	0	0	0	8.0000	2.8909	13.200	3093	1	0	0	0	0	9.5000	1.9273	13.200	3161	1	0	0	0	0	11.000	.96364	13.200
2958	1	0	0	0	0	6.5000	3.3727	13.200	3026	1	0	0	0	0	8.0000	2.4091	13.200	3094	1	0	0	0	0	9.5000	1.4455	13.200	3162	1	0	0	0	0	11.000	.48182	13.200
2959	1	0	0	0	0	6.5000	2.8909	13.200	3027	1	0	0	0	0	8.0000	1.9273	13.200	3095	1	0	0	0	0	9.5000	.96364	13.200	3163	1	0	0	0	0	11.000	-.63181E-06	13.200
2960	1	0	0	0	0	6.5000	2.4091	13.200	3028	1	0	0	0	0	8.0000	1.4455	13.200	3096	1	0	0	0	0	9.5000	.48182	13.200	3164	1	0	0	0	0	11.250	4.8182	13.200
2961	1																																		

3191	1	0	0	0	0	0	11.750	2.4091	13.200	3259	1	0	0	0	0	0	13.250	1.4455	13.200	3327	0	0	0	0	0	0	-0.35638E-06	.00000	8.1529	3395	0	0	0	0	0	0	.50000	.00000	8.9294
3192	1	0	0	0	0	0	11.750	1.9273	13.200	3260	1	0	0	0	0	0	13.250	.96364	13.200	3328	0	0	0	0	0	0	-0.37335E-06	.00000	8.5412	3396	0	0	0	0	0	0	.50000	.00000	9.3176
3193	1	0	0	0	0	0	11.750	1.4455	13.200	3261	1	0	0	0	0	0	13.250	.48182	13.200	3329	0	0	0	0	0	0	-0.39032E-06	.00000	8.9294	3397	0	0	0	0	0	0	.50000	.00000	9.7059
3194	1	0	0	0	0	0	11.750	.96364	13.200	3262	1	0	0	0	0	0	13.250	-.63181E-06	13.200	3330	0	0	0	0	0	0	-0.40729E-06	.00000	9.3176	3398	0	0	0	0	0	0	.50000	.00000	10.094
3195	1	0	0	0	0	0	11.750	.48182	13.200	3263	1	0	0	0	0	0	13.500	4.8182	13.200	3331	0	0	0	0	0	0	-0.42426E-06	.00000	9.7059	3399	0	0	0	0	0	0	.50000	.00000	10.482
3196	1	0	0	0	0	0	11.750	-.63181E-06	13.200	3264	1	0	0	0	0	0	13.500	4.3364	13.200	3332	0	0	0	0	0	0	-0.44123E-06	.00000	10.094	3400	0	0	0	0	0	0	.50000	.00000	10.871
3197	1	0	0	0	0	0	12.000	4.8182	13.200	3265	1	0	0	0	0	0	13.500	3.8545	13.200	3333	0	0	0	0	0	0	-0.45820E-06	.00000	10.482	3401	0	0	0	0	0	0	.50000	.00000	11.259
3198	1	0	0	0	0	0	12.000	4.3364	13.200	3266	1	0	0	0	0	0	13.500	3.3727	13.200	3334	0	0	0	0	0	0	-0.47517E-06	.00000	10.871	3402	0	0	0	0	0	0	.50000	.00000	11.647
3199	1	0	0	0	0	0	12.000	3.8545	13.200	3267	1	0	0	0	0	0	13.500	2.8909	13.200	3335	0	0	0	0	0	0	-0.49214E-06	.00000	11.259	3403	0	0	0	0	0	0	.50000	.00000	12.035
3200	1	0	0	0	0	0	12.000	3.3727	13.200	3268	1	0	0	0	0	0	13.500	2.4091	13.200	3336	0	0	0	0	0	0	-0.50911E-06	.00000	11.647	3404	0	0	0	0	0	0	.50000	.00000	12.424
3201	1	0	0	0	0	0	12.000	2.8909	13.200	3269	1	0	0	0	0	0	13.500	1.9273	13.200	3337	0	0	0	0	0	0	-0.52608E-06	.00000	12.035	3405	0	0	0	0	0	0	.50000	.00000	12.812
3202	1	0	0	0	0	0	12.000	2.4091	13.200	3270	1	0	0	0	0	0	13.500	1.4455	13.200	3338	0	0	0	0	0	0	-0.54305E-06	.00000	12.424	3406	0	0	0	0	0	0	.75000	.00000	.38824
3203	1	0	0	0	0	0	12.000	1.9273	13.200	3271	1	0	0	0	0	0	13.500	.96364	13.200	3339	0	0	0	0	0	0	-0.56002E-06	.00000	12.812	3407	0	0	0	0	0	0	.75000	.00000	.77647
3204	1	0	0	0	0	0	12.000	1.4455	13.200	3272	1	0	0	0	0	0	13.500	.48182	13.200	3340	0	0	0	0	0	0	.25000	.00000	.38824	3408	0	0	0	0	0	0	.75000	.00000	1.1647
3205	1	0	0	0	0	0	12.000	.96364	13.200	3273	1	0	0	0	0	0	13.500	-.63181E-06	13.200	3341	0	0	0	0	0	0	.25000	.00000	.77647	3409	0	0	0	0	0	0	.75000	.00000	1.5529
3206	1	0	0	0	0	0	12.000	.48182	13.200	3274	1	0	0	0	0	0	13.750	4.8182	13.200	3342	0	0	0	0	0	0	.25000	.00000	1.1647	3410	0	0	0	0	0	0	.75000	.00000	1.9412
3207	1	0	0	0	0	0	12.000	-.63181E-06	13.200	3275	1	0	0	0	0	0	13.750	4.3364	13.200	3343	0	0	0	0	0	0	.25000	.00000	1.5529	3411	0	0	0	0	0	0	.75000	.00000	2.3294
3208	1	0	0	0	0	0	12.250	4.8182	13.200	3276	1	0	0	0	0	0	13.750	3.8545	13.200	3344	0	0	0	0	0	0	.25000	.00000	1.9412	3412	0	0	0	0	0	0	.75000	.00000	2.7176
3209	1	0	0	0	0	0	12.250	4.3364	13.200	3277	1	0	0	0	0	0	13.750	3.3727	13.200	3345	0	0	0	0	0	0	.25000	.00000	2.3294	3413	0	0	0	0	0	0	.75000	.00000	3.1059
3210	1	0	0	0	0	0	12.250	3.8545	13.200	3278	1	0	0	0	0	0	13.750	2.8909	13.200	3346	0	0	0	0	0	0	.25000	.00000	2.7176	3414	0	0	0	0	0	0	.75000	.00000	3.4941
3211	1	0	0	0	0	0	12.250	3.3727	13.200	3279	1	0	0	0	0	0	13.750	2.4091	13.200	3347	0	0	0	0	0	0	.25000	.00000	3.1059	3415	0	0	0	0	0	0	.75000	.00000	3.8824
3212	1	0	0	0	0	0	12.250	2.8909	13.200	3280	1	0	0	0	0	0	13.750	1.9273	13.200	3348	0	0	0	0	0	0	.25000	.00000	3.4941	3416	0	0	0	0	0	0	.75000	.00000	4.2706
3213	1	0	0	0	0	0	12.250	2.4091	13.200	3281	1	0	0	0	0	0	13.750	1.4455	13.200	3349	0	0	0	0	0	0	.25000	.00000	3.8824	3417	0	0	0	0	0	0	.75000	.00000	4.6588
3214	1	0	0	0	0	0	12.250	1.9273	13.200	3282	1	0	0	0	0	0	13.750	.96364	13.200	3350	0	0	0	0	0	0	.25000	.00000	4.2706	3418	0	0	0	0	0	0	.75000	.00000	5.0471
3215	1	0	0	0	0	0	12.250	1.4455	13.200	3283	1	0	0	0	0	0	13.750	.48182	13.200	3351	0	0	0	0	0	0	.25000	.00000	4.6588	3419	0	0	0	0	0	0	.75000	.00000	5.4353
3216	1	0	0	0	0	0	12.250	.96364	13.200	3284	1	0	0	0	0	0	13.750	-.63181E-06	13.200	3352	0	0	0	0	0	0	.25000	.00000	5.0471	3420	0	0	0	0	0	0	.75000	.00000	5.8235
3217	1	0	0	0	0	0	12.250	.48182	13.200	3285	1	0	0	0	0	0	14.000	4.8182	13.200	3353	0	0	0	0	0	0	.25000	.00000	5.4353	3421	0	0	0	0	0	0	.75000	.00000	6.2118
3218	1	0	0	0	0	0	12.250	-.63181E-06	13.200	3286	1	0	0	0	0	0	14.000	4.3364	13.200	3354	0	0	0	0	0	0	.25000	.00000	5.8235	3422	0	0	0	0	0	0	.75000	.00000	6.6000
3219	1	0	0	0	0	0	12.500	4.8182	13.200	3287	1	0	0	0	0	0	14.000	3.8545	13.200	3355	0	0	0	0	0	0	.25000	.00000	6.2118	3423	0	0	0	0	0	0	.75000	.00000	6.9882
3220	1	0	0	0	0	0	12.500	4.3364	13.200	3288	1	0	0	0	0	0	14.000	3.3727	13.200	3356	0	0	0	0	0	0	.25000	.00000	6.6000	3424	0	0	0	0	0	0	.75000	.00000	7.3765
3221	1	0	0	0	0	0	12.500	3.8545	13.200	3289	1	0	0	0	0	0	14.000	2.8909	13.200	3357	0	0	0	0	0	0	.25000	.00000	6.9882	3425	0	0	0	0	0	0	.75000	.00000	7.7647
3222	1	0	0	0	0	0	12.500	3.3727	13.200	3290	1	0	0	0	0	0	14.000	2.4091	13.200	3358	0	0	0	0	0	0	.25000	.00000	7.3765	3426	0	0	0	0	0	0	.75000	.00000	8.1529
3223	1	0	0	0	0	0	12.500	2.8909	13.200	3291	1	0	0	0	0	0	14.000	1.9273	13.200	3359	0	0	0	0	0	0	.25000	.00000	7.7647	3427	0	0	0	0	0	0	.75000	.00000	8.5412
3224	1	0	0	0	0	0	12.500	2.4091	13.200	3292	1	0	0	0	0	0	14.000	1.4455	13.200	3360	0	0	0	0	0	0	.25000	.00000	8.1529	3428	0	0	0	0	0	0	.75000	.00000	8.9294
3225	1	0	0	0	0	0	12.500	1.9273	13.200	3293	1	0	0	0	0	0	14.000	.96364	13.200	3361	0	0	0	0	0	0	.25000	.00000	8.5412	3429	0	0	0	0	0	0	.75000	.00000	9.3176
3226	1	0	0	0	0	0	12.500	1.4455	13.200	3294	1	0	0	0	0	0	14.000	.48182	13.200	3362	0	0	0	0	0	0	.25000	.00000	8.9294	3430	0	0	0	0	0	0	.75000	.00000	9.7059
3227	1	0	0	0	0	0	12.500	.96364	13.200	3295	1	0	0	0	0	0	14.000	-.63181E-06	13.200	3363	0	0	0	0	0	0	.25000	.00000	9.3176	3431	0	0	0	0	0	0	.75000	.00000	10.094
3228	1	0	0	0	0	0	12.500	.48182	13.200	3296	1	0	0	0	0	0	14.250	4.8182	13.200	3364	0	0	0	0	0	0	.25000	.00000	9.7059	3432	0	0	0	0	0	0	.75000	.00000	10.482
3229	1	0	0	0	0	0	12.500	-.63181E-06	13.200	3297	1	0	0	0	0	0	14.250	4.3364	13.200	3365	0	0	0	0	0	0	.25000	.00000	10.094	3433	0	0	0	0	0	0	.75000	.00000	10.871
3230	1	0	0	0	0	0	12.750</																																

3463	0	0	0	0	0	1.0000	.00000	9.7059	3531	0	0	0	0	0	1.5000	.00000	10.482	3599	0	0	0	0	0	2.0000	.00000	11.259	3667	0	0	0	0	0	2.5000	.00000	12.035
3464	0	0	0	0	0	1.0000	.00000	10.094	3532	0	0	0	0	0	1.5000	.00000	10.871	3600	0	0	0	0	0	2.0000	.00000	11.647	3668	0	0	0	0	0	2.5000	.00000	12.424
3465	0	0	0	0	0	1.0000	.00000	10.482	3533	0	0	0	0	0	1.5000	.00000	11.259	3601	0	0	0	0	0	2.0000	.00000	12.035	3669	0	0	0	0	0	2.5000	.00000	12.812
3466	0	0	0	0	0	1.0000	.00000	10.871	3534	0	0	0	0	0	1.5000	.00000	11.647	3602	0	0	0	0	0	2.0000	.00000	12.424	3670	0	0	0	0	0	2.7500	.00000	38824
3467	0	0	0	0	0	1.0000	.00000	11.259	3535	0	0	0	0	0	1.5000	.00000	12.035	3603	0	0	0	0	0	2.0000	.00000	12.812	3671	0	0	0	0	0	2.7500	.00000	77647
3468	0	0	0	0	0	1.0000	.00000	11.647	3536	0	0	0	0	0	1.5000	.00000	12.424	3604	0	0	0	0	0	2.2500	.00000	38824	3672	0	0	0	0	0	2.7500	.00000	1.1647
3469	0	0	0	0	0	1.0000	.00000	12.035	3537	0	0	0	0	0	1.5000	.00000	12.812	3605	0	0	0	0	0	2.2500	.00000	77647	3673	0	0	0	0	0	2.7500	.00000	1.5529
3470	0	0	0	0	0	1.0000	.00000	12.424	3538	0	0	0	0	0	1.7500	.00000	38824	3606	0	0	0	0	0	2.2500	.00000	1.1647	3674	0	0	0	0	0	2.7500	.00000	1.9412
3471	0	0	0	0	0	1.0000	.00000	12.812	3539	0	0	0	0	0	1.7500	.00000	77647	3607	0	0	0	0	0	2.2500	.00000	1.5529	3675	0	0	0	0	0	2.7500	.00000	2.3294
3472	0	0	0	0	0	1.2500	.00000	38824	3540	0	0	0	0	0	1.7500	.00000	1.1647	3608	0	0	0	0	0	2.2500	.00000	1.9412	3676	0	0	0	0	0	2.7500	.00000	2.7176
3473	0	0	0	0	0	1.2500	.00000	77647	3541	0	0	0	0	0	1.7500	.00000	1.5529	3609	0	0	0	0	0	2.2500	.00000	2.3294	3677	0	0	0	0	0	2.7500	.00000	3.1059
3474	0	0	0	0	0	1.2500	.00000	1.1647	3542	0	0	0	0	0	1.7500	.00000	1.9412	3610	0	0	0	0	0	2.2500	.00000	2.7176	3678	0	0	0	0	0	2.7500	.00000	3.4941
3475	0	0	0	0	0	1.2500	.00000	1.5529	3543	0	0	0	0	0	1.7500	.00000	2.3294	3611	0	0	0	0	0	2.2500	.00000	3.1059	3679	0	0	0	0	0	2.7500	.00000	3.8824
3476	0	0	0	0	0	1.2500	.00000	1.9412	3544	0	0	0	0	0	1.7500	.00000	2.7176	3612	0	0	0	0	0	2.2500	.00000	3.4941	3680	0	0	0	0	0	2.7500	.00000	4.2706
3477	0	0	0	0	0	1.2500	.00000	2.3294	3545	0	0	0	0	0	1.7500	.00000	3.1059	3613	0	0	0	0	0	2.2500	.00000	3.8824	3681	0	0	0	0	0	2.7500	.00000	4.6588
3478	0	0	0	0	0	1.2500	.00000	2.7176	3546	0	0	0	0	0	1.7500	.00000	3.4941	3614	0	0	0	0	0	2.2500	.00000	4.2706	3682	0	0	0	0	0	2.7500	.00000	5.0471
3479	0	0	0	0	0	1.2500	.00000	3.1059	3547	0	0	0	0	0	1.7500	.00000	3.8824	3615	0	0	0	0	0	2.2500	.00000	4.6588	3683	0	0	0	0	0	2.7500	.00000	5.4353
3480	0	0	0	0	0	1.2500	.00000	3.4941	3548	0	0	0	0	0	1.7500	.00000	4.2706	3616	0	0	0	0	0	2.2500	.00000	5.0471	3684	0	0	0	0	0	2.7500	.00000	5.8235
3481	0	0	0	0	0	1.2500	.00000	3.8824	3549	0	0	0	0	0	1.7500	.00000	4.6588	3617	0	0	0	0	0	2.2500	.00000	5.4353	3685	0	0	0	0	0	2.7500	.00000	6.2118
3482	0	0	0	0	0	1.2500	.00000	4.2706	3550	0	0	0	0	0	1.7500	.00000	5.0471	3618	0	0	0	0	0	2.2500	.00000	5.8235	3686	0	0	0	0	0	2.7500	.00000	6.6000
3483	0	0	0	0	0	1.2500	.00000	4.6588	3551	0	0	0	0	0	1.7500	.00000	5.4353	3619	0	0	0	0	0	2.2500	.00000	6.2118	3687	0	0	0	0	0	2.7500	.00000	6.9882
3484	0	0	0	0	0	1.2500	.00000	5.0471	3552	0	0	0	0	0	1.7500	.00000	5.8235	3620	0	0	0	0	0	2.2500	.00000	6.6000	3688	0	0	0	0	0	2.7500	.00000	7.3765
3485	0	0	0	0	0	1.2500	.00000	5.4353	3553	0	0	0	0	0	1.7500	.00000	6.2118	3621	0	0	0	0	0	2.2500	.00000	6.9882	3689	0	0	0	0	0	2.7500	.00000	7.7647
3486	0	0	0	0	0	1.2500	.00000	5.8235	3554	0	0	0	0	0	1.7500	.00000	6.6000	3622	0	0	0	0	0	2.2500	.00000	7.3765	3690	0	0	0	0	0	2.7500	.00000	8.1529
3487	0	0	0	0	0	1.2500	.00000	6.2118	3555	0	0	0	0	0	1.7500	.00000	6.9882	3623	0	0	0	0	0	2.2500	.00000	7.7647	3691	0	0	0	0	0	2.7500	.00000	8.5412
3488	0	0	0	0	0	1.2500	.00000	6.6000	3556	0	0	0	0	0	1.7500	.00000	7.3765	3624	0	0	0	0	0	2.2500	.00000	8.1529	3692	0	0	0	0	0	2.7500	.00000	8.9294
3489	0	0	0	0	0	1.2500	.00000	6.9882	3557	0	0	0	0	0	1.7500	.00000	7.7647	3625	0	0	0	0	0	2.2500	.00000	8.5412	3693	0	0	0	0	0	2.7500	.00000	9.3176
3490	0	0	0	0	0	1.2500	.00000	7.3765	3558	0	0	0	0	0	1.7500	.00000	8.1529	3626	0	0	0	0	0	2.2500	.00000	8.9294	3694	0	0	0	0	0	2.7500	.00000	9.7059
3491	0	0	0	0	0	1.2500	.00000	7.7647	3559	0	0	0	0	0	1.7500	.00000	8.5412	3627	0	0	0	0	0	2.2500	.00000	9.3176	3695	0	0	0	0	0	2.7500	.00000	10.094
3492	0	0	0	0	0	1.2500	.00000	8.1529	3560	0	0	0	0	0	1.7500	.00000	8.9294	3628	0	0	0	0	0	2.2500	.00000	9.7059	3696	0	0	0	0	0	2.7500	.00000	10.482
3493	0	0	0	0	0	1.2500	.00000	8.5412	3561	0	0	0	0	0	1.7500	.00000	9.3176	3629	0	0	0	0	0	2.2500	.00000	10.094	3697	0	0	0	0	0	2.7500	.00000	10.871
3494	0	0	0	0	0	1.2500	.00000	8.9294	3562	0	0	0	0	0	1.7500	.00000	9.7059	3630	0	0	0	0	0	2.2500	.00000	10.482	3698	0	0	0	0	0	2.7500	.00000	11.259
3495	0	0	0	0	0	1.2500	.00000	9.3176	3563	0	0	0	0	0	1.7500	.00000	10.094	3631	0	0	0	0	0	2.2500	.00000	10.871	3699	0	0	0	0	0	2.7500	.00000	11.647
3496	0	0	0	0	0	1.2500	.00000	9.7059	3564	0	0	0	0	0	1.7500	.00000	10.482	3632	0	0	0	0	0	2.2500	.00000	11.259	3700	0	0	0	0	0	2.7500	.00000	12.035
3497	0	0	0	0	0	1.2500	.00000	10.094	3565	0	0	0	0	0	1.7500	.00000	10.871	3633	0	0	0	0	0	2.2500	.00000	11.647	3701	0	0	0	0	0	2.7500	.00000	12.424
3498	0	0	0	0	0	1.2500	.00000	10.482	3566	0	0	0	0	0	1.7500	.00000	11.259	3634	0	0	0	0	0	2.2500	.00000	12.035	3702	0	0	0	0	0	2.7500	.00000	12.812
3499	0	0	0	0	0	1.2500	.00000	10.871	3567	0	0	0	0	0	1.7500	.00000	11.647	3635	0	0	0	0	0	2.2500	.00000	12.424	3703	0	0	0	0	0	3.0000	.00000	38824
3500	0	0	0	0	0	1.2500	.00000	11.259	3568	0	0	0	0	0	1.7500	.00000	12.035	3636	0	0	0	0	0	2.2500	.00000	12.812	3704	0	0	0	0	0	3.0000	.00000	77647
3501	0	0	0	0	0	1.2500	.00000	11.647	3569	0	0	0	0	0	1.7500	.00000	12.424	3637	0	0	0	0	0	2.5000	.00000	38824	3705	0	0	0	0	0	3.0000	.00000	1.1647
3502	0	0	0	0	0	1.2500	.00000	12.035	3570	0	0	0	0	0	1.7500	.00000	12.812	3638	0	0	0	0	0	2.5000	.00000	77647	3706	0	0	0	0	0	3.0000	.00000	1.5529
3503	0	0	0	0	0	1.2500	.00000	12.424	3571	0	0	0	0	0	2.0000	.00000	38824	3639	0	0	0	0	0	2.5000	.00000	1.1647	3707	0	0	0	0	0	3.0000	.00000	1.9412
3504	0	0	0	0	0	1.2500	.00000	12.812	3572	0	0	0	0	0	2.0000	.00000	77647	3640	0	0	0	0	0	2.5000	.00000	1.5529	3708	0	0	0	0	0	3.0000	.00000	2.3294
3505	0	0	0	0	0	1.5000	.00000	38824	3573	0	0	0	0	0	2.0000	.00000	1.1647	3641	0	0	0	0	0	2.5000	.00000	1.9412	3709	0							

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5095	0	0	0	0	0	0	13.500	.00000	2.7176	5163	0	0	0	0	0	14.000	.00000	3.4941	5231	0	0	0	0	0	0	.25000	.48182	6.6000	5299	0	0	0	0	0	1.7500	4.3364	6.6000
5096	0	0	0	0	0	0	13.500	.00000	3.1059	5164	0	0	0	0	0	14.000	.00000	3.8824	5232	0	0	0	0	0	0	.25000	.96364	6.6000	5300	0	0	0	0	0	1.7500	4.8182	6.6000
5097	0	0	0	0	0	0	13.500	.00000	3.4941	5165	0	0	0	0	0	14.000	.00000	4.2706	5233	0	0	0	0	0	0	.25000	1.4455	6.6000	5301	0	0	0	0	0	2.0000	.48182	6.6000
5098	0	0	0	0	0	0	13.500	.00000	3.8824	5166	0	0	0	0	0	14.000	.00000	4.6588	5234	0	0	0	0	0	0	.25000	1.9273	6.6000	5302	0	0	0	0	0	2.0000	.96364	6.6000
5099	0	0	0	0	0	0	13.500	.00000	4.2706	5167	0	0	0	0	0	14.000	.00000	5.0471	5235	0	0	0	0	0	0	.25000	2.4091	6.6000	5303	0	0	0	0	0	2.0000	1.4455	6.6000
5100	0	0	0	0	0	0	13.500	.00000	4.6588	5168	0	0	0	0	0	14.000	.00000	5.4353	5236	0	0	0	0	0	0	.25000	2.8909	6.6000	5304	0	0	0	0	0	2.0000	1.9273	6.6000
5101	0	0	0	0	0	0	13.500	.00000	5.0471	5169	0	0	0	0	0	14.000	.00000	5.8235	5237	0	0	0	0	0	0	.25000	3.3727	6.6000	5305	0	0	0	0	0	2.0000	2.4091	6.6000
5102	0	0	0	0	0	0	13.500	.00000	5.4353	5170	0	0	0	0	0	14.000	.00000	6.2118	5238	0	0	0	0	0	0	.25000	3.8545	6.6000	5306	0	0	0	0	0	2.0000	2.8909	6.6000
5103	0	0	0	0	0	0	13.500	.00000	5.8235	5171	0	0	0	0	0	14.000	.00000	6.6000	5239	0	0	0	0	0	0	.25000	4.3364	6.6000	5307	0	0	0	0	0	2.0000	3.3727	6.6000
5104	0	0	0	0	0	0	13.500	.00000	6.2118	5172	0	0	0	0	0	14.000	.00000	6.9882	5240	0	0	0	0	0	0	.25000	4.8182	6.6000	5308	0	0	0	0	0	2.0000	3.8545	6.6000
5105	0	0	0	0	0	0	13.500	.00000	6.6000	5173	0	0	0	0	0	14.000	.00000	7.3765	5241	0	0	0	0	0	0	.50000	.48182	6.6000	5309	0	0	0	0	0	2.0000	4.3364	6.6000
5106	0	0	0	0	0	0	13.500	.00000	6.9882	5174	0	0	0	0	0	14.000	.00000	7.7647	5242	0	0	0	0	0	0	.50000	.96364	6.6000	5310	0	0	0	0	0	2.0000	4.8182	6.6000
5107	0	0	0	0	0	0	13.500	.00000	7.3765	5175	0	0	0	0	0	14.000	.00000	8.1529	5243	0	0	0	0	0	0	.50000	1.4455	6.6000	5311	0	0	0	0	0	2.2500	.48182	6.6000
5108	0	0	0	0	0	0	13.500	.00000	7.7647	5176	0	0	0	0	0	14.000	.00000	8.5412	5244	0	0	0	0	0	0	.50000	1.9273	6.6000	5312	0	0	0	0	0	2.2500	.96364	6.6000
5109	0	0	0	0	0	0	13.500	.00000	8.1529	5177	0	0	0	0	0	14.000	.00000	8.9294	5245	0	0	0	0	0	0	.50000	2.4091	6.6000	5313	0	0	0	0	0	2.2500	1.4455	6.6000
5110	0	0	0	0	0	0	13.500	.00000	8.5412	5178	0	0	0	0	0	14.000	.00000	9.3176	5246	0	0	0	0	0	0	.50000	2.8909	6.6000	5314	0	0	0	0	0	2.2500	1.9273	6.6000
5111	0	0	0	0	0	0	13.500	.00000	8.9294	5179	0	0	0	0	0	14.000	.00000	9.7059	5247	0	0	0	0	0	0	.50000	3.3727	6.6000	5315	0	0	0	0	0	2.2500	2.4091	6.6000
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5113	0	0	0	0	0	0	13.500	.00000	9.7059	5181	0	0	0	0	0	14.000	.00000	10.482	5249	0	0	0	0	0	0	.50000	4.3364	6.6000	5317	0	0	0	0	0	2.2500	3.3727	6.6000
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5117	0	0	0	0	0	0	13.500	.00000	11.259	5185	0	0	0	0	0	14.000	.00000	12.035	5253	0	0	0	0	0	0	.75000	1.4455	6.6000	5321	0	0	0	0	0	2.5000	.48182	6.6000
5118	0	0	0	0	0	0	13.500	.00000	11.647	5186	0	0	0	0	0	14.000	.00000	12.424	5254	0	0	0	0	0	0	.75000	1.9273	6.6000	5322	0	0	0	0	0	2.5000	.96364	6.6000
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5124	0	0	0	0	0	0	13.750	.00000	1.1647	5192	0	0	0	0	0	14.250	.00000	1.9412	5260	0	0	0	0	0	0	.75000	4.8182	6.6000	5328	0	0	0	0	0	2.5000	3.8545	6.6000
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Element input data
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NODE 4  NODE 5  NODE 6
      NODE 7  NODE 8  NODE 9  NODE10
NODE11  NODE12
      NODE13  NODE14  NODE15  NODE16
NODE17  NODE18
      NODE19  NODE20
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  2  1 1  1 -1    2    3   15   14
  3  1 1  1 -1    3    4   16   15
  4  1 1  1 -1    4    5   17   16
  5  1 1  1 -1    5    6   18   17
  6  1 1  1 -1    6    7   19   18
  7  1 1  1 -1    7    8   20   19
  8  1 1  1 -1    8    9   21   20
  9  1 1  1 -1    9   10   22   21
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 12  1 1  1 -1   13   14   26   25
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 14  1 1  1 -1   15   16   28   27
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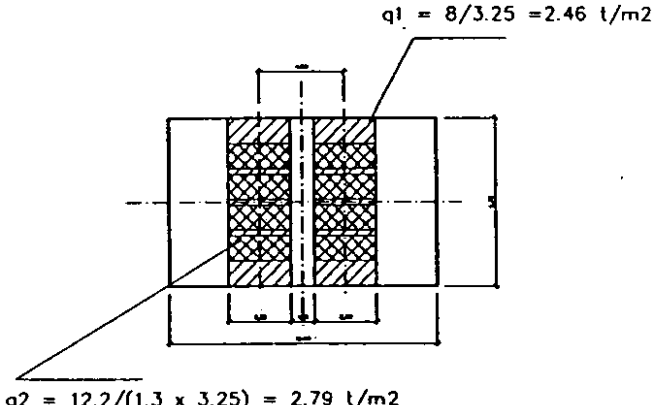
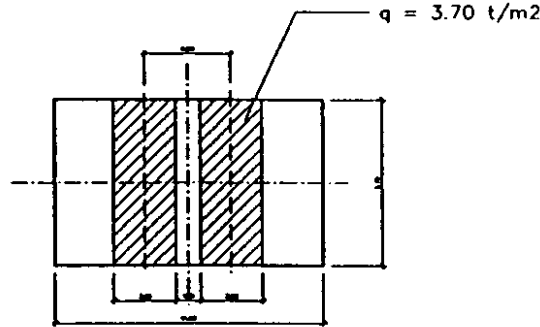
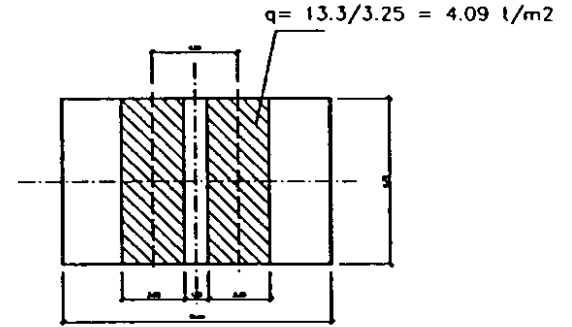
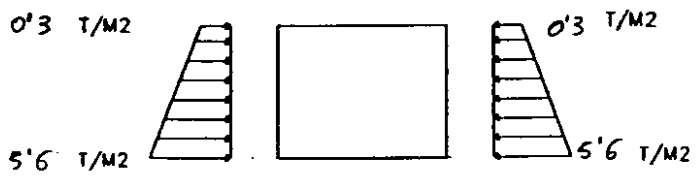
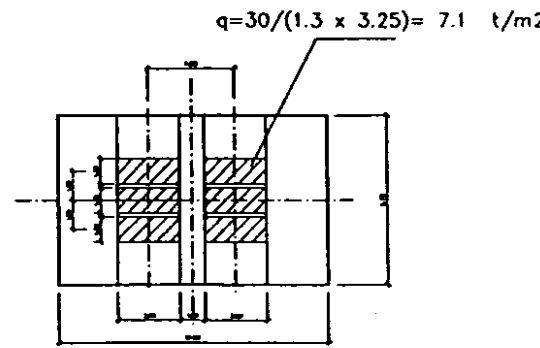
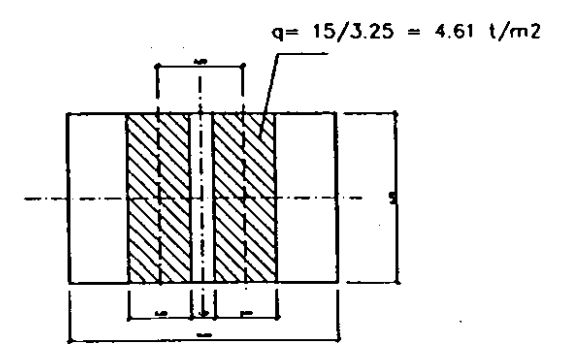
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5500	1	1	1	-1	5556	5557	5567	5566	5568	1	1	1	-1	5618	5619	5629	5628	5636	1	1	1	-1	5680	2243	2277	5690	5704	1	1	1	-1	5741	5742	5752	5751
5501	1	1	1	-1	5557	5558	5568	5567	5569	1	1	1	-1	5619	5620	5630	5629	5637	1	1	1	-1	4841	5681	5691	4874	5705	1	1	1	-1	5742	5743	5753	5752
5502	1	1	1	-1	5558	5559	5569	5568	5570	1	1	1	-1	5620	2039	2073	5630	5638	1	1	1	-1	5681	5682	5692	5691	5706	1	1	1	-1	5743	5744	5754	5753
5503	1	1	1	-1	5559	5560	5570	5569	5571	1	1	1	-1	4643	5621	5631	4676	5639	1	1	1	-1	5682	5683	5693	5692	5707	1	1	1	-1	5744	5745	5755	5754
5504	1	1	1	-1	5560	1835	1869	5570	5572	1	1	1	-1	5621	5622	5632	5631	5640	1	1	1	-1	5683	5684	5694	5693	5708	1	1	1	-1	5745	5746	5756	5755
5505	1	1	1	-1	4445	5561	5571	4478	5573	1	1	1	-1	5622	5623	5633	5632	5641	1	1	1	-1	5684	5685	5695	5694	5709	1	1	1	-1	5746	5747	5757	5756
5506	1	1	1	-1	5561	5562	5572	5571	5574	1	1	1	-1	5623	5624	5634	5633	5642	1	1	1	-1	5685	5686	5696	5695	5710	1	1	1	-1	5747	5748	5758	5757
5507	1	1	1	-1	5562	5563	5573	5572	5575	1	1	1	-1	5624	5625	5635	5634	5643	1	1	1	-1	5686	5687	5697	5696	5711	1	1	1	-1	5748	5749	5759	5758
5508	1	1	1	-1	5563	5564	5574	5573	5576	1	1	1	-1	5625	5626	5636	5635	5644	1	1	1	-1	5687	5688	5698	5697	5712	1	1	1	-1	5749	5750	5760	5759
5509	1	1	1	-1	5564	5565	5575	5574	5577	1	1	1	-1	5626	5627	5637	5636	5645	1	1	1	-1	5688	5689	5699	5698	5713	1	1	1	-1	5750	2481	2515	5760
5510	1	1	1	-1	5565	5566	5576	5575	5578	1	1	1	-1	5627	5628	5638	5637	5646	1	1	1	-1	5689	5690	5700	5699	5714	1	1	1	-1	5072	5751	5761	5105
5511	1	1	1	-1	5566	5567	5577	5576	5579	1	1	1	-1	5628	5629	5639	5638	5647	1	1	1	-1	5690	2277	2311	5700	5715	1	1	1	-1	5751	5752	5762	5761
5512	1	1	1	-1	5567	5568	5578	5577	5580	1	1	1	-1	5629	5630	5640	5639	5648	1	1	1	-1	4874	5691	5701	4907	5716	1	1	1	-1	5752	5753	5763	5762
5513	1	1	1	-1	5568	5569	5579	5578	5581	1	1	1	-1	5630	2073	2107	5640	5649	1	1	1	-1	5691	5692	5702	5701	5717	1	1	1	-1	5753	5754	5764	5763
5514	1	1	1	-1	5569	5570	5580	5579	5582	1	1	1	-1	4676	5631	5641	4709	5650	1	1	1	-1	5692	5693	5703	5702	5718	1	1	1	-1	5754	5755	5765	5764
5515	1	1	1	-1	5570	1869	1903	5580	5583	1	1	1	-1	5631	5632	5642	5641	5651	1	1	1	-1	5693	5694	5704	5703	5719	1	1	1	-1	5755	5756	5766	5765
5516	1	1	1	-1	4478	5571	5581	4511	5584	1	1	1	-1	5632	5633	5643	5642	5652	1	1	1	-1	5694	5695	5705	5704	5720	1	1	1	-1	5756	5757	5767	5766
5517	1	1	1	-1	5571	5572	5582	5581	5585	1	1	1	-1	5633	5634	5644	5643	5653	1	1	1	-1	5695	5696	5706	5705	5721	1	1	1	-1	5757	5758	5768	5767
5518	1	1	1	-1	5572	5573	5583	5582	5586	1	1	1	-1	5634	5635	5645	5644	5654	1	1	1	-1	5696	5697	5707	5706	5722	1	1	1	-1	5758	5759	5769	5768
5519	1	1	1	-1	5573	5574	5584	5583	5587	1	1	1	-1	5635	5636	5646	5645	5655	1	1	1	-1	5697	5698	5708	5707	5723	1	1	1	-1	5759	5760	5770	5769
5520	1	1	1	-1	5574	5575	5585	5584	5588	1	1	1	-1	5636	5637	5647	5646	5656	1	1	1	-1	5698	5699	5709	5708	5724	1	1	1	-1	5760	2515	2549	5770
5521	1	1	1	-1	5575	5576	5586	5585	5589	1	1	1	-1	5637	5638	5648	5647	5657	1	1	1	-1	5699	5700	5710	5709	5725	1	1	1	-1	5105	5761	5771	5138
5522	1	1	1	-1	5576	5577	5587	5586	5590	1	1	1	-1	5638	5639	5649	5648	5658	1	1	1	-1	5700	2311	2345	5710	5726	1	1	1	-1	5761	5762	5772	5771
5523	1	1	1	-1	5577	5578	5588	5587	5591	1	1	1	-1	5639	5640	5650	5649	5659	1	1	1	-1	4907	5701	5711	4940	5727	1	1	1	-1	5762	5763	5773	5772
5524	1	1	1	-1	5578	5579	5589	5588	5592	1	1	1	-1	5640	2107	2141	5650	5660	1	1	1	-1	5701	5702	5712	5711	5728	1	1	1	-1	5763	5764	5774	5773
5525	1	1	1	-1	5579	5580	5590	5589	5593	1	1	1	-1	4709	5641	5651	4742	5661	1	1	1	-1	5702	5703	5713	5712	5729	1	1	1	-1	5764	5765	5775	5774
5526	1	1	1	-1	5580	1903	1937	5590	5594	1	1	1	-1	5641	5642	5652	5651	5662	1	1	1	-1	5703	5704	5714	5713	5730	1	1	1	-1	5765	5766	5776	5775
5527	1	1	1	-1	4511	5581	5591	4544	5595	1	1	1	-1	5642	5643	5653	5652	5663	1	1	1	-1	5704	5705	5715	5714	5731	1	1	1	-1	5766	5767	5777	5776
5528	1	1	1	-1	5581	5582	5592	5591	5596	1	1	1	-1	5643	5644	5654	5653	5664	1	1	1	-1	5705	5706	5716	5715	5732	1	1	1	-1	5767	5768	5778	5777
5529	1	1	1	-1	5582	5583	5593	5592	5597	1	1	1	-1	5644	5645	5655	5654	5665	1	1	1	-1	5706	5707	5717	5716	5733	1	1	1	-1	5768	5769	5779	5778
5530	1	1	1	-1	5583	5584	5594	5593	5598	1	1	1	-1	5645	5646	5656	5655	5666	1	1	1	-1	5707	5708	5718	5717	5734	1	1	1	-1	5769	5770	5780	5779
5531	1	1	1	-1	5584	5585	5595	5594	5599	1	1	1	-1	5646	5647	5657	5656	5667	1	1	1	-1	5708	5709	5719	5718	5735	1	1	1	-1	5770	2549	2583	5780
5532	1	1	1	-1	5585	5586	5596	5595	5600	1	1	1	-1	5647	5648	5658	5657	5668	1	1	1	-1	5709	5710	5720	5719	5736	1	1	1	-1	5138	5771	5781	5171
5533	1	1	1	-1	5586	5587	5597	5596	5601	1	1	1	-1	5648	5649	5659	5658	5669	1	1	1	-1	5710	2345	2379	5720	5737	1	1	1	-1	5771	5772	5782	5781
5534	1	1	1	-1	5587	5588	5598	5597	5602	1	1	1	-1	5649	5650	5660	5659	5670	1	1	1	-1	4940	5711	5721	4973	5738	1	1	1	-1	5772	5773	5783	5782
5535	1	1	1	-1	5588	5589	5599	5598	5603	1	1	1	-1	5650	2141	2175	5660	5671	1	1	1	-1	5711	5712	5722	5721	5739	1	1	1	-1	5773	5774	5784	5783
5536	1	1	1	-1	5589	5590	5600	5599	5604	1	1	1	-1	4742	5651	5661	4775	5672	1	1	1	-1	5712	5713	5723	5722	5740	1	1	1	-1	5774	5775	5785	5784
5537	1	1	1	-1	5590	1937	1971	5600	5605	1	1	1	-1	5651	5652	5662	5661	5673	1	1	1	-1	5713	5714	5724	5723	5741	1	1	1	-1	5775	5776	5786	5785
5538	1	1	1	-1	4544	5591	5601	4577	5606	1	1	1	-1	5652	5653	5663	5662	5674	1	1	1	-1	5714	5715	5725	5724	5742	1	1	1	-1	5776	5777	5787	5786
5539	1	1	1	-1	5591	5592	5602	5601	5607	1	1	1	-1	5653	5654	5664	5663	5675	1	1	1	-1	5715	5716	5726	5725	5743	1	1	1	-1	5777	5778	5788	5787
5540	1	1	1	-1	5592	5593	5603	5602	5608	1	1	1	-1	5654	5655	5665	5664	5676	1	1	1	-1	5716	5717	5727	5726	5744	1	1	1	-1	5778	5779	5789	5788
5541	1	1	1	-1	5593	5594	5604	5603	5609	1	1	1	-1	5655	5656	5666	5665	5677	1	1	1	-1	5717	5718	5728	5727	5745	1	1	1	-1	5779	5780	5790	5789
5542	1	1	1	-1	5594	5595	5605	5604	5610	1	1	1	-1	5656	5657	5667	5666	5678	1	1	1	-1	5718	5719	5729	5728	5746	1	1	1	-1	5780	2583	2617	5790
5543	1	1	1	-1	5595	5596	5606	5605	5611	1	1	1	-1	5657	5658	5668	5667	5679	1	1	1	-1	5719	5720	5730	5729	5747	1	1	1	-1	5171	5781	5791	

E-1516.3 . HIPOTESIS DE CARGA CONSIDERADAS EN EL MODELO 3D

HIPOTESIS 1: PESO PROPIO (PESO ESPECIFICO 2.5 t/m³)	HIPOTESIS 4: EMPUJE DEL TERRENO DEBIDO A UNA SOBRECARGA DE 3 T/M² 	HIPOTESIS 7: TREN LM-71 
HIPOTESIS 2: CARGA MUERTA (PESO DE BALASTO, TRAVESAS Y CARRILES) q = 1'55 T/m²	HIPOTESIS 5: TREN TIPO B (2 x 12 t/m) 	HIPOTESIS 8: TREN TIPO SW/0 
HIPOTESIS 3: EMPUJE DEL TERRENO 	HIPOTESIS 6: TREN TIPO A 	HIPOTESIS 9: TREN TIPO SW/2 

RESULTADOS COSMOS. Esfuerzos característicos.

Proyecto : L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
Estructura: E-1516.3

Hipotesis--> Elem	PESO PROPIO			CARGA MUERTA			EMPUJE TIERRAS			EMPUJE SC			TREN TIPO B			TREN TIPO A			TREN LM-71			TREN SW/0			TREN SW/2		
	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)
309	-10.6	7.2	-1.9	-4.1	1.4	0.1	-1.1	3.0	-8.9	-0.6	1.6	-3.6	-5.2	1.4	0.6	-6.0	1.3	1.2	-6.6	1.8	0.8	-5.8	1.5	0.6	-6.5	1.7	0.7
310	-9.9	6.3	-1.9	-4.1	1.5	0.1	-1.1	-0.7	-6.5	-0.6	0.1	-2.9	-5.5	1.6	0.6	-6.3	1.8	1.1	-7.0	2.1	0.8	-6.1	1.8	0.6	-6.8	2.1	0.7
311	-9.1	5.4	-1.9	-4.1	1.5	0.1	-1.1	-3.3	-4.2	-0.6	-1.2	-2.2	-5.8	1.9	0.5	-6.6	2.3	1.1	-7.3	2.5	0.8	-6.4	2.1	0.6	-7.2	2.3	0.7
312	-8.4	4.5	-1.9	-4.1	1.6	0.2	-1.1	-4.9	-2.2	-0.6	-2.0	-1.5	-6.1	2.1	0.6	-6.9	2.8	1.1	-7.7	2.8	0.8	-6.7	2.3	0.6	-7.6	2.6	0.7
313	-7.7	3.6	-1.9	-4.1	1.7	0.2	-1.1	-5.5	-0.5	-0.6	-2.6	-0.7	-6.4	2.3	0.6	-7.2	3.3	1.2	-8.1	3.2	0.8	-7.0	2.6	0.6	-7.9	2.9	0.7
314	-7.0	2.7	-1.9	-4.1	1.8	0.2	-1.1	-5.4	1.1	-0.6	-2.8	0.0	-6.7	2.6	0.6	-7.5	3.9	1.2	-8.4	3.5	0.9	-7.4	2.9	0.7	-8.3	3.2	0.7
315	-6.2	1.8	-1.9	-4.1	1.8	0.2	-1.1	-4.6	2.4	-0.6	-2.6	0.7	-6.9	2.9	0.6	-7.9	4.4	1.3	-8.8	3.9	0.9	-7.7	3.2	0.7	-8.7	3.6	0.8
316	-5.5	0.9	-1.9	-4.1	1.9	0.2	-1.1	-3.2	3.4	-0.6	-2.1	1.4	-7.2	3.2	0.7	-8.2	5.1	1.3	-9.1	4.4	1.0	-8.0	3.5	0.7	-9.0	4.0	0.8
317	-4.8	0.1	-1.9	-4.1	2.0	0.2	-1.1	-1.3	4.3	-0.6	-1.2	2.1	-7.4	3.6	0.7	-8.5	5.8	1.4	-9.4	4.9	1.0	-8.2	3.9	0.8	-9.2	4.4	0.9
318	-4.1	-0.8	-1.9	-4.1	2.1	0.2	-1.1	0.9	4.9	-0.6	0.0	2.9	-7.5	4.0	0.7	-8.8	6.5	1.4	-9.5	5.5	1.0	-8.3	4.4	0.8	-9.4	4.9	0.9
319	-3.4	-1.7	-1.9	-4.1	2.1	0.2	-1.1	3.3	5.3	-0.6	1.5	3.6	-7.4	4.3	0.7	-9.1	7.3	1.4	-9.5	6.0	1.0	-8.2	4.8	0.7	-9.2	5.4	0.8
1580	1.9	-2.7	-2.6	-0.2	1.4	-3.8	-5.4	4.3	-1.1	-4.0	2.3	-0.6	-0.6	3.2	-6.9	-1.3	5.9	-8.8	-0.9	4.5	-8.9	-0.7	3.5	-7.6	-0.7	4.0	-8.5
1581	1.9	-3.5	-1.8	-0.2	0.1	-3.2	-5.4	3.9	-1.1	-4.0	2.1	-0.6	-0.6	0.7	-5.9	-1.3	2.6	-8.5	-0.9	1.2	-7.8	-0.7	0.8	-6.5	-0.8	0.9	-7.4
1582	1.9	-4.1	-1.1	-0.2	-1.1	-2.6	-5.5	3.5	-1.1	-4.0	1.8	-0.6	-0.6	-1.4	-4.9	-1.3	-0.6	-8.0	-0.9	-1.6	-6.5	-0.7	-1.6	-5.4	-0.8	-1.8	-6.1
1583	1.9	-4.4	-0.5	-0.2	-2.0	-2.0	-5.5	3.0	-1.1	-4.0	1.6	-0.6	-0.6	-3.1	-3.9	-1.3	-3.5	-7.0	-0.9	-3.8	-5.3	-0.7	-3.5	-4.3	-0.8	-3.9	-4.9
1584	1.9	-4.5	0.1	-0.2	-2.6	-1.4	-5.5	2.6	-1.1	-4.1	1.4	-0.6	-0.6	-4.4	-2.9	-1.3	-6.0	-5.5	-0.9	-5.6	-4.1	-0.7	-4.9	-3.2	-0.8	-5.5	-3.6
1585	1.9	-4.3	0.7	-0.2	-3.1	-0.8	-5.5	2.2	-1.1	-4.1	1.2	-0.6	-0.6	-5.3	-1.8	-1.3	-7.8	-3.9	-0.9	-6.9	-2.8	-0.6	-5.9	-2.0	-0.7	-6.6	-2.3
1586	1.9	-3.9	1.3	-0.2	-3.3	-0.2	-5.6	1.7	-1.1	-4.1	0.9	-0.6	-0.6	-5.8	-0.7	-1.3	-8.9	-2.4	-0.9	-7.7	-1.4	-0.6	-6.4	-0.8	-0.7	-7.2	-0.9
1587	1.9	-3.3	1.8	-0.2	-3.3	0.4	-5.6	1.3	-1.1	-4.1	0.7	-0.6	-0.5	-5.8	0.5	-1.2	-9.6	-0.9	-0.8	-7.9	0.1	-0.6	-6.5	0.5	-0.6	-7.3	0.6
1588	1.9	-2.5	2.4	-0.2	-3.0	1.0	-5.6	0.8	-1.1	-4.1	0.5	-0.6	-0.5	-5.5	1.6	-1.2	-9.6	0.8	-0.8	-7.6	1.4	-0.5	-6.0	1.8	-0.6	-6.8	2.0
1589	1.9	-1.5	3.0	-0.2	-2.5	1.6	-5.6	0.4	-1.1	-4.1	0.3	-0.6	-0.4	-4.6	2.8	-1.2	-9.0	2.6	-0.7	-6.8	2.8	-0.4	-5.1	3.1	-0.5	-5.8	3.5
1590	1.9	-0.2	3.6	-0.2	-1.8	2.2	-5.6	0.0	-1.1	-4.1	0.1	-0.6	-0.3	-3.4	3.9	-1.1	-7.7	4.1	-0.6	-5.5	4.3	-0.4	-3.7	4.4	-0.4	-4.2	4.9
1591	1.8	1.3	4.2	-0.3	-0.8	2.8	-5.6	-0.5	-1.1	-4.1	-0.2	-0.6	-0.2	-1.6	5.1	-1.0	-5.9	5.5	-0.5	-3.6	5.7	-0.3	-1.8	5.6	-0.3	-2.1	6.4
1592	1.8	3.1	4.8	-0.3	0.4	3.4	-5.6	-0.9	-1.1	-4.1	-0.4	-0.6	-0.1	0.5	6.2	-1.0	-3.5	7.2	-0.4	-1.2	7.1	-0.1	0.6	6.9	-0.2	0.7	7.8
1593	1.8	5.0	5.3	-0.3	1.8	4.0	-5.6	-1.3	-1.1	-4.1	-0.6	-0.6	0.0	3.2	7.3	-0.9	-0.4	8.7	-0.3	1.8	8.3	0.0	3.5	8.1	0.0	3.9	9.1
1594	1.8	7.2	5.9	-0.3	3.5	4.6	-5.6	-1.8	-1.1	-4.1	-0.8	-0.6	0.1	6.2	8.4	-0.8	3.2	9.7	-0.2	5.3	9.6	0.1	6.9	9.3	0.1	7.8	10.5
1595	1.7	9.7	6.7	-0.3	5.3	5.2	-5.6	-2.2	-1.1	-4.1	-1.1	-0.6	0.2	9.8	9.5	-0.7	7.1	10.2	-0.1	9.3	11.0	0.3	10.8	10.5	0.3	12.2	11.9
1596	1.7	12.4	7.5	-0.4	7.5	5.8	-5.5	-2.6	-1.1	-4.1	-1.3	-0.6	0.3	13.8	10.5	-0.6	11.0	10.3	0.0	13.9	12.0	0.3	15.2	11.6	0.4	17.1	13.1
1597	1.7	12.4	-7.5	-0.4	7.5	-5.8	-5.5	-2.6	1.1	-4.1	-1.3	0.6	0.3	13.8	-10.5	0.6	6.7	-1.8	0.5	12.2	-7.8	0.3	15.2	-11.6	0.4	17.1	-13.1
1598	1.7	9.7	-6.7	-0.3	5.3	-5.2	-5.6	-2.2	1.1	-4.1	-1.1	0.6	0.2	9.8	-9.5	0.5	5.9	-1.7	0.4	9.2	-7.1	0.3	10.8	-10.5	0.3	12.2	-11.9
1599	1.8	7.2	-5.9	-0.3	3.5	-4.6	-5.6	-1.8	1.1	-4.1	-0.8	0.6	0.1	6.2	-8.4	0.5	5.2	-1.5	0.3	6.5	-6.3	0.1	6.9	-9.3	0.1	7.8	-10.5
1600	1.8	5.0	-5.3	-0.3	1.8	-4.0	-5.6	-1.3	1.1	-4.1	-0.6	0.6	0.0	3.2	-7.3	0.4	4.5	-1.4	0.2	4.2	-5.5	0.0	3.5	-8.1	0.0	3.9	-9.1
1601	1.8	3.1	-4.8	-0.3	0.4	-3.4	-5.6	-0.9	1.1	-4.1	-0.4	0.6	-0.1	0.5	-6.2	0.4	4.0	-1.3	0.1	2.2	-4.8	-0.1	0.6	-6.9	-0.2	0.7	-7.8
1602	1.8	1.3	-4.2	-0.3	-0.8	-2.8	-5.6	-0.5	1.1	-4.1	-0.2	0.6	-0.2	-1.6	-5.1	0.4	3.5	-1.3	0.0	0.5	-4.0	-0.3	-1.8	-5.6	-0.3	-2.1	-6.4
1603	1.9	-0.2	-3.6	-0.2	-1.8	-																					

RESULTADOS COSMOS. Esfuerzos característicos (Continuación).**Proyecto : L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV****Estructura: E-1516.3**

Hipotesis--> Elem	PESO PROPIO			CARGA MUERTA			EMPUJE TIERRAS			EMPUJE SC			TREN TIPO B			TREN TIPO A			TREN LM-71			TREN SW/0			TREN SW/2		
	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)
4145	-1.9	-5.7	10.2	0.1	-0.6	3.8	-10.3	-4.9	1.1	-4.0	-2.4	0.6	0.6	-0.4	4.6	1.2	-0.1	5.3	0.9	-0.5	5.9	0.7	-0.4	5.1	0.8	-0.5	5.8
4146	-1.9	-2.0	8.8	0.1	0.7	3.2	-10.3	-4.5	1.1	-4.0	-2.2	0.6	0.6	1.3	3.9	1.2	1.8	4.3	0.8	1.6	4.9	0.7	1.4	4.3	0.7	1.6	4.8
4147	-1.9	1.1	7.4	0.1	1.9	2.6	-10.4	-4.0	1.1	-4.1	-2.0	0.6	0.6	2.6	3.1	1.2	3.3	3.4	0.8	3.3	3.9	0.6	2.9	3.5	0.7	3.3	3.9
4148	-2.0	3.8	6.1	0.1	2.8	2.0	-10.5	-3.6	1.1	-4.1	-1.7	0.6	0.5	3.7	2.4	1.1	4.4	2.6	0.8	4.6	3.0	0.6	4.1	2.6	0.7	4.6	3.0
4149	-2.0	5.8	4.7	0.1	3.4	1.4	-10.5	-3.1	1.1	-4.1	-1.5	0.6	0.5	4.5	1.7	1.1	5.3	1.8	0.7	5.6	2.1	0.6	4.9	1.8	0.6	5.6	2.1
4150	-2.0	7.4	3.4	0.1	3.9	0.8	-10.6	-2.7	1.1	-4.1	-1.3	0.6	0.5	5.0	0.9	1.1	5.8	1.0	0.7	6.3	1.2	0.5	5.5	1.0	0.6	6.2	1.1
4151	-2.0	8.4	2.0	0.1	4.1	0.2	-10.6	-2.3	1.1	-4.1	-1.1	0.6	0.4	5.2	0.2	1.0	6.1	0.3	0.7	6.6	0.3	0.5	5.8	0.2	0.5	6.5	0.2
4152	-2.1	9.0	0.7	0.1	4.0	-0.4	-10.6	-1.8	1.1	-4.1	-0.8	0.6	0.4	5.2	-0.5	1.0	6.1	-0.4	0.6	6.5	-0.5	0.4	5.7	-0.6	0.4	6.4	-0.7
4153	-2.1	9.0	-0.6	0.1	3.8	-0.9	-10.6	-1.4	1.1	-4.1	-0.6	0.6	0.3	4.8	-1.3	1.0	5.8	-1.0	0.5	6.2	-1.4	0.3	5.3	-1.4	0.4	6.0	-1.6
4154	-2.1	8.5	-1.9	0.1	3.3	-1.5	-10.7	-1.0	1.1	-4.2	-0.4	0.6	0.2	4.2	-2.0	0.9	5.3	-1.7	0.5	5.5	-2.2	0.2	4.6	-2.2	0.3	5.2	-2.5
4155	-2.2	7.5	-3.2	0.1	2.6	-2.1	-10.7	-0.5	1.1	-4.2	-0.2	0.6	0.1	3.3	-2.8	0.9	4.5	-2.2	0.4	4.5	-3.0	0.1	3.6	-3.1	0.1	4.1	-3.5
4156	-2.2	6.0	-4.5	0.0	1.7	-2.7	-10.7	-0.1	1.1	-4.2	0.0	0.6	0.0	2.1	-3.5	0.8	3.6	-2.8	0.3	3.2	-3.8	0.0	2.3	-3.9	0.0	2.6	-4.4
4157	-2.2	4.0	-5.8	0.0	0.5	-3.3	-10.7	0.3	1.1	-4.2	0.2	0.6	-0.1	0.6	-4.3	0.7	2.4	-3.3	0.1	1.6	-4.6	-0.1	0.6	-4.8	-0.2	0.7	-5.4
4158	-2.3	1.5	-7.2	0.0	-0.9	-3.9	-10.7	0.7	1.1	-4.1	0.5	0.6	-0.3	-1.3	-5.1	0.6	1.0	-3.9	0.0	-0.3	-5.4	-0.3	-1.4	-5.6	-0.4	-1.6	-6.3
4159	-2.3	-1.5	-8.5	0.0	-2.6	-4.5	-10.6	1.1	1.1	-4.1	0.7	0.6	-0.5	-3.4	-5.9	0.5	-0.6	-4.3	-0.2	-2.5	-6.1	-0.5	-3.7	-6.5	-0.6	-4.2	-7.3
4160	-2.4	-5.1	-9.8	0.0	-4.4	-5.1	-10.6	1.6	1.1	-4.1	0.9	0.6	-0.7	-5.8	-6.7	0.4	-2.3	-4.8	-0.4	-5.1	-6.9	-0.8	-6.4	-7.4	-0.9	-7.2	-8.3
4161	-2.4	-9.2	-11.2	-0.1	-6.6	-5.8	-10.6	2.0	1.1	-4.1	1.1	0.6	-1.0	-8.5	-7.5	0.3	-4.2	-5.2	-0.7	-7.9	-7.7	-1.1	-9.4	-8.3	-1.2	-10.6	-9.3
4162	-2.4	-9.2	11.2	-0.1	-6.6	5.8	-10.6	2.0	-1.1	-4.1	1.1	-0.6	-1.0	-8.5	7.5	-0.9	-5.0	2.6	-1.1	-8.1	6.3	-1.1	-9.4	8.3	-1.2	-10.6	9.3
4163	-2.4	-5.1	9.8	0.0	-4.4	5.1	-10.6	1.6	-1.1	-4.1	0.9	-0.6	-0.7	-5.8	6.7	-0.7	-4.1	2.2	-0.9	-5.8	5.5	-0.8	-6.4	7.4	-0.9	-7.2	8.3
4164	-2.3	-1.5	8.5	0.0	-2.6	4.5	-10.6	1.1	-1.1	-4.1	0.7	-0.6	-0.5	-3.4	5.9	-0.6	-3.3	1.8	-0.7	-3.8	4.8	-0.5	-3.7	6.5	-0.6	-4.2	7.3
4165	-2.3	1.5	7.2	0.0	-0.9	3.9	-10.7	0.7	-1.1	-4.1	0.5	-0.6	-0.3	-1.3	5.1	-0.5	-2.6	1.5	-0.5	-2.1	4.1	-0.3	-1.4	5.6	-0.4	-1.6	6.3
4166	-2.2	4.0	5.8	0.0	0.5	3.3	-10.7	0.3	-1.1	-4.2	0.2	-0.6	-0.1	0.6	4.3	-0.4	-2.1	1.2	-0.3	-0.6	3.5	-0.1	0.6	4.8	-0.2	0.7	5.4
4167	-2.2	6.0	4.5	0.0	1.7	2.7	-10.7	-0.1	-1.1	-4.2	0.0	-0.6	0.0	2.1	3.5	-0.4	-1.7	1.0	-0.2	0.6	2.8	0.0	2.3	3.9	0.0	2.6	4.4
4168	-2.2	7.5	3.2	0.1	2.6	2.1	-10.7	-0.5	-1.1	-4.2	-0.2	-0.6	0.1	3.3	2.8	-0.3	-1.4	0.8	-0.1	1.6	2.2	0.1	3.6	3.1	0.1	4.1	3.5
4169	-2.1	8.5	1.9	0.1	3.3	1.5	-10.7	-1.0	-1.1	-4.2	-0.4	-0.6	0.2	4.2	2.0	-0.3	-1.1	0.6	0.0	2.3	1.6	0.2	4.6	2.2	0.3	5.2	2.5
4170	-2.1	9.0	0.6	0.1	3.8	0.9	-10.6	-1.4	-1.1	-4.1	-0.6	-0.6	0.3	4.8	1.3	-0.2	-0.9	0.5	0.1	2.8	1.1	0.3	5.3	1.4	0.4	6.0	1.6
4171	-2.1	9.0	-0.7	0.1	4.0	0.4	-10.6	-1.8	-1.1	-4.1	-0.8	-0.6	0.4	5.2	0.5	-0.2	-0.8	0.4	0.1	3.1	0.5	0.4	5.7	0.6	0.4	6.4	0.7
4172	-2.0	8.4	-2.0	0.1	4.1	-0.2	-10.6	-2.3	-1.1	-4.1	-1.1	-0.6	0.4	5.2	-0.2	-0.2	-0.6	0.3	0.2	3.2	0.0	0.5	5.8	-0.2	0.5	6.5	-0.2
4173	-2.0	7.4	-3.4	0.1	3.9	-0.8	-10.6	-2.7	-1.1	-4.1	-1.3	-0.6	0.5	5.0	-0.9	-0.2	-0.5	0.3	0.2	3.1	-0.5	0.5	5.5	-1.0	0.6	6.2	-1.1
4174	-2.0	5.8	-4.7	0.1	3.4	-1.4	-10.5	-3.1	-1.1	-4.1	-1.5	-0.6	0.5	4.5	-1.7	-0.2	-0.4	0.3	0.2	2.8	-1.0	0.6	4.9	-1.8	0.6	5.6	-2.1
4175	-2.0	3.8	-6.1	0.1	2.8	-2.0	-10.5	-3.6	-1.1	-4.1	-1.7	-0.6	0.5	3.7	-2.4	-0.1	-0.3	0.4	0.3	2.3	-1.4	0.6	4.1	-2.6	0.7	4.6	-3.0
4176	-1.9	1.1	-7.4	0.1	1.9	-2.6	-10.4	-4.0	-1.1	-4.1	-2.0	-0.6	0.6	2.6	-3.1	-0.1	-0.1	0.5	0.3	1.6	-1.9	0.6	2.9	-3.5	0.7	3.3	-3.9
4177	-1.9	-2.0	-8.8	0.1	0.7	-3.2	-10.3	-4.5	-1.1	-4.0	-2.2	-0.6	0.6	1.3	-3.9	-0.1	0.1	0.6	0.3	0.8	-2.3	0.7	1.4	-4.3	0.7	1.6	-4.8
4178	-1.9	-5.7	-10.2	0.1	-0.6	-3.8	-10.3	-4.9	-1.1	-4.0	-2.4	-0.6	0.6	-0.4	-4.6	-0.1	0.3	0.8	0.3	-0.1	-2.7	0.7	-0.4	-5.1	0.8	-0.5	-5.8
5439	-23.3	0.0	0.0	-12.2	0.0	0.0	2.2	0.0	0.0	1.2	0.0	0.0	-16.2	0.0	0.0	-8.4	0.0	-1.1	-15.1	-0.2	-0.4	-17.9	0.0	0.0	-20.1	0.0	0.0
5440	-22.7	0.0	0.0	-12.2	0.0	0.0	2.3	0.0	0.0	1.2	0.0	0.0	-17.0	0.0	0.0	-8.9	-0.5	-1.1	-15.9	-0.4	-0.4	-18.8	0.0	0.0	-21.2	0.0	0.0
5441	-22.1	0.0	0.0	-12.3	0.0	0.0	2.3	0.0	0.0	1.2	0.0	0.0	-17.9	0.0	0.0	-9.3	-1.0	-1.1	-16.7	-0.6	-0.4	-19.8	0.0	0.0	-22.3	0.0	0.0
5442	-21.4	0.0	0.0	-12.3	0.0	0.0	2.4	0.0	0.0	1.2	0.0	0.0	-18.8	0.0	0.0	-9.8	-1.5	-1.1	-17.6	-0.8	-0.4	-20.8	0.0	0.0	-23.4	0.0	0.0
5443	-20.7	0.0	0.0	-12.4	0.0	0.0	2.4	0.0	0.0	1.2	0.0	0.0	-19.7	0.0	0.0	-10.3	-2.0	-1.1	-18.4	-1.0	-0.4	-21.8	0.0	0.0	-24.5	0.0	0.0
5444	-20.0	0.0	0.0	-12.4	0.0	0.0	2.4	0.0	0.0	1.2	0.0	0.0	-20.5	0.0	0.0	-10.8	-2.5	-1.1	-19.1	-1.2	-0.4	-22.7	0.0	0.0	-25.6	0.0	0.0
5445	-19.3	0.0	0.0	-12.4	0.0	0.0	2.4	0.0	0.0	1.2	0.0	0.0	-21.2	0.0	0.0	-11.2	-3.0	-1.2	-19.8	-1.4	-0.5	-23.5	0.0	0.0	-26.5	0.0	0.0
5446	-18.5	0.0	0.0	-12.3	0.0	0.0	2.4	0.0	0.0	1.2	0.0	0.0	-21.8	0.0	0.0	-11.5	-3.6	-1.2	-20.4	-1.6	-0.5	-24.1	0.0	0.0	-27.2	0.0	0.0
5447	-17.7	0.0	0.0	-12.3	0.0	0.0	2.3	0.0	0.0	1.2	0.0	0.0	-22.2	0.0	0.0	-11.8	-4.2	-1.2	-20.7	-1.8	-0.5	-24.5	0.0	0.0	-27.6	0.0	0.0
5448	-16.9	0.0	0.0	-12.2	0.0	0.0	2.3	0.0	0.0	1.2	0.0	0.0	-22.2	0.0	0.0	-12.0	-4.9	-1.3	-20.8	-2.1	-0.5	-24.6	0.0	0.0	-27.7	0.0	0.0
5449	-16.1	0.0	0.0	-12.2	0.0	0.0	2.3	0.0	0.0	1.2	0.0	0.0	-22.0	0.0	0.0	-12.1	-5.5	-1.3	-20.6	-2.4	-0.5	-24.3	0.0	0.0	-27.4	0.0	0.0

RESULTADOS COSMOS. Tensiones en cimentación.**Proyecto :** L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV**Estructura:** E-1516.3

Hipotesis---> Elem	PESO PROPIO Tensión cim. (T/m²)	CARGA MUERTA Tensión cim. (T/m²)	EMPUJE TIERRAS Tensión cim. (T/m²)	EMPUJE SC Tensión cim. (T/m²)	TREN TIPO B Tensión cim. (T/m²)	TREN TIPO A Tensión cim. (T/m²)	TREN LM-71 Tensión cim. (T/m²)	TREN SW/0 Tensión cim. (T/m²)	TREN SW/2 Tensión cim. (T/m²)
4145	5.4	1.6	0.0	0.0	2.0	2.5	2.6	2.2	2.5
4146	5.4	1.6	0.0	0.0	2.0	2.4	2.6	2.2	2.5
4147	5.3	1.6	0.0	0.0	2.0	2.3	2.5	2.2	2.4
4148	5.3	1.5	0.0	0.0	1.9	2.2	2.4	2.1	2.4
4149	5.2	1.5	0.0	0.0	1.9	2.1	2.4	2.1	2.4
4150	5.2	1.5	0.0	0.0	1.9	2.0	2.3	2.1	2.4
4151	5.2	1.5	0.0	0.0	1.9	1.9	2.2	2.1	2.4
4152	5.2	1.5	0.0	0.0	1.9	1.8	2.2	2.1	2.4
4153	5.1	1.5	0.0	0.0	1.9	1.7	2.2	2.1	2.4
4154	5.1	1.5	0.0	0.0	1.9	1.6	2.1	2.1	2.4
4155	5.1	1.5	0.0	0.0	1.9	1.5	2.1	2.1	2.4
4156	5.1	1.5	0.0	0.0	1.9	1.4	2.0	2.1	2.4
4157	5.1	1.6	0.0	0.0	2.0	1.4	2.0	2.2	2.4
4158	5.2	1.6	0.0	0.0	2.0	1.3	2.0	2.2	2.5
4159	5.2	1.6	0.0	0.0	2.0	1.2	2.0	2.2	2.5
4160	5.2	1.6	0.0	0.0	2.0	1.1	1.9	2.2	2.5
4161	5.2	1.6	0.0	0.0	2.0	1.1	1.9	2.2	2.5
4162	5.2	1.6	0.0	0.0	2.0	1.0	1.8	2.2	2.5
4163	5.2	1.6	0.0	0.0	2.0	0.9	1.8	2.2	2.5
4164	5.2	1.6	0.0	0.0	2.0	0.8	1.7	2.2	2.5
4165	5.2	1.6	0.0	0.0	2.0	0.7	1.7	2.2	2.5
4166	5.1	1.6	0.0	0.0	2.0	0.6	1.6	2.2	2.4
4167	5.1	1.5	0.0	0.0	1.9	0.5	1.6	2.1	2.4
4168	5.1	1.5	0.0	0.0	1.9	0.5	1.5	2.1	2.4
4169	5.1	1.5	0.0	0.0	1.9	0.4	1.5	2.1	2.4
4170	5.1	1.5	0.0	0.0	1.9	0.3	1.4	2.1	2.4
4171	5.2	1.5	0.0	0.0	1.9	0.2	1.4	2.1	2.4
4172	5.2	1.5	0.0	0.0	1.9	0.1	1.3	2.1	2.4
4173	5.2	1.5	0.0	0.0	1.9	0.0	1.3	2.1	2.4
4174	5.2	1.5	0.0	0.0	1.9	-0.1	1.2	2.1	2.4
4175	5.3	1.5	0.0	0.0	1.9	-0.2	1.2	2.1	2.4
4176	5.3	1.6	0.0	0.0	2.0	-0.3	1.1	2.2	2.4
4177	5.4	1.6	0.0	0.0	2.0	-0.4	1.1	2.2	2.5
4178	5.4	1.6	0.0	0.0	2.0	-0.5	1.1	2.2	2.5

CALCULO DE ARMADURAS

Proyecto: L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
Estructura: E-1516.3

Notación: PP= Peso propio
CM= Carga muerta de traviesas, carriles y balasto
E.t= Empuje de tierras

E.sc= Empuje de tierras debido a una sobrecarga de 3 tm/2
Tren A= Tren de cargas tipo A de la norma española.
Tren B= Tren de cargas tipo B de la norma española.

LM-71= Load model 71 del Eurocodigo 1
SW/0= Tren pesado tipo SW/0 del Eurocodigo 1
SW/2= Tren pesado tipo SW/2 del Eurocodigo 1

Envoltorio de M(t) en E.L.U. (Tracciones en cara interior de hastiales y dintel e inferior en solera).

Sección	Elemento	Cálculo	Coeficientes				Nd	Md
			PP+CM	E.t	E.sc	Sobrecarga	T/m	mT/m
Empotramiento inferior de hastial 1	309	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	-13.24	-7.76
		Cálculo 1. Tren B	0.90	0.00	0.00	0.00	-13.24	-7.76
		Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-15.84	-11.60
		Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-15.84	-11.60
		Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-15.84	-11.60
		Combinación pésima. Cálculo 1. Tren A						-13.24 -7.76
Media del hastial 1	314	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-12.55	-0.47
		Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-12.55	2.36
		Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-13.40	-0.61
		Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-13.40	0.72
		Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-13.40	-0.02
		Combinación pésima. Cálculo 1. Tren B						-12.55 2.36
Empotramiento superior de hastial 1	319	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	-6.75	-0.37
		Cálculo 1. Tren B	0.90	0.00	0.00	0.00	-6.75	-0.37
		Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-8.64	-3.71
		Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-8.64	-3.71
		Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-8.64	-3.71
		Combinación pésima. Cálculo 1. Tren A						-6.75 -0.37
Empotramiento inferior de hastial 2	5439	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-26.88	0.00
		Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-26.88	0.00
		Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-30.94	0.00
		Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-30.94	0.00
		Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-30.94	0.00
		Combinación pésima. Cálculo 1. Tren A						-26.88 0.00
Media del hastial 2	5444	Cálculo 1. Tren A	0.90	1.50	1.50	1.50	-47.91	5.60
		Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-23.72	0.00
		Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-27.50	0.00
		Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-27.50	0.00
		Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-27.50	0.00
		Combinación pésima. Cálculo 1. Tren A						-47.91 5.60
Empotramiento superior de hastial 2	5449	Cálculo 1. Tren A	0.90	1.50	1.50	1.50	-47.67	12.44
		Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-20.37	0.00
		Cálculo 2. LM-71	1.00	1.35	1.35	1.45	-68.52	5.14
		Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-23.72	0.00
		Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-23.72	0.00
		Combinación pésima. Cálculo 1. Tren A						-47.67 12.44
Empotramiento inferior de hastial 3	2884	Cálculo 1. Tren A	0.90	0.00	0.00	1.50	-11.20	-6.63
		Cálculo 1. Tren B	0.90	0.00	0.00	0.00	-13.24	-7.76
		Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-15.84	-11.60
		Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-15.84	-11.60
		Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-15.84	-11.60
		Combinación pésima. Cálculo 1. Tren A						-11.20 -6.63
Media del hastial 3	2879	Cálculo 1. Tren A	0.90	1.50	1.50	1.50	-10.36	9.98
		Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-12.55	8.20
		Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-13.40	6.53
		Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-13.40	6.53
		Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-13.40	6.53
		Combinación pésima. Cálculo 1. Tren A						-10.36 9.98
Empotramiento superior de hastial 3	2874	Cálculo 1. Tren A	0.90	0.00	0.00	1.50	-4.29	2.34
		Cálculo 1. Tren B	0.90	0.00	0.00	0.00	-6.75	-0.37
		Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-8.64	-3.71
		Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-8.64	-3.71
		Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-8.64	-3.71
		Combinación pésima. Cálculo 1. Tren A						-4.29 2.34
Empotramiento 1 de dintel	1580	Cálculo 1. Tren A	1.50	0.00	0.00	0.00	2.54	1.86
		Cálculo 1. Tren B	1.50	0.00	0.00	0.00	2.54	1.86
		Cálculo 2. LM-71	1.35	1.00	0.00	0.00	-3.12	-2.67
		Cálculo 2. SW/0	1.35	1.00	0.00	0.00	-3.12	-2.67
		Cálculo 2. SW/2	1.35	1.00	0.00	0.00	-3.12	-2.67
		Combinación pésima. Cálculo 1. Tren A						2.54 1.86
Centro de vano 1 (dintel)	1588	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	-0.21	29.98
		Cálculo 1. Tren B	1.50	0.00	0.00	1.50	1.46	20.54
		Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-4.99	23.20
		Cálculo 2. SW/0	1.35	1.00	0.00	1.45	-4.45	19.71
		Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-4.37	18.83
		Combinación pésima. Cálculo 1. Tren A						-0.21 29.98

Envoltorio de M(t) en E.L.S. (Tracciones en cara interior de hastiales y dintel e inferior en solera).

Sección	Elemento	Cálculo	Coeficientes				N	M
			PP+CM	E,t	E,sc	Sobrecarga	T/m	mT/m
Empotramiento inferior de hastial 1	309	Cálculo 1. Tren A	1.00	0.00	0.00	0.00	-14.71	-8.63
		Cálculo 1. Tren B	1.00	0.00	0.00	0.00	-14.71	-8.63
		Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-15.84	-11.60
		Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-15.84	-11.60
		Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-15.84	-11.60
		Combinación pésima. Cálculo 1. Tren A						-14.71
Media del hastial 1	314	Cálculo 1. Tren A	1.00	1.00	1.00	0.00	-12.80	-2.11
		Cálculo 1. Tren B	1.00	1.00	1.00	0.00	-12.80	-0.22
		Cálculo 2. LM-71	1.00	1.00	1.00	0.00	-12.80	-1.62
		Cálculo 2. SW/0	1.00	1.00	1.00	0.00	-12.80	-0.63
		Cálculo 2. SW/2	1.00	1.00	1.00	0.00	-12.80	-1.18
		Combinación pésima. Cálculo 1. Tren B						-12.80
Empotramiento superior de hastial 1	319	Cálculo 1. Tren A	1.00	0.00	0.00	0.00	-7.50	-0.41
		Cálculo 1. Tren B	1.00	0.00	0.00	0.00	-7.50	-0.41
		Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-8.64	-3.71
		Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-8.64	-3.71
		Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-8.64	-3.71
		Combinación pésima. Cálculo 1. Tren A						-7.50
Empotramiento inferior de hastial 2	5439	Cálculo 1. Tren A	1.00	1.00	1.00	0.00	-32.12	0.00
		Cálculo 1. Tren B	1.00	1.00	1.00	0.00	-32.12	0.00
		Cálculo 2. LM-71	1.00	1.00	1.00	0.00	-32.12	0.00
		Cálculo 2. SW/0	1.00	1.00	1.00	0.00	-32.12	0.00
		Cálculo 2. SW/2	1.00	1.00	1.00	0.00	-32.12	0.00
		Combinación pésima. Cálculo 1. Tren A						-32.12
Media del hastial 2	5444	Cálculo 1. Tren A	1.00	1.00	1.00	1.00	-44.89	3.74
		Cálculo 1. Tren B	1.00	1.00	1.00	0.00	-28.76	0.00
		Cálculo 2. LM-71	1.00	1.00	1.00	0.00	-28.76	0.00
		Cálculo 2. SW/0	1.00	1.00	1.00	0.00	-28.76	0.00
		Cálculo 2. SW/2	1.00	1.00	1.00	0.00	-28.76	0.00
		Combinación pésima. Cálculo 1. Tren A						-44.89
Empotramiento superior de hastial 2	5449	Cálculo 1. Tren A	1.00	1.00	1.00	1.00	-43.11	8.30
		Cálculo 1. Tren B	1.00	1.00	1.00	0.00	-24.91	0.00
		Cálculo 2. LM-71	1.00	1.00	1.00	1.00	-55.81	3.54
		Cálculo 2. SW/0	1.00	1.00	1.00	0.00	-24.91	0.00
		Cálculo 2. SW/2	1.00	1.00	1.00	0.00	-24.91	0.00
		Combinación pésima. Cálculo 1. Tren A						-43.11
Empotramiento inferior de hastial 3	2884	Cálculo 1. Tren A	1.00	0.00	0.00	1.00	-13.35	-7.87
		Cálculo 1. Tren B	1.00	0.00	0.00	0.00	-14.71	-8.63
		Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-15.84	-11.60
		Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-15.84	-11.60
		Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-15.84	-11.60
		Combinación pésima. Cálculo 1. Tren A						-13.35
Media del hastial 3	2879	Cálculo 1. Tren A	1.00	1.00	1.00	1.00	-11.34	4.86
		Cálculo 1. Tren B	1.00	1.00	1.00	0.00	-12.80	3.67
		Cálculo 2. LM-71	1.00	1.00	1.00	0.00	-12.80	3.67
		Cálculo 2. SW/0	1.00	1.00	1.00	0.00	-12.80	3.67
		Cálculo 2. SW/2	1.00	1.00	1.00	0.00	-12.80	3.67
		Combinación pésima. Cálculo 1. Tren A						-11.34
Empotramiento superior de hastial 3	2874	Cálculo 1. Tren A	1.00	0.00	0.00	1.00	-5.86	1.40
		Cálculo 1. Tren B	1.00	0.00	0.00	0.00	-7.50	-0.41
		Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-8.64	-3.71
		Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-8.64	-3.71
		Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-8.64	-3.71
		Combinación pésima. Cálculo 1. Tren A						-5.86
Empotramiento 1 de dintel	1580	Cálculo 1. Tren A	1.00	0.00	0.00	0.00	1.69	1.24
		Cálculo 1. Tren B	1.00	0.00	0.00	0.00	1.69	1.24
		Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-3.71	-3.10
		Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-3.71	-3.10
		Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-3.71	-3.10
		Combinación pésima. Cálculo 1. Tren A						1.69
Centro de vano 1 (dintel)	1588	Cálculo 1. Tren A	1.00	0.00	0.00	1.00	-0.14	19.99
		Cálculo 1. Tren B	1.00	0.00	0.00	1.00	0.97	13.70
		Cálculo 2. LM-71	1.00	1.00	0.00	1.00	-5.08	16.12
		Cálculo 2. SW/0	1.00	1.00	0.00	1.00	-4.69	13.71
		Cálculo 2. SW/2	1.00	1.00	0.00	1.00	-4.78	14.86
		Combinación pésima. Cálculo 1. Tren A						-0.14

CÁLCULO DE ARMADURAS

Proyecto: L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
Estructura: E-1516.3

Notación: PP= Peso propio
CM= Carga muerta de traviesas, carriles y balasto
E.t= Empuje de tierras

E.sc= Empuje de tierras debido a una sobrecarga de 3 tm/2
Tren A= Tren de cargas tipo A de la norma española.
Tren B= Tren de cargas tipo B de la norma española.

LM-71= Load model 71 del Eurocodigo 1
SW/0= Tren pesado tipo SW/0 del Eurocodigo 1
SW/2= Tren pesado tipo SW/2 del Eurocodigo 1

Envoltorio de M(+) en E.L.U. (Tracciones en cara interior de hastiales y dintel e inferior en solera) (Continuación).

Sección	Elemento	Cálculo	Coeficientes				Nd T/m	Md mT/m
			PP+CM	E.t	E.sc	Sobrecarga		
Empotramiento 2 de dintel	1596	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-13.22	-12.04
		Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-13.22	-12.04
		Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-11.64	-14.62
		Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-11.64	-14.62
		Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-11.64	-14.62
		Combinación pésima. Cálculo 1. Tren A						-13.22
Empotramiento 3 de dintel	1597	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-13.22	-12.04
		Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-13.22	-12.04
		Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-11.64	-14.62
		Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-11.64	-14.62
		Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-11.64	-14.62
		Combinación pésima. Cálculo 1. Tren A						-13.22
Centro de vano 2 (dintel)	1605	Cálculo 1. Tren A	1.50	0.00	0.00	0.00	2.49	8.27
		Cálculo 1. Tren B	1.50	0.00	0.00	1.50	1.46	20.54
		Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-3.69	12.45
		Cálculo 2. SW/0	1.35	1.00	0.00	1.45	-4.45	19.71
		Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-4.37	18.83
		Combinación pésima. Cálculo 1. Tren B						1.46
Empotramiento 4 de dintel	1613	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	2.93	4.25
		Cálculo 1. Tren B	1.50	0.00	0.00	0.00	2.54	1.86
		Cálculo 2. LM-71	1.35	1.00	0.00	0.00	-3.12	-2.67
		Cálculo 2. SW/0	1.35	1.00	0.00	0.00	-3.12	-2.67
		Cálculo 2. SW/2	1.35	1.00	0.00	0.00	-3.12	-2.67
		Combinación pésima. Cálculo 1. Tren A						2.93
Empotramiento 1 de solera	4145	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	-21.31	20.58
		Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-22.64	21.29
		Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-19.72	19.41
		Cálculo 2. SW/0	1.35	1.35	1.35	1.45	-20.14	19.30
		Cálculo 2. SW/2	1.35	1.35	1.35	1.20	-20.24	19.24
		Combinación pésima. Cálculo 1. Tren B						-22.64
Centro de vano 1 (solera)	4153	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-23.97	-8.48
		Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-23.97	-8.48
		Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-21.95	-10.06
		Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-21.95	-10.06
		Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-21.95	-10.06
		Combinación pésima. Cálculo 1. Tren A						-23.97
Empotramiento 2 de solera	4161	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	-3.12	33.12
		Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-5.91	42.75
		Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-15.38	36.35
		Cálculo 2. SW/0	1.35	1.00	0.00	1.45	-16.30	39.71
		Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-16.15	38.34
		Combinación pésima. Cálculo 1. Tren B						-5.91
Empotramiento 3 de solera	4162	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	-5.88	34.81
		Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-5.91	42.75
		Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-16.37	36.78
		Cálculo 2. SW/0	1.35	1.00	0.00	1.45	-16.30	39.71
		Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-16.15	38.34
		Combinación pésima. Cálculo 1. Tren B						-5.91
Centro de vano 2 (solera)	4170	Cálculo 1. Tren A	0.90	1.50	1.50	1.50	-24.50	-6.44
		Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-23.97	-8.48
		Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-21.95	-10.06
		Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-21.95	-10.06
		Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-21.95	-10.06
		Combinación pésima. Cálculo 1. Tren A						-24.50
Empotramiento 4 de solera	4178	Cálculo 1. Tren A	1.50	1.50	1.50	0.00	-24.01	20.45
		Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-22.64	21.29
		Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-20.90	18.73
		Cálculo 2. SW/0	1.35	1.35	1.35	1.45	-20.14	19.30
		Cálculo 2. SW/2	1.35	1.35	1.35	1.20	-20.24	19.24
		Combinación pésima. Cálculo 1. Tren B						-22.64

Envoltorio de M(+) en E.L.S. (Tracciones en cara interior de hastiales y dintel e inferior en solera) (Continuación).

Sección	Elemento	Cálculo	Coeficientes				N T/m	M mT/m
			PP+CM	E.t	E.sc	Sobrecarga		
Empotramiento 2 de dintel	1596	Cálculo 1. Tren A	1.00	1.00	1.00	0.00	-8.27	-15.98
		Cálculo 1. Tren B	1.00	1.00	1.00	0.00	-8.27	-15.98
		Cálculo 2. LM-71	1.00	1.00	1.00	0.00	-8.27	-15.98
		Cálculo 2. SW/0	1.00	1.00	1.00	0.00	-8.27	-15.98
		Cálculo 2. SW/2	1.00	1.00	1.00	0.00	-8.27	-15.98
		Combinación pésima. Cálculo 1. Tren A						-8.27
Empotramiento 3 de dintel	1597	Cálculo 1. Tren A	1.00	1.00	1.00	0.00	-8.27	-15.98
		Cálculo 1. Tren B	1.00	1.00	1.00	0.00	-8.27	-15.98
		Cálculo 2. LM-71	1.00	1.00	1.00	0.00	-8.27	-15.98
		Cálculo 2. SW/0	1.00	1.00	1.00	0.00	-8.27	-15.98
		Cálculo 2. SW/2	1.00	1.00	1.00	0.00	-8.27	-15.98
		Combinación pésima. Cálculo 1. Tren A						-8.27
Centro de vano 2 (dintel)	1605	Cálculo 1. Tren A	1.00	0.00	0.00	0.00	1.66	5.51
		Cálculo 1. Tren B	1.00	0.00	0.00	1.00	0.97	13.70
		Cálculo 2. LM-71	1.00	1.00	0.00	1.00	-4.16	8.70
		Cálculo 2. SW/0	1.00	1.00	0.00	1.00	-4.69	13.71
		Cálculo 2. SW/2	1.00	1.00	0.00	1.00	-4.78	14.86
		Combinación pésima. Cálculo 2. SW/2						-4.78
Empotramiento 4 de dintel	1613	Cálculo 1. Tren A	1.00	0.00	0.00	1.00	1.95	2.84
		Cálculo 1. Tren B	1.00	0.00	0.00	0.00	1.69	1.24
		Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-3.71	-3.10
		Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-3.71	-3.10
		Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-3.71	-3.10
		Combinación pésima. Cálculo 1. Tren A						1.95
Empotramiento 1 de solera	4145	Cálculo 1. Tren A	1.00	1.00	1.00	1.00	-14.20	13.72
		Cálculo 1. Tren B	1.00	1.00	1.00	1.00	-15.09	14.19
		Cálculo 2. LM-71	1.00	1.00	1.00	1.00	-14.71	14.32
		Cálculo 2. SW/0	1.00	1.00	1.00	1.00	-15.00	14.25
		Cálculo 2. SW/2	1.00	1.00	1.00	1.00	-14.87	14.33
		Combinación pésima. Cálculo 2. LM-71						-14.71
Centro de vano 1 (solera)	4153	Cálculo 1. Tren A	1.00	1.00	1.00	0.00	-16.78	-10.77
		Cálculo 1. Tren B	1.00	1.00	1.00	0.00	-16.78	-10.77
		Cálculo 2. LM-71	1.00	1.00	1.00	0.00	-16.78	-10.77
		Cálculo 2. SW/0	1.00	1.00	1.00	0.00	-16.78	-10.77
		Cálculo 2. SW/2	1.00	1.00	1.00	0.00	-16.78	-10.77
		Combinación pésima. Cálculo 1. Tren A						-16.78
Empotramiento 2 de solera	4161	Cálculo 1. Tren A	1.00	0.00	0.00	1.00	-2.08	22.08
		Cálculo 1. Tren B	1.00	0.00	0.00	1.00	-3.94	28.50
		Cálculo 2. LM-71	1.00	1.00	0.00	1.00	-14.07	25.53
		Cálculo 2. SW/0	1.00	1.00	0.00	1.00	-14.71	27.85
		Cálculo 2. SW/2	1.00	1.00	0.00	1.00	-14.92	29.65
		Combinación pésima. Cálculo 1. Tren B						-3.94
Empotramiento 3 de solera	4162	Cálculo 1. Tren A	1.00	0.00	0.00	1.00	-3.79	23.20
		Cálculo 1. Tren B	1.00	0.00	0.00	1.00	-3.94	28.50
		Cálculo 2. LM-71	1.00	1.00	0.00	1.00	-14.76	25.83
		Cálculo 2. SW/0	1.00	1.00	0.00	1.00	-14.71	27.85
		Cálculo 2. SW/2	1.00	1.00	0.00	1.00	-14.92	29.65
		Combinación pésima. Cálculo 1. Tren B						-3.94
Centro de vano 2 (solera)	4170	Cálculo 1. Tren A	1.00	1.00	1.00	1.00	-17.13	-9.41
		Cálculo 1. Tren B	1.00	1.00	1.00	0.00	-16.78	-10.77
		Cálculo 2. LM-71	1.00	1.00	1.00	0.00	-16.78	-10.77
		Cálculo 2. SW/0	1.00	1.00	1.00	0.00	-16.78	-10.77
		Cálculo 2. SW/2	1.00	1.00	1.00	0.00	-16.78	-10.77
		Combinación pésima. Cálculo 1. Tren A						-17.13
Empotramiento 4 de solera	4178	Cálculo 1. Tren A	1.00	1.00	1.00	0.00	-16.01	13.63
		Cálculo 1. Tren B	1.00	1.00	1.00	1.00	-15.09	14.19
		Cálculo 2. LM-71	1.00	1.00	1.00	1.00	-15.52	13.86
		Cálculo 2. SW/0	1.00	1.00	1.00	1.00	-15.00	14.25
		Cálculo 2. SW/2	1.00	1.00	1.00	1.00	-14.87	14.33
		Combinación pésima. Cálculo 2. SW/2						-14.87

CÁLCULO DE ARMADURAS

Proyecto: L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
Estructura: E-1516.3

Notación: PP= Peso propio
CM= Carga muerta de traviesas, carriles y balasto
E.t= Empuje de tierras

E.sc= Empuje de tierras debido a una sobrecarga de 3 t/m2
Tren A= Tren de cargas tipo A de la norma española.
Tren B= Tren de cargas tipo B de la norma española.

LM-71= Load model 71 del Eurocodigo 1
SW/0= Tren pesado tipo SW/0 del Eurocodigo 1
SW/2= Tren pesado tipo SW/2 del Eurocodigo 1

Envoltorio de M(-) en E.L.U. (Tracciones en cara exterior de hastiales y dintel y superior en solera).

Sección	Elemento	Cálculo	Coeficientes				Nd T/m	Md mT/m
			PP+CM	E.t	E.sc	Sobrecarga		
Empotramiento inferior de hastial 1	309	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	-38.06	-22.88
		Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-38.34	-23.02
		Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-36.58	-21.77
		Cálculo 2. SW/0	1.35	1.35	1.35	1.45	-34.68	-21.25
		Cálculo 2. SW/2	1.35	1.35	1.35	1.20	-33.84	-21.02
		Combinación pésima. Cálculo 1. Tren B						-38.34 -23.02
Media del hastial 1	314	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	-33.57	-8.73
		Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-31.62	-8.73
		Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-34.38	-0.65
		Cálculo 2. SW/0	1.35	1.00	0.00	1.45	-32.12	-0.65
		Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-31.05	-0.65
		Combinación pésima. Cálculo 1. Tren B						-31.62 -8.73
Empotramiento superior de hastial 1	319	Cálculo 1. Tren A	0.90	1.50	1.50	1.50	-29.70	-23.96
		Cálculo 1. Tren B	0.90	1.50	1.50	1.50	-25.96	-17.41
		Cálculo 2. LM-71	1.00	1.35	1.35	1.45	-30.45	-19.99
		Cálculo 2. SW/0	1.00	1.35	1.35	1.45	-27.60	-17.40
		Cálculo 2. SW/2	1.00	1.35	1.35	1.20	-26.40	-16.69
		Combinación pésima. Cálculo 1. Tren A						-29.70 -23.96
Empotramiento inferior de hastial 2	5439	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-26.88	0.00
		Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-26.88	0.00
		Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-30.94	0.00
		Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-30.94	0.00
		Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-30.94	0.00
		Combinación pésima. Cálculo 1. Tren A						-26.88 0.00
Media del hastial 2	5444	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-23.72	0.00
		Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-23.72	0.00
		Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-27.50	0.00
		Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-27.50	0.00
		Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-27.50	0.00
		Combinación pésima. Cálculo 1. Tren A						-23.72 0.00
Empotramiento superior de hastial 2	5449	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-20.37	0.00
		Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-20.37	0.00
		Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-23.72	0.00
		Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-23.72	0.00
		Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-23.72	0.00
		Combinación pésima. Cálculo 1. Tren A						-20.37 0.00
Empotramiento inferior de hastial 3	2884	Cálculo 1. Tren A	1.50	1.50	1.50	0.00	-24.63	-19.87
		Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-36.34	-23.02
		Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-28.78	-19.50
		Cálculo 2. SW/0	1.35	1.35	1.35	1.45	-34.68	-21.25
		Cálculo 2. SW/2	1.35	1.35	1.35	1.20	-33.84	-21.02
		Combinación pésima. Cálculo 1. Tren B						-36.34 -23.02
Media del hastial 3	2879	Cálculo 1. Tren A	1.50	0.00	0.00	0.00	-16.83	-8.73
		Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-31.62	-12.57
		Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-24.75	-3.82
		Cálculo 2. SW/0	1.35	1.00	0.00	1.45	-32.12	-6.89
		Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-31.05	-6.47
		Combinación pésima. Cálculo 1. Tren B						-31.62 -12.57
Empotramiento superior de hastial 3	2874	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-9.32	-7.82
		Cálculo 1. Tren B	0.90	1.50	1.50	1.50	-25.97	-17.41
		Cálculo 2. LM-71	1.00	1.35	1.35	1.45	-19.41	-11.94
		Cálculo 2. SW/0	1.00	1.35	1.35	1.45	-27.60	-17.40
		Cálculo 2. SW/2	1.00	1.35	1.35	1.20	-26.40	-16.69
		Combinación pésima. Cálculo 1. Tren B						-25.97 -17.41
Empotramiento 1 de dintel	1580	Cálculo 1. Tren A	0.90	1.50	1.50	1.50	-15.38	-22.19
		Cálculo 1. Tren B	0.90	1.50	1.50	1.50	-13.87	-16.01
		Cálculo 2. LM-71	1.00	1.35	1.35	1.45	-12.83	-17.52
		Cálculo 2. SW/0	1.00	1.35	1.35	1.45	-12.39	-15.38
		Cálculo 2. SW/2	1.00	1.35	1.35	1.20	-12.29	-14.86
		Combinación pésima. Cálculo 1. Tren A						-15.38 -22.19
Centro de vano 1 (dintel)	1588	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-13.05	2.94
		Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-13.05	2.94
		Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-11.43	3.70
		Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-11.43	3.70
		Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-11.43	3.70
		Combinación pésima. Cálculo 1. Tren A						-13.05 2.94

Envoltorio de M(-) en E.L.S. (Tracciones en cara exterior de hastiales y dintel y superior en solera).

Sección	Elemento	Cálculo	Coeficientes				N T/m	M mT/m
			PP+CM	E.I	E.sc	Sobrecarga		
Empotramiento inferior de hastial 1	309	Cálculo 1. Tren A	1.00	1.00	1.00	1.00	-25.37	-15.25
		Cálculo 1. Tren B	1.00	1.00	1.00	1.00	-24.23	-15.35
		Cálculo 2. LM-71	1.00	1.00	1.00	1.00	-26.36	-15.92
		Cálculo 2. SW/0	1.00	1.00	1.00	1.00	-25.05	-15.57
		Cálculo 2. SW/2	1.00	1.00	1.00	1.00	-26.15	-15.86
		Combinación pésima. Cálculo 2. LM-71						-26.36
Media del hastial 1	314	Cálculo 1. Tren A	1.00	0.00	0.00	1.00	-22.38	-4.49
		Cálculo 1. Tren B	1.00	0.00	0.00	1.00	-21.08	-4.49
		Cálculo 2. LM-71	1.00	1.00	0.00	1.00	-24.83	0.92
		Cálculo 2. SW/0	1.00	1.00	0.00	1.00	-23.27	0.92
		Cálculo 2. SW/2	1.00	1.00	0.00	1.00	-24.68	0.92
		Combinación pésima. Cálculo 1. Tren B						-21.08
Empotramiento superior de hastial 1	319	Cálculo 1. Tren A	1.00	1.00	1.00	1.00	-22.80	-16.14
		Cálculo 1. Tren B	1.00	1.00	1.00	1.00	-20.31	-11.77
		Cálculo 2. LM-71	1.00	1.00	1.00	1.00	-23.44	-14.25
		Cálculo 2. SW/0	1.00	1.00	1.00	1.00	-21.48	-12.46
		Cálculo 2. SW/2	1.00	1.00	1.00	1.00	-23.04	-13.37
		Combinación pésima. Cálculo 1. Tren A						-22.80
Empotramiento inferior de hastial 2	5439	Cálculo 1. Tren A	1.00	1.00	1.00	0.00	-32.12	0.00
		Cálculo 1. Tren B	1.00	1.00	1.00	0.00	-32.12	0.00
		Cálculo 2. LM-71	1.00	1.00	1.00	0.00	-32.12	0.00
		Cálculo 2. SW/0	1.00	1.00	1.00	0.00	-32.12	0.00
		Cálculo 2. SW/2	1.00	1.00	1.00	0.00	-32.12	0.00
		Combinación pésima. Cálculo 1. Tren A						-32.12
Media del hastial 2	5444	Cálculo 1. Tren A	1.00	1.00	1.00	0.00	-28.76	0.00
		Cálculo 1. Tren B	1.00	1.00	1.00	0.00	-28.76	0.00
		Cálculo 2. LM-71	1.00	1.00	1.00	0.00	-28.76	0.00
		Cálculo 2. SW/0	1.00	1.00	1.00	0.00	-28.76	0.00
		Cálculo 2. SW/2	1.00	1.00	1.00	0.00	-28.76	0.00
		Combinación pésima. Cálculo 1. Tren A						-28.76
Empotramiento superior de hastial 2	5449	Cálculo 1. Tren A	1.00	1.00	1.00	0.00	-24.91	0.00
		Cálculo 1. Tren B	1.00	1.00	1.00	0.00	-24.91	0.00
		Cálculo 2. LM-71	1.00	1.00	1.00	0.00	-24.91	0.00
		Cálculo 2. SW/0	1.00	1.00	1.00	0.00	-24.91	0.00
		Cálculo 2. SW/2	1.00	1.00	1.00	0.00	-24.91	0.00
		Combinación pésima. Cálculo 1. Tren A						-24.91
Empotramiento inferior de hastial 3	2884	Cálculo 1. Tren A	1.00	1.00	1.00	0.00	-16.42	-13.25
		Cálculo 1. Tren B	1.00	1.00	1.00	1.00	-24.23	-15.35
		Cálculo 2. LM-71	1.00	1.00	1.00	1.00	-20.97	-14.36
		Cálculo 2. SW/0	1.00	1.00	1.00	1.00	-25.05	-15.57
		Cálculo 2. SW/2	1.00	1.00	1.00	1.00	-26.15	-15.86
		Combinación pésima. Cálculo 2. SW/2						-26.15
Media del hastial 3	2879	Cálculo 1. Tren A	1.00	0.00	0.00	0.00	-11.09	-4.49
		Cálculo 1. Tren B	1.00	0.00	0.00	1.00	-21.08	-8.38
		Cálculo 2. LM-71	1.00	1.00	0.00	1.00	-18.19	-1.13
		Cálculo 2. SW/0	1.00	1.00	0.00	1.00	-23.27	-3.39
		Cálculo 2. SW/2	1.00	1.00	0.00	1.00	-24.68	-3.93
		Combinación pésima. Cálculo 1. Tren B						-21.08
Empotramiento superior de hastial 3	2874	Cálculo 1. Tren A	1.00	1.00	1.00	0.00	-9.21	-5.25
		Cálculo 1. Tren B	1.00	1.00	1.00	1.00	-20.31	-11.77
		Cálculo 2. LM-71	1.00	1.00	1.00	1.00	-15.83	-8.70
		Cálculo 2. SW/0	1.00	1.00	1.00	1.00	-21.48	-12.46
		Cálculo 2. SW/2	1.00	1.00	1.00	1.00	-23.04	-13.37
		Combinación pésima. Cálculo 2. SW/2						-23.04
Empotramiento 1 de dintel	1580	Cálculo 1. Tren A	1.00	1.00	1.00	1.00	-9.58	-14.30
		Cálculo 1. Tren B	1.00	1.00	1.00	1.00	-8.57	-10.17
		Cálculo 2. LM-71	1.00	1.00	1.00	1.00	-8.97	-12.18
		Cálculo 2. SW/0	1.00	1.00	1.00	1.00	-8.68	-10.68
		Cálculo 2. SW/2	1.00	1.00	1.00	1.00	-8.79	-11.35
		Combinación pésima. Cálculo 1. Tren A						-8.58
Centro de vano 1 (dintel)	1588	Cálculo 1. Tren A	1.00	1.00	1.00	0.00	-8.04	4.17
		Cálculo 1. Tren B	1.00	1.00	1.00	0.00	-8.04	4.17
		Cálculo 2. LM-71	1.00	1.00	1.00	0.00	-8.04	4.17
		Cálculo 2. SW/0	1.00	1.00	1.00	0.00	-8.04	4.17
		Cálculo 2. SW/2	1.00	1.00	1.00	0.00	-8.04	4.17
		Combinación pésima. Cálculo 1. Tren A						-8.04

CÁLCULO DE ARMADURAS

Proyecto: L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
Estructura: E-1516.3

Notación: PP= Peso propio
CM= Carga muerta de traviesas, carriles y balasto
E.t= Empuje de tierras

E.sc= Empuje de tierras debido a una sobrecarga de 3 t/m²
Tren A= Tren de cargas tipo A de la norma española.
Tren B= Tren de cargas tipo B de la norma española.

LM-71= Load model 71 del Eurocodigo 1
SW/0= Tren pesado tipo SW/0 del Eurocodigo 1
SW/2= Tren pesado tipo SW/2 del Eurocodigo 1

Envoltorio de M(-) en E.L.U. (Tracciones en cara exterior de hastiales y dintel y superior en solera) (Continuación).

Sección	Elemento	Cálculo	Coeficientes				Nd T/m	Md mT/m
			PP+CM	E.t	E.sc	Sobrecarga		
Empotramiento 2 de dintel	1596	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	0.61	-54.62
		Cálculo 1. Tren B	1.50	0.00	0.00	1.50	2.72	-60.76
		Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-3.65	-54.36
		Cálculo 2. SW/0	1.35	1.00	0.00	1.45	-2.97	-57.27
		Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-3.02	-55.05
		Combinación pésima. Cálculo 1. Tren B						2.72
Empotramiento 3 de dintel	1597	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	3.31	-44.87
		Cálculo 1. Tren B	1.50	0.00	0.00	1.50	2.72	-60.76
		Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-2.64	-50.68
		Cálculo 2. SW/0	1.35	1.00	0.00	1.45	-2.97	-57.27
		Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-3.02	-55.05
		Combinación pésima. Cálculo 1. Tren B						2.72
Centro de vano 2 (dintel)	1605	Cálculo 1. Tren A	0.90	1.50	1.50	1.50	-12.42	-1.73
		Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-13.05	2.94
		Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-11.43	3.70
		Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-11.43	3.70
		Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-11.43	3.70
		Combinación pésima. Cálculo 1. Tren A						-12.42
Empotramiento 4 de dintel	1613	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-12.53	-8.83
		Cálculo 1. Tren B	0.90	1.50	1.50	1.50	-13.87	-16.01
		Cálculo 2. LM-71	1.00	1.35	1.35	1.45	-11.81	-11.18
		Cálculo 2. SW/0	1.00	1.35	1.35	1.45	-12.39	-15.38
		Cálculo 2. SW/2	1.00	1.35	1.35	1.20	-12.29	-14.86
		Combinación pésima. Cálculo 1. Tren B						-13.87
Empotramiento 1 de solera	4145	Cálculo 1. Tren A	0.90	0.00	0.00	1.50	1.15	5.81
		Cálculo 1. Tren B	0.90	0.00	0.00	0.00	-1.56	5.69
		Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-12.00	11.23
		Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-12.00	11.23
		Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-12.00	11.23
		Combinación pésima. Cálculo 1. Tren A						1.15
Centro de vano 1 (solera)	4153	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	-0.84	-32.24
		Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-2.32	-30.00
		Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-12.16	-29.30
		Cálculo 2. SW/0	1.35	1.00	0.00	1.45	-12.62	-27.43
		Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-12.67	-26.65
		Combinación pésima. Cálculo 1. Tren A						-0.84
Empotramiento 2 de solera	4161	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-24.33	9.49
		Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-24.33	9.49
		Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-22.36	11.53
		Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-22.36	11.53
		Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-22.36	11.53
		Combinación pésima. Cálculo 1. Tren A						-24.33
Empotramiento 3 de solera	4162	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-24.33	9.49
		Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-24.33	9.49
		Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-22.36	11.53
		Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-22.36	11.53
		Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-22.36	11.53
		Combinación pésima. Cálculo 1. Tren A						-24.33
Centro de vano 2 (solera)	4170	Cálculo 1. Tren A	1.50	0.00	0.00	0.00	-2.98	-19.18
		Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-2.32	-30.00
		Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-13.19	-21.92
		Cálculo 2. SW/0	1.35	1.00	0.00	1.45	-12.62	-27.43
		Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-12.67	-26.65
		Combinación pésima. Cálculo 1. Tren B						-2.32
Empotramiento 4 de solera	4178	Cálculo 1. Tren A	0.90	0.00	0.00	1.50	-1.85	4.94
		Cálculo 1. Tren B	0.90	0.00	0.00	0.00	-1.56	5.69
		Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-12.00	11.23
		Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-12.00	11.23
		Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-12.00	11.23
		Combinación pésima. Cálculo 1. Tren A						-1.85

Envoltorio de M(-) en E.L.B. (Tracciones en cara exterior de hastiales y dintel y superior en solera) (Continuación).

			Coeficientes				N	M
Sección	Elemento	Cálculo	PP+CM	E.I	E.sc	Sobrecarga	T/m	mT/m
Empotramiento 2 de dintel	1596	Cálculo 1. Tren A	1.00	0.00	0.00	1.00	0.40	-36.41
		Cálculo 1. Tren B	1.00	0.00	0.00	1.00	1.81	-40.51
		Cálculo 2. LM-71	1.00	1.00	0.00	1.00	-4.14	-38.04
		Cálculo 2. SW/0	1.00	1.00	0.00	1.00	-3.68	-40.05
		Cálculo 2. SW/2	1.00	1.00	0.00	1.00	-3.61	-42.95
		Combinación pésima. Cálculo 2. SW/2						
Empotramiento 3 de dintel	1597	Cálculo 1. Tren A	1.00	0.00	0.00	1.00	2.21	-29.91
		Cálculo 1. Tren B	1.00	0.00	0.00	1.00	1.81	-40.51
		Cálculo 2. LM-71	1.00	1.00	0.00	1.00	-3.45	-35.51
		Cálculo 2. SW/0	1.00	1.00	0.00	1.00	-3.68	-40.05
		Cálculo 2. SW/2	1.00	1.00	0.00	1.00	-3.61	-42.95
		Combinación pésima. Cálculo 2. SW/2						
Centro de vano 2 (dintel)	1605	Cálculo 1. Tren A	1.00	1.00	1.00	1.00	-7.62	1.05
		Cálculo 1. Tren B	1.00	1.00	1.00	0.00	-8.04	4.17
		Cálculo 2. LM-71	1.00	1.00	1.00	0.00	-8.04	4.17
		Cálculo 2. SW/0	1.00	1.00	1.00	0.00	-8.04	4.17
		Cálculo 2. SW/2	1.00	1.00	1.00	0.00	-8.04	4.17
		Combinación pésima. Cálculo 1. Tren A						
Empotramiento 4 de dintel	1613	Cálculo 1. Tren A	1.00	1.00	1.00	0.00	-7.67	-5.39
		Cálculo 1. Tren B	1.00	1.00	1.00	1.00	-8.57	-10.17
		Cálculo 2. LM-71	1.00	1.00	1.00	1.00	-8.13	-7.78
		Cálculo 2. SW/0	1.00	1.00	1.00	1.00	-8.66	-10.68
		Cálculo 2. SW/2	1.00	1.00	1.00	1.00	-8.79	-11.35
		Combinación pésima. Cálculo 2. SW/2						
Empotramiento 1 de solera	4145	Cálculo 1. Tren A	1.00	0.00	0.00	1.00	0.08	6.40
		Cálculo 1. Tren B	1.00	0.00	0.00	0.00	-1.73	6.32
		Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-12.00	11.23
		Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-12.00	11.23
		Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-12.00	11.23
		Combinación pésima. Cálculo 1. Tren A						
Centro de vano 1 (solera)	4153	Cálculo 1. Tren A	1.00	0.00	0.00	1.00	-0.58	-21.49
		Cálculo 1. Tren B	1.00	0.00	0.00	1.00	-1.55	-20.00
		Cálculo 2. LM-71	1.00	1.00	0.00	1.00	-11.82	-20.85
		Cálculo 2. SW/0	1.00	1.00	0.00	1.00	-12.14	-19.36
		Cálculo 2. SW/2	1.00	1.00	0.00	1.00	-12.08	-20.38
		Combinación pésima. Cálculo 1. Tren A						
Empotramiento 2 de solera	4161	Cálculo 1. Tren A	1.00	1.00	1.00	0.00	-17.21	12.62
		Cálculo 1. Tren B	1.00	1.00	1.00	0.00	-17.21	12.62
		Cálculo 2. LM-71	1.00	1.00	1.00	0.00	-17.21	12.62
		Cálculo 2. SW/0	1.00	1.00	1.00	0.00	-17.21	12.62
		Cálculo 2. SW/2	1.00	1.00	1.00	0.00	-17.21	12.62
		Combinación pésima. Cálculo 1. Tren A						
Empotramiento 3 de solera	4162	Cálculo 1. Tren A	1.00	1.00	1.00	0.00	-17.21	12.62
		Cálculo 1. Tren B	1.00	1.00	1.00	0.00	-17.21	12.62
		Cálculo 2. LM-71	1.00	1.00	1.00	0.00	-17.21	12.62
		Cálculo 2. SW/0	1.00	1.00	1.00	0.00	-17.21	12.62
		Cálculo 2. SW/2	1.00	1.00	1.00	0.00	-17.21	12.62
		Combinación pésima. Cálculo 1. Tren A						
Centro de vano 2 (solera)	4170	Cálculo 1. Tren A	1.00	0.00	0.00	0.00	-1.99	-12.78
		Cálculo 1. Tren B	1.00	0.00	0.00	1.00	-1.55	-20.00
		Cálculo 2. LM-71	1.00	1.00	0.00	1.00	-12.53	-15.56
		Cálculo 2. SW/0	1.00	1.00	0.00	1.00	-12.14	-19.36
		Cálculo 2. SW/2	1.00	1.00	0.00	1.00	-12.08	-20.38
		Combinación pésima. Cálculo 1. Tren B						
Empotramiento 4 de solera	4178	Cálculo 1. Tren A	1.00	0.00	0.00	1.00	-1.93	5.82
		Cálculo 1. Tren B	1.00	0.00	0.00	0.00	-1.73	6.32
		Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-12.00	11.23
		Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-12.00	11.23
		Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-12.00	11.23
		Combinación pésima. Cálculo 1. Tren A						

Proyecto :	L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
Estructura:	E-1516.3

Notación: PP= Peso propio
CM= Carga muerta de traviesas, camles y balasto
E,t= Empuje de tierras

E_{sc}= Empuje de tierras debido a una sobrecarga de 3 t/m²
Tren A= Tren de cargas tipo A de la norma española.
Tren B= Tren de cargas tipo B de la norma española.

LM-71= Load model 71 del Eurocodigo 1
SW/0= Tren pesado tipo SW/0 del Eurocodigo 1
SW/2= Tren pesado tipo SW/2 del Eurocodigo 1

Envolvente de $V(t)$ en E.L.U.

Sección	Elemento	Cálculo	Coeficientes				Vd mT/m
			PP+CM	E _t	E _{sc}	Sobrecarga	
Empotramiento inferior de hastial 1	309	Cálculo 1. Tren A	0.90	0.00	0.00	1.50	1.06
		Cálculo 1. Tren B	0.90	0.00	0.00	1.50	-0.24
		Cálculo 2. LM-71	1.00	1.00	0.00	1.45	-8.87
		Cálculo 2. SW/0	1.00	1.00	0.00	1.45	-9.27
		Cálculo 2. SW/2	1.00	1.00	0.00	1.20	-9.36
		Combinación pésima. Cálculo 1. Tren A					
Media del hastial 1	314	Cálculo 1. Tren A	0.90	1.50	0.00	1.50	2.75
		Cálculo 1. Tren B	0.90	1.50	0.00	1.50	1.40
		Cálculo 2. LM-71	1.00	1.35	0.00	1.45	1.59
		Cálculo 2. SW/0	1.00	1.35	0.00	1.45	1.16
		Cálculo 2. SW/2	1.00	1.35	0.00	1.20	1.06
		Combinación pésima. Cálculo 1. Tren A					
Empotramiento superior de hastial 1	319	Cálculo 1. Tren A	0.90	1.50	1.50	1.50	14.86
		Cálculo 1. Tren B	0.90	1.50	1.50	1.50	13.24
		Cálculo 2. LM-71	1.00	1.35	1.35	1.45	12.32
		Cálculo 2. SW/0	1.00	1.35	1.35	1.45	11.85
		Cálculo 2. SW/2	1.00	1.35	1.35	1.20	11.74
		Combinación pésima. Cálculo 1. Tren A					
Empotramiento inferior de hastial 2	5439	Cálculo 1. Tren A	0.90	1.50	0.00	0.00	0.00
		Cálculo 1. Tren B	0.90	1.50	0.00	0.00	0.00
		Cálculo 2. LM-71	1.00	1.35	0.00	0.00	0.00
		Cálculo 2. SW/0	1.00	1.35	0.00	0.00	0.00
		Cálculo 2. SW/2	1.00	1.35	0.00	0.00	0.00
		Combinación pésima. Cálculo 1. Tren A					
Media del hastial 2	5444	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	0.00
		Cálculo 1. Tren B	0.90	0.00	0.00	0.00	0.00
		Cálculo 2. LM-71	1.00	1.00	0.00	0.00	0.00
		Cálculo 2. SW/0	1.00	1.00	0.00	0.00	0.00
		Cálculo 2. SW/2	1.00	1.00	0.00	0.00	0.00
		Combinación pésima. Cálculo 1. Tren A					
Empotramiento superior de hastial 2	5449	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	0.00
		Cálculo 1. Tren B	0.90	0.00	0.00	0.00	0.00
		Cálculo 2. LM-71	1.00	1.00	0.00	0.00	0.00
		Cálculo 2. SW/0	1.00	1.00	0.00	0.00	0.00
		Cálculo 2. SW/2	1.00	1.00	0.00	0.00	0.00
		Combinación pésima. Cálculo 1. Tren A					
Empotramiento inferior de hastial 3	2684	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	21.73
		Cálculo 1. Tren B	1.50	1.50	1.50	0.00	21.46
		Cálculo 2. LM-71	1.35	1.35	1.35	0.00	19.31
		Cálculo 2. SW/0	1.35	1.35	1.35	0.00	19.31
		Cálculo 2. SW/2	1.35	1.35	1.35	0.00	19.31
		Combinación pésima. Cálculo 1. Tren A					
Media del hastial 3	2679	Cálculo 1. Tren A	1.50	0.00	1.50	1.50	2.90
		Cálculo 1. Tren B	1.50	0.00	1.50	0.00	2.59
		Cálculo 2. LM-71	1.35	1.00	1.35	0.00	1.28
		Cálculo 2. SW/0	1.35	1.00	1.35	0.00	1.28
		Cálculo 2. SW/2	1.35	1.00	1.35	0.00	1.28
		Combinación pésima. Cálculo 1. Tren A					
Empotramiento superior de hastial 3	2674	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	2.95
		Cálculo 1. Tren B	1.50	0.00	0.00	0.00	2.53
		Cálculo 2. LM-71	1.35	1.00	0.00	0.00	-2.97
		Cálculo 2. SW/0	1.35	1.00	0.00	0.00	-2.97
		Cálculo 2. SW/2	1.35	1.00	0.00	0.00	-2.97
		Combinación pésima. Cálculo 1. Tren A					
Empotramiento 1 de dintel	1580	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	-5.79
		Cálculo 1. Tren B	0.90	0.00	0.00	0.00	-5.79
		Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-7.56
		Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-7.56
		Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-7.56
		Combinación pésima. Cálculo 1. Tren A					
Centro de vano 1 (dintel)	1588	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	6.81
		Cálculo 1. Tren B	1.50	0.00	0.00	1.50	6.72
		Cálculo 2. LM-71	1.35	1.00	0.00	1.45	6.60
		Cálculo 2. SW/0	1.35	1.00	0.00	1.45	7.34
		Cálculo 2. SW/2	1.35	1.00	0.00	1.20	7.08
		Combinación pésima. Cálculo 1. Tren B					

Envolvente de $V(\cdot)$ en E.L.U.

Sección	Elemento	Cálculo	Coeficientes				Vd mT/m
			PP+CM	E.I	E.sc	Sobrecarga	
Empotramiento inferior de hestial 1	309	Cálculo 1. Tren A	1.50	1.50	1.50	0.00	-21.48
		Cálculo 1. Tren B	1.50	1.50	1.50	0.00	-21.46
		Cálculo 2. LM-71	1.35	1.35	1.35	0.00	-19.31
		Cálculo 2. SW/0	1.35	1.35	1.35	0.00	-19.31
		Cálculo 2. SW/2	1.35	1.35	1.35	0.00	-19.31
		Combinación pésima. Cálculo 1. Tren A					
Media del hestial 1	314	Cálculo 1. Tren A	1.50	0.00	1.50	0.00	-2.59
		Cálculo 1. Tren B	1.50	0.00	1.50	0.00	-2.59
		Cálculo 2. LM-71	1.35	1.00	1.35	0.00	-1.28
		Cálculo 2. SW/0	1.35	1.00	1.35	0.00	-1.28
		Cálculo 2. SW/2	1.35	1.00	1.35	0.00	-1.28
		Combinación pésima. Cálculo 1. Tren A					
Empotramiento superior de hestial 1	319	Cálculo 1. Tren A	1.50	0.00	0.00	0.00	-2.53
		Cálculo 1. Tren B	1.50	0.00	0.00	0.00	-2.53
		Cálculo 2. LM-71	1.35	1.00	0.00	0.00	2.97
		Cálculo 2. SW/0	1.35	1.00	0.00	0.00	2.97
		Cálculo 2. SW/2	1.35	1.00	0.00	0.00	2.97
		Combinación pésima. Cálculo 1. Tren A					
Empotramiento inferior de hestial 2	5439	Cálculo 1. Tren A	1.50	0.00	1.50	1.50	-2.49
		Cálculo 1. Tren B	1.50	0.00	1.50	1.50	0.00
		Cálculo 2. LM-71	1.35	1.00	1.35	1.45	-0.96
		Cálculo 2. SW/0	1.35	1.00	1.35	1.45	0.00
		Cálculo 2. SW/2	1.35	1.00	1.35	1.20	0.00
		Combinación pésima. Cálculo 1. Tren A					
Media del hestial 2	5444	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	-2.52
		Cálculo 1. Tren B	1.50	1.50	1.50	1.50	0.00
		Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-0.97
		Cálculo 2. SW/0	1.35	1.35	1.35	1.45	0.00
		Cálculo 2. SW/2	1.35	1.35	1.35	1.20	0.00
		Combinación pésima. Cálculo 1. Tren A					
Empotramiento superior de hestial 2	5449	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	-2.84
		Cálculo 1. Tren B	1.50	1.50	1.50	1.50	0.00
		Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-1.06
		Cálculo 2. SW/0	1.35	1.35	1.35	1.45	0.00
		Cálculo 2. SW/2	1.35	1.35	1.35	1.20	0.00
		Combinación pésima. Cálculo 1. Tren A					
Empotramiento inferior de hestial 3	2884	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	1.55
		Cálculo 1. Tren B	0.90	0.00	0.00	1.50	0.24
		Cálculo 2. LM-71	1.00	1.00	0.00	1.45	9.99
		Cálculo 2. SW/0	1.00	1.00	0.00	1.45	9.27
		Cálculo 2. SW/2	1.00	1.00	0.00	1.20	9.36
		Combinación pésima. Cálculo 1. Tren B					
Media del hestial 3	2879	Cálculo 1. Tren A	0.90	1.50	0.00	0.00	-0.05
		Cálculo 1. Tren B	0.90	1.50	0.00	1.50	-1.40
		Cálculo 2. LM-71	1.00	1.35	0.00	1.45	-0.41
		Cálculo 2. SW/0	1.00	1.35	0.00	1.45	-1.16
		Cálculo 2. SW/2	1.00	1.35	0.00	1.20	-1.06
		Combinación pésima. Cálculo 1. Tren B					
Empotramiento superior de hestial 3	2874	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-11.74
		Cálculo 1. Tren B	0.90	1.50	1.50	1.50	-13.24
		Cálculo 2. LM-71	1.00	1.35	1.35	1.45	-10.99
		Cálculo 2. SW/0	1.00	1.35	1.35	1.45	-11.85
		Cálculo 2. SW/2	1.00	1.35	1.35	1.20	-11.74
		Combinación pésima. Cálculo 1. Tren B					
Empotramiento 1 de dintel	1580	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	-32.12
		Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-27.64
		Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-30.41
		Cálculo 2. SW/0	1.35	1.35	1.35	1.45	-27.47
		Cálculo 2. SW/2	1.35	1.35	1.35	1.20	-28.36
		Combinación pésima. Cálculo 1. Tren A					
Centro de vano 1 (dintel)	1588	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	0.52
		Cálculo 1. Tren B	0.90	1.50	1.50	0.00	0.52
		Cálculo 2. LM-71	1.00	1.35	1.35	0.00	1.11
		Cálculo 2. SW/0	1.00	1.35	1.35	0.00	1.11
		Cálculo 2. SW/2	1.00	1.35	1.35	0.00	1.11
		Combinación pésima. Cálculo 1. Tren A					

CÁLCULO DE ARMADURAS

Proyecto : L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
Estructura: E-1516.3

Notación: PP= Peso propio
CM= Carga muerta de traviesas, carriles y balasto
E.t= Empuje de tierras

E.sc= Empuje de tierras debido a una sobrecarga de 3 t/m²
Tren A= Tren de cargas tipo A de la norma española.
Tren B= Tren de cargas tipo B de la norma española.

LM-71= Load model 71 del Eurocodigo 1
SW/0= Tren pesado tipo SW/0 del Eurocodigo 1
SW/2= Tren pesado tipo SW/2 del Eurocodigo 1

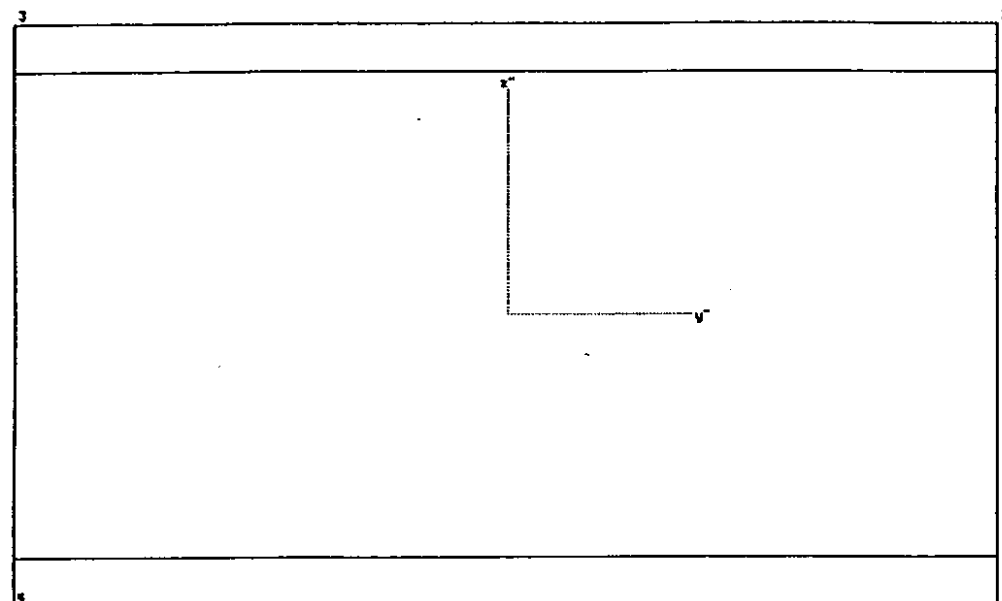
Envoltorio de V(+) en E.L.U. (Continuación).

Sección	Elemento	Cálculo	Coeficientes				Vd mT/m
			PP+CM	E _t	E _{sc}	Sobrecarga	
Empotramiento 2 de dintel	1596	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	43.05
		Cálculo 1. Tren B	1.50	0.00	0.00	1.50	43.47
		Cálculo 2. LM-71	1.35	1.00	0.00	1.45	42.87
		Cálculo 2. SW/0	1.35	1.00	0.00	1.45	42.00
		Cálculo 2. SW/2	1.35	1.00	0.00	1.20	40.29
		Combinación pésima. Cálculo 1. Tren B					
Empotramiento 3 de dintel	1597	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-9.38
		Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-9.38
		Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-10.95
		Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-10.95
		Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-10.95
		Combinación pésima. Cálculo 1. Tren A					
Centro de vano 2 (dintel)	1605	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-0.52
		Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-0.52
		Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-1.11
		Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-1.11
		Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-1.11
		Combinación pésima. Cálculo 1. Tren A					
Empotramiento 4 de dintel	1613	Cálculo 1. Tren A	1.50	1.50	1.50	0.00	12.21
		Cálculo 1. Tren B	1.50	1.50	1.50	1.50	27.64
		Cálculo 2. LM-71	1.35	1.35	1.35	1.45	19.84
		Cálculo 2. SW/0	1.35	1.35	1.35	1.45	27.47
		Cálculo 2. SW/2	1.35	1.35	1.35	1.20	26.36
		Combinación pésima. Cálculo 1. Tren B					
Empotramiento 1 de solera	4145	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	35.53
		Cálculo 1. Tren B	1.50	1.50	1.50	1.50	34.11
		Cálculo 2. LM-71	1.35	1.35	1.35	1.45	34.12
		Cálculo 2. SW/0	1.35	1.35	1.35	1.45	32.46
		Cálculo 2. SW/2	1.35	1.35	1.35	1.20	31.71
		Combinación pésima. Cálculo 1. Tren A					
Centro de vano 1 (solera)	4153	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	1.10
		Cálculo 1. Tren B	0.90	1.50	1.50	0.00	1.10
		Cálculo 2. LM-71	1.00	1.35	1.35	0.00	0.69
		Cálculo 2. SW/0	1.00	1.35	1.35	0.00	0.69
		Cálculo 2. SW/2	1.00	1.35	1.35	0.00	0.69
		Combinación pésima. Cálculo 1. Tren A					
Empotramiento 2 de solera	4161	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-12.72
		Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-12.72
		Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-14.66
		Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-14.66
		Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-14.66
		Combinación pésima. Cálculo 1. Tren A					
Empotramiento 3 de solera	4162	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	31.16
		Cálculo 1. Tren B	1.50	0.00	0.00	1.50	42.17
		Cálculo 2. LM-71	1.35	1.00	0.00	1.45	35.34
		Cálculo 2. SW/0	1.35	1.00	0.00	1.45	39.68
		Cálculo 2. SW/2	1.35	1.00	0.00	1.20	38.47
		Combinación pésima. Cálculo 1. Tren B					
Centro de vano 2 (solera)	4170	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	3.37
		Cálculo 1. Tren B	1.50	0.00	0.00	1.50	5.22
		Cálculo 2. LM-71	1.35	1.00	0.00	1.45	3.29
		Cálculo 2. SW/0	1.35	1.00	0.00	1.45	4.09
		Cálculo 2. SW/2	1.35	1.00	0.00	1.20	3.88
		Combinación pésima. Cálculo 1. Tren B					
Empotramiento 4 de solera	4178	Cálculo 1. Tren A	0.90	0.00	0.00	1.50	-10.88
		Cálculo 1. Tren B	0.90	0.00	0.00	0.00	-12.65
		Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-15.19
		Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-15.19
		Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-15.19
		Combinación pésima. Cálculo 1. Tren A					

Envoltorio de V(-) en E.L.U. (Continuación).

Sección	Elemento	Cálculo	Coeficientes				Vd mT/m
			PP+CM	EI	E.sc	Sobrecarga	
Empotramiento 2 de dintel	1596	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	9.38
		Cálculo 1. Tren B	0.90	1.50	1.50	0.00	9.38
		Cálculo 2. LM-71	1.00	1.35	1.35	0.00	10.95
		Cálculo 2. SW/0	1.00	1.35	1.35	0.00	10.95
		Cálculo 2. SW/2	1.00	1.35	1.35	0.00	10.95
Combinación pésima. Cálculo 1. Tren A							9.38
Empotramiento 3 de dintel	1597	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	-23.87
		Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-43.47
		Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-33.73
		Cálculo 2. SW/0	1.35	1.00	0.00	1.45	-42.00
		Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-40.29
Combinación pésima. Cálculo 1. Tren B							-43.47
Centro de vano 2 (dintel)	1605	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	-7.67
		Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-8.72
		Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-6.95
		Cálculo 2. SW/0	1.35	1.00	0.00	1.45	-7.34
		Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-7.08
Combinación pésima. Cálculo 1. Tren B							-8.72
Empotramiento 4 de dintel	1613	Cálculo 1. Tren A	0.90	0.00	0.00	1.50	3.41
		Cálculo 1. Tren B	0.90	0.00	0.00	0.00	5.79
		Cálculo 2. LM-71	1.00	1.00	0.00	0.00	7.56
		Cálculo 2. SW/0	1.00	1.00	0.00	0.00	7.56
		Cálculo 2. SW/2	1.00	1.00	0.00	0.00	7.56
Combinación pésima. Cálculo 1. Tren A							3.41
Empotramiento 1 de solera	4145	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	12.65
		Cálculo 1. Tren B	0.90	0.00	0.00	0.00	12.65
		Cálculo 2. LM-71	1.00	1.00	0.00	0.00	15.19
		Cálculo 2. SW/0	1.00	1.00	0.00	0.00	15.19
		Cálculo 2. SW/2	1.00	1.00	0.00	0.00	15.19
Combinación pésima. Cálculo 1. Tren A							12.65
Centro de vano 1 (solera)	4153	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	-4.65
		Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-5.22
		Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-3.96
		Cálculo 2. SW/0	1.35	1.00	0.00	1.45	-4.09
		Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-3.88
Combinación pésima. Cálculo 1. Tren B							-5.22
Empotramiento 2 de solera	4161	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	-37.12
		Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-42.17
		Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-38.42
		Cálculo 2. SW/0	1.35	1.00	0.00	1.45	-39.68
		Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-38.47
Combinación pésima. Cálculo 1. Tren B							-42.17
Empotramiento 3 de solera	4162	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	12.72
		Cálculo 1. Tren B	0.90	1.50	1.50	0.00	12.72
		Cálculo 2. LM-71	1.00	1.35	1.35	0.00	14.66
		Cálculo 2. SW/0	1.00	1.35	1.35	0.00	14.66
		Cálculo 2. SW/2	1.00	1.35	1.35	0.00	14.66
Combinación pésima. Cálculo 1. Tren A							12.72
Centro de vano 2 (solera)	4170	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-1.10
		Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-1.10
		Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-0.69
		Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-0.69
		Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-0.69
Combinación pésima. Cálculo 1. Tren A							-1.10
Empotramiento 4 de solera	4178	Cálculo 1. Tren A	1.50	1.50	1.50	0.00	-23.66
		Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-34.11
		Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-27.21
		Cálculo 2. SW/0	1.35	1.35	1.35	1.45	-32.46
		Cálculo 2. SW/2	1.35	1.35	1.35	1.20	-31.71
Combinación pésima. Cálculo 1. Tren B							-34.11

Mstb. 1 : 7.0



Sección : "DINTEL" Armadura : "B1"
Tipo : tipo viga/ Rectángulo Unidades : [cm]
Material : "H250"

Ancho = 100.00 cm Canto = 60.00 cm

Características mecánicas de la sección:
Area : Ax= 0.600000 [m2]
Momentos de inercia : Iy= 0.018000 [m4] Iz= 0.050000 [m4]
Inercia a torsión : Ix= 0.045075 [m4]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.300000 [m]

I: R=dist.borde [m] W=I/R [m3] W/Ax [m]
izq. Iz -0.500 -0.100000 0.167
dch. Iz 0.500 0.100000 -0.167
abajo Iy -0.300 -0.060000 0.100
arriba Iy 0.300 0.060000 -0.100

Armadura: "B1"

Nº	Nom.mat	Cod.dim.	Area [cm2]	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]
1	AEN500	(2)	0.00	-50.00	5.00	50.00	5.00
2	AEN500	(2)	0.00	-50.00	55.00	50.00	55.00

Total: 0.00 Cuantía de armadura: 0.000 [o/o]

Cód. dimensionamiento: (0) = As constante
Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada
Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero"AEH500"/Hormigón"H250")
Cortante Area mín.cercos Ancho alma ideal Canto útil Incl.bielas

	Vz	0.00 [cm2/m]	100.00 [cm]	56.00 [cm]	0.00
Vy	0.00 [cm2/m]	60.00 [cm]	96.00 [cm]	0.00	

Características del material:

Nom.Mat.	Módulo E [kp/cm2]	0.85*fcd,fyd [kp/cm2]	eps-fc [o/oo]	fct [kp/cm2]	fcv [kp/cm2]	fcw,mín [kp/cm2]
"H250"	300000.0	-141.600	-2.000	0.0	6.460	250.000
"AEH500"	2.10E+06	4434.700				

Legenda:

fcd,fyd resistencia de cálculo del hormigón,acero
eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)
fct resistencia de cálculo a tracción del hormigón
fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Dimensionamiento : Viga "DINTEL"/"B1"

Esfuerzos (Rotura)							Unidades : [tm]	
N	Vy	Vz	Mx	My	Mz	Alpha		
					29.980			45.0

Armadura	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]	dado [cm2]	dimens. [cm2]	As-nuevo [cm2]
Longitudinal:							
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	12.90	12.90
2 "AEH500"	-50.0	55.0	50.0	55.0	0.00	-	0.00

Cuantía arm. 0.22 [o/o] Suma 12.90

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3UF. DINTEL

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas y [cm]	Eps z [cm]	Estado-II [kp/cm2]	
Hormigón-Min	-50.00	60.00	-1.508	-133.037 "H250"
Armadura-Min	-50.00	55.00	-0.462	-970.139 "AEH500"
Hormigón-Max	50.00	0.00	11.046	0.000 "H250"
Armadura-Max	50.00	5.00	10.000	4434.700 "AEH500"

Fibra neutra	zn	52.79 cm	yn	-0.00 cm	Angulo	0.0
Ancho zona comprim.		7.21 cm	Zona comprimida/Canto útil			0.13

Dimensionamiento : Viga "DINTEL"/"B1"

Esfuerzos (Rotura)							Unidades : [tm]	
N	Vy	Vz	Mx	My	Mz	Alpha		
					-1.730			45.0

Armadura	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]	dado [cm2]	dimens. [cm2]	As-nuevo [cm2]
Longitudinal:							
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	-	0.00
2 "AEH500"	-50.0	55.0	50.0	55.0	0.00	0.72	0.72

Cuantía arm. 0.01 [o/o] Suma 0.72

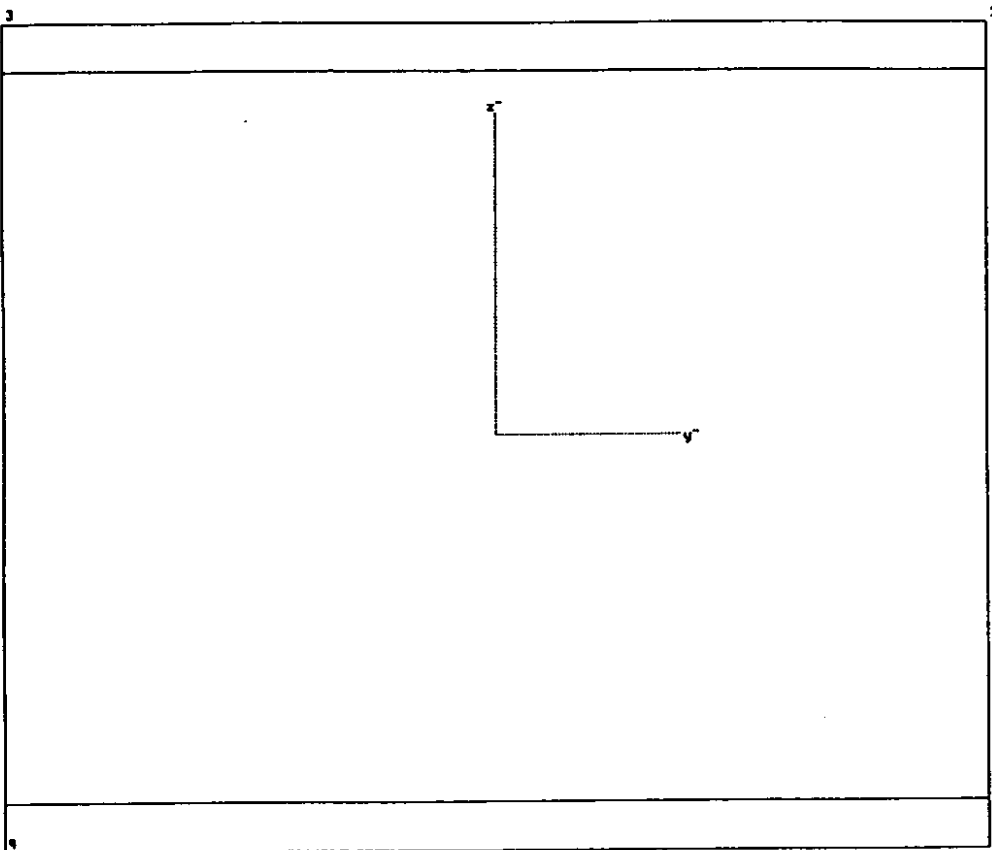
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Deformaciones y tensiones extremas (Rotura):

1	Coordenadas y [cm]	Eps z [cm]	Estado-II [kp/cm2]	
Hormigón-Min	50.00	0.00	-0.298	-39.008 "H250"
Armadura-Min	50.00	5.00	0.639	1340.899 "AEH500"
Hormigón-Max	-50.00	60.00	10.936	0.000 "H250"
Armadura-Max	-50.00	55.00	10.000	4434.700 "AEH500"

Fibra neutra	zn	1.59 cm	yn	0.00 cm	Angulo	0.0
Ancho zona comprim.		1.59 cm	Zona comprimida/Canto útil			0.03

Mstb. 1 : 7.0



Sección : "CARTELA" Armadura : "B1"
Tipo : tipo viga/ Rectángulo Unidades : [cm]
Material : "H250"

Ancho = 100.00 cm Canto = 85.00 cm

Características mecánicas de la sección:
Area : Ax= 0.850000 [m2]
Momentos de inercia : Iy= 0.051177 [m4] Iz= 0.070833 [m4]
Inercia a torsión : Ix= 0.099810 [m4]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.425000 [m]

I: R=dist.borde [m] W=I/R [m3] W/Ax [m]
izq. Iz -0.500 -0.141667 0.167
dch. Iz 0.500 0.141667 -0.167
abajo Iy -0.425 -0.120417 0.142
arriba Iy 0.425 0.120417 -0.142

Armadura: "B1"

Nº	Nom.mat	Cod.dim.	Area [cm2]	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]
1	AEH500	(2)	0.00	-50.00	5.00	50.00	5.00

2	AEH500	(2)	0.00	-50.00	80.00	50.00	80.00
---	--------	-----	------	--------	-------	-------	-------

Total: 0.00 Cuantía de armadura: 0.000 [o/o]

Cód. dimensionamiento: (0) = As constante
Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada
Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero"AEH500"/Hormigón"H250")
Cortante Area mín.cercos Ancho alma ideal Canto útil Incl.bielas

Vz	0.00 [cm2/m]	100.00 [cm]	81.00 [cm]	0.00
Vy	0.00 [cm2/m]	85.00 [cm]	96.00 [cm]	0.00

Características del material:

Nom.Mat.	Módulo E	0.85*fcd,fyd	eps-fc	fct	fcv	fcw,mín
"H250"	300000.0	-141.600	-2.000	0.0	6.460	250.000
"AEH500"	2.10E+06	4434.700				

Leyenda:

fcd,fyd resistencia de cálculo del hormigón,acero
eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)
fct resistencia de cálculo a tracción del hormigón
fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Dimensionamiento : Viga "CARTELA"/"B1"

N	Vy	Vz	Mx	My	Mz	Alpha
2.930					4.250	45.0

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	1.56	1.56
2 "AEH500"	-50.0	80.0	50.0	80.0	0.00	-	0.00

Cuantía arm. 0.02 [o/o] Suma 1.56

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas	Eps	Estado-II
---	-------------	-----	-----------

Hormigón-Min	-50.00	85.00	-0.275	-36.261	"H250"
Armadura-Min	-50.00	80.00	0.367	771.130	"AEH500"
Hormigón-Max	50.00	0.00	10.642	0.000	"H250"
Armadura-Max	50.00	5.00	10.000	4434.700	"AEH500"

Fibra neutra zn 82.86 cm yn -0.00 cm Angulo 0.0
Ancho zona comprim. 2.14 cm Zona comprimida/Canto útil 0.03

Dimensionamiento : Viga "CARTELA"/"B1"

N	Vy	Vz	Mx	My	Mz	Alpha
					-22.190	45.0

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	-	0.00
2 "AEH500"	-50.0	80.0	50.0	80.0	0.00	6.42	6.42

Cuantía arm. 0.08 [o/o] Suma 6.42

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas	Eps	Estado-II
---	-------------	-----	-----------

Hormigón-Min	50.00	0.00	-0.791	-89.823	"H250"
Armadura-Min	50.00	5.00	-0.116	-244.007	"AEH500"
Hormigón-Max	-50.00	85.00	10.674	0.000	"H250"
Armadura-Max	-50.00	80.00	10.000	4434.700	"AEH500"

Fibra neutra zn 5.86 cm yn 0.00 cm Angulo 0.0
Ancho zona comprim. 5.86 cm Zona comprimida/Canto útil 0.07

Dimensionamiento : Viga "CARTELA"/"B1"

N	Vy	Vz	Mx	My	Mz	Alpha
2.720					-60.760	45.0

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	-	0.00
2 "AEH500"	-50.0	80.0	50.0	80.0	0.00	18.25	18.25

Cuantía arm. 0.21 [o/o] Suma 18.25

SUP. DINTEL
MISTIAL CENTRAL

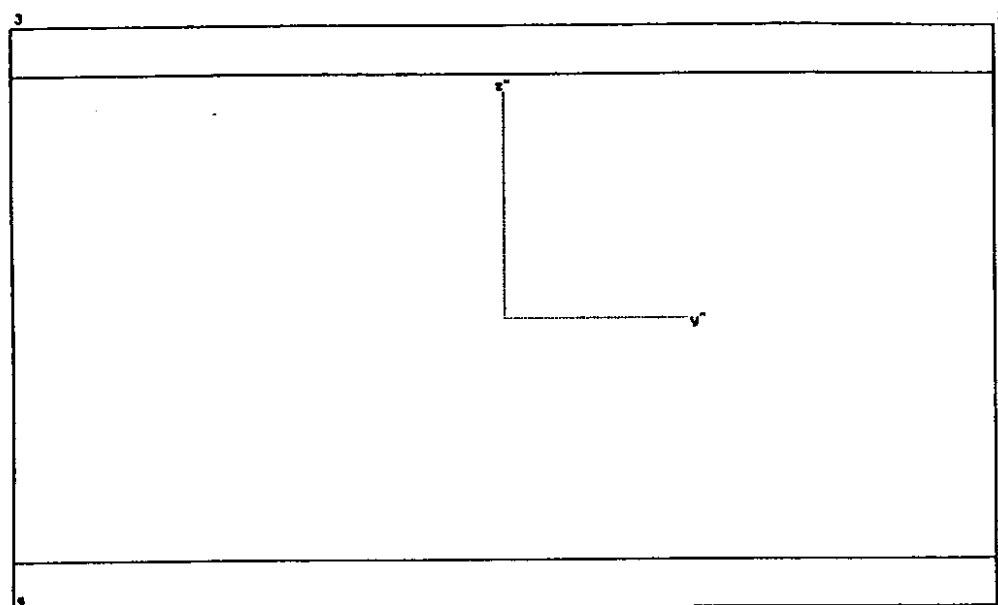
Deformaciones y tensiones extremas (Rotura):

1	Coordenadas	Eps	Estado-II
---	-------------	-----	-----------

Hormigón-Min	50.00	0.00	-1.444	-130.648	"H250"
Armadura-Min	50.00	5.00	-0.729	-1529.945	"AEH500"
Hormigón-Max	-50.00	85.00	10.715	0.000	"H250"
Armadura-Max	-50.00	80.00	10.000	4434.700	"AEH500"

Fibra neutra zn 10.09 cm yn 0.00 cm Angulo 0.0
Ancho zona comprim. 10.09 cm Zona comprimida/Canto útil 0.13

Mstb. 1 : 7.0



Sección : "HASTIAL"
Tipo : tipo viga/ Rectángulo
Material : "H250"

Armadura : "B1"
Unidades : [cm]

Ancho = 100.00 cm Canto = 60.00 cm

Características mecánicas de la sección:

Area : Ax= 0.600000 [m2]
Momentos de inercia : Iy= 0.018000 [m4] Iz= 0.050000 [m4]
Inercia a torsión : Ix= 0.045075 [m4]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.300000 [m]

I: R=dist.borde [m] W=I/R [m3] W/Ax [m]
izq. Iz -0.500 -0.100000 0.167
dch. Iz 0.500 0.100000 -0.167
abajo Iy -0.300 -0.060000 0.100
arriba Iy 0.300 0.060000 -0.100

Armadura: "B1"

Nº	Nom.mat	Cod.dim.	Area [cm2]	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]
1	AEH500	(2)	0.00	-50.00	5.00	50.00	5.00
2	AEH500	(2)	0.00	-50.00	55.00	50.00	55.00

Total: 0.00 Cuantía de armadura: 0.000 [o/o]

Cód. dimensionamiento: (0) = As constante

Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada

Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero"AEH500"/Hormigón"H250")
Cortante Area mín.cercos Ancho alma ideal Canto útil Incl.bielas

Vz	0.00 [cm2/m]	100.00 [cm]	56.00 [cm]	0.00
Vy	0.00 [cm2/m]	60.00 [cm]	96.00 [cm]	0.00

Características del material:

Nom.Mat.	Módulo E [kp/cm2]	0.85*fcd,fyd [kp/cm2]	eps-fc [o/oo]	fct [kp/cm2]	fcv [kp/cm2]	fcw,mín [kp/cm2]
"H250"	300000.0	-141.600	-2.000	0.0	6.460	250.000
"AEH500"	2.10E+06	4434.700				

Leyenda:

fcd,fyd resistencia de cálculo del hormigón,acero
eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)
fct resistencia de cálculo a tracción del hormigón
fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Dimensionamiento : Viga "HASTIAL"/"B1"

N	Vy	Vz	Mx	My	Mz	Alpha
-47.670				12.440		45.0

La armadura mínima entrada es suficiente !

Armadura mínima definida con las áreas entradas ..

Factor actual de minoración de la resistencia de la sección 2.14
Factor necesario de minoración de la resistencia de la sección .. 1.00

Armadura	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]	dado [As-min]	dimens. [cm2]	As-nuevo [cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	-	0.00
2 "AEH500"	-50.0	55.0	50.0	55.0	0.00	-	0.00

Cuantía arm. 0.00 [o/o] Suma 0.00

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas y [cm] z [cm]	Eps [o/oo]	Estado-I [kp/cm2]
Hormigón-Min	-50.00 60.00	-2.271	-141.600
Armadura-Min	-50.00 55.00	-1.156	-2426.934
Hormigón-Max	50.00 0.00	11.116	0.000
Armadura-Max	50.00 5.00	10.000	4434.700

Fibra neutra zn 49.82 cm yn -0.00 cm Angulo 0.0
Ancho zona comprim. 10.18 cm Zona comprimida/Canto útil 0.19

Dimensionamiento : Viga "HASTIAL"/"B1"

N	Vy	Vz	Mx	My	Mz	Alpha
-29.700				-23.960		45.0

Armadura	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]	dado [cm2]	dimens. [cm2]	As-nuevo [cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	-	0.00
2 "AEH500"	-50.0	55.0	50.0	55.0	0.00	6.83	6.83

Cuantía arm. 0.11 [o/o] Suma 6.83

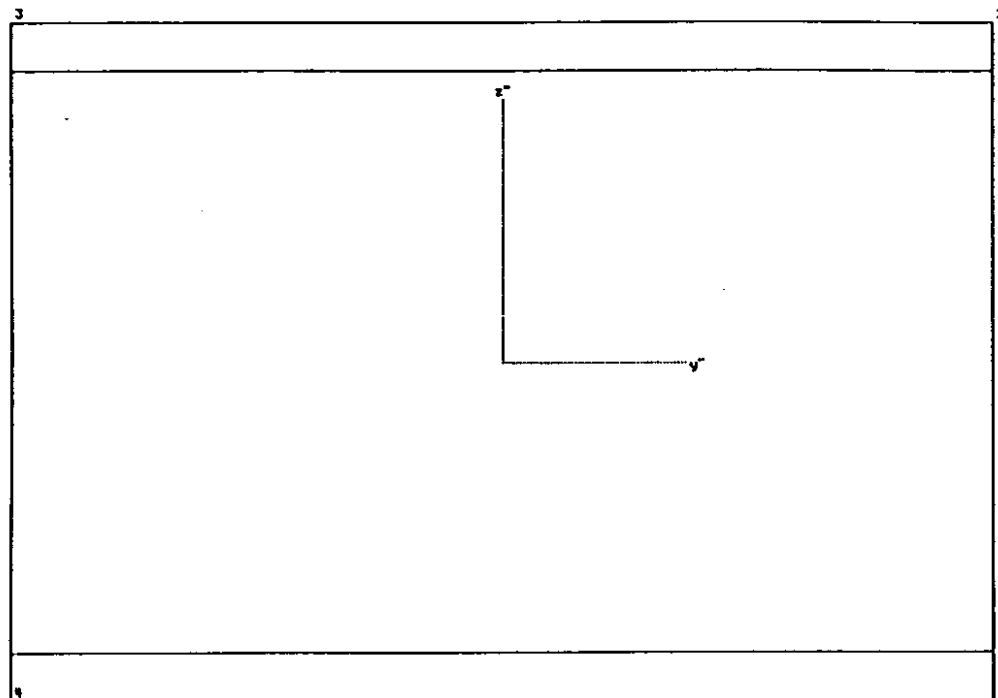
EXT. HASTIAL

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas y [cm] z [cm]	Eps [o/oo]	Estado-I [kp/cm2]
Hormigón-Min	50.00 0.00	-1.553	-134.523
Armadura-Min	50.00 5.00	-0.503	-1055.485
Hormigón-Max	-50.00 60.00	11.050	0.000
Armadura-Max	-50.00 55.00	10.000	4434.700

Fibra neutra zn 7.39 cm yn 0.00 cm Angulo 0.0
Ancho zona comprim. 7.39 cm Zona comprimida/Canto útil 0.13

Mstb. 1 : 7.0



Sección : "SOLERA" Armadura : "B1"
Tipo : tipo viga/ Rectángulo Unidades : [cm]
Material : "H250"

Ancho = 100.00 cm Canto = 70.00 cm

Características mecánicas de la sección:

Area : Ax= 0.700000 [m2]
Momentos de inercia : Iy= 0.028583 [m4] Iz= 0.058333 [m4]
Inercia a torsión : Ix= 0.064912 [m4]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.350000 [m]

I: R=dist.borde [m] W=I/R [m3] W/Ax [m]
Izq. Iz -0.500 -0.116667 0.167
dch. Iz 0.500 0.116667 -0.167
abajo Iy -0.350 -0.081667 0.117
arriba Iy 0.350 0.081667 -0.117

Armadura: "B1"

Nº	Nom.mat	Cod.dím.	Area [cm2]	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]
1	AEH500	(2)	0.00	-50.00	5.00	50.00	5.00
2	AEH500	(2)	0.00	-50.00	65.00	50.00	65.00

Total: 0.00 Cuantía de armadura: 0.000 [o/o]

Cód. dimensionamiento: (0) = As constante

Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada
Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero "AEH500"/Hormigón "H250")

Cortante	Area mín.cercos	Ancho alma ideal	Canto útil	Incl.bielas
Vz	0.00 [cm2/m]	100.00 [cm]	66.00 [cm]	0.00
Vy	0.00 [cm2/m]	70.00 [cm]	96.00 [cm]	0.00

Características del material:

Nom.Mat.	Módulo E	0.85*fcd,fyd	eps-fc	fct	fcv	fcw,mfn
	[kp/cm2]	[kp/cm2]	[o/o]	[kp/cm2]	[kp/cm2]	[kp/cm2]
"H250"	300000.0	-141.600	-2.000	0.0	6.460	250.000
"AEH500"	2.10E+06	4434.700				

Leyenda:

fcd,fyd resistencia de cálculo del hormigón, acero
eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)
fct resistencia de cálculo a tracción del hormigón
fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Dimensionamiento : Viga "SOLERA"/"B1"

Esfuerzos (Rotura)							Unidades : [tm]
N	Vy	Vz	Hx	My	Mz	Alpha	
-0.840000					-32.340	45.0	

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	7.62	7.62
2 "AEH500"	-50.0	65.0	50.0	65.0	0.00	-	0.00
Cuantía arm. 0.11 [o/o]						Suma	7.63

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas		Eps	Estado-II
	y [cm]	z [cm]	[o/o]	[kp/cm2]
Hormigón-Min	-50.00	70.00	-0.984	-105.055
Armadura-Min	-50.00	65.00	-0.139	-291.985
Hormigón-Max	50.00	0.00	10.845	0.000
Armadura-Max	50.00	5.00	10.000	4434.700

Fibra neutra zn 64.18 cm yn -0.00 cm Angulo 0.0
Ancho zona comprim. 5.82 cm Zona comprimida/Canto útil 0.09

Dimensionamiento : Viga "SOLERA"/"B1"

Esfuerzos (Rotura)							Unidades : [tm]
N	Vy	Vz	Hx	My	Mz	Alpha	
-5.910					42.750	45.0	

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	14.92	14.92
2 "AEH500"	-50.0	65.0	50.0	65.0	0.00	-	0.00
Cuantía arm. 0.21 [o/o]						Suma	14.92

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas		Eps	Estado-II
	y [cm]	z [cm]	[o/o]	[kp/cm2]
Hormigón-Min	-50.00	70.00	-1.576	-135.225
Armadura-Min	-50.00	65.00	-0.685	-1438.946
Hormigón-Max	50.00	0.00	10.890	0.000
Armadura-Max	50.00	5.00	10.000	4434.700

Fibra neutra zn 61.15 cm yn -0.00 cm Angulo 0.0
Ancho zona comprim. 8.85 cm Zona comprimida/Canto útil 0.14

Dimensionamiento : Viga "SOLERA"/"B1"

Esfuerzos (Rotura)							Unidades : [tm]
N	Vy	Vz	Hx	My	Mz	Alpha	
-0.840000					-32.340	45.0	

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	-	0.00
2 "AEH500"	-50.0	65.0	50.0	65.0	0.00	11.59	11.59
Cuantía arm. 0.17 [o/o]						Suma	11.59

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas		Eps	Estado-II
	y [cm]	z [cm]	[o/o]	[kp/cm2]
Hormigón-Min	50.00	0.00	-1.278	-123.145
Armadura-Min	50.00	5.00	-0.410	-861.904
Hormigón-Max	-50.00	70.00	10.868	0.000
Armadura-Max	-50.00	65.00	10.000	4434.700

Fibra neutra zn 7.37 cm yn 0.00 cm Angulo 0.0
Ancho zona comprim. 7.37 cm Zona comprimida/Canto útil 0.11

PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA TT1

Obra : L.A.V. MADRID - ZARAGOZA. Subtramo XV.
E-1516.3. HASTIALES.

Fecha: 30/6/1998
Hora : 19:24

CALCULO A CORTANTE DE SECCIONES RECTANGULARES

1. Datos

- Materiales:

fck [kp/cm²] = 250
fyk [kp/cm²] = 5100
GammaC = 1.50
GammaS = 1.15

- Tipo de Elemento Estructural:

Tipo: losa
As [cm²] = 21

- Sección

b [cm] = 100.0
h [cm] = 60.0
r [cm] = 5.0

2. Comprobación

psi = 1.05
ro1 [%] = 3.81
 $0.5 \cdot \text{psi} \cdot (1+50 \cdot \text{ro1}) = 0.62$

Vcu [Mp] = 35.50
Vu2 [Mp] = 22.19 > 21.73 $\Rightarrow$ NO
Vu1 [Mp] = 275.00 NECESITA.

PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA TT1

Obra : L.A.V. MADRID - ZARAGOZA. Subtramo XV.
E-1516.3. EMPOTRAMIENTO DINTEL.

Fecha: 30/6/1998
Hora : 19:25

CALCULO A CORTANTE DE SECCIONES RECTANGULARES

1. Datos

- Materiales:

fck [kp/cm²] = 250
fyk [kp/cm²] = 5100
GammaC = 1.50
GammaS = 1.15

- Tipo de Elemento Estructural:

Tipo: losa
As [cm²] = 29

- Sección

b [cm] = 100.0
h [cm] = 80.0
r [cm] = 5.0

2. Comprobación

psi = 1.00
ro1 [%] = 3.88
 $0.5 \cdot \text{psi} \cdot (1+50 \cdot \text{ro1}) = 0.60$

Vcu [Mp] = 48.41 > 43.47 $\Rightarrow$ Arec = 0 cm²/m.
Vu2 [Mp] = 28.90
Vu1 [Mp] = 375.00

PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA TT1

Obra : L.A.V. MADRID - ZARAGOZA. Subtramo XV.
E-1516.3. SOLERA.

Fecha: 30/6/1998
Hora : 19:25

CALCULO A CORTANTE DE SECCIONES RECTANGULARES

1. Datos

- Materiales:

fck [kp/cm²] = 250
fyk [kp/cm²] = 5100
GammaC = 1.50
GammaS = 1.15

- Tipo de Elemento Estructural:

Tipo: losa
As [cm²] = 29

- Sección

b [cm] = 100.0
h [cm] = 70.0
r [cm] = 5.0

2. Comprobación

psi = 1.00
ro1 [%] = 4.48
 $0.5 \cdot \text{psi} \cdot (1+50 \cdot \text{ro1}) = 0.61$

Vcu [Mp] = 41.96 < 42.17 $\Rightarrow$ Arec = 0.09 cm²/m.
Vu2 [Mp] = 25.67
Vu1 [Mp] = 325.00

Obra : L.A.V. MADRID - ZARAGOZA. Subtramo XV.
E-1516.3. EMPOTRAMIENTO DINTEL HASTIAL CENTRAL.
Fecha: 1/7/1998
Hora : 9:19

COMPROBACION DEL ESTADO LIMITE DE FISURACION DEBIDO
A SOLICITACIONES NORMALES

1. Datos

- Materiales

f_{ck} [kp/cm²] = 250
 f_{yk} [kp/cm²] = 5100

- Sección

b [cm] = 150.0
 h [cm] = 85.0
 ϕ [mm] = 20.0
 c [cm] = 3.5
 n° de capas = 1
 n° de diámetros capa 1 = 10

- Solicitación de servicio

M_k [m·Mp] = -64.43

2. Resultados

ABERTURA DE FISURA CARACTERISTICA

w_k [mm]	S_m [cm]	ϵ_{sm} ·1.E-3	σ_{sr} [kp/cm ²]	σ_s [kp/cm ²]
0.29	19.4	0.88	2145	2704

ABERTURA DE FISURA MAXIMA ADMITIDA

AMBIENTE I (interior)	0.600 [mm]
AMBIENTE II (exterior no agresivo)	0.300 [mm]
AMBIENTE III (agresivo)	0.150 [mm]

El número de capas consideradas en el cálculo es 1

Obra : L.A.V. MADRID - ZARAGOZA. Subtramo XV.
E-1516.3. VANO DINTEL.
Fecha: 1/7/1998
Hora : 9:22

COMPROBACION DEL ESTADO LIMITE DE FISURACION DEBIDO
A SOLICITACIONES NORMALES

1. Datos

- Materiales

f_{ck} [kp/cm²] = 250
 f_{yk} [kp/cm²] = 5100

- Sección

b [cm] = 100.0
 h [cm] = 60.0
 ϕ [mm] = 20.0
 c [cm] = 3.5
 n° de capas = 1
 n° de diámetros capa 1 = 5

- Solicitación de servicio

M_k [m·Mp] = 19.99

2. Resultados

ABERTURA DE FISURA CARACTERISTICA

w_k [mm]	S_m [cm]	ϵ_{sm} ·1.E-3	σ_{sr} [kp/cm ²]	σ_s [kp/cm ²]
0.30	24.0	0.74	2069	2439

ABERTURA DE FISURA MAXIMA ADMITIDA

AMBIENTE I (interior)	0.600 [mm]
AMBIENTE II (exterior no agresivo)	0.300 [mm]
AMBIENTE III (agresivo)	0.150 [mm]

El número de capas consideradas en el cálculo es 1

Obra : L.A.V. MADRID - ZARAGOZA. Subtramo XV.
E-1516.3. EMPOTRAMIENTO SOLERA HASTIAL CENTRAL.
Fecha: 1/7/1998
Hora : 9:26

COMPROBACION DEL ESTADO LIMITE DE FISURACION DEBIDO
A SOLICITACIONES NORMALES

1. Datos

- Materiales

f_{ck} [kp/cm²] = 250
 f_{yk} [kp/cm²] = 5100

- Sección

b [cm] = 150.0
 h [cm] = 70.0
 ϕ [mm] = 20.0
 c [cm] = 3.5
 n° de capas = 1
 n° de diámetros capa 1 = 10

- Solicitación de servicio

M_k [m·Mp] = 42.75

2. Resultados

ABERTURA DE FISURA CARACTERISTICA

w_k [mm]	S_m [cm]	ϵ_{sm} ·1.E-3	σ_{sr} [kp/cm ²]	σ_s [kp/cm ²]
0.23	19.4	0.70	1812	2218

ABERTURA DE FISURA MAXIMA ADMITIDA

AMBIENTE I (interior)	0.600 [mm]
AMBIENTE II (exterior no agresivo)	0.300 [mm]
AMBIENTE III (agresivo)	0.150 [mm]

El número de capas consideradas en el cálculo es 1

CALCULO DE MUROS.

NOMBRE PROYECTO :
NOMBRE OBRA :

I.A.V. MADRID - ZARAGOZA. Subtramo XV.
Aletas marcos con cobertura. Altura máxima.

DATOS

GEOMETRIA DE CALCULO DEL MURO

G. Canto del muro en coronación (m) :	0.300
ST. Sobreespesor muro en trasdós (m) :	0.625
SI. Sobreespesor muro en intradós (m) :	0.000
P. Puntera zapata (m) :	1.500
T. Talón zapata (m) :	4.575
H. Altura muro (m) :	7.500
H _z . Canto zapata (m) :	1.100
Anchura total cimentación (m) :	7.000
Angulo trasdós muro (°) :	85.236

DEFINICION TERRENO

	X	Y
0. Coordenadas base trasdós (m) :	0.000	0.000
1. Coordenadas coronación trasdós (m) :	-0.625	7.500
2. Coordenadas fin tramo 1 terreno (m) :	4.825	8.863
3. Coordenadas fin tramo 2 terreno (m) :	9.825	8.863
4. Coordenadas fin tramo 3 terreno (m) :	14.825	8.863

COEFICIENTES DE SEGURIDAD

Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
γ _o (coeficiente combinación variables) :	1.00

Estado Límite Ultimo	
Favorable	Desfavorable

Acciones permanentes (G)		
Peso propio, cargas muertas :	0.90	1.50
Acciones permanentes de valor no constante (G*)		
Terreno (peso propio y empujes) :	0.00	1.50
Acciones variables (Q)		
Sobrecargas :	0.00	1.50

CARACTERISTICAS DEL TERRENO

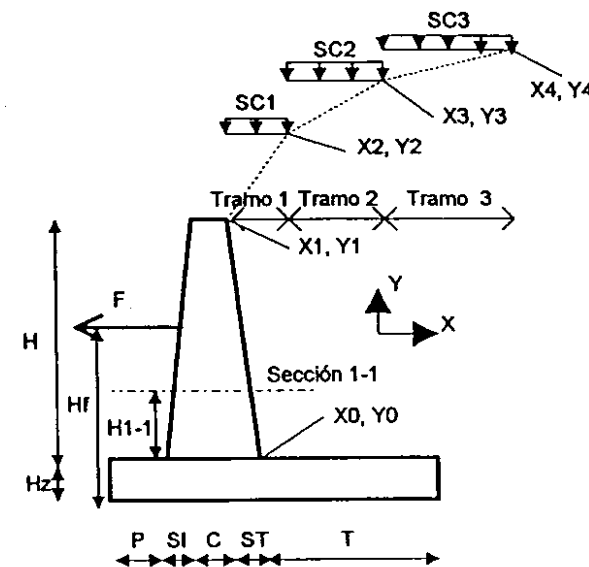
γ. Peso específico (T/m³) :	2.00
φ. Angulo rozamiento interno (°) :	30.000
δ _{mt} . Angulo rozamiento muro-terras (°) :	0.000
φ _{tt} . Angulo rozamiento tierras-terras (°) :	0.000
μ. Coeficiente rozamiento zapata-terras :	0.580
Tensión admisible cimentación (T/m²) :	20.000

ARMADO

H1-1. Dist. sección 1 a sup. zapata (m) :	1.500
Recubrimiento alzado (m) :	0.050
Recubrimiento cimentación (m) :	0.050

Cuantías mínimas

Vertical muros (1/3 mín. cara)(o/oo) :	0.900
Horizontal muros (1/3 mín. cara)(o/oo) :	1.600
Cortante o montaje alzado (cm²/m²) :	4.500
Transversal zapata (sup+inf)(o/oo) :	1.447
Longitudinal zapata (sup+inf)(o/oo) :	1.447
Cortante zapata (cm²/m²) :	0.000
Perimetral zapata (en canto)(cm²/m) :	7.959

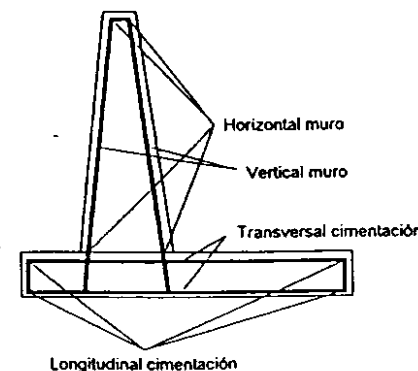


CARGAS (sin mayorar)

Acciones permanentes (G)	
Peso propio barrera coronación (T/m) :	0.000
Acciones permanentes de valor no constante (G*)	
Fg. Carga horizontal sobre muro (T/m) :	0.000
Hfg. Posición Fg a inferior zapata (m) :	0.000
Acciones variables (Q)	
SC1. Sobrecarga en tramo 1 (T/m) :	0.000
SC2. Sobrecarga en tramo 2 (T/m) :	3.000
SC3. Sobrecarga en tramo 3 (T/m) :	3.000
Fq. Carga horizontal sobre muro (T/m) :	0.000
Hfq. Posición Fq a inferior zapata (m) :	0.000

CARACTERISTICAS MATERIALES

Peso específico hormigón (T/m³) :	2.500
Hormigón alzado (T/m³) :	H - 250
Hormigón cimentación (T/m³) :	H - 250
Acero (T/P) :	AEH - 500



RESUMEN ACCIONES SOBRE EL MURO

		F.vertical (T / m)	X (m)	F. Horizontal (T / m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 (ΣP _i i=1..3)	8.250	1.794	—	—
	Sobre sección base muro (ΣP _i i=1..3)	11.484	1.833	—	—
	Total peso propio (ΣP _i i=1..6)	30.734	2.877	—	—
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E1t)	1.296	2.133	15.550	4.600
	Sobre sección base muro (E1t)	2.025	2.217	24.297	3.600
	Total tierras (E2t + ΣT)	80.073	4.613	32.942	3.300
	Verticales sobre talón (ΣT ⁺ ij)	75.287	4.765	—	—
	Verticales sobre talón (cortante) (ΣT ⁻ ij)	58.934	5.268	—	—
Fuerza Fg	Sobre sección 1	—	—	0.000	0.000
	Sobre sección base muro	—	—	0.000	0.000
	Total Fg	—	—	0.000	0.000
Acciones variables (Q)					
Sobrecargas sobre terreno	Sección 1 (E1'sc)	0.115	2.050	1.380	5.600
	Base muro (E1'sc)	0.144	2.113	1.726	4.850
	Inf. cimentación (E2'sc + ΣS)	0.000	0.000	9.450	4.950
	Verticales sobre talón (ΣS ⁺ i, i=1..3)	0.000	0.000	—	—
	Verticales sobre talón (cortante) (ΣS ⁻ i)	0.000	0.000	—	—
Fuerza Fq	Sobre sección 1	—	—	0.000	0.000
	Sobre sección base muro	—	—	0.000	0.000
	Total Fq	—	—	0.000	0.000

COMPROBACIONES**SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)**

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	17.826	—
Acciones permanentes de valor no constante (G*)		
Tierras	46.442	32.942
Fuerza Fg	—	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	9.450
Fuerza Fq	—	0.000
TOTAL	64.268	42.393

Csd= 1.516 Vale

SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	88.424	—
Acciones permanentes de valor no constante (G*)		
Tierras	369.389	108.710
Fuerza Fg	—	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	46.779
Fuerza Fq	—	0.000
TOTAL	457.812	155.489

Csv= 2.944 Vale

TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	30.734	19.146
Acciones permanentes de valor no constante (G*)		
Tierras	80.073	19.575
Fuerza Fg	0.000	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	46.779
Fuerza Fq	0.000	0.000
TOTAL	110.807	85.500

D (m) = 7.00

 σ puntera (T / m²) = 26.30 σ talón (T / m²) = 5.36 σ med (T / m²) = 15.83 σ cob (T / m²) = 20

Vale

ARMADO**Secciones**

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	0.93	1.00	0.93
	1-1	1.00	0.80	1.00	0.80
PUNTERA	2-2 f	1.00	1.10	1.00	1.10
	2-2 c	1.00	1.10	1.00	1.10
TALON	3-3 f	1.00	1.10	1.00	1.10
	3-3 c	1.00	1.10	1.00	1.10

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	13.589	101.357	39.034
	0-0 (-)	10.336	1.340	0.000
	1-1 (+)	9.541	53.171	25.396
	1-1 (-)	7.425	0.787	0.000
PUNTERA	2-2 f (+)	0.000	44.140	—
	2-2 f (-)	0.000	4.374	—
	2-2 c (+)	—	—	32.308
	2-2 c (-)	—	—	3.210
TALON	3-3 f (+)	0.000	5.810	—
	3-3 f (-)	-33.348	-160.487	—
	3-3 c (+)	—	—	2.521
	3-3 c (-)	—	—	-47.731

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm2/m	Minima cm2/m	Control cálculo	Adoptada cm2/m
ALZADO	Vert. trasdós	0-0 (+)	26.013	5.550	Vale	26.013
		0-0 (-)	0.000	2.775	Vale	
		1-1 (+)	15.488	4.800	Vale	15.488
		1-1 (-)	0.000	2.400	Vale	
	Vert. intradós	0-0 (+)	0.000	2.775	Vale	2.775
		0-0 (-)	0.000	2.775	Vale	
		1-1 (+)	0.000	2.400	Vale	
		1-1 (-)	0.000	2.400	Vale	
	Hor. trasdós (*)	—	5.203	9.867	Vale	9.867
	Hor. intradós (*)	—	0.000	4.933	Vale	4.933
	Cortante	0-0 (+)	0.000	4.500	Vale	4.500
		0-0 (-)	0.000	4.500	Vale	(cm²/m²)
		1-1 (+)	0.000	4.500	Vale	
		1-1 (-)	0.000	4.500	Vale	
PUNTERA	Trans. inferior	2-2 f (+)	9.617	7.959	Vale	9.617
		2-2 f (-)	0.941	7.959	Vale	
	Long. inf. (*)	—	1.923	7.959	Vale	7.959
		—	—	—	—	—
	Trans. superior	2-2 f (+)	0.000	7.959	Vale	43.965
		2-2 f (-)	0.000	7.959	Vale	
	Long. sup. (*)	—	0.000	7.959	Vale	8.793
		—	—	—	—	—
TALON	Cortante	2-2 c (+)	0.000	0.000	Vale	0.000
		2-2 c (-)	0.000	0.000	Vale	(cm²/m²)
	Trans. inferior	3-3 f (+)	1.250	7.959	Vale	9.617
		3-3 f (-)	0.000	7.959	Vale	
	Long. inf. (*)	—	0.250	7.959	Vale	7.959
		—	—	—	—	—
	Trans. superior	3-3 f (+)	0.000	7.959	Vale	43.965
		3-3 f (-)	43.965	7.959	Vale	
ZAPATA	Long. sup. (*)	—	8.793	7.959	Vale	8.793
		—	—	—	—	—
	Cortante	3-3 c (+)	0.000	0.000	Vale	0.000
		3-3 c (-)	0.000	0.000	Vale	(cm²/m²)
ZAPATA	Perimetral	—	0.000	7.959	Vale	7.959
		—	—	—	—	—

(*) Calculada como el 20% de la armadura perpendicular a ella

CALCULO DE MUROS.

NOMBRE PROYECTO :
NOMBRE OBRA :

L.A.V. MADRID - ZARAGOZA. Subtramo XV.
Aletas marcos con cobertura. Altura media.

DATOS

GEOMETRIA DE CALCULO DEL MURO

C. Canto del muro en coronación (m) :	0.300
ST. Sobreespesor muro en trasdós (m) :	0.600
SI. Sobreespesor muro en intradós (m) :	0.000
P. Puntera zapata (m) :	1.500
T. Talón zapata (m) :	3.300
H. Altura muro (m) :	6.000
H _z . Canto zapata (m) :	1.100
Anchura total cimentación (m) :	5.600
Angulo trasdós muro (°) :	85.236

DEFINICION TERRENO

	X	Y
0. Coordenadas base trasdós (m) :	0.000	0.000
1. Coordenadas coronación trasdós (m) :	-0.500	6.000
2. Coordenadas fin tramo 1 terreno (m) :	3.550	7.013
3. Coordenadas fin tramo 2 terreno (m) :	7.550	8.013
4. Coordenadas fin tramo 3 terreno (m) :	11.550	9.013

COEFICIENTES DE SEGURIDAD

Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
Ψo (coeficiente combinación variables) :	1.00

Estado Límite Último	
Favorable	Desfavorable

Acciones permanentes (G)		
Peso propio, cargas muertas :	0.90	1.50
Acciones permanentes de valor no constante (G*)		
Terreno (peso propio y empujes) :	0.00	1.50
Acciones variables (Q)		
Sobrecargas :	0.00	1.50

CARACTERISTICAS DEL TERRENO

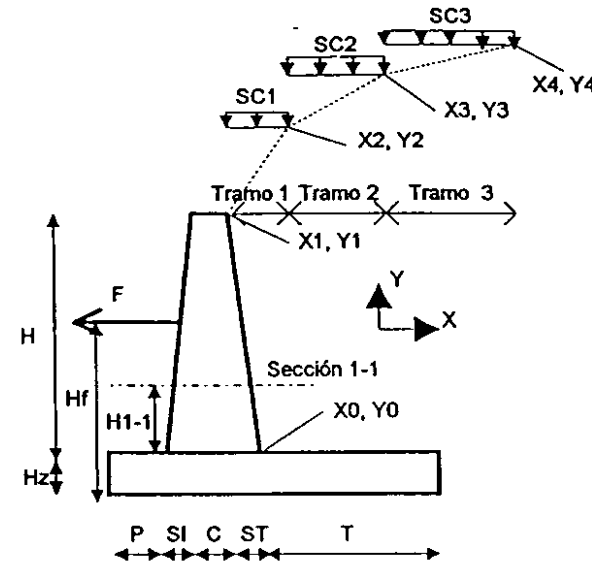
γ. Peso específico (T/m³) :	2.00
φ. Angulo rozamiento interno (°) :	30.000
δ _{mt} . Angulo rozamiento muro-terras (°) :	0.000
φ _{tt} . Angulo rozamiento tierras-terras (°) :	0.000
μ. Coeficiente rozamiento zapata-terras :	0.580
Tensión admisible cimentación (T/m²) :	20.000

ARMADO

H1-1. Dist. sección 1 a sup. zapata (m) :	0.000
Recubrimiento alzado (m) :	0.050
Recubrimiento cimentación (m) :	0.050

Cuantías mínimas

Vertical muros (1/3 mín. cara)(o/oo) :	0.900
Horizontal muros (1/3 mín. cara)(o/oo) :	1.600
Cortante o montaje alzado (cm²/m²) :	4.500
Transversal zapata (sup+inf)(o/oo) :	1.447
Longitudinal zapata (sup+inf)(o/oo) :	1.447
Cortante zapata (cm²/m²) :	0.000
Perimetral zapata (en canto)(cm²/m) :	7.959

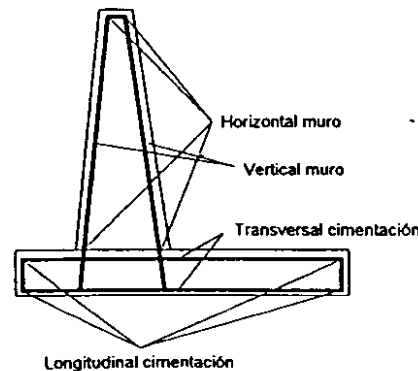


CARGAS (sin mayorar)

Acciones permanentes (G)	
Peso propio barrera coronación (T/m) :	0.000
Acciones permanentes de valor no constante (G*)	
Fg. Carga horizontal sobre muro (T/m) :	0.000
H _g . Posición Fg a inferior zapata (m) :	0.000
Acciones variables (Q)	
SC1. Sobrecarga en tramo 1 (T/m) :	0.000
SC2. Sobrecarga en tramo 2 (T/m) :	0.000
SC3. Sobrecarga en tramo 3 (T/m) :	0.000
Fq. Carga horizontal sobre muro (T/m) :	0.000
H _q . Posición Fq a inferior zapata (m) :	0.000

CARACTERISTICAS MATERIALES

Peso específico hormigón (T/m³) :	2.500
Hormigón alzado (T/m²) :	H - 250
Hormigón cimentación (T/m²) :	H - 250
Acero (T/F) :	AEH - 500



RESUMEN ACCIONES SOBRE EL MURO

		F.vertical (T / m)	X (m)	F. Horizontal (T / m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 (ΣP _i , i=1..3)	8.250	1.794	---	---
	Sobre sección base muro (ΣP _i , i=1..3)	8.250	1.794	---	---
	Total peso propio (ΣP _i , i=1..6)	23.650	2.449	---	---
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E1 ^{ti})	1.309	2.133	15.706	3.100
	Sobre sección base muro (E1 ^{ti})	1.309	2.133	15.706	3.100
	Total tierras (E2 ^{ti} + ΣT ^{ti})	46.210	3.862	25.600	2.683
	Verticales sobre talón (ΣT ^{ti} i)	43.148	3.985	---	---
	Verticales sobre talón (cortante) (ΣT ^{ti} i)	30.009	4.491	---	---
Fuerza Fg	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fg	---	---	0.000	0.000
Acciones variables (Q)					
Sobrecargas sobre terreno	Sección 1 (E1 ^{sc})	0.000	2.050	0.000	4.100
	Base muro (E1 ^{sc})	0.000	2.050	0.000	4.100
	Inf. cimentación (E2 ^{sc} + ΣS)	0.000	0.000	0.000	4.025
	Verticales sobre talón (ΣS ^{sc} i, i=1..3)	0.000	0.000	---	---
	Verticales sobre talón (cortante) (ΣS ^{sc} i)	0.000	0.000	---	---
Fuerza Fq	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fq	---	---	0.000	0.000

COMPROBACIONES

SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	13.717	—
Acciones permanentes de valor no constante (G*)		
Tierras	26.802	25.600
Fuerza Fg	—	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	—	0.000
TOTAL	40.519	25.600

Csd= 1.583 Vale

SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	57.920	—
Acciones permanentes de valor no constante (G*)		
Tierras	178.463	68.694
Fuerza Fg	—	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	—	0.000
TOTAL	236.383	68.694

Csv= 3.441 Vale

TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	23.650	8.300
Acciones permanentes de valor no constante (G*)		
Tierras	46.210	19.619
Fuerza Fg	0.000	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	0.000	0.000
TOTAL	69.860	27.919

D (m) = 5.60
 σ puntera (T / m²) = 17.82
 σ talón (T / m²) = 7.13
 σ med (T / m²) = 12.48
 σ cob (T / m²) = 14.55
 Vale

ARMADO

Secciones

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	0.80	1.00	0.80
	1-1	1.00	0.80	1.00	0.80
PUNTERA	2-2 f	1.00	1.10	1.00	1.10
	2-2 c	1.00	1.10	1.00	1.10
TALON	3-3 f	1.00	1.10	1.00	1.10
	3-3 c	1.00	1.10	1.00	1.10

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	9.388	47.447	23.559
	0-0 (-)	7.425	0.787	0.000
	1-1 (+)	9.388	47.447	23.559
	1-1 (-)	7.425	0.787	0.000
PUNTERA	2-2 f (+)	0.000	27.628	—
	2-2 f (-)	0.000	3.254	—
	2-2 c (+)	—	—	20.675
	2-2 c (-)	—	—	2.444
TALON	3-3 f (+)	0.000	4.665	—
	3-3 f (-)	-19.468	-61.138	—
	3-3 c (+)	—	—	1.766
	3-3 c (-)	—	—	-23.683

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm²/m	Minima cm²/m	Control cálculo	Adoptada cm²/m
ALZADO	Vert. trasdós	0-0 (+)	13.655	4.800	Vale	13.655
		0-0 (-)	0.000	2.400	Vale	
		1-1 (+)	13.655	4.800	Vale	
		1-1 (-)	0.000	2.400	Vale	
	Vert. intradós	0-0 (+)	0.000	2.400	Vale	2.400
		0-0 (-)	0.000	2.400	Vale	
		1-1 (+)	0.000	2.400	Vale	
		1-1 (-)	0.000	2.400	Vale	
	Hor. trasdós (*)	—	2.731	8.533	Vale	8.533
	Hor. intradós (*)	—	0.000	4.267	Vale	4.267
	Cortante	0-0 (+)	0.000	4.500	Vale	4.500 (cm²/m²)
		0-0 (-)	0.000	4.500	Vale	
		1-1 (+)	0.000	4.500	Vale	
		1-1 (-)	0.000	4.500	Vale	
PUNTERA	Trans. inferior	2-2 f (+)	5.987	7.959	Vale	7.959
		2-2 f (-)	0.699	7.959	Vale	
	Long. inf. (*)	—	1.197	7.959	Vale	7.959
	Trans. superior	2-2 f (+)	0.000	7.959	Vale	17.787
		2-2 f (-)	0.000	7.959	Vale	
	Long. sup. (*)	—	0.000	7.959	Vale	7.959
	Cortante	2-2 c (+)	0.000	0.000	Vale	0.000 (cm²/m²)
		2-2 c (-)	0.000	0.000	Vale	
TALON	Trans. inferior	3-3 f (+)	1.003	7.959	Vale	7.959
		3-3 f (-)	0.000	7.959	Vale	
	Long. inf. (*)	—	0.201	7.959	Vale	7.959
	Trans. superior	3-3 f (+)	0.000	7.959	Vale	17.787
		3-3 f (-)	17.787	7.959	Vale	
	Long. sup. (*)	—	3.557	7.959	Vale	7.959
	Cortante	3-3 c (+)	0.000	0.000	Vale	0.000 (cm²/m²)
		3-3 c (-)	0.000	0.000	Vale	
ZAPATA	Perimetral	—	0.000	7.959	Vale	7.959

(*) Calculada como el 20% de la armadura perpendicular a ella

CALCULO DE MUROS.

NOMBRE PROYECTO :	I.A.V. MADRID - ZARAGOZA - Subtramo XV.
NOMBRE OBRA :	Aletas marcos con cobertura. Altura mínima.

DATOS

GEOMETRIA DE CALCULO DEL MURO

C. Canto del muro en coronación (m) :	0.300
ST. Sobreespesor muro en trasdós (m) :	0.333
SI. Sobreespesor muro en intradós (m) :	0.000
P. Puntera zapata (m) :	1.500
T. Talón zapata (m) :	1.867
H. Altura muro (m) :	4.000
H _z . Canto zapata (m) :	1.100
Anchura total cimentación (m) :	4.000
Angulo trasdós muro (°) :	85.236

DEFINICION TERRENO

	X	Y
0. Coordenadas base trasdós (m) :	0.000	0.000
1. Coordenadas coronación trasdós (m) :	-0.333	4.000
2. Coordenadas fin tramo 1 terreno (m) :	3.667	5.000
3. Coordenadas fin tramo 2 terreno (m) :	6.333	5.667
4. Coordenadas fin tramo 3 terreno (m) :	9.000	6.333

COEFICIENTES DE SEGURIDAD

Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
Ψo (coeficiente combinación variables) :	1.00

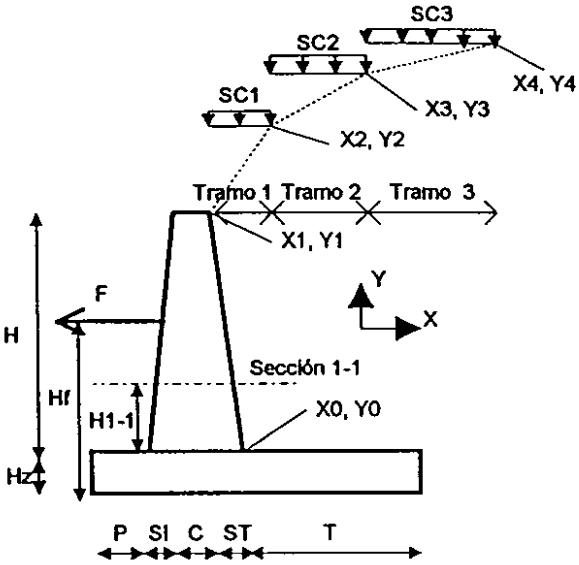
Estado Limite Ultimo		
	Favorable	Desfavorable
Acciones permanentes (G)		
Peso propio, cargas muertas :	0.90	1.50
Acciones permanentes de valor no constante (G*)		
Terreno (peso propio y empujes) :	0.00	1.50
Acciones variables (Q)		
Sobrecargas :	0.00	1.50

CARACTERISTICAS DEL TERRENO

γ. Peso específico (T/m³) :	2.00
φ. Angulo rozamiento interno (°) :	30.000
δmt. Angulo rozamiento muro-terras (°) :	0.000
φlt. Angulo rozamiento tierras-tierras (°) :	0.000
μ. Coeficiente rozamiento zapata-tierras :	0.580
Tensión admisible cimentación (T/m²) :	20.000

ARMADO

H1-1. Dist. sección 1 a sup. zapata (m) :	0.000
Recubrimiento alzado (m) :	0.050
Recubrimiento cimentación (m) :	0.050
Cuantías mínimas	
Vertical muros (1/3 mín. cara)(o/oo) :	0.900
Horizontal muros (1/3 mín. cara)(o/oo) :	1.600
Cortante o montaje alzado (cm²/m²) :	4.500
Transversal zapata (sup+inf)(o/oo) :	1.447
Longitudinal zapata (sup+inf)(o/oo) :	1.447
Cortante zapata (cm²/m²) :	0.000
Perimetral zapata (en canto)(cm²/m) :	7.959

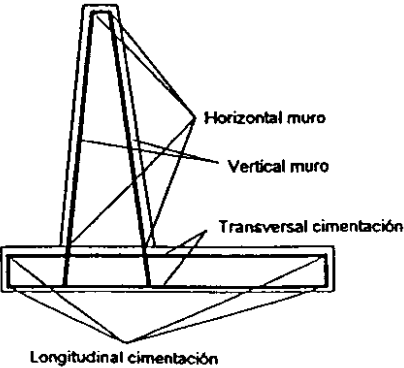


CARGAS (sin mayorar)

Acciones permanentes (G)	
Peso propio barrera coronación (T/m) :	0.000
Acciones permanentes de valor no constante (G*)	
Fg. Carga horizontal sobre muro (T/m) :	0.000
Hfg. Posición Fg a inferior zapata (m) :	0.000
Acciones variables (Q)	
SC1. Sobrecarga en tramo 1 (T/m) :	0.000
SC2. Sobrecarga en tramo 2 (T/m) :	0.000
SC3. Sobrecarga en tramo 3 (T/m) :	0.000
Fq. Carga horizontal sobre muro (T/m) :	0.000
Hfq. Posición Fq a inferior zapata (m) :	0.000

CARACTERISTICAS MATERIALES

Peso específico hormigón (T/m³) :	2.500
Hormigón alzado (T/m²) :	H - 250
Hormigón cimentación (T/m²) :	H - 250
Acero (T/P) :	AEH - 500



RESUMEN ACCIONES SOBRE EL MURO

		F.vertical (T / m)	X (m)	F. Horizontal (T / m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 (ΣP _i i=1..3)	4.667	1.743	---	---
	Sobre sección base muro (ΣP _i i=1..3)	4.667	1.743	---	---
	Total peso propio (ΣP _i i=1..6)	15.667	1.924	---	---
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E1'i)	0.578	2.022	6.931	2.433
	Sobre sección base muro (E1'i)	0.578	2.022	6.931	2.433
	Total tierras (E2t + ΣT _i)	17.477	3.001	12.622	1.883
	Verticales sobre talón (ΣT _i i)	16.116	3.083	---	---
	Verticales sobre talón (cortante) (ΣT _i i)	11.759	3.338	---	---
Fuerza Fg	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fg	---	---	0.000	0.000
Acciones variables (Q)					
Sobrecargas sobre terreno	Sección 1 (E1'sc)	0.000	1.967	0.000	3.100
	Base muro (E1'sc)	0.000	1.967	0.000	3.100
	Inf. cimentación (E2sc + ΣS)	0.000	0.000	0.000	2.825
	Verticales sobre talón (ΣS _i i, i=1..3)	0.000	0.000	---	---
	Verticales sobre talón (cortante) (ΣS _i i)	0.000	0.000	---	---
Fuerza Fq	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fq	---	---	0.000	0.000

COMPROBACIONES

SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	9.087	—
Acciones permanentes de valor no constante (G*)		
Tierras	10.136	12.622
Fuerza Fg	—	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	—	0.000
TOTAL	19.223	12.622

Csd= 1.523 Vale

SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	30.135	—
Acciones permanentes de valor no constante (G*)		
Tierras	52.445	23.771
Fuerza Fg	—	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	—	0.000
TOTAL	82.580	23.771

Csv= 3.474 Vale

TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	15.667	1.198
Acciones permanentes de valor no constante (G*)		
Tierras	17.477	6.280
Fuerza Fg	0.000	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	0.000	0.000
TOTAL	33.143	7.478

D (m) = 4.00
 σ puntera (T / m²) = 11.09
 σ talón (T / m²) = 5.48
 σ med (T / m²) = 8.29

σ cob (T / m²) = 9.34
 Vale

ARMADO

Secciones

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	0.63	1.00	0.63
	1-1	1.00	0.63	1.00	0.63
PUNTERA	2-2 f	1.00	1.10	1.00	1.10
	2-2 c	1.00	1.10	1.00	1.10
TALON	3-3 f	1.00	1.10	1.00	1.10
	3-3 c	1.00	1.10	1.00	1.10

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	5.066	13.993	10.397
	0-0 (-)	4.200	0.308	0.000
	1-1 (+)	5.066	13.993	10.397
	1-1 (-)	4.200	0.308	0.000
PUNTERA	2-2 f (+)	0.000	14.491	—
	2-2 f (-)	0.000	1.713	—
	2-2 c (+)	—	—	11.198
	2-2 c (-)	—	—	1.322
TALON	3-3 f (+)	0.000	2.494	—
	3-3 f (-)	-7.437	-15.733	—
	3-3 c (+)	—	—	1.747
	3-3 c (-)	—	—	-10.947

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm²/m	Minima cm²/m	Control cálculo	Adoptada cm²/m
ALZADO	Vert. trasdós	0-0 (+)	4.886	3.800	Vale	4.886
		0-0 (-)	0.000	1.900	Vale	
		1-1 (+)	4.886	3.800	Vale	
		1-1 (-)	0.000	1.900	Vale	
	Vert. intrados	0-0 (+)	0.000	1.900	Vale	1.900
		0-0 (-)	0.000	1.900	Vale	
		1-1 (+)	0.000	1.900	Vale	
		1-1 (-)	0.000	1.900	Vale	
	Hor. trasdós (*)	—	0.977	6.756	Vale	6.756
	Hor. intrados (*)	—	0.000	3.378	Vale	3.378
	Cortante	0-0 (+)	0.000	4.500	Vale	4.500 (cm²/m²)
		0-0 (-)	0.000	4.500	Vale	
		1-1 (+)	0.000	4.500	Vale	
PUNTERA	Trans. inferior	2-2 f (+)	3.126	7.959	Vale	7.959
		2-2 f (-)	0.368	7.959	Vale	
	Long. inf. (*)	—	0.625	7.959	Vale	7.959
		—	0.000	7.959	Vale	
	Trans. superior	2-2 f (+)	0.000	7.959	Vale	7.959
		2-2 f (-)	0.000	7.959	Vale	
	Long. sup. (*)	—	0.000	7.959	Vale	7.959
		—	0.000	0.000	Vale	
TALON	Trans. inferior	2-2 c (+)	0.000	0.000	Vale	0.000 (cm²/m²)
		2-2 c (-)	0.000	0.000	Vale	
	Trans. superior	3-3 f (+)	0.536	7.959	Vale	7.959
		3-3 f (-)	0.000	7.959	Vale	
	Long. inf. (*)	—	0.107	7.959	Vale	7.959
		—	0.000	7.959	Vale	
	Long. sup. (*)	3-3 f (+)	0.000	7.959	Vale	7.959
		3-3 f (-)	5.073	7.959	Vale	
ZAPATA	Cortante	3-3 c (+)	0.000	0.000	Vale	0.000 (cm²/m²)
		3-3 c (-)	0.000	0.000	Vale	
	Perimetral	—	0.000	7.959	Vale	7.959
		—	0.000	7.959	Vale	

(*) Calculada como el 20% de la armadura perpendicular a ella

4.4.7 Paso inferior EVN3-2.0

PASO INFERIOR EVN3-2.0

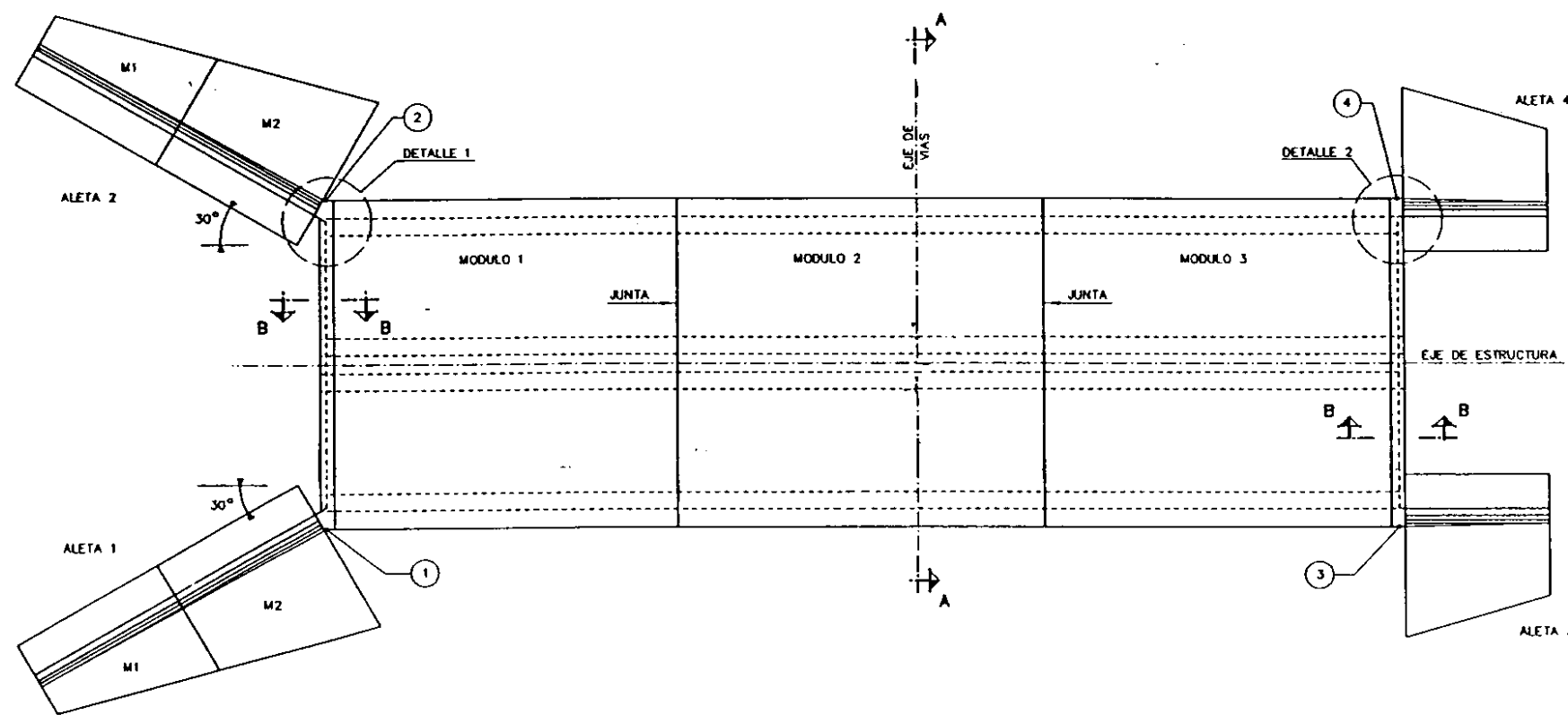
INDICE

1º DEFINICION GEOMETRICA

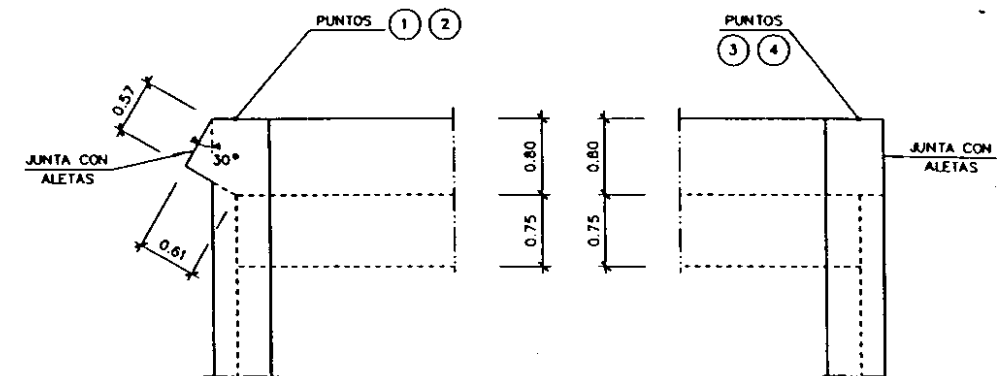
2º CALCULOS

PASO INFERIOR EVN3-2.0

1º DEFINICION GEOMETRICA



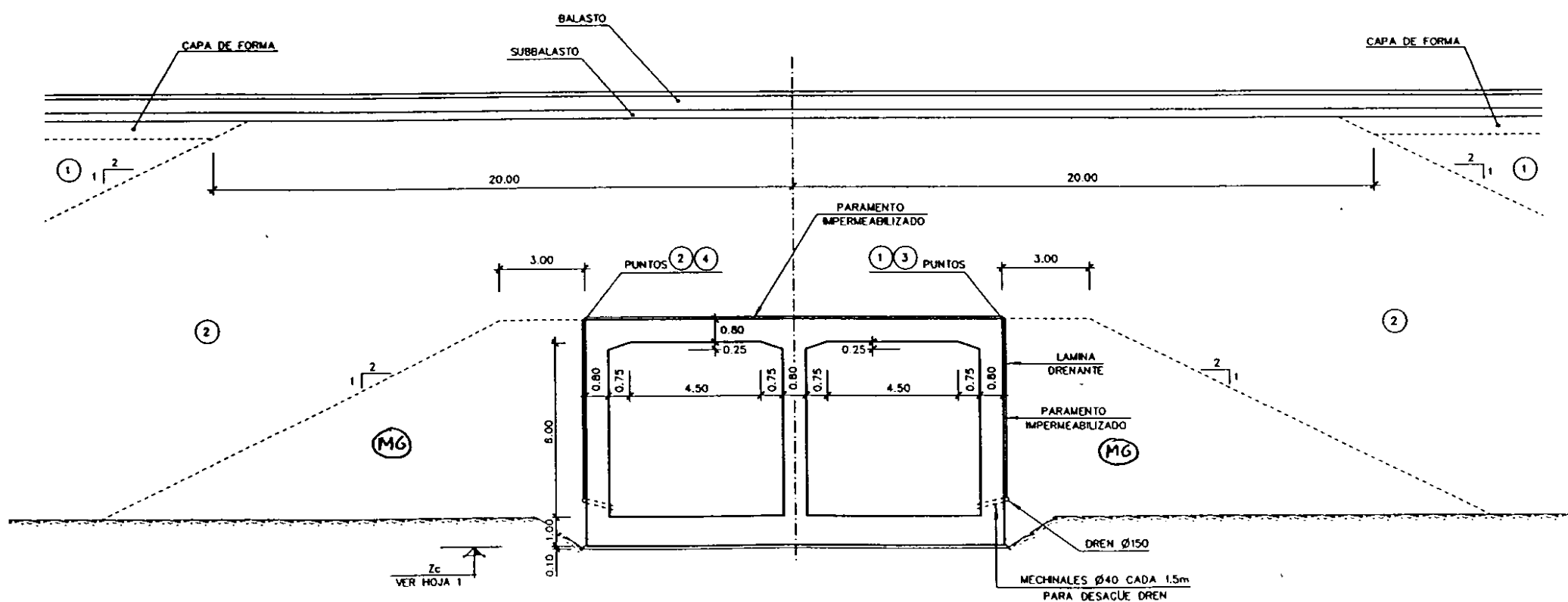
PLANTA



DETALLE 1

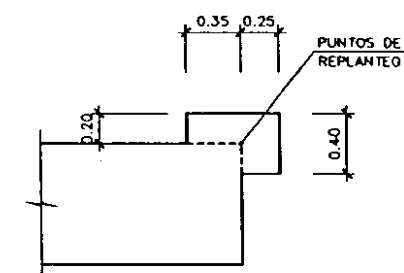
DETALLE 2

PUNTOS DE REPLANTEO			
PUNTO	X	Y	Z
1	679913.926	4607682.908	231.643
2	679927.252	4607677.444	231.643
3	679896.650	4607639.198	232.113
4	679909.975	4607633.734	232.113

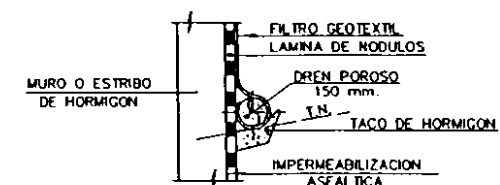


SECCION A-A

- M6 MATERIAL GRANULAR
 2 Q3J
 1 NUCLEO DE RELLENO

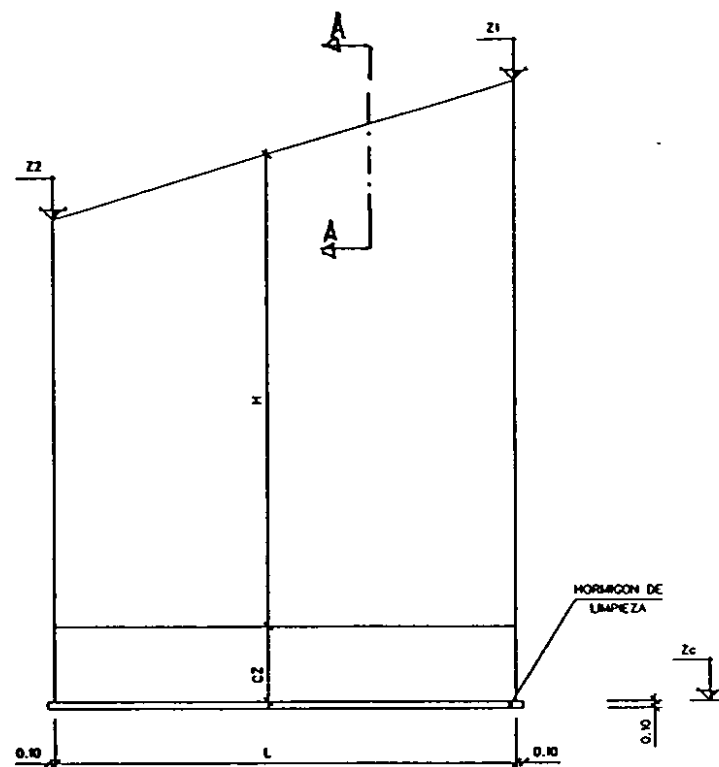


SECCION B-B

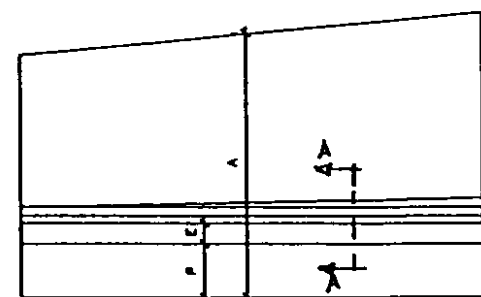


DETALLE DE IMPERMEABILIZACION EN TRASDOS DE MUROS Y ESTRIBOS

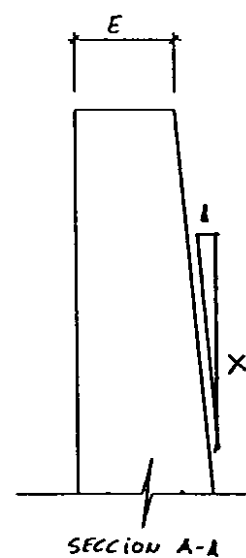
DEFINICION GEOMETRICA ALETAS



ALZADO TIPO DE MURO



PLANTA TIPO DE MURO



EVN3-2.0

DEFINICION GEOMETRICA

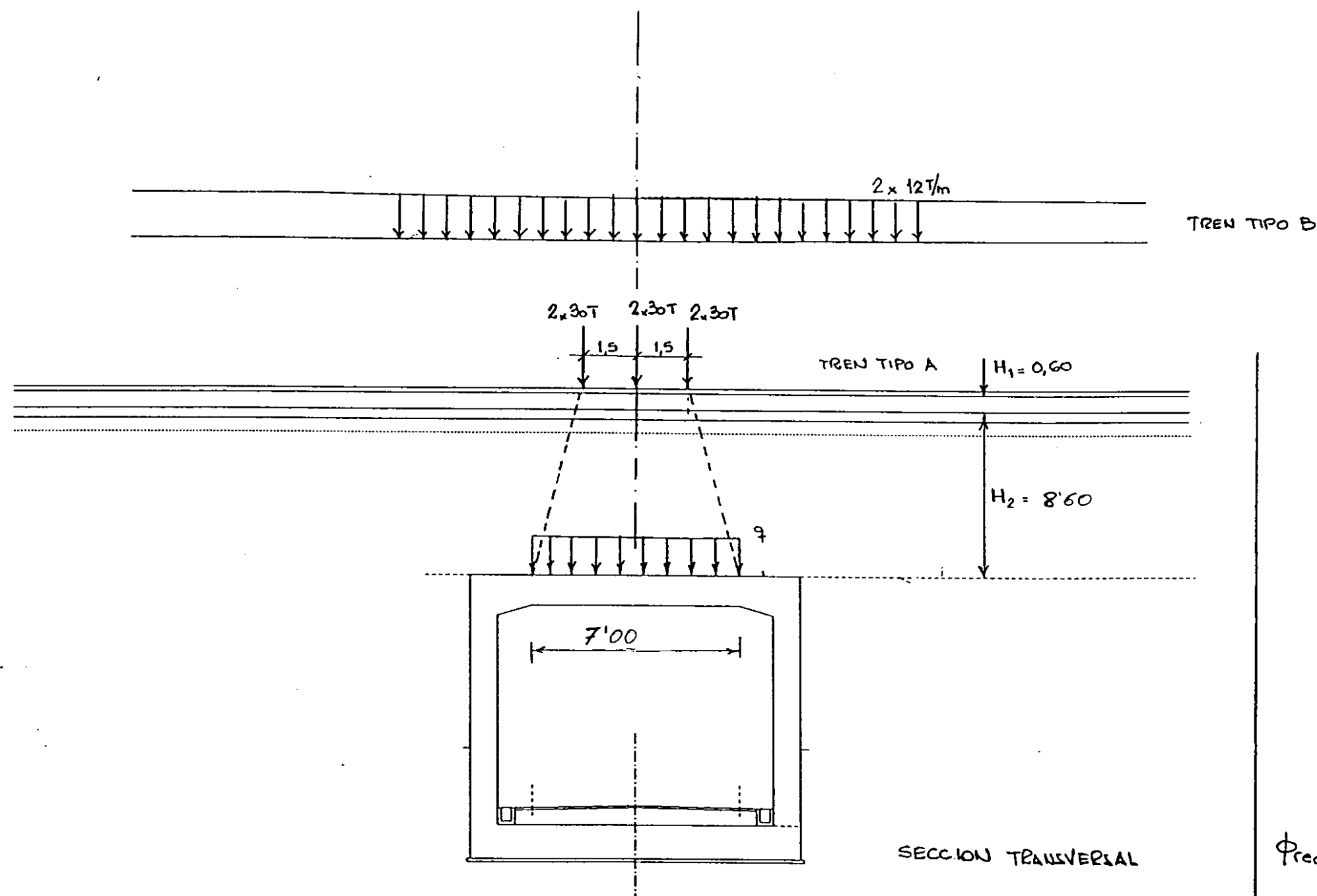
	Aletas 1 y 2. M1	Aletas 1 y 2. M2	Aletas 3 y 4
Z1	228.771	231.843	232.313
Z2	225.700	228.771	228.927
ZC	223.743	223.743	224.063
H	De 3.93 a 0.86	De 7.00 a 3.93	De 7.15 a 3.76
CZ	1.10	1.10	1.10
L	7.00	7.00	6.25
A	De 5.35 a 3.50	De 7.20 a 5.35	De 7.20 a 5.35
P	1.50	1.50	1.50
E	0.30	0.30	0.30
X	12.0	12.0	12

PASO INFERIOR EVN3-2.0

2º CALCULOS

EVN3-2.0

Cálculo 1



Coef. Impacto

$$V = 200 \text{ km/h}$$

$$T = 0,05 \text{ seg.}$$

$$L = 8,80 \text{ m}$$

$$\mu = \frac{VT}{2L} = 0,57$$

$$I = 65 \frac{\mu}{1 - \mu + \mu^2} = 50$$

$$\phi_0 = 1,50$$

$$\phi_{red} = \phi_0 - \frac{h - 1,0}{10,0} \quad \text{Para } h = 6 \text{ m:}$$

$$\phi_{red} = 1,50 - \frac{6 - 1}{10} = 1,00$$

CARGA PERMANENTE

$$g: \text{Riel + Traveses} = \frac{0,12 \text{ T/m} + 0,52 \text{ T/m}}{2,4 \text{ m}} = 0,27 \text{ T/m}^2$$

$$\text{Baldasto} = 0,60 \text{ m} \cdot 1,6 \text{ T/m}^3 = 0,96 \text{ T/m}^2$$

$$\text{Repleno} = 8,60 \text{ m} \cdot 2,0 \text{ T/m}^3 = 17,20 \text{ T/m}^2$$

$$g = 18,43 \text{ T/m}^2 + \text{PESO PROPIO MARCO}$$

SOBRECARGA DE TREN

$$q_A = \frac{2 \times 30 \text{ T}}{10,0 \text{ m} \times 7,5 \text{ m}} = 2,40 \text{ T/m}^2$$

$$q_B = \frac{2 \times 12 \text{ T/m}}{10,0 \text{ m}} = 2,4 \text{ T/m}^2$$

$$S_d = 1,5 g + 1,5 q$$

ESTADO LÍMITE ULTIMO

$$S_k = 1,0 g + 1,0 q$$

ESTADOS LÍMITES DE SERVICIO

$3,30T, 90T$



$12T/m$



$3,30T = 90T$



$12T/m$

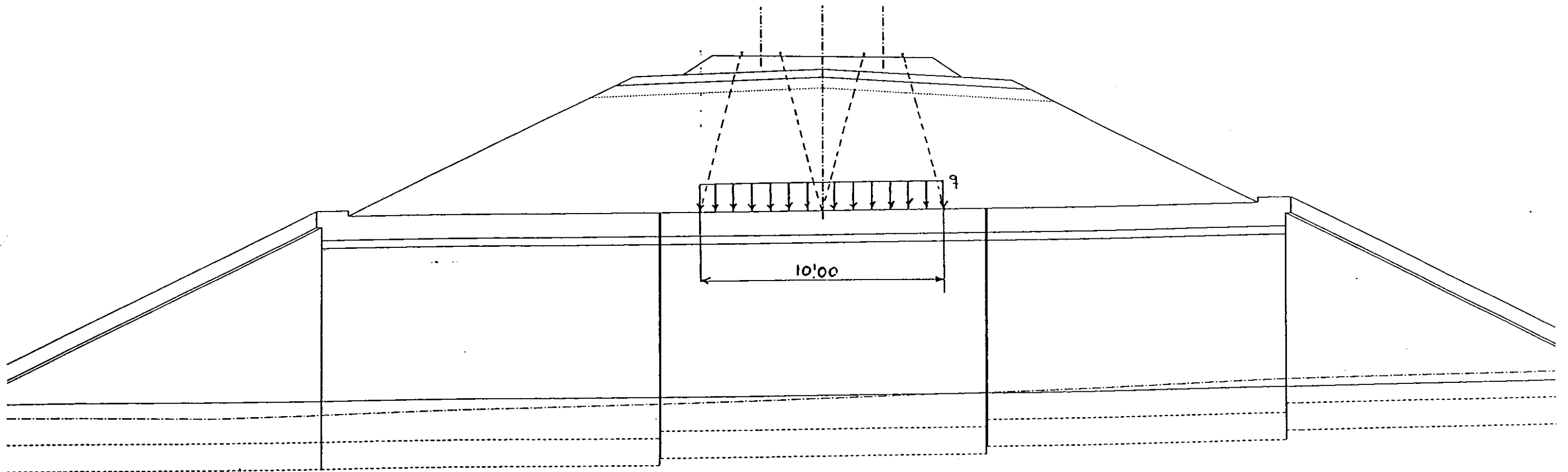


TREN TIPO A

TREN TIPO B

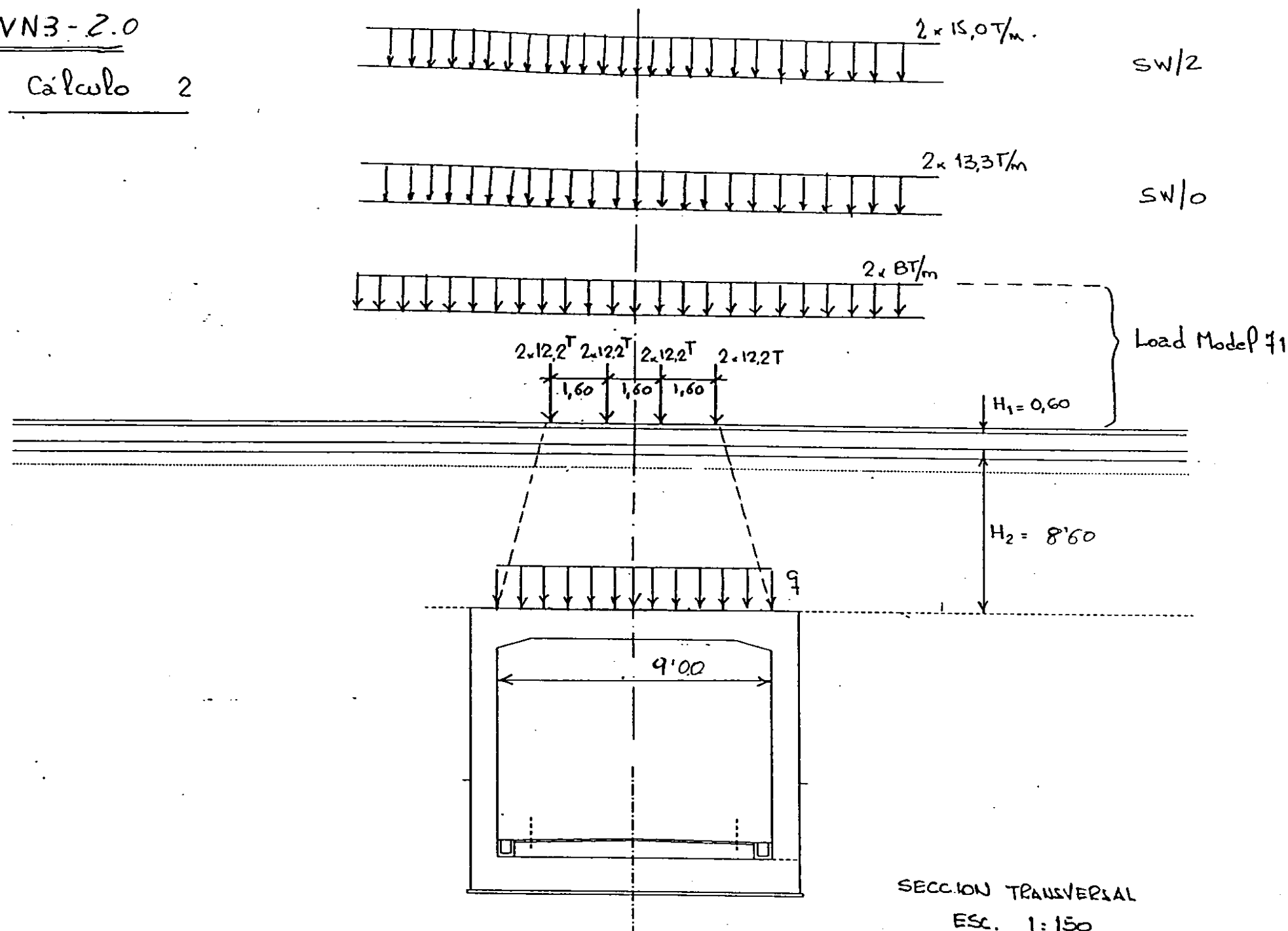
ENV3-2.0

Cálculo 1



EVN3-2.0

Cálculo 2



CARGA PERMANENTE

$$g: \text{Riel + Traveses} = \frac{0.12 \text{ T/m} + 0.52 \text{ T/m}}{2.4 \text{ m}} = 0.27 \text{ T/m}^2$$

$$\text{Ballasto} = 0.60 \text{ m} \cdot 1.6 \text{ T/m}^3 = 0.96 \text{ T/m}^2$$

$$\text{Relleno} = 8.60 \text{ m} \cdot 2.0 \text{ T/m}^3 = 17.20 \text{ T/m}^2$$

$$g = 18.43 \text{ T/m}^2 + \text{PESO PROPIO MARCO}$$

SOBRECARGA TREN

$$q_{LM71} = \frac{8 \times 12.2 \text{ T}}{9.0 \text{ m} \times 10 \text{ m}} + \frac{2 \times 8 \text{ T/m}}{10 \text{ m}} = 2.7 \text{ T/m}^2$$

$$q_{SW/0} = \frac{2 \times 13.3 \text{ T/m}}{10 \text{ m}} = 2.7 \text{ T/m}^2$$

$$q_{SW/2} = \frac{2 \times 15.0 \text{ T/m}}{10 \text{ m}} = 3.0 \text{ T/m}^2$$

Coef. de Impacto

$$L_m = \frac{1}{3}(7 + 8.8 + 7) = 7.6 \text{ m}$$

$$L_\phi = K L_m = 1.3 \times 7.6 \text{ m} = 9.9 \text{ m}$$

$$\phi_3 = \frac{2.16}{\sqrt{L_\phi} - 0.2} + 0.73 = 1.5$$

$$V = 1.2 \times 350 \text{ km/h} = 420 \text{ km/h} = 117 \text{ m/s}$$

$$L = 8.8 \text{ m}$$

$$T_1 = 0.05 \text{ seg} \quad \beta = \frac{T_1}{T_V} = 0.33$$

$$T_V = \frac{2 \times 8.8}{117} = 0.15 \text{ seg}$$

$$\frac{f_{din}}{f_{est.}} = \frac{1 + \beta}{1 - \beta^2} = 1.5$$

$$\therefore \text{Adoptando } \phi_0 = 1.50$$

$$\phi_{red} = \phi_0 - \frac{h-1}{10} \quad \text{Para } h = 6 \text{ m}$$

$$\phi_{red} = 1.50 - \frac{6-1}{10} = 1.00$$

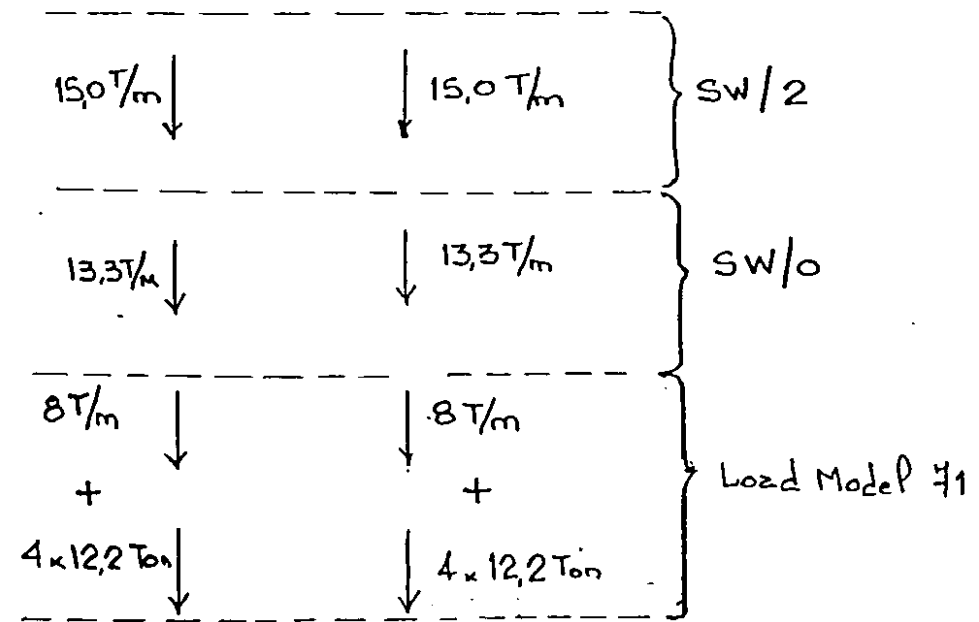
ESTADO LÍMITE ÚLTIMO

$$S_d = 1.35 g + 1.45 q_{LM71}$$

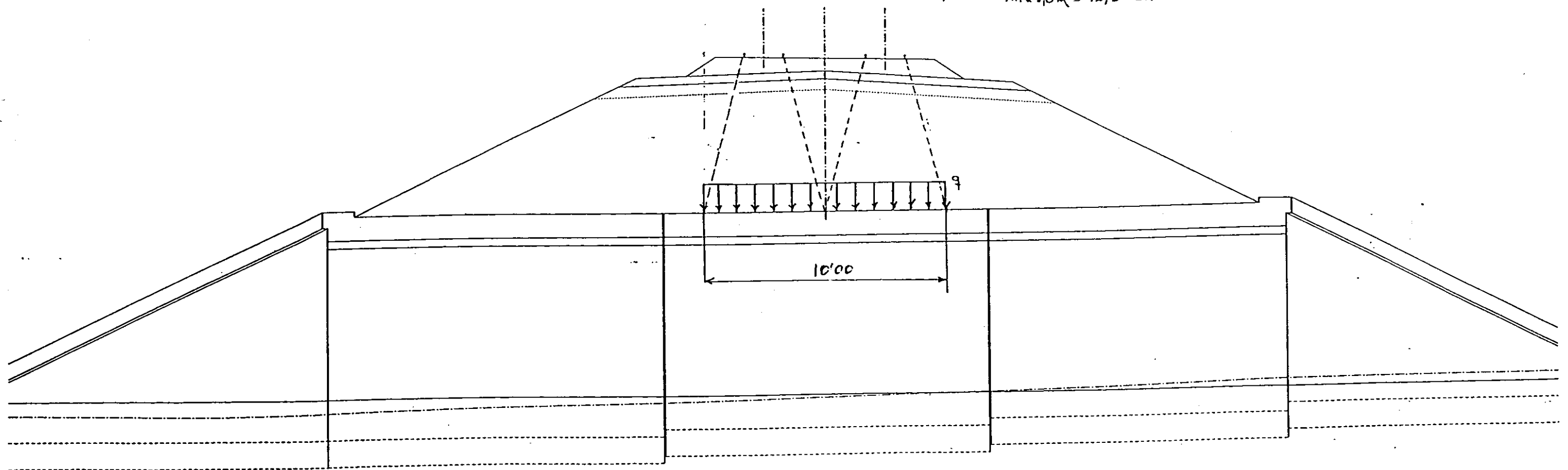
$$S_d = 1.35 g + 1.45 q_{SW/0}$$

$$S_d = 1.35 g + 1.20 q_{SW/2}$$

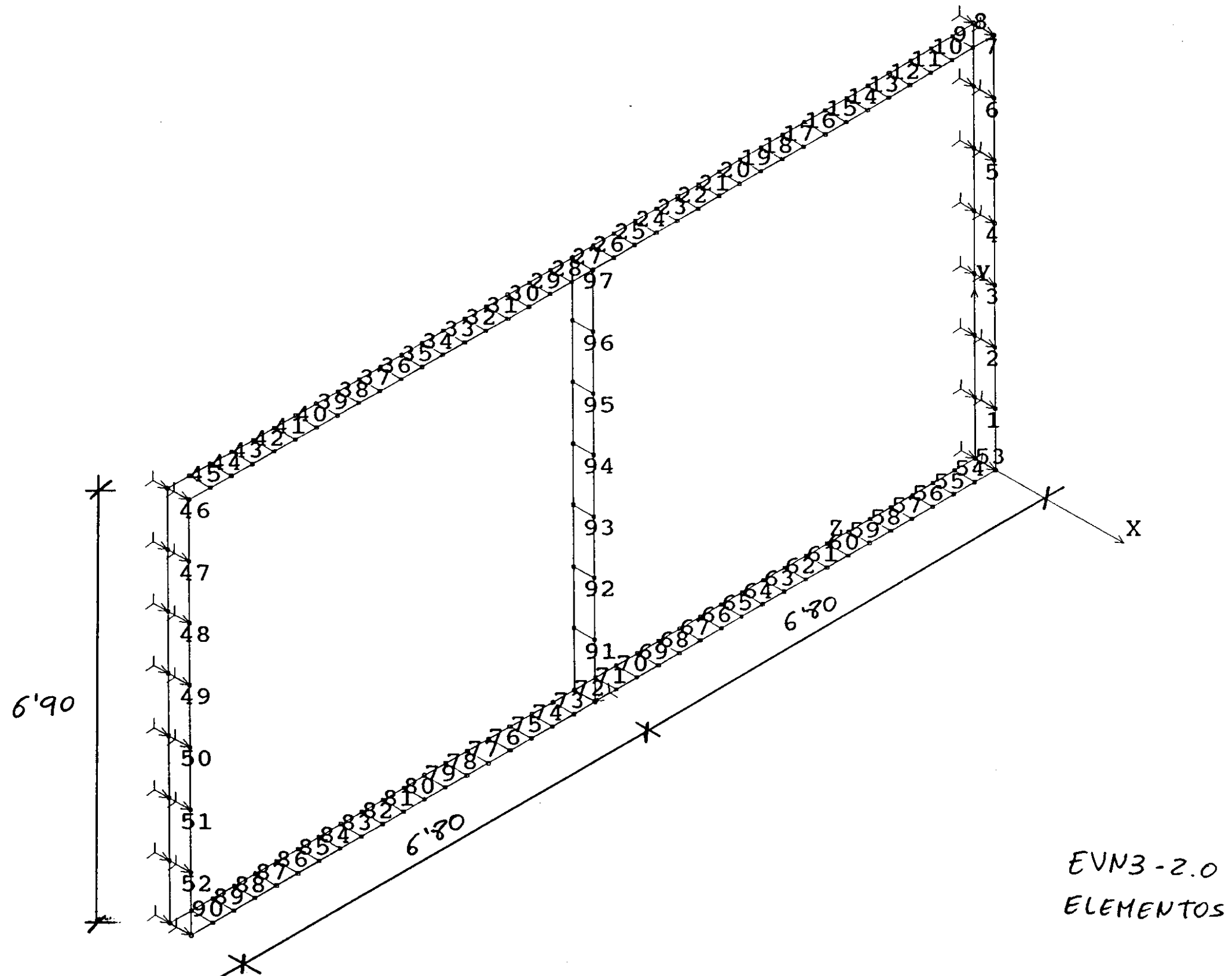
ENV3-2.0
Cálculo 2



$$25,0 \text{ T} = 8 \text{ T/m} \times 3,125 \text{ m} = 25,0 \text{ T}$$



RC	CLR
1	
2	
3	
4	
5	
6	



EVN3-2.0
ELEMENTOS

Element group data

Element group number= 1
 Element name:
 SHELL4T Four node thick shell elements
 Type of Shell element= 2
 EQ. 0 ; QUAD 2 element
 EQ. 1 ; QUAD 4 element

Real constant data

Real constant set 1
 Associated with :
 SHELL4T Four node thick shell elements
 Thickness of the plate = .80000
 Temperature Gradient = .00000
 Real constant set 2
 Associated with :
 SHELL4T Four node thick shell elements
 Thickness of the plate = 1.0500
 Temperature Gradient = .00000
 Real constant set 3
 Associated with :
 SHELL4T Four node thick shell elements
 Thickness of the plate = .97895
 Temperature Gradient = .00000
 Real constant set 4
 Associated with :
 SHELL4T Four node thick shell elements
 Thickness of the plate = .85965
 Temperature Gradient = .00000
 Real constant set 5
 Associated with :
 SHELL4T Four node thick shell elements
 Thickness of the plate = .80000
 Temperature Gradient = .00000
 Real constant set 6
 Associated with :
 SHELL4T Four node thick shell elements
 Thickness of the plate = 1.0000
 Temperature Gradient = .00000
 Foundation stiffness = 500.00

Material property data

Material property set 1

	Value	Temp curve no.
EX : X Elastic Modulus	.35000E+07	0
NUXY : Poisson Ratio	.20000	0
DENS : Mass Density	2.5000	0

Nodal input data

 NODE BOUNDARY CONDITION CODES NODAL
 POINT COORDINATES
 (0 = FREE ; 1 = FIXED) -----

	X	Y	Z	XX	YY	ZZ	X	Y	Z
1	1	0	0	0	0	0	.00000	.00000	.00000
2	1	0	0	0	0	0	.00000	.91429	.00000
3	1	0	0	0	0	0	.00000	1.8286	.00000
4	1	0	0	0	0	0	.00000	2.7429	.00000
5	1	0	0	0	0	0	.00000	3.6571	.00000
6	1	0	0	0	0	0	.00000	4.5714	.00000
7	1	0	0	0	0	0	.00000	5.4857	.00000
8	1	0	0	0	0	0	.00000	6.4000	.00000
9	1	0	0	0	0	0	.35000	.00000	.00000
10	1	0	0	0	0	0	.35000	.91429	.00000
11	1	0	0	0	0	0	.35000	1.8286	.00000
12	1	0	0	0	0	0	.35000	2.7429	.00000
13	1	0	0	0	0	0	.35000	3.6571	.00000
14	1	0	0	0	0	0	.35000	4.5714	.00000
15	1	0	0	0	0	0	.35000	5.4857	.00000
16	1	0	0	0	0	0	.35000	6.4000	.00000
17	0	0	0	0	0	0	-.15644E-07	6.4000	.35789
18	0	0	0	0	0	0	-.31288E-07	6.4000	.71579
19	0	0	0	0	0	0	-.46932E-07	6.4000	1.0737
20	0	0	0	0	0	0	-.62576E-07	6.4000	1.4316
21	0	0	0	0	0	0	-.78220E-07	6.4000	1.7895
22	0	0	0	0	0	0	-.93864E-07	6.4000	2.1474
23	0	0	0	0	0	0	-.10951E-06	6.4000	2.5053
24	0	0	0	0	0	0	-.12515E-06	6.4000	2.8632
25	0	0	0	0	0	0	-.14080E-06	6.4000	3.2211
26	0	0	0	0	0	0	-.15644E-06	6.4000	3.5789
27	0	0	0	0	0	0	-.17208E-06	6.4000	3.9368
28	0	0	0	0	0	0	-.18773E-06	6.4000	4.2947
29	0	0	0	0	0	0	-.20337E-06	6.4000	4.6526
30	0	0	0	0	0	0	-.21902E-06	6.4000	5.0105
31	0	0	0	0	0	0	-.23466E-06	6.4000	5.3684
32	0	0	0	0	0	0	-.25031E-06	6.4000	5.7263
33	0	0	0	0	0	0	-.26595E-06	6.4000	6.0842
34	0	0	0	0	0	0	-.28159E-06	6.4000	6.4421
35	0	0	0	0	0	0	-.29724E-06	6.4000	6.8000
36	0	0	0	0	0	0	-.31288E-06	6.4000	7.1579
37	0	0	0	0	0	0	-.32853E-06	6.4000	7.5158
38	0	0	0	0	0	0	-.34417E-06	6.4000	7.8737
39	0	0	0	0	0	0	-.35981E-06	6.4000	8.2316
40	0	0	0	0	0	0	-.37546E-06	6.4000	8.5895
41	0	0	0	0	0	0	-.39110E-06	6.4000	8.9474
42	0	0	0	0	0	0	-.40675E-06	6.4000	9.3053
43	0	0	0	0	0	0	-.42239E-06	6.4000	9.6632
44	0	0	0	0	0	0	-.43803E-06	6.4000	10.021
45	0	0	0	0	0	0	-.45368E-06	6.4000	10.379
46	0	0	0	0	0	0	-.46932E-06	6.4000	10.737
47	0	0	0	0	0	0	-.48497E-06	6.4000	11.095
48	0	0	0	0	0	0	-.50061E-06	6.4000	11.453
49	0	0	0	0	0	0	-.51625E-06	6.4000	11.811
50	0	0	0	0	0	0	-.53190E-06	6.4000	12.168
51	0	0	0	0	0	0	-.54754E-06	6.4000	12.526
52	0	0	0	0	0	0	-.56319E-06	6.4000	12.884
53	0	0	0	0	0	0	-.57883E-06	6.4000	13.242
54	1	0	0	0	0	0	-.59448E-06	6.4000	13.600
55	0	0	0	0	0	0	.35000	6.4000	.35789
56	0	0	0	0	0	0	.35000	6.4000	.71579
57	0	0	0	0	0	0	.35000	6.4000	1.0737
58	0	0	0	0	0	0	.35000	6.4000	1.4316
59	0	0	0	0	0	0	.35000	6.4000	1.7895
60	0	0	0	0	0	0	.35000	6.4000	2.1474
61	0	0	0	0	0	0	.35000	6.4000	2.5053

62	0	0	0	0	0	0	.35000	6.4000	2.8632	130	0	0	0	0	0	-.37546E-06	.00000	8.5895
63	0	0	0	0	0	0	.35000	6.4000	3.2211	131	0	0	0	0	0	-.39110E-06	.00000	8.9474
64	0	0	0	0	0	0	.35000	6.4000	3.5789	132	0	0	0	0	0	-.40675E-06	.00000	9.3053
65	0	0	0	0	0	0	.35000	6.4000	3.9368	133	0	0	0	0	0	-.42239E-06	.00000	9.6632
66	0	0	0	0	0	0	.35000	6.4000	4.2947	134	0	0	0	0	0	-.43803E-06	.00000	10.021
67	0	0	0	0	0	0	.35000	6.4000	4.6526	135	0	0	0	0	0	-.45368E-06	.00000	10.379
68	0	0	0	0	0	0	.35000	6.4000	5.0105	136	0	0	0	0	0	-.46932E-06	.00000	10.737
69	0	0	0	0	0	0	.35000	6.4000	5.3684	137	0	0	0	0	0	-.48497E-06	.00000	11.095
70	0	0	0	0	0	0	.35000	6.4000	5.7263	138	0	0	0	0	0	-.50061E-06	.00000	11.453
71	0	0	0	0	0	0	.35000	6.4000	6.0842	139	0	0	0	0	0	-.51625E-06	.00000	11.811
72	0	0	0	0	0	0	.35000	6.4000	6.4421	140	0	0	0	0	0	-.53190E-06	.00000	12.168
73	0	0	0	0	0	0	.35000	6.4000	6.8000	141	0	0	0	0	0	-.54754E-06	.00000	12.526
74	0	0	0	0	0	0	.35000	6.4000	7.1579	142	0	0	0	0	0	-.56319E-06	.00000	12.884
75	0	0	0	0	0	0	.35000	6.4000	7.5158	143	0	0	0	0	0	-.57883E-06	.00000	13.242
76	0	0	0	0	0	0	.35000	6.4000	7.8737	144	0	0	0	0	0	.35000	.00000	.35789
77	0	0	0	0	0	0	.35000	6.4000	8.2316	145	0	0	0	0	0	.35000	.00000	.71579
78	0	0	0	0	0	0	.35000	6.4000	8.5895	146	0	0	0	0	0	.35000	.00000	1.0737
79	0	0	0	0	0	0	.35000	6.4000	8.9474	147	0	0	0	0	0	.35000	.00000	1.4316
80	0	0	0	0	0	0	.35000	6.4000	9.3053	148	0	0	0	0	0	.35000	.00000	1.7895
81	0	0	0	0	0	0	.35000	6.4000	9.6632	149	0	0	0	0	0	.35000	.00000	2.1474
82	0	0	0	0	0	0	.35000	6.4000	10.021	150	0	0	0	0	0	.35000	.00000	2.5053
83	0	0	0	0	0	0	.35000	6.4000	10.379	151	0	0	0	0	0	.35000	.00000	2.8632
84	0	0	0	0	0	0	.35000	6.4000	10.737	152	0	0	0	0	0	.35000	.00000	3.2211
85	0	0	0	0	0	0	.35000	6.4000	11.095	153	0	0	0	0	0	.35000	.00000	3.5789
86	0	0	0	0	0	0	.35000	6.4000	11.453	154	0	0	0	0	0	.35000	.00000	3.9368
87	0	0	0	0	0	0	.35000	6.4000	11.811	155	0	0	0	0	0	.35000	.00000	4.2947
88	0	0	0	0	0	0	.35000	6.4000	12.168	156	0	0	0	0	0	.35000	.00000	4.6526
89	0	0	0	0	0	0	.35000	6.4000	12.526	157	0	0	0	0	0	.35000	.00000	5.0105
90	0	0	0	0	0	0	.35000	6.4000	12.884	158	0	0	0	0	0	.35000	.00000	5.3684
91	0	0	0	0	0	0	.35000	6.4000	13.242	159	0	0	0	0	0	.35000	.00000	5.7263
92	1	0	0	0	0	0	.35000	6.4000	13.600	160	0	0	0	0	0	.35000	.00000	6.0842
93	1	0	0	0	0	0	-.59447E-06	5.4857	13.600	161	0	0	0	0	0	.35000	.00000	6.4421
94	1	0	0	0	0	0	-.59447E-06	4.5714	13.600	162	0	0	1	0	0	.35000	.00000	6.8000
95	1	0	0	0	0	0	-.59447E-06	3.6571	13.600	163	0	0	0	0	0	.35000	.00000	7.1579
96	1	0	0	0	0	0	-.59447E-06	2.7429	13.600	164	0	0	0	0	0	.35000	.00000	7.5158
97	1	0	0	0	0	0	-.59447E-06	1.8286	13.600	165	0	0	0	0	0	.35000	.00000	7.8737
98	1	0	0	0	0	0	-.59447E-06	.91429	13.600	166	0	0	0	0	0	.35000	.00000	8.2316
99	1	0	0	0	0	0	-.59447E-06	.00000	13.600	167	0	0	0	0	0	.35000	.00000	8.5895
100	1	0	0	0	0	0	.35000	5.4857	13.600	168	0	0	0	0	0	.35000	.00000	8.9474
101	1	0	0	0	0	0	.35000	4.5714	13.600	169	0	0	0	0	0	.35000	.00000	9.3053
102	1	0	0	0	0	0	.35000	3.6571	13.600	170	0	0	0	0	0	.35000	.00000	

Element input data

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ELEM EGRP MP REAL ECS NODE 1 NODE 2 NODE
3 NODE 4 NODE 5 NODE 6
      NODE 7 NODE 8 NODE 9 NODE10
NODE11 NODE12
      NODE13 NODE14 NODE15 NODE16
NODE17 NODE18
      NODE19 NODE20
1 1 1 1 -1 1 2 10 9
2 1 1 1 -1 2 3 11 10
3 1 1 1 -1 3 4 12 11
4 1 1 1 -1 4 5 13 12
5 1 1 1 -1 5 6 14 13
6 1 1 1 -1 6 7 15 14
7 1 1 1 -1 7 8 16 15
8 1 1 2 -1 8 17 55 16
9 1 1 3 -1 17 18 56 55
10 1 1 4 -1 18 19 57 56
11 1 1 5 -1 19 20 58 57
12 1 1 5 -1 20 21 59 58
13 1 1 5 -1 21 22 60 59
14 1 1 5 -1 22 23 61 60
15 1 1 5 -1 23 24 62 61
16 1 1 5 -1 24 25 63 62
17 1 1 5 -1 25 26 64 63
18 1 1 5 -1 26 27 65 64
19 1 1 5 -1 27 28 66 65
20 1 1 5 -1 28 29 67 66
21 1 1 5 -1 29 30 68 67
22 1 1 5 -1 30 31 69 68
23 1 1 5 -1 31 32 70 69
24 1 1 4 -1 32 33 71 70
25 1 1 3 -1 33 34 72 71
26 1 1 2 -1 34 35 73 72
27 1 1 2 -1 35 36 74 73
28 1 1 3 -1 36 37 75 74
29 1 1 4 -1 37 38 76 75
30 1 1 5 -1 38 39 77 76
31 1 1 5 -1 39 40 78 77
32 1 1 5 -1 40 41 79 78
33 1 1 5 -1 41 42 80 79
34 1 1 5 -1 42 43 81 80
35 1 1 5 -1 43 44 82 81
36 1 1 5 -1 44 45 83 82
37 1 1 5 -1 45 46 84 83
38 1 1 5 -1 46 47 85 84
39 1 1 5 -1 47 48 86 85
40 1 1 5 -1 48 49 87 86
41 1 1 5 -1 49 50 88 87
42 1 1 5 -1 50 51 89 88
43 1 1 4 -1 51 52 90 89
44 1 1 3 -1 52 53 91 90
45 1 1 2 -1 53 54 92 91
46 1 1 1 -1 54 93 100 92
47 1 1 1 -1 93 94 101 100
48 1 1 1 -1 94 95 102 101
49 1 1 1 -1 95 96 103 102
50 1 1 1 -1 96 97 104 103
51 1 1 1 -1 97 98 105 104
52 1 1 1 -1 98 99 106 105
53 1 1 6 -1 1 107 144 9
54 1 1 6 -1 107 108 145 144
55 1 1 6 -1 108 109 146 145
56 1 1 6 -1 109 110 147 146
57 1 1 6 -1 110 111 148 147
58 1 1 6 -1 111 112 149 148
59 1 1 6 -1 112 113 150 149

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60 1 1 6 -1 113 114 151 150
61 1 1 6 -1 114 115 152 151
62 1 1 6 -1 115 116 153 152
63 1 1 6 -1 116 117 154 153
64 1 1 6 -1 117 118 155 154
65 1 1 6 -1 118 119 156 155
66 1 1 6 -1 119 120 157 156
67 1 1 6 -1 120 121 158 157
68 1 1 6 -1 121 122 159 158
69 1 1 6 -1 122 123 160 159
70 1 1 6 -1 123 124 161 160
71 1 1 6 -1 124 125 162 161
72 1 1 6 -1 125 126 163 162
73 1 1 6 -1 126 127 164 163
74 1 1 6 -1 127 128 165 164
75 1 1 6 -1 128 129 166 165
76 1 1 6 -1 129 130 167 166
77 1 1 6 -1 130 131 168 167
78 1 1 6 -1 131 132 169 168
79 1 1 6 -1 132 133 170 169
80 1 1 6 -1 133 134 171 170
81 1 1 6 -1 134 135 172 171
82 1 1 6 -1 135 136 173 172
83 1 1 6 -1 136 137 174 173
84 1 1 6 -1 137 138 175 174
85 1 1 6 -1 138 139 176 175
86 1 1 6 -1 139 140 177 176
87 1 1 6 -1 140 141 178 177
88 1 1 6 -1 141 142 179 178
89 1 1 6 -1 142 143 180 179
90 1 1 6 -1 143 99 106 180
91 1 1 1 -1 125 181 187 162
92 1 1 1 -1 181 182 188 187
93 1 1 1 -1 182 183 189 188
94 1 1 1 -1 183 184 190 189
95 1 1 1 -1 184 185 191 190
96 1 1 1 -1 185 186 192 191
97 1 1 1 -1 186 35 73 192

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RESULTADOS COSMOS. Esfuerzos característicos.**Proyecto :** L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV**Estructura:** EVN3-2.0

Hipotesis--> Elem	PESO PROPIO			CARGA MUERTA			EMPUJE TIERRAS			EMPUJE SC			SOBRECARGA		
	NX (U/m)	MX (m.U/m)	VX (U/m)	NX (U/m)	MX (m.U/m)	VX (U/m)	NX (U/m)	MX (m.U/m)	VX (U/m)	NX (U/m)	MX (m.U/m)	VX (U/m)	NX (U/m)	MX (m.U/m)	VX (U/m)
1	-15.6	-10.4	-2.4	-3.4	-1.0	0.1	-6.6	-15.7	-36.1	-0.7	-1.6	-3.3	-54.1	-15.8	1.9
2	-13.8	-8.2	-2.4	-3.4	-1.1	0.1	-6.6	11.3	-22.5	-0.7	0.9	-2.2	-54.1	-17.6	1.9
3	-11.9	-6.0	-2.4	-3.4	-1.2	0.1	-6.6	26.6	-10.4	-0.7	2.5	-1.1	-54.1	-19.3	1.9
4	-10.1	-3.7	-2.4	-3.4	-1.3	0.1	-6.6	30.9	1.0	-0.7	3.0	-0.1	-54.1	-21.1	1.9
5	-8.3	-1.5	-2.4	-3.4	-1.4	0.1	-6.6	25.1	11.6	-0.7	2.6	1.0	-54.1	-22.8	1.9
6	-6.4	0.7	-2.4	-3.4	-1.5	0.1	-6.6	9.8	21.3	-0.7	1.1	2.1	-54.1	-24.6	1.9
7	-4.6	2.9	-2.4	-3.4	-1.7	0.1	-6.6	-14.2	30.6	-0.7	-1.3	3.2	-54.1	-26.3	1.9
8	2.4	4.6	-3.2	-0.1	-1.1	-3.2	-35.1	-27.1	-6.8	-3.8	-2.7	-0.7	-1.9	-18.2	-50.3
9	2.4	5.6	-2.3	-0.1	-0.1	-2.7	-35.1	-24.7	-6.7	-3.8	-2.5	-0.7	-1.9	-1.3	-43.1
10	2.4	6.2	-1.4	-0.1	0.8	-2.3	-35.1	-22.3	-6.8	-3.8	-2.2	-0.7	-1.9	13.0	-36.0
11	2.4	6.7	-0.7	-0.1	1.6	-1.8	-35.1	-20.0	-6.6	-3.8	-2.0	-0.7	-1.9	24.8	-29.0
12	2.4	6.8	0.0	-0.1	2.1	-1.4	-35.1	-17.6	-6.5	-3.8	-1.8	-0.6	-1.9	34.1	-22.2
13	2.4	6.7	0.7	-0.1	2.6	-1.0	-35.1	-15.2	-6.5	-3.8	-1.5	-0.6	-1.9	40.9	-15.3
14	2.4	6.3	1.4	-0.1	2.8	-0.5	-35.1	-12.8	-6.5	-3.8	-1.3	-0.6	-1.9	45.2	-8.3
15	2.4	5.7	2.1	-0.1	2.9	-0.1	-35.1	-10.5	-6.5	-3.8	-1.1	-0.6	-1.9	47.0	-1.4
16	2.4	4.8	2.8	-0.1	2.9	0.3	-35.1	-8.1	-6.5	-3.8	-0.8	-0.6	-1.9	46.2	5.5
17	2.4	3.7	3.5	-0.1	2.7	0.8	-35.1	-5.7	-6.5	-3.8	-0.6	-0.6	-1.9	43.0	12.4
18	2.4	2.3	4.2	-0.1	2.3	1.2	-35.1	-3.3	-6.5	-3.8	-0.4	-0.6	-1.9	37.2	19.3
19	2.4	0.6	4.9	-0.1	1.8	1.6	-35.1	-1.0	-6.5	-3.8	-0.1	-0.6	-1.9	28.9	26.3
20	2.4	-1.3	5.6	-0.1	1.1	2.1	-35.1	1.4	-6.5	-3.8	0.1	-0.6	-1.9	18.2	33.2
21	2.4	-3.4	6.3	-0.1	0.3	2.5	-35.1	3.8	-6.5	-3.8	0.3	-0.6	-1.9	4.9	40.1
22	2.4	-5.9	7.0	-0.1	-0.7	3.0	-35.1	6.1	-6.5	-3.8	0.6	-0.6	-1.9	-10.9	47.0
23	2.4	-8.5	7.8	-0.1	-1.8	3.4	-35.1	8.5	-6.6	-3.8	0.8	-0.6	-1.9	-29.2	54.0
24	2.4	-11.5	8.6	-0.1	-3.1	3.9	-35.1	10.9	-6.7	-3.8	1.1	-0.7	-1.9	-50.1	61.6
25	2.4	-14.7	9.4	-0.1	-4.6	4.3	-35.1	13.3	-6.7	-3.8	1.3	-0.7	-1.9	-73.4	68.5
26	2.4	-18.2	10.4	-0.1	-6.2	4.8	-35.1	15.6	-6.7	-3.8	1.5	-0.7	-1.9	-99.2	76.4
27	2.4	-18.2	-10.4	-0.1	-6.2	-4.8	-35.1	15.6	6.7	-3.8	1.5	0.7	-1.9	-99.2	-76.4
28	2.4	-14.7	-9.4	-0.1	-4.6	-4.3	-35.1	13.3	6.7	-3.8	1.3	0.7	-1.9	-73.4	-68.5
29	2.4	-11.5	-8.6	-0.1	-3.1	-3.9	-35.1	10.9	6.7	-3.8	1.1	0.7	-1.9	-50.1	-61.6
30	2.4	-8.5	-7.8	-0.1	-1.8	-3.4	-35.1	8.5	6.6	-3.8	0.8	0.6	-1.9	-29.2	-54.0
31	2.4	-5.9	-7.0	-0.1	-0.7	-3.0	-35.1	6.1	6.5	-3.8	0.6	0.6	-1.9	-10.9	-47.0
32	2.4	-3.4	-6.3	-0.1	0.3	-2.5	-35.1	3.8	6.5	-3.8	0.3	0.6	-1.9	4.9	-40.1
33	2.4	-1.3	-5.6	-0.1	1.1	-2.1	-35.1	1.4	6.5	-3.8	0.1	0.6	-1.9	18.2	-33.2
34	2.4	0.6	-4.9	-0.1	1.8	-1.6	-35.1	-1.0	6.5	-3.8	-0.1	0.6	-1.9	28.9	-26.3
35	2.4	2.3	-4.2	-0.1	2.3	-1.2	-35.1	-3.3	6.5	-3.8	-0.4	0.6	-1.9	37.2	-19.3
36	2.4	3.7	-3.5	-0.1	2.7	-0.8	-35.1	-5.7	6.5	-3.8	-0.6	0.6	-1.9	43.0	-12.4
37	2.4	4.8	-2.8	-0.1	2.9	-0.3	-35.1	-8.1	6.5	-3.8	-0.8	0.6	-1.9	46.2	-5.5
38	2.4	5.7	-2.1	-0.1	2.9	0.1	-35.1	-10.5	6.5	-3.8	-1.1	0.6	-1.9	47.0	1.4
39	2.4	6.3	-1.4	-0.1	2.8	0.5	-35.1	-12.8	6.5	-3.8	-1.3	0.6	-1.9	45.2	8.3
40	2.4	6.7	-0.7	-0.1	2.6	1.0	-35.1	-15.2	6.5	-3.8	-1.5	0.6	-1.9	40.9	15.3
41	2.4	6.8	0.0	-0.1	2.1	1.4	-35.1	-17.6	6.5	-3.8	-1.8	0.6	-1.9	34.1	22.2
42	2.4	6.7	0.7	-0.1	1.6	1.8	-35.1	-20.0	6.6	-3.8	-2.0	0.7	-1.9	24.8	29.0
43	2.4	6.2	1.4	-0.1	0.8	2.3	-35.1	-22.3	6.8	-3.8	-2.2	0.7	-1.9	13.0	36.0
44	2.4	5.6	2.3	-0.1	-0.1	2.7	-35.1	-24.7	6.7	-3.8	-2.5	0.7	-1.9	-1.3	43.1
45	2.4	4.6	3.2	-0.1	-1.1	3.2	-35.1	-27.1	6.8	-3.8	-2.7	0.7	-1.9	-18.2	50.3
46	-4.6	2.9	2.4	-3.4	-1.7	-0.1	-6.6	-14.2	-30.6	-0.7	-1.3	-3.2	-54.1	-26.3	-1.9
47	-6.4	0.7	2.4	-3.4	-1.5	-0.1	-6.6	9.8	-21.3	-0.7	1.1	-2.1	-54.1	-24.6	-1.9
48	-8.3	-1.5	2.4	-3.4	-1.4	-0.1	-6.6	25.1	-11.6	-0.7	2.6	-1.0	-54.1	-22.8	-1.9
49	-10.1	-3.7	2.4	-3.4	-1.3	-0.1	-6.6	30.9	-1.0	-0.7	3.0	0.1	-54.1	-21.1	-1.9
50	-11.9	-6.0	2.4	-3.4	-1.2	-0.1	-6.6	26.6	10.4	-0.7	2.5	1.1	-54.1	-19.3	-1.9
51	-13.8	-8.2	2.4	-3.4	-1.1	-0.1	-6.6	11.3	22.5	-0.7	0.9	2.2	-54.1	-17.6	-1.9
52	-15.6	-10.4	2.4	-3.4	-1.0	-0.1	-6.6	-15.7	36.1	-0.7	-1.6	3.3	-54.1	-15.8	-1.9

RESULTADOS COSMOS. Esfuerzos característicos (continuación)**Proyecto :** L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV**Estructura:** EVN3-2.0

53	-2.4	8.7	15.5	0.1	0.4	3.1	-43.0	31.1	6.8	-3.9	3.0	0.7	1.9	5.9	50.2
54	-2.4	3.4	13.6	0.1	-0.7	2.7	-43.0	28.7	6.6	-3.9	2.8	0.6	1.9	-10.9	43.0
55	-2.4	-1.2	11.8	0.1	-1.6	2.3	-43.0	26.3	6.6	-3.9	2.6	0.7	1.9	-25.2	36.0
56	-2.4	-5.1	10.1	0.1	-2.3	1.8	-43.0	23.9	6.6	-3.9	2.3	0.7	1.9	-36.9	29.1
57	-2.4	-8.4	8.3	0.1	-2.9	1.4	-43.0	21.5	6.6	-3.9	2.1	0.7	1.9	-46.1	22.1
58	-2.4	-11.1	6.5	0.1	-3.3	1.0	-43.0	19.1	6.6	-3.9	1.8	0.7	1.9	-52.9	15.2
59	-2.4	-13.1	4.7	0.1	-3.6	0.5	-43.0	16.8	6.6	-3.9	1.6	0.7	1.9	-57.1	8.3
60	-2.4	-14.5	3.0	0.1	-3.7	0.1	-43.0	14.4	6.6	-3.9	1.4	0.6	1.9	-58.8	1.4
61	-2.4	-15.3	1.2	0.1	-3.6	-0.3	-43.0	12.0	6.6	-3.9	1.1	0.6	1.9	-58.1	-5.5
62	-2.4	-15.4	-0.5	0.1	-3.4	-0.8	-43.0	9.6	6.6	-3.9	0.9	0.6	1.9	-54.8	-12.4
63	-2.4	-14.9	-2.2	0.1	-3.1	-1.2	-43.0	7.2	6.6	-3.9	0.7	0.6	1.9	-49.1	-19.3
64	-2.4	-13.8	-4.0	0.1	-2.6	-1.6	-43.0	4.9	6.5	-3.9	0.4	0.6	1.9	-40.9	-26.2
65	-2.4	-12.0	-5.7	0.1	-1.9	-2.1	-43.0	2.5	6.5	-3.9	0.2	0.6	1.9	-30.2	-33.2
66	-2.4	-9.6	-7.5	0.1	-1.1	-2.5	-43.0	0.2	6.5	-3.9	0.0	0.6	1.9	-16.9	-40.1
67	-2.4	-6.6	-9.2	0.1	-0.1	-3.0	-43.0	-2.2	6.5	-3.9	-0.3	0.6	1.9	-1.2	-47.1
68	-2.4	-3.0	-10.9	0.1	1.1	-3.4	-43.0	-4.6	6.5	-3.9	-0.5	0.6	1.9	17.0	-54.0
69	-2.4	1.3	-12.7	0.1	2.4	-3.8	-43.0	-6.9	6.6	-3.9	-0.7	0.6	1.9	37.8	-61.1
70	-2.4	6.1	-14.4	0.1	3.8	-4.3	-43.0	-9.3	6.5	-3.9	-1.0	0.6	1.9	61.1	-67.8
71	-2.4	11.7	-16.4	0.1	5.5	-4.8	-43.0	-11.7	6.6	-3.9	-1.2	0.7	1.9	86.9	-76.2
72	-2.4	11.7	16.4	0.1	5.5	4.8	-43.0	-11.7	-6.6	-3.9	-1.2	-0.7	1.9	86.9	76.2
73	-2.4	6.1	14.4	0.1	3.8	4.3	-43.0	-9.3	-6.5	-3.9	-1.0	-0.6	1.9	61.1	67.8
74	-2.4	1.3	12.7	0.1	2.4	3.8	-43.0	-6.9	-6.6	-3.9	-0.7	-0.6	1.9	37.8	61.1
75	-2.4	-3.0	10.9	0.1	1.1	3.4	-43.0	-4.6	-6.5	-3.9	-0.5	-0.6	1.9	17.0	54.0
76	-2.4	-6.6	9.2	0.1	-0.1	3.0	-43.0	-2.2	-6.5	-3.9	-0.3	-0.6	1.9	-1.2	47.1
77	-2.4	-9.6	7.5	0.1	-1.1	2.5	-43.0	0.2	-6.5	-3.9	0.0	-0.6	1.9	-16.9	40.1
78	-2.4	-12.0	5.7	0.1	-1.9	2.1	-43.0	2.5	-6.5	-3.9	0.2	-0.6	1.9	-30.2	33.2
79	-2.4	-13.8	4.0	0.1	-2.6	1.6	-43.0	4.9	-6.5	-3.9	0.4	-0.6	1.9	-40.9	26.2
80	-2.4	-14.9	2.2	0.1	-3.1	1.2	-43.0	7.2	-6.6	-3.9	0.7	-0.6	1.9	-49.1	19.3
81	-2.4	-15.4	0.5	0.1	-3.4	0.8	-43.0	9.6	-6.6	-3.9	0.9	-0.6	1.9	-54.8	12.4
82	-2.4	-15.3	-1.2	0.1	-3.6	0.3	-43.0	12.0	-6.6	-3.9	1.1	-0.6	1.9	-58.1	5.5
83	-2.4	-14.5	-3.0	0.1	-3.7	-0.1	-43.0	14.4	-6.6	-3.9	1.4	-0.6	1.9	-58.8	-1.4
84	-2.4	-13.1	-4.7	0.1	-3.6	-0.5	-43.0	16.8	-6.6	-3.9	1.6	-0.7	1.9	-57.1	-8.3
85	-2.4	-11.1	-6.5	0.1	-3.3	-1.0	-43.0	19.1	-6.6	-3.9	1.8	-0.7	1.9	-52.9	-15.2
86	-2.4	-8.4	-8.3	0.1	-2.9	-1.4	-43.0	21.5	-6.6	-3.9	2.1	-0.7	1.9	-46.1	-22.1
87	-2.4	-5.1	-10.1	0.1	-2.3	-1.8	-43.0	23.9	-6.6	-3.9	2.3	-0.7	1.9	-36.9	-29.1
88	-2.4	-1.2	-11.8	0.1	-1.6	-2.3	-43.0	26.3	-6.6	-3.9	2.6	-0.7	1.9	-25.2	-36.0
89	-2.4	3.4	-13.6	0.1	-0.7	-2.7	-43.0	28.7	-6.6	-3.9	2.8	-0.6	1.9	-10.9	-43.0
90	-2.4	8.7	-15.5	0.1	0.4	-3.1	-43.0	31.1	-6.8	-3.9	3.0	-0.7	1.9	5.9	-50.2
91	-33.4	0.0	0.0	-9.9	0.0	0.0	13.3	0.0	0.0	1.3	0.0	0.0	-158.4	0.0	0.0
92	-31.6	0.0	0.0	-9.9	0.0	0.0	13.3	0.0	0.0	1.3	0.0	0.0	-158.4	0.0	0.0
93	-29.8	0.0	0.0	-9.9	0.0	0.0	13.3	0.0	0.0	1.3	0.0	0.0	-158.4	0.0	0.0
94	-27.9	0.0	0.0	-9.9	0.0	0.0	13.3	0.0	0.0	1.3	0.0	0.0	-158.4	0.0	0.0
95	-26.1	0.0	0.0	-9.9	0.0	0.0	13.3	0.0	0.0	1.3	0.0	0.0	-158.4	0.0	0.0
96	-24.3	0.0	0.0	-9.9	0.0	0.0	13.3	0.0	0.0	1.3	0.0	0.0	-158.4	0.0	0.0
97	-22.5	0.0	0.0	-9.9	0.0	0.0	13.3	0.0	0.0	1.3	0.0	0.0	-158.4	0.0	0.0

CALCULO DE ARMADURAS

Proyecto : L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
 Estructura: EVN3-2.0

Notación: PP= Peso propio
 CM= Carga muerta de traviesas, carriles y balasto
 E,t= Empuje de tierras

E,sc= Empuje de tierras debido a la sobrecarga repartida
 Sobrecarga= Sobrecarga repartida + cobertura de tierras

M(+) indica armadura inferior en dintel y solera e interior en hastiales
 M(-) indica armadura superior en dintel y solera y exterior en hastiales

Envolvente de M(+) en E.L.U. (Tracciones en cara interior de hastiales y dintel e inferior en solera).

Sección	Elemento	Coeficientes				Nd T/m	Md mT/m
		PP+CM	E,t	E,sc	Sobrecarga		
Hastial 1	1	0.90	0.00	0.00	0.00	-17.08	-10.24
	2	0.90	1.50	1.50	0.00	-26.36	10.00
	3	0.90	1.50	1.50	0.00	-24.71	37.17
	4	0.90	1.50	1.50	0.00	-23.07	46.40
	5	0.90	1.50	1.50	0.00	-21.42	38.80
	6	0.90	1.50	1.50	0.00	-19.78	15.56
	7	1.50	0.00	0.00	0.00	-12.01	1.85
Dintel 1	8	1.50	0.00	0.00	0.00	3.45	5.14
	9	1.50	0.00	0.00	0.00	3.45	8.22
	10	1.50	0.00	0.00	1.50	0.57	30.08
	11	1.50	0.00	0.00	1.50	0.57	49.53
	12	1.50	0.00	0.00	1.50	0.57	64.57
	13	1.50	0.00	0.00	1.50	0.57	75.23
	14	1.50	0.00	0.00	1.50	0.57	81.50
	15	1.50	0.00	0.00	1.50	0.57	83.40
	16	1.50	0.00	0.00	1.50	0.57	80.90
	17	1.50	0.00	0.00	1.50	0.57	74.01
	18	1.50	0.00	0.00	1.50	0.57	62.75
	19	1.50	0.00	0.00	1.50	0.57	47.09
	20	1.50	0.00	0.00	1.50	0.57	27.05
	21	0.90	0.00	0.00	1.50	-0.80	4.50
	22	0.90	1.50	1.50	0.00	-56.22	4.21
	23	0.90	1.50	1.50	0.00	-56.22	4.68
	24	0.90	1.50	1.50	0.00	-56.22	4.77
	25	0.90	1.50	1.50	0.00	-56.22	4.46
	26	0.90	1.50	1.50	0.00	-56.22	3.75
Dintel 2	27	0.90	1.50	1.50	0.00	-56.22	3.75
	28	0.90	1.50	1.50	0.00	-56.22	4.46
	29	0.90	1.50	1.50	0.00	-56.22	4.77
	30	0.90	1.50	1.50	0.00	-56.22	4.68
	31	0.90	1.50	1.50	0.00	-56.22	4.21
	32	0.90	0.00	0.00	1.50	-0.80	4.50
	33	1.50	0.00	0.00	1.50	0.57	27.05
	34	1.50	0.00	0.00	1.50	0.57	47.09
	35	1.50	0.00	0.00	1.50	0.57	62.75
	36	1.50	0.00	0.00	1.50	0.57	74.01
	37	1.50	0.00	0.00	1.50	0.57	80.90
	38	1.50	0.00	0.00	1.50	0.57	83.40
	39	1.50	0.00	0.00	1.50	0.57	81.50
	40	1.50	0.00	0.00	1.50	0.57	75.23
	41	1.50	0.00	0.00	1.50	0.57	64.57
	42	1.50	0.00	0.00	1.50	0.57	49.53
	43	1.50	0.00	0.00	1.50	0.57	30.08
	44	1.50	0.00	0.00	0.00	3.45	8.22
	45	1.50	0.00	0.00	0.00	3.45	5.14
Hastial 2	46	1.50	0.00	0.00	0.00	-12.01	1.85
	47	0.90	1.50	1.50	0.00	-19.78	15.56
	48	0.90	1.50	1.50	0.00	-21.42	38.80
	49	0.90	1.50	1.50	0.00	-23.07	46.40
	50	0.90	1.50	1.50	0.00	-24.71	37.17
	51	0.90	1.50	1.50	0.00	-26.36	10.00
	52	0.90	0.00	0.00	0.00	-17.08	-10.24

Envolvente de M(+) en E.L.S. (Tracciones en cara interior de hastiales y dintel e inferior en solera).

Sección	Elemento	Coeficientes				N T/m	M mT/m
		PP+CM	E,t	E,sc	Sobrecarga		
Hastial 1	1	1.00	0.00	0.00	0.00	-18.98	-11.37
	2	1.00	1.00	1.00	0.00	-24.43	2.96
	3	1.00	1.00	1.00	0.00	-22.60	21.91
	4	1.00	1.00	1.00	0.00	-20.77	28.90
	5	1.00	1.00	1.00	0.00	-18.95	24.68
	6	1.00	1.00	1.00	0.00	-17.12	10.03
	7	1.00	0.00	0.00	0.00	-8.01	1.23
Dintel 1	8	1.00	0.00	0.00	0.00	2.30	3.43
	9	1.00	0.00	0.00	0.00	2.30	5.48
	10	1.00	0.00	0.00	1.00	0.38	20.05
	11	1.00	0.00	0.00	1.00	0.38	33.02
	12	1.00	0.00	0.00	1.00	0.38	43.04
	13	1.00	0.00	0.00	1.00	0.38	50.15
	14	1.00	0.00	0.00	1.00	0.38	54.34
	15	1.00	0.00	0.00	1.00	0.38	55.60
	16	1.00	0.00	0.00	1.00	0.38	53.93
	17	1.00	0.00	0.00	1.00	0.38	49.34
	18	1.00	0.00	0.00	1.00	0.38	41.83
	19	1.00	0.00	0.00	1.00	0.38	31.39
	20	1.00	0.00	0.00	1.00	0.38	18.03
	21	1.00	0.00	0.00	1.00	0.38	1.75
	22	1.00	1.00	1.00	0.00	-36.56	0.19
	23	1.00	1.00	1.00	0.00	-36.56	-1.03
	24	1.00	1.00	1.00	0.00	-36.56	-2.66
	25	1.00	1.00	1.00	0.00	-36.56	-4.74
	26	1.00	1.00	1.00	0.00	-36.56	-7.27
Dintel 2	27	1.00	1.00	1.00	0.00	-36.56	-7.27
	28	1.00	1.00	1.00	0.00	-36.56	-4.74
	29	1.00	1.00	1.00	0.00	-36.56	-2.66
	30	1.00	1.00	1.00	0.00	-36.56	-1.03
	31	1.00	1.00	1.00	0.00	-36.56	0.19
	32	1.00	0.00	0.00	1.00	0.38	1.75
	33	1.00	0.00	0.00	1.00	0.38	18.03
	34	1.00	0.00	0.00	1.00	0.38	31.39
	35	1.00	0.00	0.00	1.00	0.38	41.83
	36	1.00	0.00	0.00	1.00	0.38	49.34
	37	1.00	0.00	0.00	1.00	0.38	53.93
	38	1.00	0.00	0.00	1.00	0.38	55.60
	39	1.00	0.00	0.00	1.00	0.38	54.34
	40	1.00	0.00	0.00	1.00	0.38	50.15
	41	1.00	0.00	0.00	1.00	0.38	43.04
	42	1.00	0.00	0.00	1.00	0.38	33.02
	43	1.00	0.00	0.00	1.00	0.38	20.05
	44	1.00	0.00	0.00	0.00	2.30	5.48
	45	1.00	0.00	0.00	0.00	2.30	3.43
Hastial 2	46	1.00	0.00	0.00	0.00	-8.01	1.23
	47	1.00	1.00	1.00	0.00	-17.12	10.03
	48	1.00	1.00	1.00	0.00	-18.95	24.68
	49	1.00	1.00	1.00	0.00	-20.77	28.90
	50	1.00	1.00	1.00	0.00	-22.60	21.91
	51	1.00	1.00	1.00	0.00	-24.43	2.96
	52	1.00	0.00	0.00	0.00	-18.98	-11.37

CALCULO DE ARMADURAS

Proyecto : L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
 Estructura: EVN3-2.0

Notación: PP= Peso propio
 CM= Carga muerta de traviesas, carriles y balasto
 E,t= Empuje de tierras

E,sc= Empuje de tierras debido a la sobrecarga repartida
 Sobrecarga= Sobrecarga repartida + cobertura de tierras

M(+) indica armadura inferior en dintel y solera e interior en hastiales
 M(-) indica armadura superior en dintel y solera y exterior en hastiales

Solera 1	53	1.50	1.50	1.50	1.50	-70.93	73.64
	54	1.50	1.50	1.50	0.00	-73.80	51.38
	55	0.90	1.50	1.50	0.00	-72.42	40.84
	56	0.90	1.50	1.50	0.00	-72.42	32.68
	57	0.90	1.50	1.50	0.00	-72.42	25.24
	58	0.90	1.50	1.50	0.00	-72.42	18.53
	59	0.90	1.50	1.50	0.00	-72.42	12.53
	60	0.90	1.50	1.50	0.00	-72.42	7.25
	61	0.90	1.50	1.50	0.00	-72.42	2.68
	62	0.90	1.50	1.50	0.00	-72.42	-1.16
	63	0.90	1.50	1.50	0.00	-72.42	-4.29
	64	0.90	0.00	0.00	0.00	-2.07	-14.70
	65	0.90	0.00	0.00	0.00	-2.07	-12.52
	66	0.90	0.00	0.00	0.00	-2.07	-9.63
	67	0.90	0.00	0.00	0.00	-2.07	-6.04
	68	0.90	0.00	0.00	1.50	0.80	23.81
	69	1.50	0.00	0.00	1.50	-0.57	62.14
	70	1.50	0.00	0.00	1.50	-0.57	106.60
	71	1.50	0.00	0.00	1.50	-0.57	156.04
	72	1.50	0.00	0.00	1.50	-0.57	156.04
Solera 2	73	1.50	0.00	0.00	1.50	-0.57	106.60
	74	1.50	0.00	0.00	1.50	-0.57	62.14
	75	0.90	0.00	0.00	1.50	0.80	23.81
	76	0.90	0.00	0.00	0.00	-2.07	-6.04
	77	0.90	0.00	0.00	0.00	-2.07	-9.63
	78	0.90	0.00	0.00	0.00	-2.07	-12.52
	79	0.90	0.00	0.00	0.00	-2.07	-14.70
	80	0.90	1.50	1.50	0.00	-72.42	-4.29
	81	0.90	1.50	1.50	0.00	-72.42	-1.16
	82	0.90	1.50	1.50	0.00	-72.42	2.68
	83	0.90	1.50	1.50	0.00	-72.42	7.25
	84	0.90	1.50	1.50	0.00	-72.42	12.53
	85	0.90	1.50	1.50	0.00	-72.42	18.53
	86	0.90	1.50	1.50	0.00	-72.42	25.24
	87	0.90	1.50	1.50	0.00	-72.42	32.68
	88	0.90	1.50	1.50	0.00	-72.42	40.84
	89	1.50	1.50	1.50	0.00	-73.80	51.38
	90	1.50	1.50	1.50	1.50	-70.93	73.65
Hastial central	91	0.90	1.50	1.50	0.00	-17.18	0.00
	92	0.90	1.50	1.50	0.00	-15.54	0.00
	93	0.90	1.50	1.50	0.00	-13.89	0.00
	94	0.90	1.50	1.50	0.00	-12.24	0.00
	95	0.90	1.50	1.50	0.00	-10.60	0.00
	96	0.90	1.50	1.50	0.00	-8.96	0.00
	97	0.90	1.50	1.50	0.00	-7.31	0.00

Solera 1	53	1.00	1.00	1.00	1.00	-47.29	49.10
	54	1.00	1.00	1.00	0.00	-49.20	34.25
	55	1.00	1.00	1.00	0.00	-49.20	26.13
	56	1.00	1.00	1.00	0.00	-49.20	18.82
	57	1.00	1.00	1.00	0.00	-49.20	12.31
	58	1.00	1.00	1.00	0.00	-49.20	6.60
	59	1.00	1.00	1.00	0.00	-49.20	1.68
	60	1.00	1.00	1.00	0.00	-49.20	-2.45
	61	1.00	1.00	1.00	0.00	-49.20	-5.77
	62	1.00	1.00	1.00	0.00	-49.20	-8.31
	63	1.00	1.00	1.00	0.00	-49.20	-10.05
	64	1.00	0.00	0.00	0.00	-2.30	-16.34
	65	1.00	0.00	0.00	0.00	-2.30	-13.91
	66	1.00	0.00	0.00	0.00	-2.30	-10.70
	67	1.00	0.00	0.00	0.00	-2.30	-6.71
	68	1.00	0.00	0.00	1.00	-0.38	15.10
	69	1.00	0.00	0.00	1.00	-0.38	41.43
	70	1.00	0.00	0.00	1.00	-0.38	71.07
	71	1.00	0.00	0.00	1.00	-0.38	104.02
	72	1.00	0.00	0.00	1.00	-0.38	104.02
Solera 2	73	1.00	0.00	0.00	1.00	-0.38	71.07
	74	1.00	0.00	0.00	1.00	-0.38	41.43
	75	1.00	0.00	0.00	1.00	-0.38	15.10
	76	1.00	0.00	0.00	0.00	-2.30	-6.71
	77	1.00	0.00	0.00	0.00	-2.30	-10.70
	78	1.00	0.00	0.00	0.00	-2.30	-13.91
	79	1.00	0.00	0.00	0.00	-2.30	-16.34
	80	1.00	1.00	1.00	0.00	-49.20	-10.05
	81	1.00	1.00	1.00	0.00	-49.20	-8.31
	82	1.00	1.00	1.00	0.00	-49.20	-5.77
	83	1.00	1.00	1.00	0.00	-49.20	-2.45
	84	1.00	1.00	1.00	0.00	-49.20	1.68
	85	1.00	1.00	1.00	0.00	-49.20	6.60
	86	1.00	1.00	1.00	0.00	-49.20	12.31
	87	1.00	1.00	1.00	0.00	-49.20	18.82
	88	1.00	1.00	1.00	0.00	-49.20	26.13
	89	1.00	1.00	1.00	0.00	-49.20	34.25
	90	1.00	1.00	1.00	1.00	-47.29	49.10
Hastial central	91	1.00	1.00	1.00	0.00	-28.81	0.00
	92	1.00	1.00	1.00	0.00	-26.98	0.00
	93	1.00	1.00	1.00	0.00	-25.15	0.00
	94	1.00	1.00	1.00	0.00	-23.32	0.00
	95	1.00	1.00	1.00	0.00	-21.50	0.00
	96	1.00	1.00	1.00	0.00	-19.67	0.00
	97	1.00	1.00	1.00	0.00	-17.84	0.00

CALCULO DE ARMADURAS

Proyecto : L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
 Estructura: EVN3-2.0

Notación: PP= Peso propio
 CM= Carga muerta de traviesas, carriles y balasto
 E,t= Empuje de tierras

E,sc= Empuje de tierras debido a la sobrecarga repartida
 Sobrecarga= Sobrecarga repartida + cobertura de tierras

M(+) indica armadura inferior en dintel y solera e interior en hastiales
 M(-) indica armadura superior en dintel y solera y exterior en hastiales

Envolvente de M(-) en E.L.U. (Tracciones en cara exterior de hastiales y dintel y superior en solera).

Sección	Elemento	Coeficientes				Nd T/m	Md mT/m
		PP+CM	E,t	E,sc	Sobrecarga		
Hastial 1	1	1.50	1.50	1.50	1.50	-120.49	-66.83
	2	1.50	0.00	0.00	1.50	-106.82	-40.29
	3	1.50	0.00	0.00	1.50	-104.07	-39.77
	4	1.50	0.00	0.00	1.50	-101.33	-39.25
	5	1.50	0.00	0.00	1.50	98.59	-38.71
	6	0.90	0.00	0.00	1.50	-89.94	-37.67
	7	0.90	1.50	1.50	1.50	-99.22	-61.70
Dintel 1	8	0.90	1.50	1.50	1.50	-59.09	-68.82
	9	0.90	1.50	1.50	1.50	-59.09	-37.81
	10	0.90	1.50	1.50	0.00	-56.22	-30.46
	11	0.90	1.50	1.50	0.00	-56.22	-25.52
	12	0.90	1.50	1.50	0.00	-56.22	-20.96
	13	0.90	1.50	1.50	0.00	-56.22	-16.77
	14	0.90	1.50	1.50	0.00	-56.22	-12.94
	15	0.90	1.50	1.50	0.00	-56.22	-9.50
	16	0.90	1.50	1.50	0.00	-56.22	-6.42
	17	0.90	1.50	1.50	0.00	-56.22	-3.72
	18	0.90	0.00	0.00	0.00	2.07	4.15
	19	0.90	0.00	0.00	0.00	2.07	2.20
	20	1.50	0.00	0.00	0.00	3.45	-0.20
	21	1.50	0.00	0.00	0.00	3.45	-4.69
	22	1.50	0.00	0.00	1.50	0.57	-26.20
	23	1.50	0.00	0.00	1.50	0.57	-59.40
	24	1.50	0.00	0.00	1.50	0.57	-96.99
	25	1.50	0.00	0.00	1.50	0.57	-139.01
	26	1.50	0.00	0.00	1.50	0.57	-185.49
Dintel 2	27	1.50	0.00	0.00	1.50	0.57	-185.49
	28	1.50	0.00	0.00	1.50	0.57	-139.01
	29	1.50	0.00	0.00	1.50	0.57	-96.99
	30	1.50	0.00	0.00	1.50	0.57	-59.40
	31	1.50	0.00	0.00	1.50	0.57	-26.20
	32	1.50	0.00	0.00	0.00	3.45	-4.69
	33	1.50	0.00	0.00	0.00	3.45	-0.20
	34	0.90	0.00	0.00	0.00	2.07	2.20
	35	0.90	0.00	0.00	0.00	2.07	4.15
	36	0.90	1.50	1.50	0.00	-56.22	-3.72
	37	0.90	1.50	1.50	0.00	-56.22	-6.42
	38	0.90	1.50	1.50	0.00	-56.22	-9.50
	39	0.90	1.50	1.50	0.00	-56.22	-12.94
	40	0.90	1.50	1.50	0.00	-56.22	-16.77
	41	0.90	1.50	1.50	0.00	-56.22	-20.96
	42	0.90	1.50	1.50	0.00	-56.22	-25.52
	43	0.90	1.50	1.50	0.00	-56.22	-30.46
	44	0.90	1.50	1.50	1.50	-59.09	-37.81
	45	0.90	1.50	1.50	1.50	-59.09	-68.82
Hastial 2	46	0.90	1.50	1.50	1.50	-99.22	-61.70
	47	0.90	0.00	0.00	1.50	-89.94	-37.67
	48	1.50	0.00	0.00	1.50	-98.59	-38.71
	49	1.50	0.00	0.00	1.50	-101.33	-39.25
	50	1.50	0.00	0.00	1.50	-104.07	-39.77
	51	1.50	0.00	0.00	1.50	-106.82	-40.29
	52	1.50	1.50	1.50	1.50	-120.49	-66.83

Envolvente de M(-) en E.L.S. (Tracciones en cara exterior de hastiales y dintel y superior en solera).

Sección	Elemento	Coeficientes				N T/m	M mT/m
		PP+CM	E,t	E,sc	Sobrecarga		
Hastial 1	1	1.00	1.00	1.00	1.00	-80.32	-44.55
	2	1.00	0.00	0.00	1.00	-71.21	-26.86
	3	1.00	0.00	0.00	1.00	-69.38	-26.51
	4	1.00	0.00	0.00	1.00	-67.55	-26.16
	5	1.00	0.00	0.00	1.00	-65.73	-25.81
	6	1.00	0.00	0.00	1.00	-63.90	-25.46
	7	1.00	1.00	1.00	1.00	-69.35	-40.64
Dintel 1	8	1.00	1.00	1.00	1.00	-38.48	-44.51
	9	1.00	1.00	1.00	1.00	-38.48	-23.02
	10	1.00	1.00	1.00	0.00	-36.56	-17.48
	11	1.00	1.00	1.00	0.00	-36.56	-13.73
	12	1.00	1.00	1.00	0.00	-36.56	-10.40
	13	1.00	1.00	1.00	0.00	-36.56	-7.48
	14	1.00	1.00	1.00	0.00	-36.56	-4.97
	15	1.00	1.00	1.00	0.00	-36.56	-2.88
	16	1.00	1.00	1.00	0.00	-36.56	-1.20
	17	1.00	1.00	1.00	0.00	-36.56	0.07
	18	1.00	0.00	0.00	0.00	2.30	4.62
	19	1.00	0.00	0.00	0.00	2.30	2.45
	20	1.00	0.00	0.00	0.00	2.30	-0.13
	21	1.00	0.00	0.00	0.00	2.30	-3.13
	22	1.00	0.00	0.00	1.00	0.38	-17.46
	23	1.00	0.00	0.00	1.00	0.38	-39.60
	24	1.00	0.00	0.00	1.00	0.38	-64.66
	25	1.00	0.00	0.00	1.00	0.38	-92.67
	26	1.00	0.00	0.00	1.00	0.38	-123.66
Dintel 2	27	1.00	0.00	0.00	1.00	0.38	-123.66
	28	1.00	0.00	0.00	1.00	0.38	-92.67
	29	1.00	0.00	0.00	1.00	0.38	-64.66
	30	1.00	0.00	0.00	1.00	0.38	-39.60
	31	1.00	0.00	0.00	1.00	0.38	-17.46
	32	1.00	0.00	0.00	0.00	2.30	-3.13
	33	1.00	0.00	0.00	0.00	2.30	-0.13
	34	1.00	0.00	0.00	0.00	2.30	2.45
	35	1.00	0.00	0.00	0.00	2.30	4.62
	36	1.00	1.00	1.00	0.00	-36.56	0.07
	37	1.00	1.00	1.00	0.00	-36.56	-1.20
	38	1.00	1.00	1.00	0.00	-36.56	-2.88
	39	1.00	1.00	1.00	0.00	-36.56	-4.97
	40	1.00	1.00	1.00	0.00	-36.56	-7.48
	41	1.00	1.00	1.00	0.00	-36.56	-10.40
	42	1.00	1.00	1.00	0.00	-36.56	-13.73
	43	1.00	1.00	1.00	0.00	-36.56	-17.48
	44	1.00	1.00	1.00	1.00	-38.48	-23.02
	45	1.00	1.00	1.00	1.00	-38.48	-44.51
Hastial 2	46	1.00	1.00	1.00	1.00	-69.35	-40.64
	47	1.00	0.00	0.00	1.00	-63.90	-25.46
	48	1.00	0.00	0.00	1.00	-65.73	-25.81
	49	1.00	0.00	0.00	1.00	-67.55	-26.16
	50	1.00	0.00	0.00	1.00	-69.38	-26.51
	51	1.00	0.00	0.00	1.00	-71.21	-26.86
	52	1.00	1.00	1.00	1.00	-80.32	-44.55

CALCULO DE ARMADURAS

Proyecto : L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
 Estructura: EVN3-2.0

Notación: PP= Peso propio
 CM= Carga muerta de traviesas, carriles y balasto
 E,t= Empuje de tierras

E,sc= Empuje de tierras debido a la sobrecarga repartida
 Sobrecarga= Sobrecarga repartida + cobertura de tierras

M(+) indica armadura inferior en dintel y solera e interior en hastiales
 M(-) indica armadura superior en dintel y solera y exterior en hastiales

Solera 1	53	0.90	0.00	0.00	0.00	-2.07	8.16
	54	0.90	0.00	0.00	1.50	0.80	-13.83
	55	1.50	0.00	0.00	1.50	-0.57	-41.82
	56	1.50	0.00	0.00	1.50	-0.57	-66.47
	57	1.50	0.00	0.00	1.50	-0.57	-86.16
	58	1.50	0.00	0.00	1.50	-0.57	-100.89
	59	1.50	0.00	0.00	1.50	-0.57	-110.68
	60	1.50	0.00	0.00	1.50	-0.57	-115.54
	61	1.50	0.00	0.00	1.50	-0.57	-115.48
	62	1.50	0.00	0.00	1.50	-0.57	-110.52
	63	1.50	0.00	0.00	1.50	-0.57	-100.61
	64	1.50	0.00	0.00	1.50	-0.57	-85.82
	65	1.50	0.00	0.00	1.50	-0.57	-66.10
	66	1.50	0.00	0.00	1.50	-0.57	-41.45
	67	1.50	0.00	0.00	1.50	-0.57	-11.87
	68	1.50	0.00	0.00	0.00	-3.45	-2.90
	69	0.90	0.00	1.50	0.00	-7.91	2.18
	70	0.90	1.50	1.50	0.00	-72.42	-6.39
	71	0.90	1.50	1.50	0.00	-72.42	-3.87
Solera 2	72	0.90	1.50	1.50	0.00	-72.42	-3.87
	73	0.90	1.50	1.50	0.00	-72.42	-6.39
	74	0.90	0.00	1.50	0.00	-7.91	2.18
	75	1.50	0.00	0.00	0.00	-3.45	-2.90
	76	1.50	0.00	0.00	1.50	-0.57	-11.87
	77	1.50	0.00	0.00	1.50	-0.57	-41.45
	78	1.50	0.00	0.00	1.50	-0.57	-66.10
	79	1.50	0.00	0.00	1.50	-0.57	-85.82
	80	1.50	0.00	0.00	1.50	-0.57	-100.61
	81	1.50	0.00	0.00	1.50	-0.57	-110.52
	82	1.50	0.00	0.00	1.50	-0.57	-115.48
	83	1.50	0.00	0.00	1.50	-0.57	-115.54
	84	1.50	0.00	0.00	1.50	-0.57	-110.68
	85	1.50	0.00	0.00	1.50	-0.57	-100.89
	86	1.50	0.00	0.00	1.50	-0.57	-86.16
	87	1.50	0.00	0.00	1.50	-0.57	-66.47
	88	1.50	0.00	0.00	1.50	-0.57	-41.82
	89	0.90	0.00	0.00	1.50	0.80	-13.83
	90	0.90	0.00	0.00	0.00	-2.07	8.16
Hastial central	91	0.90	1.50	1.50	0.00	-17.18	0.00
	92	0.90	1.50	1.50	0.00	-15.54	0.00
	93	0.90	1.50	1.50	0.00	-13.89	0.00
	94	0.90	1.50	1.50	0.00	-12.24	0.00
	95	0.90	1.50	1.50	0.00	-10.60	0.00
	96	0.90	1.50	1.50	0.00	-8.96	0.00
	97	0.90	1.50	1.50	0.00	-7.31	0.00

Solera 1	53	1.00	0.00	0.00	0.00	-2.30	9.07
	54	1.00	0.00	0.00	1.00	-0.38	-8.11
	55	1.00	0.00	0.00	1.00	-0.38	-27.88
	56	1.00	0.00	0.00	1.00	-0.38	-44.32
	57	1.00	0.00	0.00	1.00	-0.38	-57.44
	58	1.00	0.00	0.00	1.00	-0.38	-67.26
	59	1.00	0.00	0.00	1.00	-0.38	-73.79
	60	1.00	0.00	0.00	1.00	-0.38	-77.03
	61	1.00	0.00	0.00	1.00	-0.38	-76.99
	62	1.00	0.00	0.00	1.00	-0.38	-73.68
	63	1.00	0.00	0.00	1.00	-0.38	-67.08
	64	1.00	0.00	0.00	1.00	-0.38	-57.21
	65	1.00	0.00	0.00	1.00	-0.38	-44.07
	66	1.00	0.00	0.00	1.00	-0.38	-27.64
	67	1.00	0.00	0.00	1.00	-0.38	-7.91
	68	1.00	0.00	0.00	0.00	-2.30	-1.94
	69	1.00	0.00	1.00	0.00	-6.19	2.91
	70	1.00	1.00	1.00	0.00	-49.20	-0.27
	71	1.00	1.00	1.00	0.00	-49.20	4.27
Solera 2	72	1.00	1.00	1.00	0.00	-49.20	4.27
	73	1.00	1.00	1.00	0.00	-49.20	-0.27
	74	1.00	0.00	1.00	0.00	-6.19	2.91
	75	1.00	0.00	0.00	0.00	-2.30	-1.94
	76	1.00	0.00	0.00	1.00	-0.38	-7.91
	77	1.00	0.00	0.00	1.00	-0.38	-27.64
	78	1.00	0.00	0.00	1.00	-0.38	-44.07
	79	1.00	0.00	0.00	1.00	-0.38	-57.21
	80	1.00	0.00	0.00	1.00	-0.38	-67.08
	81	1.00	0.00	0.00	1.00	-0.38	-73.68
	82	1.00	0.00	0.00	1.00	-0.38	-76.99
	83	1.00	0.00	0.00	1.00	-0.38	-77.03
	84	1.00	0.00	0.00	1.00	-0.38	-73.79
	85	1.00	0.00	0.00	1.00	-0.38	-67.26
	86	1.00	0.00	0.00	1.00	-0.38	-57.44
	87	1.00	0.00	0.00	1.00	-0.38	-44.32
	88	1.00	0.00	0.00	1.00	-0.38	-27.88
	89	1.00	0.00	0.00	1.00	-0.38	-8.11
	90	1.00	0.00	0.00	0.00	-2.30	9.07
Hastial central	91	1.00	1.00	1.00	0.00	-28.81	0.00
	92	1.00	1.00	1.00	0.00	-26.98	0.00
	93	1.00	1.00	1.00	0.00	-25.15	0.00
	94	1.00	1.00	1.00	0.00	-23.32	0.00
	95	1.00	1.00	1.00	0.00	-21.50	0.00
	96	1.00	1.00	1.00	0.00	-19.67	0.00
	97	1.00	1.00	1.00	0.00	-17.84	0.00

CALCULO DE ARMADURAS

Proyecto : L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
Estructura: EVN3-2.0

Notación: PP= Peso propio
CM= Carga muerta de traviesas, carriles y balasto
E,t= Empuje de tierras

E,sc= Empuje de tierras debido a la sobrecarga repartida
Sobrecarga= Sobrecarga repartida + cobertura de tierras

M(+) indica armadura inferior en dintel y solera e interior en hastiales
M(-) indica armadura superior en dintel y solera y exterior en hastiales

Envolvente de V(+) en E.L.U.

Sección	Elemento	Coeficientes				Vd mT/m
		PP+CM	E,t	E,sc	Sobrecarga	
Hastial 1	1	0.90	0.00	0.00	1.50	0.77
	2	0.90	0.00	0.00	1.50	0.80
	3	0.90	0.00	0.00	1.50	0.79
	4	0.90	1.50	0.00	1.50	2.34
	5	0.90	1.50	1.50	1.50	19.81
	6	0.90	1.50	1.50	1.50	35.92
	7	0.90	1.50	1.50	1.50	51.63
Dintel 1	8	0.90	0.00	0.00	0.00	-5.69
	9	0.90	0.00	0.00	0.00	-4.48
	10	0.90	0.00	0.00	0.00	-3.31
	11	0.90	0.00	0.00	0.00	-2.29
	12	0.90	0.00	0.00	0.00	-1.30
	13	0.90	0.00	0.00	0.00	-0.27
	14	1.50	0.00	0.00	0.00	1.27
	15	1.50	0.00	0.00	0.00	2.98
	16	1.50	0.00	0.00	1.50	12.93
	17	1.50	0.00	0.00	1.50	25.03
	18	1.50	0.00	0.00	1.50	37.12
	19	1.50	0.00	0.00	1.50	49.20
	20	1.50	0.00	0.00	1.50	61.31
	21	1.50	0.00	0.00	1.50	73.40
	22	1.50	0.00	0.00	1.50	85.46
	23	1.50	0.00	0.00	1.50	97.79
	24	1.50	0.00	0.00	1.50	111.08
	25	1.50	0.00	0.00	1.50	123.24
	26	1.50	0.00	0.00	1.50	137.43
Dintel 2	27	0.90	1.50	1.50	0.00	-2.68
	28	0.90	1.50	1.50	0.00	-1.35
	29	0.90	1.50	1.50	0.00	-0.22
	30	0.90	1.50	1.50	0.00	0.80
	31	0.90	1.50	1.50	0.00	1.80
	32	0.90	1.50	1.50	0.00	2.83
	33	0.90	1.50	1.50	0.00	3.86
	34	0.90	1.50	1.50	0.00	4.89
	35	0.90	1.50	1.50	0.00	5.91
	36	0.90	1.50	1.50	0.00	6.94
	37	0.90	1.50	1.50	0.00	7.97
	38	0.90	1.50	1.50	1.50	11.13
	39	0.90	1.50	1.50	1.50	22.54
	40	1.50	1.50	1.50	1.50	34.13
	41	1.50	1.50	1.50	1.50	46.24
	42	1.50	1.50	1.50	1.50	58.27
	43	1.50	1.50	1.50	1.50	70.69
	44	1.50	1.50	1.50	1.50	83.26
	45	1.50	1.50	1.50	1.50	96.19
Hastial 2	46	1.50	0.00	0.00	0.00	3.43
	47	1.50	0.00	0.00	0.00	3.39
	48	1.50	0.00	0.00	0.00	3.40
	49	1.50	0.00	1.50	0.00	3.48
	50	1.50	1.50	1.50	0.00	20.72
	51	1.50	1.50	1.50	0.00	40.51
	52	1.50	1.50	1.50	0.00	62.52

Envolvente de V(-) en E.L.U.

Sección	Elemento	Coeficientes				Vd mT/m
		PP+CM	E,t	E,sc	Sobrecarga	
Hastial 1	1	1.50	1.50	1.50	0.00	-62.52
	2	1.50	1.50	1.50	0.00	-40.51
	3	1.50	1.50	1.50	0.00	-20.72
	4	1.50	0.00	1.50	0.00	-3.48
	5	1.50	0.00	0.00	0.00	-3.40
	6	1.50	0.00	0.00	0.00	-3.39
	7	1.50	0.00	0.00	0.00	-3.43
Dintel 1	8	1.50	1.50	1.50	1.50	-96.19
	9	1.50	1.50	1.50	1.50	-83.26
	10	1.50	1.50	1.50	1.50	-70.69
	11	1.50	1.50	1.50	1.50	-58.27
	12	1.50	1.50	1.50	1.50	-46.24
	13	1.50	1.50	1.50	1.50	-34.13
	14	0.90	1.50	1.50	1.50	-22.54
	15	0.90	1.50	1.50	1.50	-11.13
	16	0.90	1.50	1.50	0.00	-7.97
	17	0.90	1.50	1.50	0.00	-6.94
	18	0.90	1.50	1.50	0.00	-5.91
	19	0.90	1.50	1.50	0.00	-4.89
	20	0.90	1.50	1.50	0.00	-3.86
	21	0.90	1.50	1.50	0.00	-2.83
	22	0.90	1.50	1.50	0.00	-1.80
	23	0.90	1.50	1.50	0.00	-0.80
	24	0.90	1.50	1.50	0.00	0.22
	25	0.90	1.50	1.50	0.00	1.35
	26	0.90	1.50	1.50	0.00	2.68
Dintel 2	27	1.50	0.00	0.00	1.50	-137.43
	28	1.50	0.00	0.00	1.50	-123.24
	29	1.50	0.00	0.00	1.50	-111.08
	30	1.50	0.00	0.00	1.50	-97.79
	31	1.50	0.00	0.00	1.50	-85.46
	32	1.50	0.00	0.00	1.50	-73.40
	33	1.50	0.00	0.00	1.50	-61.31
	34	1.50	0.00	0.00	1.50	-49.20
	35	1.50	0.00	0.00	1.50	-37.12
	36	1.50	0.00	0.00	1.50	-25.03
	37	1.50	0.00	0.00	1.50	-12.93
	38	1.50	0.00	0.00	0.00	-2.98
	39	1.50	0.00	0.00	0.00	-1.27
	40	0.90	0.00	0.00	0.00	0.27
	41	0.90	0.00	0.00	0.00	1.30
	42	0.90	0.00	0.00	0.00	2.29
	43	0.90	0.00	0.00	0.00	3.31
	44	0.90	0.00	0.00	0.00	4.48
	45	0.90	0.00	0.00	0.00	5.69
Hastial 2	46	0.90	1.50	1.50	1.50	-51.63
	47	0.90	1.50	1.50	1.50	-35.92
	48	0.90	1.50	1.50	1.50	-19.81
	49	0.90	1.50	0.00	1.50	-2.34
	50	0.90	0.00	0.00	1.50	-0.79
	51	0.90	0.00	0.00	1.50	-0.80
	52	0.90	0.00	0.00	1.50	-0.77

CALCULO DE ARMADURAS

Proyecto : L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
 Estructura: EVN3-2.0

Notación: PP= Peso propio
 CM= Carga muerta de traviesas, carriles y balasto
 E,t= Empuje de tierras

E,sc= Empuje de tierras debido a la sobrecarga repartida
 Sobrecarga= Sobrecarga repartida + cobertura de tierras

M(+) indica armadura inferior en dintel y solera e interior en hastiales
 M(-) indica armadura superior en dintel y solera y exterior en hastiales

Solera 1	53	1.50	1.50	1.50	1.50	114.49
	54	1.50	1.50	1.50	1.50	99.86
	55	1.50	1.50	1.50	1.50	86.14
	56	1.50	1.50	1.50	1.50	72.32
	57	1.50	1.50	1.50	1.50	58.56
	58	1.50	1.50	1.50	1.50	44.85
	59	1.50	1.50	1.50	1.50	31.17
	60	1.50	1.50	1.50	1.50	17.50
	61	1.50	1.50	1.50	0.00	12.17
	62	0.90	1.50	1.50	0.00	9.66
	63	0.90	1.50	1.50	0.00	7.69
	64	0.90	1.50	1.50	0.00	5.72
	65	0.90	1.50	1.50	0.00	3.76
	66	0.90	1.50	1.50	0.00	1.80
	67	0.90	1.50	1.50	0.00	-0.15
	68	0.90	1.50	1.50	0.00	-2.11
	69	0.90	1.50	1.50	0.00	-4.06
	70	0.90	1.50	1.50	0.00	-5.98
	71	0.90	1.50	1.50	0.00	-8.11
Solera 2	72	1.50	0.00	0.00	1.50	146.03
	73	1.50	0.00	0.00	1.50	129.66
	74	1.50	0.00	0.00	1.50	116.35
	75	1.50	0.00	0.00	1.50	102.50
	76	1.50	0.00	0.00	1.50	88.79
	77	1.50	0.00	0.00	1.50	75.11
	78	1.50	0.00	0.00	1.50	61.46
	79	1.50	0.00	0.00	1.50	47.81
	80	1.50	0.00	0.00	1.50	34.20
	81	1.50	0.00	0.00	1.50	20.58
	82	0.90	0.00	0.00	1.50	7.51
	83	0.90	0.00	0.00	0.00	-2.76
	84	0.90	0.00	0.00	0.00	-4.73
	85	0.90	0.00	0.00	0.00	-6.71
	86	0.90	0.00	0.00	0.00	-8.69
	87	0.90	0.00	0.00	0.00	-10.69
	88	0.90	0.00	0.00	0.00	-12.69
	89	0.90	0.00	0.00	0.00	-14.70
	90	0.90	0.00	0.00	0.00	-16.81
Hastial central	91	0.90	1.50	1.50	0.00	0.00
	92	0.90	0.00	0.00	0.00	0.00
	93	0.90	0.00	0.00	0.00	0.00
	94	0.90	0.00	0.00	0.00	0.00
	95	0.90	0.00	0.00	0.00	0.00
	96	0.90	0.00	0.00	0.00	0.00
	97	1.50	0.00	0.00	1.50	0.00

Solera 1	53	0.90	0.00	0.00	0.00	16.81
	54	0.90	0.00	0.00	0.00	14.70
	55	0.90	0.00	0.00	0.00	12.69
	56	0.90	0.00	0.00	0.00	10.69
	57	0.90	0.00	0.00	0.00	8.69
	58	0.90	0.00	0.00	0.00	6.71
	59	0.90	0.00	0.00	0.00	4.73
	60	0.90	0.00	0.00	0.00	2.76
	61	0.90	0.00	0.00	1.50	-7.51
	62	1.50	0.00	0.00	1.50	-20.58
	63	1.50	0.00	0.00	1.50	-34.20
	64	1.50	0.00	0.00	1.50	-47.81
	65	1.50	0.00	0.00	1.50	-61.44
	66	1.50	0.00	0.00	1.50	-75.11
	67	1.50	0.00	0.00	1.50	-88.79
	68	1.50	0.00	0.00	1.50	-102.50
	69	1.50	0.00	0.00	1.50	-116.35
	70	1.50	0.00	0.00	1.50	-129.66
	71	1.50	0.00	0.00	1.50	-146.03
Solera 2	72	0.90	1.50	1.50	0.00	8.11
	73	0.90	1.50	1.50	0.00	5.98
	74	0.90	1.50	1.50	0.00	4.06
	75	0.90	1.50	1.50	0.00	2.11
	76	0.90	1.50	1.50	0.00	0.15
	77	0.90	1.50	1.50	0.00	-1.80
	78	0.90	1.50	1.50	0.00	-3.76
	79	0.90	1.50	1.50	0.00	-5.72
	80	0.90	1.50	1.50	0.00	-7.69
	81	0.90	1.50	1.50	0.00	-9.66
	82	1.50	1.50	1.50	0.00	-12.17
	83	1.50	1.50	1.50	1.50	-17.50
	84	1.50	1.50	1.50	1.50	-31.17
	85	1.50	1.50	1.50	1.50	-44.85
	86	1.50	1.50	1.50	1.50	-58.56
	87	1.50	1.50	1.50	1.50	-72.32
	88	1.50	1.50	1.50	1.50	-86.14
	89	1.50	1.50	1.50	1.50	-99.86
	90	1.50	1.50	1.50	1.50	-114.49
Hastial central	91	1.50	0.00	0.00	1.50	0.00
	92	1.50	1.50	1.50	1.50	0.00
	93	1.50	1.50	1.50	1.50	0.00
	94	1.50	1.50	1.50	1.50	0.00
	95	1.50	1.50	1.50	1.50	0.00
	96	1.50	1.50	1.50	1.50	0.00
	97	0.90	1.50	1.50	0.00	0.00

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PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA TT1

Obra : L.A.V. MADID-ZARAGOZA. Subtramo XV.
EVN3-2.0. Hastiales.
Fecha: 30/10/1998
Hora : 17:22

CALCULO A CORTANTE DE SECCIONES RECTANGULARES

1. Datos

- Materiales:

f_{ck} [kp/cm²] = 250
 f_{yk} [kp/cm²] = 5100
 γ_{mc} = 1.50
 γ_{ms} = 1.15

- Tipo de Elemento Estructural:

Tipo: viga
En el cálculo no se considera la armadura comprimida

- Sección

b [cm] = 100.0
 h [cm] = 80.0
 r [cm] = 5.0

2. Dimensionamiento con cercos a 90°

V_d [Mp] = 62.52

A_{90_est} [cm²/m] = 4.98

V_{cu} [Mp] = 48.41
 V_{u1} [Mp] = 375.00

PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA TT1

Obra : L.A.V. MADID-ZARAGOZA. Subtramo XV.
EVN3-2.0. Dintel.
Fecha: 30/10/1998
Hora : 17:25

CALCULO A CORTANTE DE SECCIONES RECTANGULARES

1. Datos

- Materiales:

f_{ck} [kp/cm²] = 250
 f_{yk} [kp/cm²] = 5100
 γ_{mc} = 1.50
 γ_{ms} = 1.15

- Tipo de Elemento Estructural:

Tipo: viga
En el cálculo no se considera la armadura comprimida

- Sección

b [cm] = 100.0
 h [cm] = 105.0
 r [cm] = 5.0

2. Dimensionamiento con cercos a 90°

V_d [Mp] = 137.40

A_{90_est} [cm²/m] = 19.27

V_{cu} [Mp] = 64.55
 V_{u1} [Mp] = 500.00

PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA TT1

Obra : L.A.V. MADID-ZARAGOZA. Subtramo XV.
EVN3-2.0. Solera.
Fecha: 30/10/1998
Hora : 17:27

CALCULO A CORTANTE DE SECCIONES RECTANGULARES

1. Datos

- Materiales:

f_{ck} [kp/cm²] = 250
 f_{yk} [kp/cm²] = 5100
 γ_{mc} = 1.50
 γ_{ms} = 1.15

- Tipo de Elemento Estructural:

Tipo: viga
En el cálculo no se considera la armadura comprimida

- Sección

b [cm] = 100.0
 h [cm] = 100.0
 r [cm] = 5.0

2. Dimensionamiento con cercos a 90°

V_d [Mp] = 130.34

A_{90_est} [cm²/m] = 19.22

V_{cu} [Mp] = 61.32
 V_{u1} [Mp] = 475.00

PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA F1

Obra : L.A.V. MADID-ZARAGOZA. Subtramo XV.
EVN3-2.0. Inferior dintel.
Fecha: 30/10/1998
Hora : 17:17

COMPROBACION DEL ESTADO LIMITE DE FISURACION DEBIDO A SOLICITACIONES NORMALES

1. Datos

- Materiales

fck [kp/cm²] = 250
fyk [kp/cm²] = 5100

- Sección

b [cm] = 105.0
h [cm] = 80.0
φ [mm] = 25.0
c [cm] = 3.5
nº de capas = 1
nº de diámetros capa 1 = 7

- Solicitación de servicio

Mk [m·Mp] = 58.38

2. Resultados

ABERTURA DE FISURA CARACTERISTICA

wk [mm]	Sm [cm]	εsm ·1.E-3	σ,sr [kp/cm²]	σ,s [kp/cm²]
0.3	19.2	0.98	1359	2435

ABERTURA DE FISURA MAXIMA ADMITIDA

AMBIENTE I (interior)	0.6 [mm]
AMBIENTE II (exterior no agresivo)	0.3 [mm]
AMBIENTE III (agresivo)	0.1 [mm]

El número de capas consideradas en el cálculo es 1

PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA F1

Obra : L.A.V. MADID-ZARAGOZA. Subtramo XV.
EVN3-2.0. Superior dintel.
Fecha: 30/10/1998
Hora : 17:18

COMPROBACION DEL ESTADO LIMITE DE FISURACION DEBIDO A SOLICITACIONES NORMALES

1. Datos

- Materiales

fck [kp/cm²] = 250
fyk [kp/cm²] = 5100

- Sección

b [cm] = 100.0
h [cm] = 105.0
φ [mm] = 25.0
c [cm] = 3.5
nº de capas = 1
nº de diámetros capa 1 = 10

- Solicitación de servicio

Mk [m·Mp] = -123.66

2. Resultados

ABERTURA DE FISURA CARACTERISTICA

wk [mm]	Sm [cm]	εsm ·1.E-3	σ,sr [kp/cm²]	σ,s [kp/cm²]
0.3	15.0	1.17	1195	2721

ABERTURA DE FISURA MAXIMA ADMITIDA

AMBIENTE I (interior)	0.6 [mm]
AMBIENTE II (exterior no agresivo)	0.3 [mm]
AMBIENTE III (agresivo)	0.1 [mm]

El número de capas consideradas en el cálculo es 1

PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA F1

Obra : L.A.V. MADID-ZARAGOZA. Subtramo XV.
EVN3-2.0. Inferior solera.
Fecha: 30/10/1998
Hora : 17:19

COMPROBACION DEL ESTADO LIMITE DE FISURACION DEBIDO A SOLICITACIONES NORMALES

1. Datos

- Materiales

fck [kp/cm²] = 250
fyk [kp/cm²] = 5100

- Sección

b [cm] = 100.0
h [cm] = 100.0
φ [mm] = 25.0
c [cm] = 3.5
nº de capas = 1
nº de diámetros capa 1 = 10

- Solicitación de servicio

Mk [m·Mp] = 104.02

2. Resultados

ABERTURA DE FISURA CARACTERISTICA

wk [mm]	Sm [cm]	εsm ·1.E-3	σ,sr [kp/cm²]	σ,s [kp/cm²]
0.3	15.0	1.02	1147	2414

ABERTURA DE FISURA MAXIMA ADMITIDA

AMBIENTE I (interior)	0.6 [mm]
AMBIENTE II (exterior no agresivo)	0.3 [mm]
AMBIENTE III (agresivo)	0.1 [mm]

El número de capas consideradas en el cálculo es 1

PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA F1

Obra : L.A.V. MADID-ZARAGOZA. Subtramo XV.
EVN3-2.0. Superior solera.
Fecha: 30/10/1998
Hora : 17:20

COMPROBACION DEL ESTADO LIMITE DE FISURACION DEBIDO A SOLICITACIONES NORMALES

1. Datos

- Materiales

fck [kp/cm²] = 250
fyk [kp/cm²] = 5100

- Sección

b [cm] = 105.0
h [cm] = 100.0
φ [mm] = 25.0
c [cm] = 3.5
nº de capas = 1
nº de diámetros capa 1 = 7

- Solicitación de servicio

Mk [m·Mp] = -80.88

2. Resultados

ABERTURA DE FISURA CARACTERISTICA

wk [mm]	Sm [cm]	εsm ·1.E-3	σ,sr [kp/cm²]	σ,s [kp/cm²]
0.3	19.2	1.02	1646	2644

ABERTURA DE FISURA MAXIMA ADMITIDA

AMBIENTE I (interior)	0.6 [mm]
AMBIENTE II (exterior no agresivo)	0.3 [mm]
AMBIENTE III (agresivo)	0.1 [mm]

El número de capas consideradas en el cálculo es 1

CALCULO DE MUROS.

NOMBRE PROYECTO :
NOMBRE OBRA :

L.A.V. MADRID - ZARAGOZA. Subtramo XV.
Aletas marcos con cobertura. Altura máxima.

DATOS

GEOMETRIA DE CALCULO DEL MURO

C. Canto del muro en coronación (m) :	0.300
ST. Sobreespesor muro en trasdós (m) :	0.625
SI. Sobreespesor muro en intradós (m) :	0.000
P. Puntalera zapata (m) :	1.500
T. Talón zapata (m) :	4.575
H. Altura muro (m) :	7.500
H _z . Canto zapata (m) :	1.100
Anchura total cimentación (m) :	7.000
Angulo trasdós muro (°) :	85.236

DEFINICION TERRENO

	X	Y
0. Coordenadas base trasdós (m) :	0.000	0.000
1. Coordenadas coronación trasdós (m) :	-0.625	7.500
2. Coordenadas fin tramo 1 terreno (m) :	4.825	8.863
3. Coordenadas fin tramo 2 terreno (m) :	9.825	8.863
4. Coordenadas fin tramo 3 terreno (m) :	14.825	8.863

COEFICIENTES DE SEGURIDAD

Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
γ _o (coeficiente combinación variables) :	1.00

Estado Límite Último	
Favorable	Desfavorable

Acciones permanentes (G)		
Peso propio, cargas muertas :	0.90	1.50
Acciones permanentes de valor no constante (G*)		
Terreno (peso propio y empujes) :	0.00	1.50
Acciones variables (Q)		
Sobrecargas :	0.00	1.50

CARACTERISTICAS DEL TERRENO

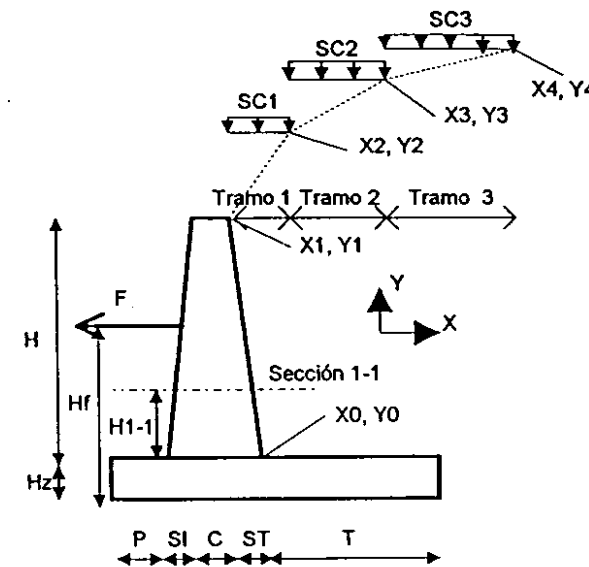
γ. Peso específico (T/m³) :	2.00
φ. Angulo rozamiento interno (°) :	30.000
δ _{mt} . Angulo rozamiento muro-tierras (°) :	0.000
φ _{tl} . Angulo rozamiento tierras-tierras (°) :	0.000
μ. Coeficiente rozamiento zapata-tierras :	0.580
Tensión admisible cimentación (T/m²) :	20.000

ARMADO

H1-1. Dist. sección 1 a sup. zapata (m) :	1.500
Recubrimiento alzado (m) :	0.050
Recubrimiento cimentación (m) :	0.050

Cuantías mínimas

Vertical muros (1/3 mín cara)(o/oo) :	0.900
Horizontal muros (1/3 mín. cara)(o/oo) :	1.600
Cortante o montaje alzado (cm²/m²) :	4.500
Transversal zapata (sup+inf)(o/oo) :	1.447
Longitudinal zapata (sup+inf)(o/oo) :	1.447
Cortante zapata (cm²/m²) :	0.000
Perimetral zapata (en canto)(cm²/m) :	7.959

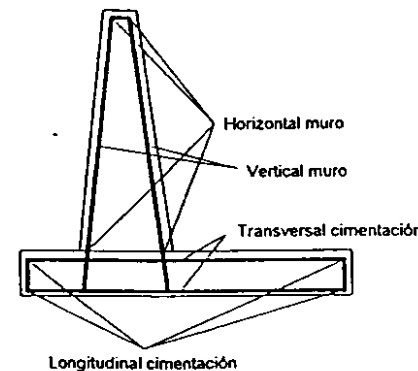


CARGAS (sin mayorar)

Acciones permanentes (G)	
Peso propio barrera coronación (T/m) :	0.000
Acciones permanentes de valor no constante (G*)	
Fg. Carga horizontal sobre muro (T/m) :	0.000
Hfg. Posición Fg a inferior zapata (m) :	0.000
Acciones variables (Q)	
SC1. Sobrecarga en tramo 1 (T/m) :	0.000
SC2. Sobrecarga en tramo 2 (T/m) :	3.000
SC3. Sobrecarga en tramo 3 (T/m) :	3.000
Fq. Carga horizontal sobre muro (T/m) :	0.000
Hfq. Posición Fq a inferior zapata (m) :	0.000

CARACTERISTICAS MATERIALES

Peso específico hormigón (T/m³) :	2.500
Hormigón alzado (T/m³) :	H - 250
Hormigón cimentación (T/m³) :	H - 250
Acero (T/F) :	AEH - 500



RESUMEN ACCIONES SOBRE EL MURO

		F.vertical (T / m)	X (m)	F. Horizontal (T / m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 (ΣP _i , i=1..3)	8.250	1.794	---	---
	Sobre sección base muro (ΣP _i , i=1..3)	11.484	1.833	---	---
	Total peso propio (ΣP _i , i=1..6)	30.734	2.877	---	---
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E1t)	1.296	2.133	15.550	4.600
	Sobre sección base muro (E1t)	2.025	2.217	24.297	3.600
	Total tierras (E2t + ΣT)	80.073	4.613	32.942	3.300
	Verticales sobre talón (ΣT ⁺ ij)	75.287	4.765	---	---
	Verticales sobre talón (cortante) (ΣT ⁻ ij)	58.934	5.268	---	---
Fuerza Fg	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fg	---	---	0.000	0.000
Acciones variables (Q)					
Sobrecargas sobre terreno	Sección 1 (E1sc)	0.115	2.050	1.380	5.600
	Base muro (E1sc)	0.144	2.113	1.726	4.850
	Inf. cimentación (E2sc + IS)	0.000	0.000	9.450	4.950
	Verticales sobre talón (ΣS ⁺ i, i=1..3)	0.000	0.000	---	---
	Verticales sobre talón (cortante) (ΣS ⁻ i)	0.000	0.000	---	---
Fuerza Fq	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fq	---	---	0.000	0.000

COMPROBACIONES

SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	17.826	---
Acciones permanentes de valor no constante (G*)		
Tierras	46.442	32.942
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	9.450
Fuerza Fq	---	0.000

TOTAL 64.268 42.393

Csd= 1.516 Vale

SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	88.424	---
Acciones permanentes de valor no constante (G*)		
Tierras	369.389	108.710
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	46.779
Fuerza Fq	---	0.000

TOTAL 457.812 155.489

Csv= 2.944 Vale

TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	30.734	19.146
Acciones permanentes de valor no constante (G*)		
Tierras	80.073	19.575
Fuerza Fg	0.000	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	46.779
Fuerza Fq	0.000	0.000

TOTAL 110.807 85.500

D (m) = 7.00
σ puntera (T / m²) = 26.30
σ talón (T / m²) = 5.36
σ med (T / m²) = 15.83

σcob (T / m²) = 20
Vale

ARMADO

Secciones

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	0.93	1.00	0.93
	1-1	1.00	0.80	1.00	0.80
PUNTERA	2-2 f	1.00	1.10	1.00	1.10
	2-2 c	1.00	1.10	1.00	1.10
TALON	3-3 f	1.00	1.10	1.00	1.10
	3-3 c	1.00	1.10	1.00	1.10

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	13.589	101.357	39.034
	0-0 (-)	10.336	1.340	0.000
	1-1 (+)	9.541	53.171	25.396
	1-1 (-)	7.425	0.787	0.000
PUNTERA	2-2 f (+)	0.000	44.140	---
	2-2 f (-)	0.000	4.374	---
	2-2 c (+)	---	---	32.308
	2-2 c (-)	---	---	3.210
TALON	3-3 f (+)	0.000	5.810	---
	3-3 f (-)	-33.348	-160.487	---
	3-3 c (+)	---	---	2.521
	3-3 c (-)	---	---	-47.731

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm2/m	Minima cm2/m	Control cálculo	Adoptada cm2/m
ALZADO	Vert. trasdós	0-0 (+)	26.013	5.550	Vale	26.013
		0-0 (-)	0.000	2.775	Vale	
		1-1 (+)	15.488	4.800	Vale	15.488
		1-1 (-)	0.000	2.400	Vale	
	Vert. intrados	0-0 (+)	0.000	2.775	Vale	2.775
		0-0 (-)	0.000	2.775	Vale	
		1-1 (+)	0.000	2.400	Vale	
		1-1 (-)	0.000	2.400	Vale	
	Hor. trasdós (*)	---	5.203	9.867	Vale	9.867
		---	0.000	4.933	Vale	4.933
	Cortante	0-0 (+)	0.000	4.500	Vale	4.500
		0-0 (-)	0.000	4.500	Vale	(cm²/m²)
PUNTERA	Trans. inferior	2-2 f (+)	9.617	7.959	Vale	9.617
		2-2 f (-)	0.941	7.959	Vale	
	Long. inf. (*)	---	1.923	7.959	Vale	7.959
		---	---	---	---	---
	Trans. superior	2-2 f (+)	0.000	7.959	Vale	43.965
		2-2 f (-)	0.000	7.959	Vale	
	Long. sup. (*)	---	0.000	7.959	Vale	8.793
		---	---	---	---	---
	Cortante	2-2 c (+)	0.000	0.000	Vale	0.000
		2-2 c (-)	0.000	0.000	Vale	(cm²/m²)
TALON	Trans. inferior	3-3 f (+)	1.250	7.959	Vale	9.617
		3-3 f (-)	0.000	7.959	Vale	
	Long. inf. (*)	---	0.250	7.959	Vale	7.959
		---	---	---	---	---
	Trans. superior	3-3 f (+)	0.000	7.959	Vale	43.965
		3-3 f (-)	43.965	7.959	Vale	
	Long. sup. (*)	---	8.793	7.959	Vale	8.793
		---	---	---	---	---
ZAPATA	Perimetral	3-3 c (+)	0.000	0.000	Vale	0.000
		3-3 c (-)	0.000	0.000	Vale	(cm²/m²)

(*) Calculada como el 20% de la armadura perpendicular a ella

CALCULO DE MUROS.

NOMBRE PROYECTO :

L.A.V. MADRID - ZARAGOZA. Subtramo XV.

NOMBRE OBRA :

Aletas marcos con cobertura. Altura media.

DATOS

GEOMETRIA DE CALCULO DEL MURO

C. Canto del muro en coronación (m) :	0.300
ST. Sobreespesor muro en trasdós (m) :	0.500
SI. Sobreespesor muro en intradós (m) :	0.000
P. Puntera zapata (m) :	1.500
T. Talón zapata (m) :	3.300
H. Altura muro (m) :	6.000
H _z . Canto zapata (m) :	1.100
Anchura total cimentación (m) :	5.600
Angulo trasdós muro (°) :	85.236

DEFINICION TERRENO

	X	Y
0. Coordenadas base trasdós (m) :	0.000	0.000
1. Coordenadas coronación trasdós (m) :	-0.500	6.000
2. Coordenadas fin tramo 1 terreno (m) :	3.550	7.013
3. Coordenadas fin tramo 2 terreno (m) :	7.550	8.013
4. Coordenadas fin tramo 3 terreno (m) :	11.550	9.013

COEFICIENTES DE SEGURIDAD

Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
γ _o (coeficiente combinación variables) :	1.00

Estado Límite Ultimo	
Favorable	Desfavorable

Acciones permanentes (G)	
Peso propio, cargas muertas :	0.90
Acciones permanentes de valor no constante (G*)	
Terreno (peso propio y empujes) :	0.00
Acciones variables (Q)	
Sobrecargas :	0.00
	1.50

CARACTERISTICAS DEL TERRENO

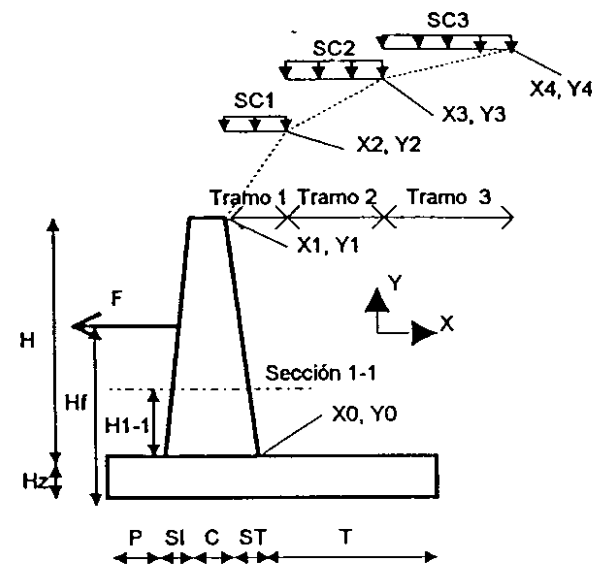
γ. Peso específico (T/m³) :	2.00
φ. Angulo rozamiento interno (°) :	30.000
δ _{mt} . Angulo rozamiento muro-terras (°) :	0.000
φ _{tt} . Angulo rozamiento tierras-terras (°) :	0.000
μ. Coeficiente rozamiento zapata-terras :	0.580
Tensión admisible cimentación (T/m²) :	20.000

ARMADO

H1-1. Dist. sección 1 a sup. zapata (m) :	0.000
Recubrimiento alzado (m) :	0.050
Recubrimiento cimentación (m) :	0.050

Cuantías mínimas

Vertical muros (1/3 min cara)(o/o) :	0.900
Horizontal muros (1/3 min. cara)(o/o) :	1.600
Cortante o montaje alzado (cm²/m²) :	4.500
Transversal zapata (sup+inf)(o/o) :	1.447
Longitudinal zapata (sup+inf)(o/o) :	1.447
Cortante zapata (cm²/m²) :	0.000
Perimetral zapata (en canto)(cm²/m) :	7.959



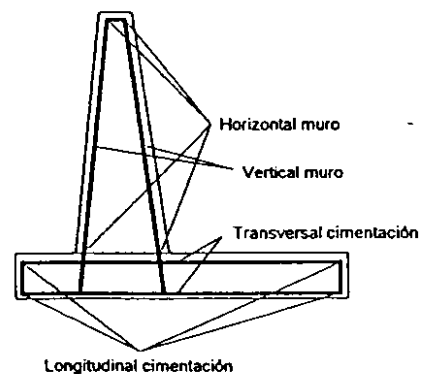
CARGAS (sin mayorar)

Acciones permanentes (G)	
Peso propio barrera coronación (T/m) :	0.000
Acciones permanentes de valor no constante (G*)	
Fg. Carga horizontal sobre muro (T/m) :	0.000
Hf. Posición Fg a inferior zapata (m) :	0.000

Acciones variables (Q)	
SC1. Sobrecarga en tramo 1 (T/m) :	0.000
SC2. Sobrecarga en tramo 2 (T/m) :	0.000
SC3. Sobrecarga en tramo 3 (T/m) :	0.000
Fq. Carga horizontal sobre muro (T/m) :	0.000
Hf. Posición Fq a inferior zapata (m) :	0.000

CARACTERISTICAS MATERIALES

Peso específico hormigón (T/m³) :	2.500
Hormigón alzado (T/m²) :	H - 250
Hormigón cimentación (T/m²) :	H - 250
Acero (T/P) :	AEH - 500



RESUMEN ACCIONES SOBRE EL MURO

		F.vertical (T / m)	X (m)	F. Horizontal (T / m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 (ΣP _i , i=1..3)	8.250	1.794	---	---
	Sobre sección base muro (ΣP _i , i=1..3)	8.250	1.794	---	---
	Total peso propio (ΣP _i , i=1..6)	23.650	2.449	---	---
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E1 _t)	1.309	2.133	15.706	3.100
	Sobre sección base muro (E1 _t)	1.309	2.133	15.706	3.100
	Total tierras (E2 _t + ΣT)	46.210	3.862	25.600	2.683
	Verticales sobre talón (ΣT _i , i)	43.148	3.985	---	---
	Verticales sobre talón (cortante) (ΣT _i , i)	30.009	4.491	---	---
Fuerza Fg	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fg	---	---	0.000	0.000
Acciones variables (Q)					
Sobrecargas sobre terreno	Sección 1 (E1 _{sc})	0.000	2.050	0.000	4.100
	Base muro (E1 _{sc})	0.000	2.050	0.000	4.100
	Inf. cimentación (E2 _{sc} + ΣS)	0.000	0.000	0.000	4.025
	Verticales sobre talón (ΣS _i , i=1..3)	0.000	0.000	---	---
	Verticales sobre talón (cortante) (ΣS _i , i)	0.000	0.000	---	---
Fuerza Fq	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fq	---	---	0.000	0.000

COMPROBACIONES**SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)**

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	13.717	---
Acciones permanentes de valor no constante (G*)		
Tierras	26.802	25.600
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	---	0.000
TOTAL	40.519	25.600

Csd= 1.583 Vale

SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	57.920	---
Acciones permanentes de valor no constante (G*)		
Tierras	178.463	68.694
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	---	0.000
TOTAL	236.383	68.694

Csv= 3.441 Vale

TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	23.650	8.300
Acciones permanentes de valor no constante (G*)		
Tierras	46.210	19.619
Fuerza Fg	0.000	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	0.000	0.000
TOTAL	69.860	27.919

D (m) = 5.60
 σ puntera (T / m²) = 17.82
 σ talón (T / m²) = 7.13
 σ med (T / m²) = 12.48
 σ cob (T / m²) = 14.55
 Vale

ARMADO**Secciones**

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	0.80	1.00	0.80
	1-1	1.00	0.80	1.00	0.80
PUNTERA	2-2 f	1.00	1.10	1.00	1.10
	2-2 c	1.00	1.10	1.00	1.10
TALON	3-3 f	1.00	1.10	1.00	1.10
	3-3 c	1.00	1.10	1.00	1.10

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	9.388	47.447	23.559
	0-0 (-)	7.425	0.787	0.000
	1-1 (+)	9.388	47.447	23.559
	1-1 (-)	7.425	0.787	0.000
PUNTERA	2-2 f (+)	0.000	27.628	---
	2-2 f (-)	0.000	3.254	---
	2-2 c (+)	---	---	20.675
	2-2 c (-)	---	---	2.444
TALON	3-3 f (+)	0.000	4.665	---
	3-3 f (-)	-19.468	-61.138	---
	3-3 c (+)	---	---	1.766
	3-3 c (-)	---	---	-23.683

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm2/m	Minima cm2/m	Control cálculo	Adoptada cm2/m
ALZADO	Vert. trasdós	0-0 (+)	13.655	4.800	Vale	13.655
		0-0 (-)	0.000	2.400	Vale	
		1-1 (+)	13.655	4.800	Vale	13.655
		1-1 (-)	0.000	2.400	Vale	
	Vert. intradós	0-0 (+)	0.000	2.400	Vale	2.400
		0-0 (-)	0.000	2.400	Vale	
		1-1 (+)	0.000	2.400	Vale	
		1-1 (-)	0.000	2.400	Vale	
	Hor. trasdós (*)	---	2.731	8.533	Vale	8.533
		---	0.000	4.267	Vale	4.267
	Cortante	0-0 (+)	0.000	4.500	Vale	4.500
		0-0 (-)	0.000	4.500	Vale	(cm²/m²)
		1-1 (+)	0.000	4.500	Vale	
		1-1 (-)	0.000	4.500	Vale	
PUNTERA	Trans. inferior	2-2 f (+)	5.987	7.959	Vale	7.959
		2-2 f (-)	0.699	7.959	Vale	
	Long. inf. (*)	---	1.197	7.959	Vale	7.959
		---	---	---	---	---
	Trans. superior	2-2 f (+)	0.000	7.959	Vale	17.787
		2-2 f (-)	0.000	7.959	Vale	
	Long. sup. (*)	---	0.000	7.959	Vale	7.959
		---	---	---	---	---
TALON	Cortante	2-2 c (+)	0.000	0.000	Vale	0.000
		2-2 c (-)	0.000	0.000	Vale	(cm²/m²)
	Trans. inferior	3-3 f (+)	1.003	7.959	Vale	7.959
		3-3 f (-)	0.000	7.959	Vale	
	Long. inf. (*)	---	0.201	7.959	Vale	7.959
		---	---	---	---	---
	Trans. superior	3-3 f (+)	0.000	7.959	Vale	17.787
		3-3 f (-)	17.787	7.959	Vale	
ZAPATA	Long. sup. (*)	---	3.557	7.959	Vale	7.959
		---	---	---	---	---
	Cortante	3-3 c (+)	0.000	0.000	Vale	0.000
		3-3 c (-)	0.000	0.000	Vale	(cm²/m²)

(*) Calculada como el 20% de la armadura perpendicular a ella

CALCULO DE MUROS.

NOMBRE PROYECTO :
NOMBRE OBRA :

L.A.V. MADRID - ZARAGOZA. Subtramo XV.
Aletas marcos con cobertura. Altura mínima.

DATOS

GEOMETRIA DE CALCULO DEL MURO

C. Canto del muro en coronación (m) :	0.300
ST. Sobreespesor muro en trasdós (m) :	0.333
Sl. Sobreespesor muro en intradós (m) :	0.000
P. Puntera zapata (m) :	1.500
T. Talón zapata (m) :	1.867
H. Altura muro (m) :	4.000
H _z . Canto zapata (m) :	1.100
Anchura total cimentación (m) :	4.000
Angulo trasdós muro (°) :	85.236

DEFINICION TERRENO

	X	Y
0. Coordenadas base trasdós (m) :	0.000	0.000
1. Coordenadas coronación trasdós (m) :	-0.333	4.000
2. Coordenadas fin tramo 1 terreno (m) :	3.667	5.000
3. Coordenadas fin tramo 2 terreno (m) :	6.333	5.667
4. Coordenadas fin tramo 3 terreno (m) :	9.000	6.333

COEFICIENTES DE SEGURIDAD

Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
ψ ₀ (coeficiente combinación variables) :	1.00

	Estado Límite Último	
	Favorable	Desfavorable

Acciones permanentes (G)		
Peso propio, cargas muertas :	0.90	1.50
Acciones permanentes de valor no constante (G*)		
Terreno (peso propio y empujes) :	0.00	1.50
Acciones variables (Q)		
Sobrecargas :	0.00	1.50

CARACTERISTICAS DEL TERRENO

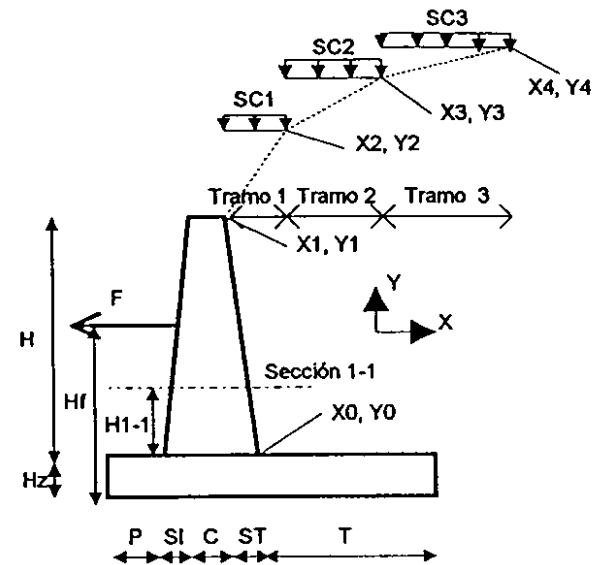
γ. Peso específico (T/m³) :	2.00
φ. Angulo rozamiento interno (°) :	30.000
δ _{mt} . Angulo rozamiento muro-terras (°) :	0.000
φ _{lt} . Angulo rozamiento tierras-terras (°) :	0.000
μ. Coeficiente rozamiento zapata-terras :	0.580
Tensión admisible cimentación (T/m²) :	20.000

ARMADO

H1-1. Dist. sección 1 a sup. zapata (m) :	0.000
Recubrimiento alzado (m) :	0.050
Recubrimiento cimentación (m) :	0.050

Cuantías mínimas

Vertical muros (1/3 mín. cara)(o/o) :	0.900
Horizontal muros (1/3 mín. cara)(o/o) :	1.600
Cortante o montaje alzado (cm²/m²) :	4.500
Transversal zapata (sup+inf)(o/o) :	1.447
Longitudinal zapata (sup+inf)(o/o) :	1.447
Cortante zapata (cm²/m²) :	0.000
Perimetral zapata (en canto)(cm²/m) :	7.959



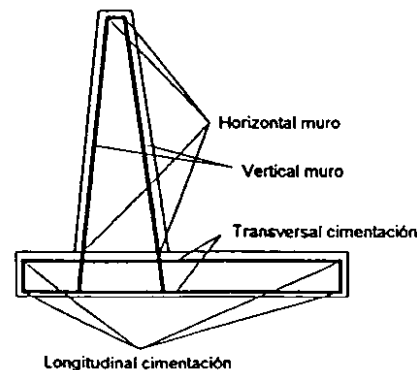
CARGAS (sin mayorar)

Acciones permanentes (G)	
Peso propio barrera coronación (T/m) :	0.000
Acciones permanentes de valor no constante (G*)	
Fg. Carga horizontal sobre muro (T/m) :	0.000
Hfg. Posición Fg a inferior zapata (m) :	0.000

Acciones variables (Q)	
SC1. Sobrecarga en tramo 1 (T/m) :	0.000
SC2. Sobrecarga en tramo 2 (T/m) :	0.000
SC3. Sobrecarga en tramo 3 (T/m) :	0.000
Fq. Carga horizontal sobre muro (T/m) :	0.000
Hfq. Posición Fq a inferior zapata (m) :	0.000

CARACTERISTICAS MATERIALES

Peso específico hormigón (T/m³) :	2.500
Hormigón alzado (T/m³) :	H - 250
Hormigón cimentación (T/m³) :	H - 250
Acero (T/m) :	AEH - 500



RESUMEN ACCIONES SOBRE EL MURO

		F. vertical (T / m)	X (m)	F. Horizontal (T / m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 (ΣP _i , i=1..3)	4.667	1.743	---	---
	Sobre sección base muro (ΣP _i , i=1..3)	4.667	1.743	---	---
	Total peso propio (ΣP _i , i=1..6)	15.667	1.924	---	---
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E1'i)	0.578	2.022	6.931	2.433
	Sobre sección base muro (E1'i)	0.578	2.022	6.931	2.433
	Total tierras (E2i + ΣT _i)	17.477	3.001	12.622	1.883
	Verticales sobre talón (ΣT _i i)	16.116	3.083	---	---
	Verticales sobre talón (cortante) (ΣT _i i)	11.759	3.338	---	---
Fuerza Fg	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fg	---	---	0.000	0.000
Acciones variables (Q)					
Sobrecargas sobre terreno	Sección 1 (E1'sc)	0.000	1.967	0.000	3.100
	Base muro (E1'sc)	0.000	1.967	0.000	3.100
	Inf. cimentación (E2sc + ΣS)	0.000	0.000	0.000	2.825
	Verticales sobre talón (ΣS _i , i=1..3)	0.000	0.000	---	---
	Verticales sobre talón (cortante) (ΣS _i i)	0.000	0.000	---	---
Fuerza Fq	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fq	---	---	0.000	0.000

COMPROBACIONES

SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	9.087	—
Acciones permanentes de valor no constante (G*)		
Tierras	10.136	12.622
Fuerza Fg	—	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	—	0.000
TOTAL	19.223	12.622

Csd= 1.523 Vale

SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	30.135	—
Acciones permanentes de valor no constante (G*)		
Tierras	52.445	23.771
Fuerza Fg	—	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	—	0.000
TOTAL	82.580	23.771

Csv= 3.474 Vale

TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	15.667	1.198
Acciones permanentes de valor no constante (G*)		
Tierras	17.477	6.280
Fuerza Fg	0.000	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	0.000	0.000
TOTAL	33.143	7.478

D (m) = 4.00
 σ puntera (T / m²) = 11.09
 σ talón (T / m²) = 5.48
 σ med (T / m²) = 8.29
 σ cob (T / m²) = 9.34
 Vale

ARMADO

Secciones

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	0.63	1.00	0.63
	1-1	1.00	0.63	1.00	0.63
PUNTERA	2-2 f	1.00	1.10	1.00	1.10
	2-2 c	1.00	1.10	1.00	1.10
TALON	3-3 f	1.00	1.10	1.00	1.10
	3-3 c	1.00	1.10	1.00	1.10

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	5.066	13.993	10.397
	0-0 (-)	4.200	0.308	0.000
	1-1 (+)	5.066	13.993	10.397
	1-1 (-)	4.200	0.308	0.000
PUNTERA	2-2 f (+)	0.000	14.491	—
	2-2 f (-)	0.000	1.713	—
	2-2 c (+)	—	—	11.198
	2-2 c (-)	—	—	1.322
TALON	3-3 f (+)	0.000	2.494	—
	3-3 f (-)	-7.437	-15.733	—
	3-3 c (+)	—	—	1.747
	3-3 c (-)	—	—	-10.947

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm²/m	Minima cm²/m	Control cálculo	Adoptada cm²/m
ALZADO	Vert. trasdós	0-0 (+)	4.886	3.800	Vale	4.886
		0-0 (-)	0.000	1.900	Vale	
		1-1 (+)	4.886	3.800	Vale	
		1-1 (-)	0.000	1.900	Vale	
	Vert. intradós	0-0 (+)	0.000	1.900	Vale	1.900
		0-0 (-)	0.000	1.900	Vale	
		1-1 (+)	0.000	1.900	Vale	
		1-1 (-)	0.000	1.900	Vale	
	Hor. trasdós (*)	—	0.977	6.756	Vale	6.756
		—	0.000	3.378	Vale	
	Cortante	0-0 (+)	0.000	4.500	Vale	4.500 (cm²/m²)
		0-0 (-)	0.000	4.500	Vale	
		1-1 (+)	0.000	4.500	Vale	
		1-1 (-)	0.000	4.500	Vale	
PUNTERA	Trans. inferior	2-2 f (+)	3.126	7.959	Vale	7.959
		2-2 f (-)	0.368	7.959	Vale	
	Long. inf. (*)	—	0.625	7.959	Vale	7.959
		—	0.000	7.959	Vale	
	Trans. superior	2-2 f (+)	0.000	7.959	Vale	7.959
		2-2 f (-)	0.000	7.959	Vale	
	Long. sup. (*)	—	0.000	7.959	Vale	7.959
		—	0.000	0.000	Vale	
TALON	Trans. inferior	3-3 f (+)	0.536	7.959	Vale	7.959
		3-3 f (-)	0.000	7.959	Vale	
	Long. inf. (*)	—	0.107	7.959	Vale	7.959
		—	0.000	7.959	Vale	
	Trans. superior	3-3 f (+)	0.000	7.959	Vale	7.959
		3-3 f (-)	5.073	7.959	Vale	
	Long. sup. (*)	—	1.015	7.959	Vale	7.959
		—	0.000	0.000	Vale	
ZAPATA	Perimetral	—	0.000	7.959	Vale	7.959
		—	0.000	0.000	Vale	

(*) Calculada como el 20% de la armadura perpendicular a ella

4.4.8 Paso inferior E-1516.9.1

PASO INFERIOR E-1516.9.1

INDICE

1º DEFINICION GEOMETRICA

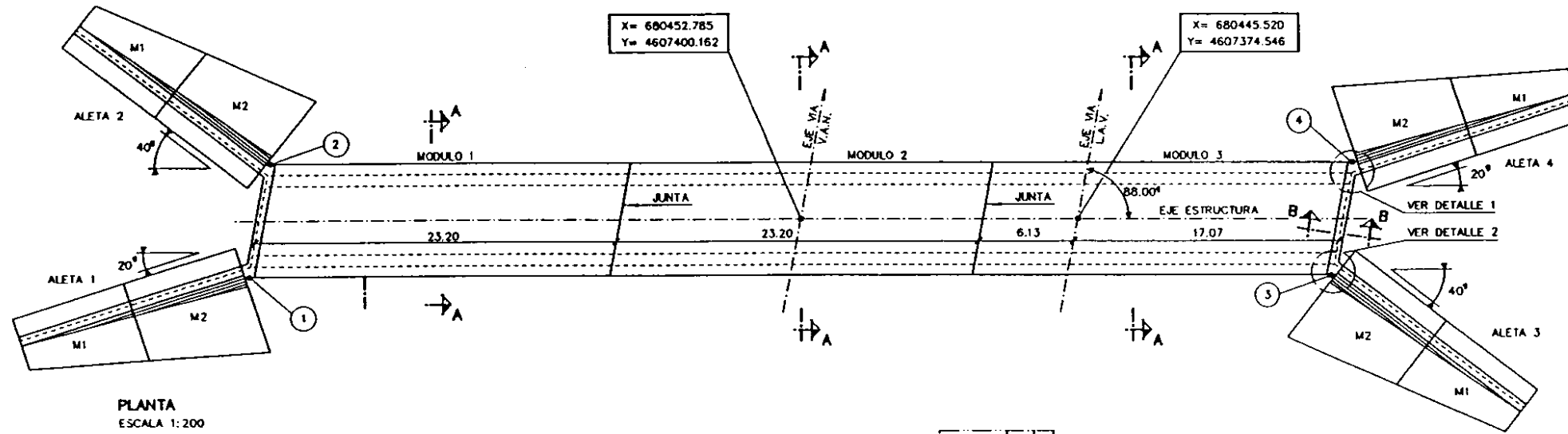
2º CALCULOS

PASO INFERIOR E-1516.9.1

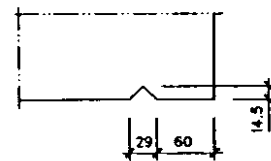
1º DEFINICION GEOMETRICA

PUNTOS DE REPLANTEO

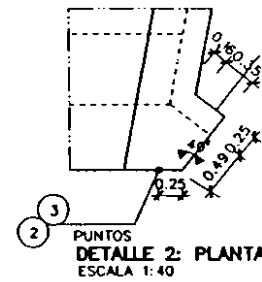
PUNTO	X	Y	Z	Zc
1	680456.506	4607426.849	222.465	214.965
2	680463.182	4607423.269	222.490	214.990
3	680437.497	4607359.813	223.510	216.010
4	680444.229	4607356.437	223.532	216.032



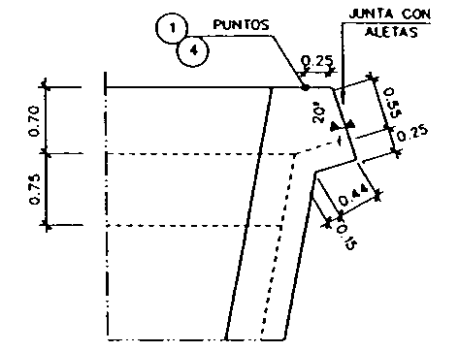
PLANTA
ESCALA 1:200



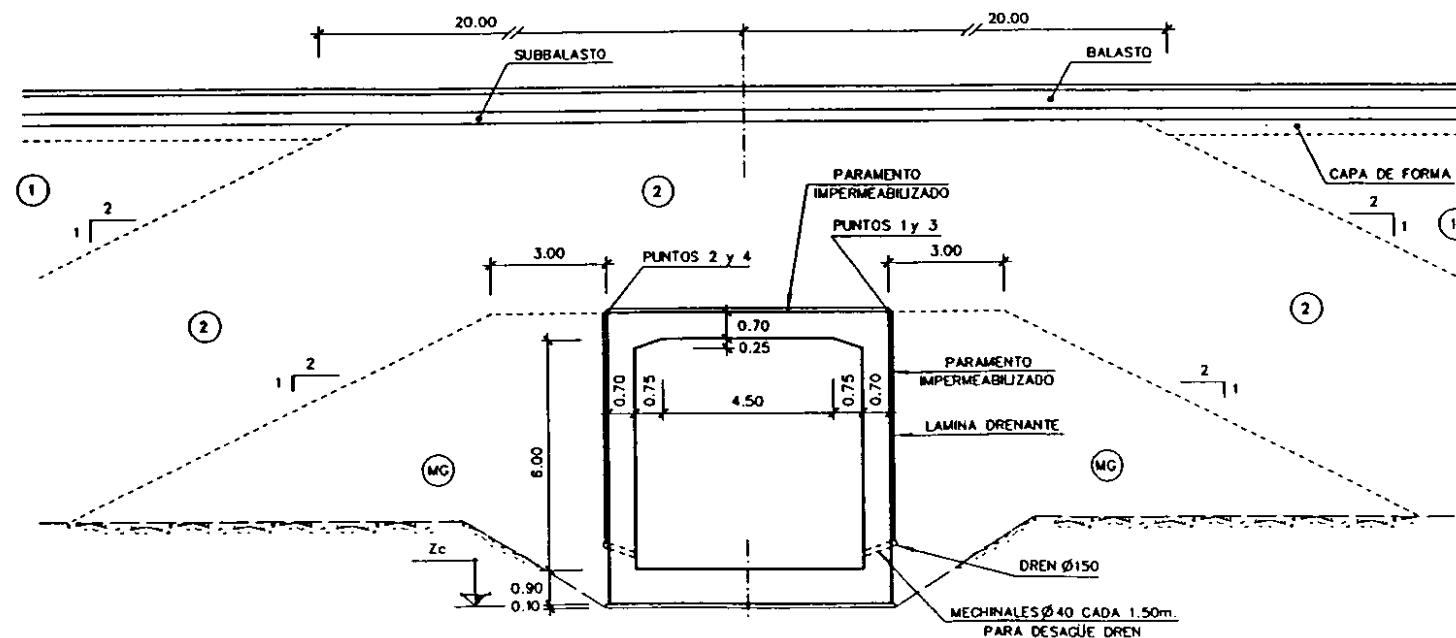
DETALLE DE GOTERON
ESCALA 1:4 (COTAS EN mm.)



DETALLE 2: PLANTA
ESCALA 1:40

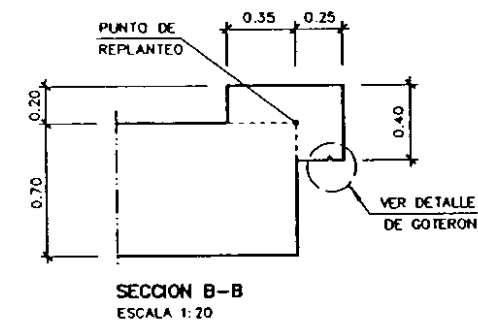


DETALLE 1: PLANTA
ESCALA 1:40

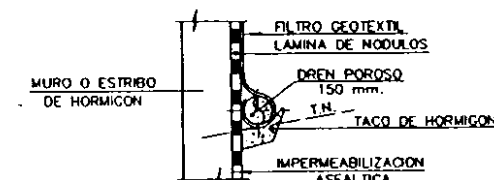


SECCION A-A
ESCALA 1:100

- (MG) MATERIAL GRANULAR (CON CARACTERISTICAS DE SUBBALASTO)
- (2) QS3
- (1) NUCLEO DE RELLENO

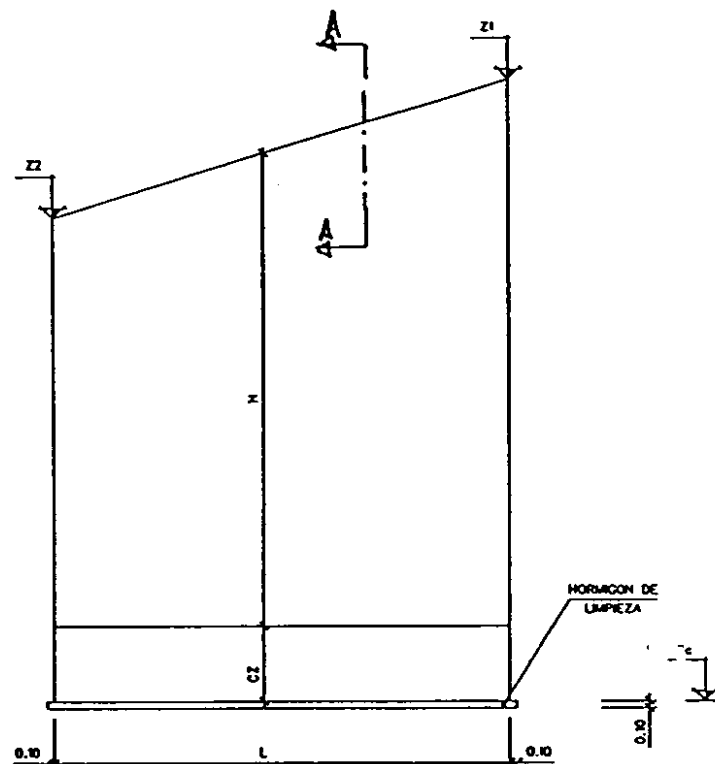


SECCION B-B
ESCALA 1:20

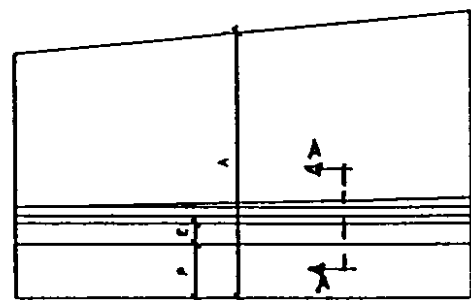


DETALLE DE IMPERMEABILIZACION
ESCALA 1:20

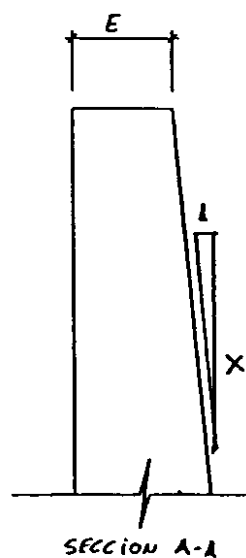
DEFINICION GEOMETRICA ALETAS



ALZADO TIPO DE MURO



PLANTA TIPO DE MURO



SECCION A-A

E-1516.9.1

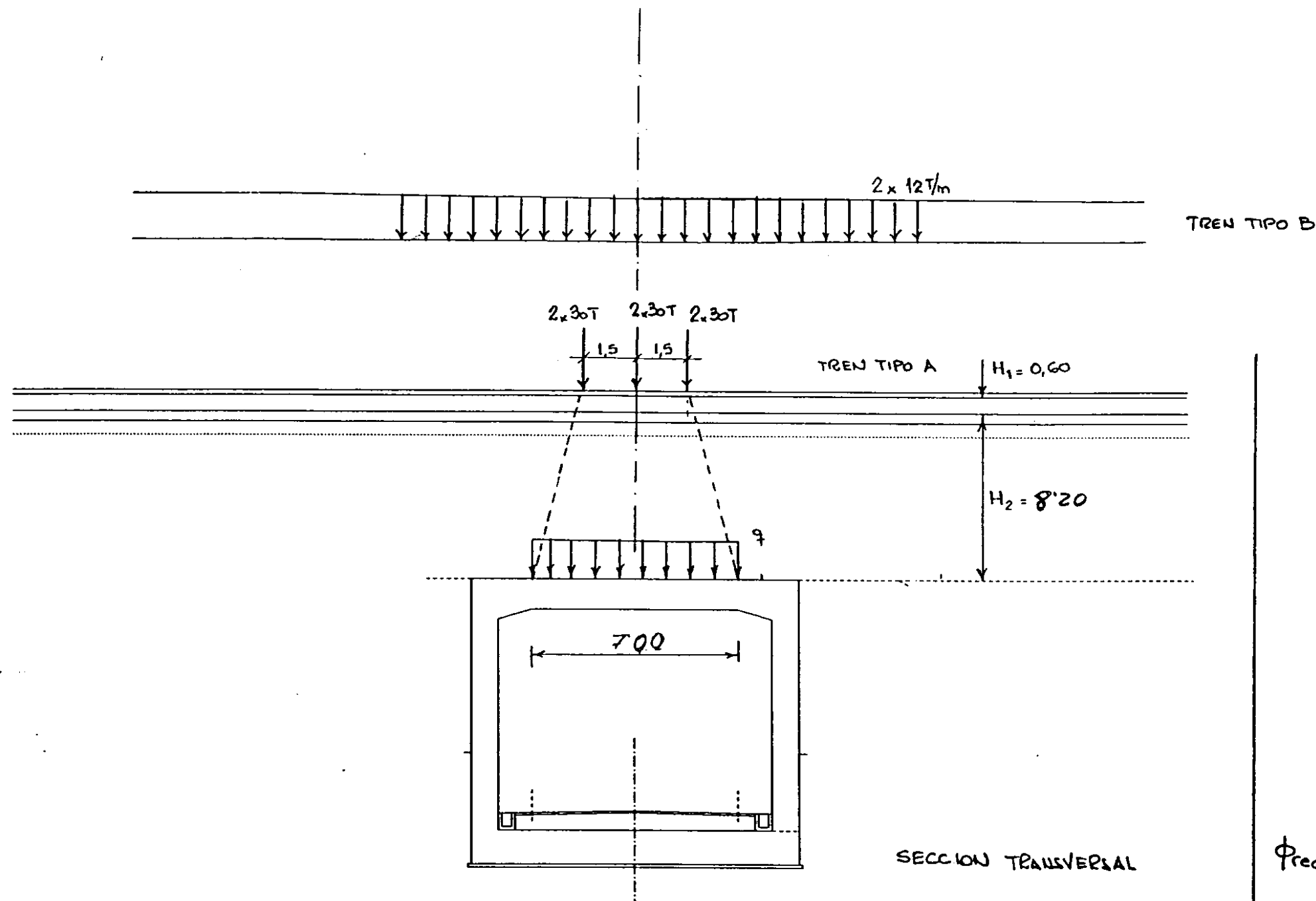
DEFINICION GEOMETRICA

	Aleta 1. M1	Aleta 1. M2	Aleta 2. M1	Aleta 2. M2	Aleta 3. M1	Aleta 3. M1	Aleta 4. M1	Aleta 4. M2
Z1	219.533	222.665	220.195	222.690	220.463	223.710	220.484	223.732
Z2	216.400	219.533	217.700	220.195	217.215	220.463	217.236	220.484
ZC	214.665	214.665	214.690	214.690	215.710	215.710	215.732	215.732
H	De 3.77 a 0.63	De 6.90 a 3.77	De 4.41 a 1.91	De 6.90 a 4.41	De 3.65 a 0.40	De 6.90 a 3.65	De 3.65 a 0.40	De 6.90 a 3.65
CZ	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
L	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50
A	De 5.35 a 3.50	De 7.20 a 5.35	De 5.35 a 3.50	De 7.20 a 5.35	De 5.35 a 3.50	De 7.20 a 5.35	De 5.35 a 3.50	De 7.20 a 5.35
P	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
E	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
X	12.0	12.0	12	12	12	12	12	12

PASO INFERIOR E-1516.9.1

2º CALCULOS

E-1516.9.1
Cálculo 1



Coef. Impacto

$$V = 200 \text{ km/h}$$

$$T = 0,05 \text{ seg.}$$

$$L = 8,80 \text{ m}$$

$$\mu = \frac{VT}{2L} = 0,57$$

$$I = 65 \frac{\mu}{1 - \mu + \mu^2} = 50$$

$$\phi_0 = 1,50$$

$$\phi_{red} = \phi_0 - \frac{h - 1,0}{10,0} \quad \text{Para } h = 6 \text{ m:}$$

$$\phi_{red} = 1,50 - \frac{6 - 1}{10} = 1,00$$

CARGA PERMANENTE

$$g: \text{Riel + Traveses} = \frac{0,12 \text{ T/m} + 0,52 \text{ T/m}}{2,4 \text{ m}} = 0,27 \text{ T/m}^2$$

$$\text{Balasto} = 0,60 \text{ m} \cdot 1,6 \text{ T/m}^3 = 0,96 \text{ T/m}^2$$

$$\text{Relleno} = 8,20 \text{ m} \cdot 2,0 \text{ T/m}^3 = 16,40 \text{ T/m}^2$$

$$g = 17,63 \text{ T/m}^2 + \text{PESO PROPIO MARCO}$$

SOBRECARGA DE TREN

$$q_A = \frac{2 \times 90 \text{ T}}{7,0 \text{ m} \times 10,0 \text{ m}} = 2,6 \text{ T/m}^2$$

$$q_B = \frac{2 \times 12 \text{ T/m}}{10,0 \text{ m}} = 2,4 \text{ T/m}^2$$

$$S_d = 1,5 g + 1,5 q$$

ESTADO LÍMITE ULTIMO

$$S_k = 1,0 g + 1,0 q$$

ESTADOS LÍMITES DE SERVICIO

$$3 \times 30T = 90T$$



$$12T/m$$



$$3 \times 30T = 90T$$



$$12T/m$$

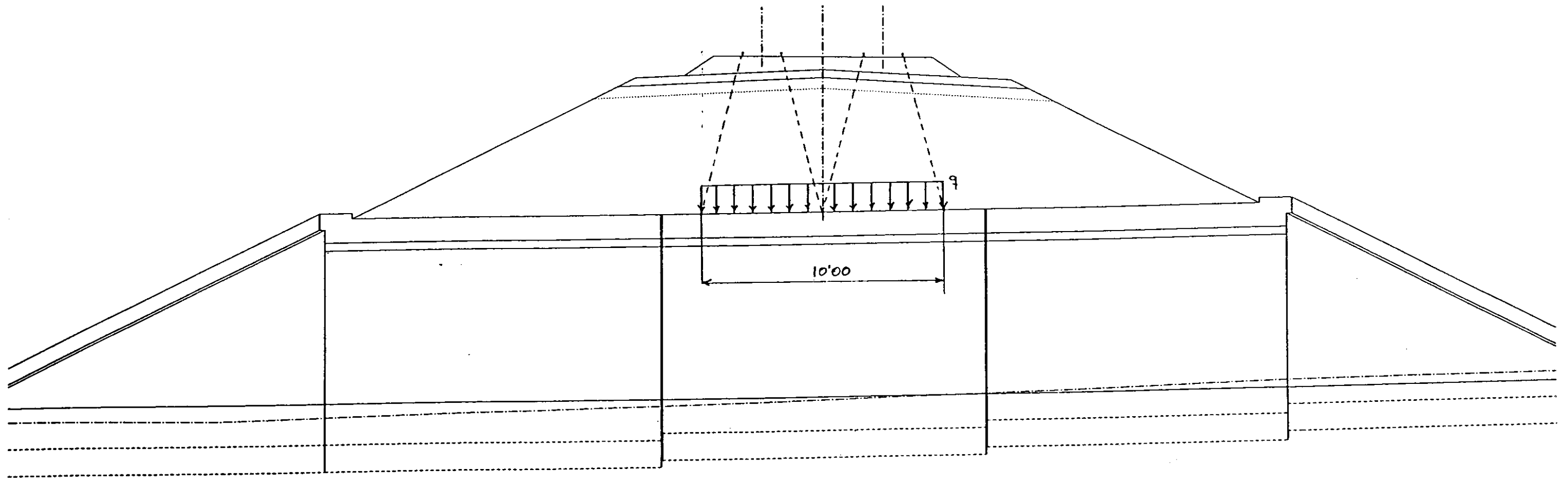


TREN TIPO A

TREN TIPO B

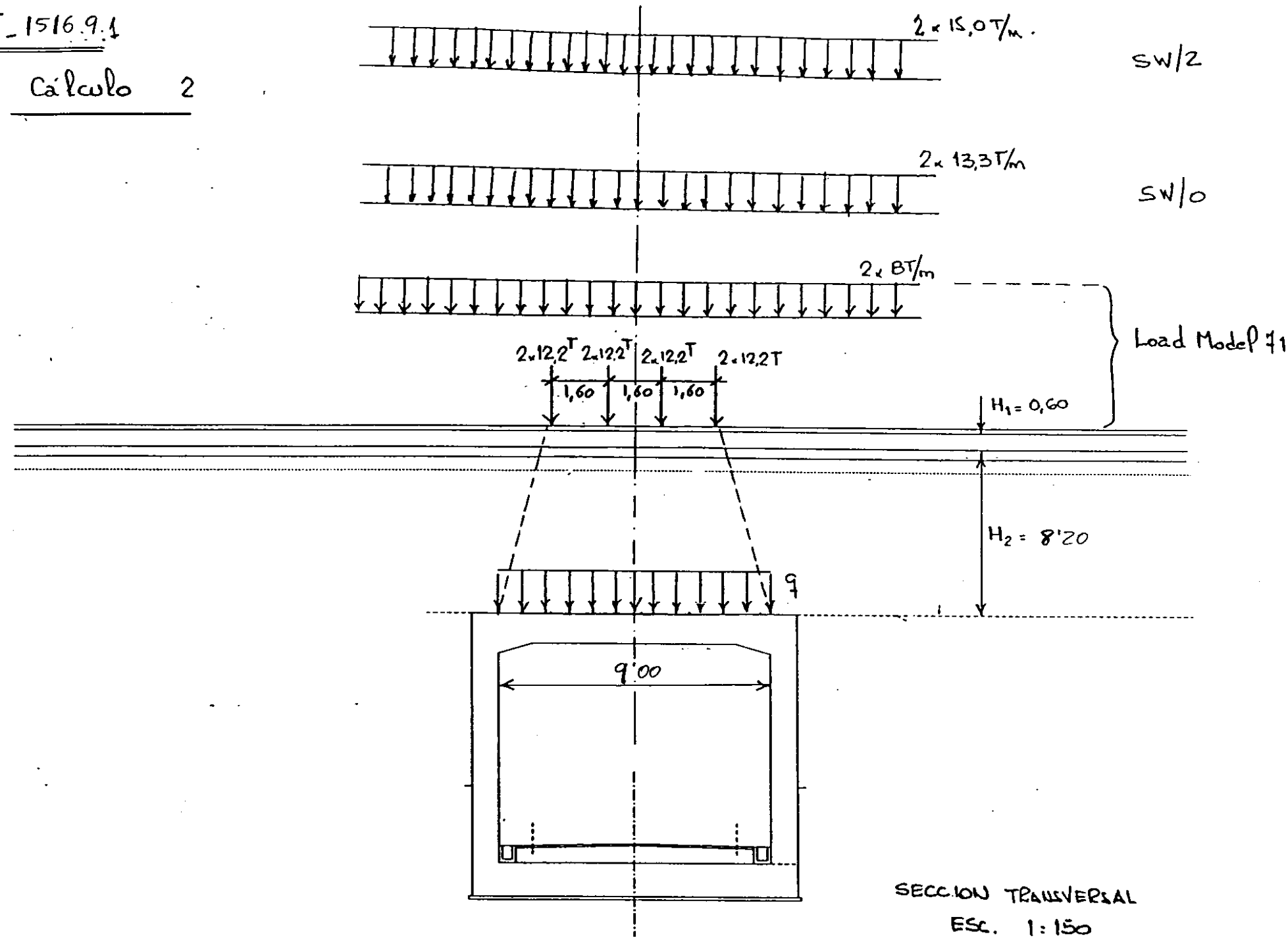
E-1516.9.1

Cálculo 1



E-1516.9.1

Cálculo 2



CARGA PERMANENTE

$$g: \text{Riel + Traveses} = \frac{0,12 \text{ T/m} + 0,52 \text{ T/m}}{2,4 \text{ m}} = 0,27 \text{ T/m}^2$$

$$\text{Balsato} = 0,60 \text{ m} \cdot 1,6 \text{ T/m}^3 = 0,96 \text{ T/m}^2$$

$$\text{Relleno} = 8,20 \text{ m} \cdot 2,0 \text{ T/m}^3 = 16,40 \text{ T/m}^2$$

$$g = 17,63 \text{ T/m}^2 + \text{PESO PROPIO MARCO}$$

SOBRECARGA TREN

$$q_{LM71} = \frac{8 \times 12,2 \text{ T}}{9 \text{ m} \times 10 \text{ m}} + \frac{2 \times 8 \text{ T/m}}{10,0 \text{ m}} = 2,7 \text{ T/m}^2$$

$$q_{SW/0} = \frac{2 \times 13,3 \text{ T/m}}{10,0 \text{ m}} = 2,7 \text{ T/m}^2$$

$$q_{SW/2} = \frac{2 \times 15,0 \text{ T/m}}{10,0 \text{ m}} = 3,0 \text{ T/m}^2$$

Coef. de Impacto

$$L_m = \frac{1}{3}(7 + 8,8 + 7) = 7,6 \text{ m}$$

$$L_\phi = K L_m = 1,3 \times 7,6 \text{ m} = 9,9 \text{ m}$$

$$\phi_3 = \frac{2,16}{\sqrt{L_\phi} - 0,2} + 0,73 = 1,5$$

$$V = 1,2 \times 350 \text{ Km/h} = 420 \text{ Km/h} = 117 \text{ m/s}$$

$$L = 8,8 \text{ m}$$

$$T_1 = 0,05 \text{ seg} \quad \beta = \frac{T_1}{T_v} = 0,33$$

$$T_v = \frac{2 \times 8,8}{117} = 0,15 \text{ seg}$$

$$\frac{f_{din}}{f_{est.}} = \frac{1 + \beta}{1 - \beta^2} = 1,5$$

$$\therefore \text{Adoptando } \phi_0 = 1,50$$

$$\phi_{red} = \phi_0 - \frac{h-1}{10} \quad \text{Para } h = 6 \text{ m}$$

$$\phi_{red} = 1,50 - \frac{6-1}{10} = 1,00$$

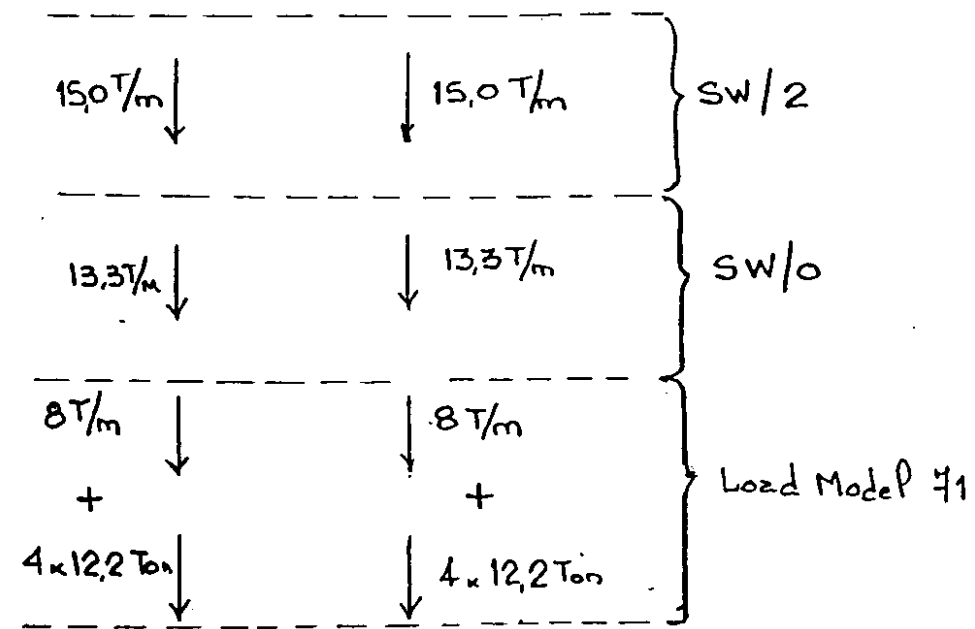
ESTADO LÍMITE ÚLTIMO

$$S_d = 1,35 g + 1,45 q_{LM71}$$

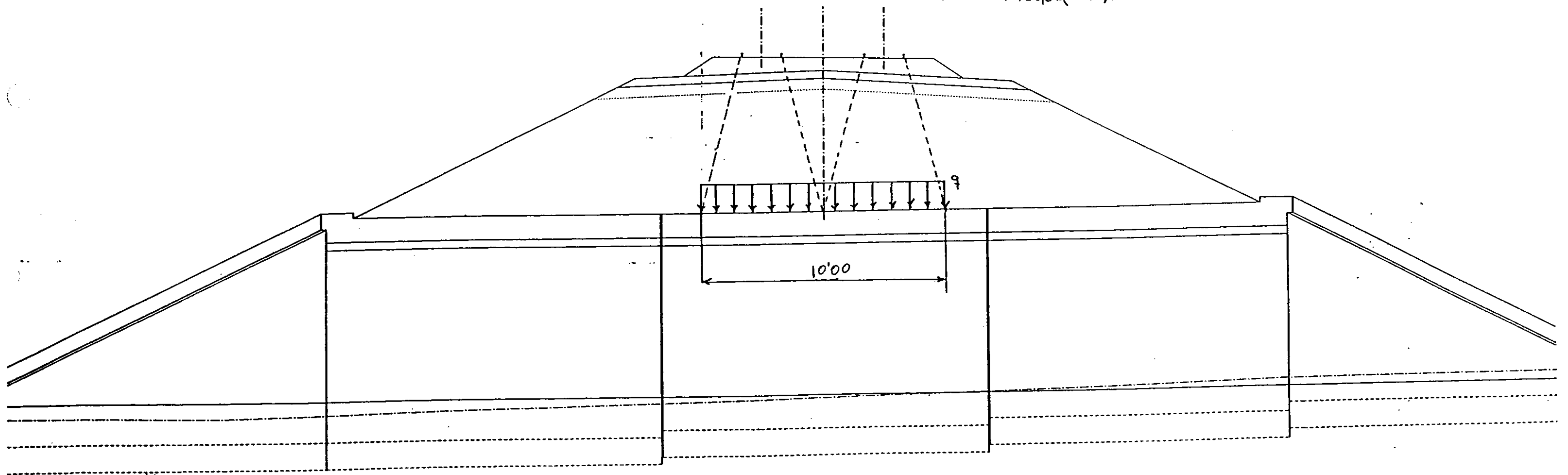
$$S_d = 1,35 g + 1,45 q_{SW/0}$$

$$S_d = 1,35 g + 1,20 q_{SW/2}$$

E-1516.9.1.
Cálculo 2



$$25,0 \text{ T} - 8 \text{ T/m} \times 1,6 \text{ m} = 12,2 \text{ Ton}$$



IBM

Ordenador Personal

PROGRAMA

ARCO

CALCULO DE ARCOS, PASOS INFERIORES Y GALERIAS ENTERRADAS

(C) Copyright J. Diaz del Valle, 1988

PROYECTO :

Referencia : E-1516.9.f

Fecha : 11-05-1998

PROGRAMA ARCO .

11-05-1998

PAG 1

DATOS DE LA ESTRUCTURA

NUMERO DE SEGMENTOS = 50
 SALTO = 1

TIPO DE GEOMETRIA :

TIPO 0 : POLIGONAL ARBITRARIA DADA POR COORDENADAS
 TIPO 1 : ARCO CIRCULAR DEFINIDO POR : f,a
 TIPO 2 : PARABOLA CON $y'(0)=0$, DEFINIDA POR : f,a
 TIPO 3 : PARABOLA CON $y'(0)=0$, DEFINIDA POR : a,c,b
 TIPO 4 : PARABOLA CON $y'(0)<0$ DEFINIDA POR : f,a,c,b
 TIPO 5 : CUBICA CON $y'(0)=0$ DEFINIDA POR : f,a,c,b
 TIPO 6 : PORTICO CIRCULAR DEFINIDO POR : f,a,h,B
 TIPO 7 : CURVA GENERAL DEFINIDA POR PUNTOS DE PASO
 TIPO 8 : GEOMETRIA ANTERIOR ALMACENADA EN FICHERO DE DATOS

2a = CUERDA , f = FLECHA , (c,b) = COORDENADAS DE UN PUNTO

TIPO = 9

CUERDA 2a = 6.700 m
 ALTURA H = 6.750 m

TIPO DE CONDICIONES DE APOYO :

TIPO 0 : TRIARTICULADO (EN APOYOS Y CLAVE)
 TIPO 1 : BIARTICULADO (EN APOYOS)
 TIPO 2 : EMPOTRADO EN EXTREMOS
 TIPO 3 : EMPOTRADO EN EXTREMOS CON ROTULA EN CLAVE
 TIPO 4 : EMPOTRADO ELASTICAMENTE
 TIPO 5 : ATIRANTADO EN EXTREMOS

TIPO = 2

PESO ESPECIFICO DEL HORMIGON = 2.50 t/m³
 RESISTENCIA CARACTERISTICA DEL HORMIGON f_{ck} = 250 Kp/cm²
 COEFICIENTE DE MINORACION DE f_{ck} γ_c = 1.50
 LIMITE ELASTICO CARACTERISTICO DEL ACERO f_{yk} = 5100 Kp/cm²
 COEFICIENTE DE MINORACION DE f_{yk} γ_s = 1.15
 RECUBRIMIENTO DE LAS ARMADURAS c = 5 cm
 SE DISPONEN ARMADURAS MINIMAS DE FLEXOCOMPRESION

ALTURA DE TIERRAS DESDE LA BASE = 16.00 m
 PESO ESPECIFICO DE LAS TIERRAS = 2.00 t/m³
 COEFICIENTE EMPUJE TIERRAS = 0.50

SOBRECARGA q = 2.60 t/m²

CARGAS CONCENTRADAS EN LOS MUJOS : NINGUNA

COEFICIENTE DE MAYORACION DE LAS CARGAS %f = 1.50

GALIBO GX = 6.00 m

GALIBO GY = 6.00 m

EXISTE LOSA DE CIMENTACION :

SOBRECARGA DE LA LOSA DE CIMENTACION q = 0.40 t/m²

CANTO DE LA LOSA DE CIMENTACION t = 0.90 m

COEFICIENTE DE BALASTO DEL TERRENO K = 500 t/m³

ESFUERZOS EN EL ARCO

=====

SEC	X (m)	Y (m)	AXIL (t/m)	CORTANTE (t/m)	FLECTOR (txm/m)	ESPESOR (m)
1	3.350	0.000	133.150	-67.064	-93.223	0.700
2	3.350	0.414	132.606	-62.138	-67.494	0.700
3	3.350	0.828	131.519	-52.457	-45.774	0.700
4	3.350	1.242	130.432	-43.034	-27.955	0.700
5	3.350	1.656	129.346	-33.868	-13.931	0.700
6	3.350	2.070	128.259	-24.959	-3.596	0.700
7	3.350	2.484	127.172	-16.308	3.156	0.700
8	3.350	2.898	126.085	-7.913	6.433	0.700
9	3.350	3.313	124.998	0.224	6.340	0.700
10	3.350	3.727	123.911	8.104	2.985	0.700
11	3.350	4.141	122.824	15.727	-3.527	0.700
12	3.350	4.555	121.737	23.093	-13.089	0.700
13	3.350	4.969	120.650	30.201	-25.595	0.700
14	3.350	5.383	119.563	37.053	-40.937	0.700
15	3.350	5.797	118.476	43.647	-59.009	0.700
16	3.350	6.211	117.390	49.984	-79.706	0.700
17	3.350	6.625	68.826	-109.132	-102.920	0.950
18	3.281	6.633	71.606	-106.941	-95.520	0.934
19	3.212	6.641	71.439	-104.502	-88.290	0.919
20	3.144	6.648	71.273	-102.068	-81.227	0.903
21	3.075	6.656	71.107	-99.640	-74.333	0.887
22	3.006	6.664	70.942	-97.218	-67.606	0.872
23	2.938	6.672	70.778	-94.801	-61.047	0.856
24	2.869	6.680	70.614	-92.390	-54.654	0.841
25	2.800	6.688	70.450	-89.984	-48.428	0.825
26	2.731	6.695	70.287	-87.584	-42.368	0.809
27	2.662	6.703	70.125	-85.190	-36.473	0.794
28	2.594	6.711	69.963	-82.802	-30.744	0.778
29	2.525	6.719	69.802	-80.419	-25.180	0.762
30	2.456	6.727	69.641	-78.041	-19.780	0.747

31	2.388	6.734	69.481	-75.670	-14.544	0.731
32	2.319	6.742	69.322	-73.304	-9.472	0.716
33	2.250	6.750	60.710	-78.299	-4.563	0.700
34	2.125	6.750	60.764	-74.977	4.809	0.700
35	2.000	6.750	60.764	-70.692	13.645	0.700
36	1.875	6.750	60.764	-66.408	21.946	0.700
37	1.750	6.750	60.764	-62.123	29.712	0.700
38	1.625	6.750	60.764	-57.839	36.942	0.700
39	1.500	6.750	60.764	-53.555	43.636	0.700
40	1.375	6.750	60.764	-49.270	49.795	0.700
41	1.250	6.750	60.764	-44.986	55.418	0.700
42	1.125	6.750	60.764	-40.702	60.506	0.700
43	1.000	6.750	60.764	-36.417	65.058	0.700
44	0.875	6.750	60.764	-32.133	69.075	0.700
45	0.750	6.750	60.764	-27.848	72.556	0.700
46	0.625	6.750	60.764	-23.564	75.501	0.700
47	0.500	6.750	60.764	-19.280	77.911	0.700
48	0.375	6.750	60.764	-14.995	79.786	0.700
49	0.250	6.750	60.764	-10.711	81.124	0.700
50	0.125	6.750	60.764	-6.427	81.928	0.700
51	0.000	6.750	60.764	-2.142	82.196	0.700

R = 0.13315E+03 M = -.93223E+02 H = -.67064E+02 V = 0.37708E-02m

LONGITUD DEL SEMIARCO = 9.982 LONGITUD DE TRANSPORTE = 7.536

LOSA DE CIMENTACION SOBRE TERRENO ELASTICO

=====

X (m)	W (mm)	GIRO (1000xrad)	FLECTOR (txm/m)	CORTANTE (t/m)	REACCION (t/m ²)
3.350	89.169	-1.004	93.223	133.150	44.585
3.015	88.808	-1.136	50.893	119.575	44.404
2.680	88.416	-1.194	13.101	106.064	44.208
2.345	88.016	-1.187	-20.177	92.619	44.008
2.010	87.627	-1.123	-48.962	79.241	43.814
1.675	87.269	-1.010	-73.276	65.926	43.634
1.340	86.955	-0.856	-93.138	52.667	43.478
1.005	86.699	-0.671	-108.568	39.456	43.349
0.670	86.509	-0.461	-119.578	26.282	43.254
0.335	86.392	-0.234	-126.180	13.135	43.196
-0.000	86.353	0.000	-128.380	-0.000	43.176

ARMADURAS EN EL ARCO

=====

SEC	X (m)	Y (m)	Ainterior (cm ² /m)	Aexterior (cm ² /m)	Acortante (cm ² /m)
-----	----------	----------	-----------------------------------	-----------------------------------	-----------------------------------

1	3.350	0.000	5.250	23.182	10.218
2	3.350	0.414	5.250	12.233	8.213
3	3.350	0.828	5.250	5.250	4.274
4	3.350	1.242	5.250	5.250	0.438
5	3.350	1.656	5.250	5.250	0.000
6	3.350	2.070	5.250	5.250	0.000
7	3.350	2.484	5.250	5.250	0.000
8	3.350	2.898	5.250	5.250	0.000
9	3.350	3.313	5.250	5.250	0.000
10	3.350	3.727	5.250	5.250	0.000
11	3.350	4.141	5.250	5.250	0.000
12	3.350	4.555	5.250	5.250	0.000
13	3.350	4.969	5.250	5.250	0.000
14	3.350	5.383	5.250	5.250	0.000
15	3.350	5.797	5.250	9.884	0.688
16	3.350	6.211	5.250	19.410	3.267
17	3.350	6.625	7.125	21.128	15.002
18	3.281	6.633	7.008	19.132	14.914
19	3.213	6.641	6.891	17.454	14.746
20	3.144	6.648	6.773	15.771	14.574
21	3.075	6.656	6.656	14.081	14.398
22	3.006	6.664	6.539	12.385	14.216
23	2.938	6.672	6.422	11.591	14.030
24	2.869	6.680	6.305	10.273	13.838
25	2.800	6.688	6.188	8.759	13.640
26	2.731	6.695	6.070	7.034	13.436
27	2.662	6.703	5.953	5.953	13.225
28	2.594	6.711	5.836	5.836	13.008
29	2.525	6.719	5.719	5.719	12.783
30	2.456	6.727	5.602	5.602	12.550
31	2.388	6.734	5.484	5.484	12.308
32	2.319	6.742	5.367	5.367	12.058
33	2.250	6.750	5.250	5.250	14.791
34	2.125	6.750	5.250	5.250	13.439
35	2.000	6.750	5.250	5.250	11.695
36	1.875	6.750	5.250	5.250	9.951
37	1.750	6.750	5.283	5.250	8.208
38	1.625	6.750	8.135	5.250	6.464
39	1.500	6.750	9.771	5.250	4.720
40	1.375	6.750	12.244	5.250	2.976
41	1.250	6.750	14.601	5.250	1.233
42	1.125	6.750	16.758	5.250	0.000
43	1.000	6.750	18.709	5.250	0.000
44	0.875	6.750	20.447	5.250	0.000
45	0.750	6.750	21.967	5.250	0.000
46	0.625	6.750	23.262	5.250	0.000
47	0.500	6.750	24.328	5.250	0.000
48	0.375	6.750	25.162	5.250	0.000
49	0.250	6.750	25.760	5.250	0.000
50	0.125	6.750	26.120	5.250	0.000
51	0.000	6.750	26.240	5.250	0.000

ARMADURAS EN LA LOSA

SEC	X (m)	Y (m)	Ainferior (cm ² /m)	Asuperior (cm ² /m)	Acortante (cm ² /m)
1	3.350	-0.450	27.667	6.750	24.364
2	3.015	-0.450	14.817	6.750	20.139
3	2.680	-0.450	6.750	6.750	15.934
4	2.345	-0.450	6.750	7.453	11.750
5	2.010	-0.450	6.750	14.243	7.586
6	1.675	-0.450	6.750	21.544	3.442
7	1.340	-0.450	6.750	27.641	0.000
8	1.005	-0.450	6.750	32.470	0.000
9	0.670	-0.450	6.750	35.969	0.000
10	0.335	-0.450	6.750	38.090	0.000
11	0.000	-0.450	6.750	38.801	0.000

Obra : L.A.V. MADID-ZARAGOZA. Subtramo XV.
E-1516.9.1. Centro dintel.
Fecha: 5/11/1998
Hora : 12:28

COMPROBACION DEL ESTADO LIMITE DE FISURACION DEBIDO
A SOLICITACIONES NORMALES

1. Datos

- Materiales

f_{ck} [kp/cm²] = 250
 f_{yk} [kp/cm²] = 5100

- Sección

b [cm] = 100.0
 h [cm] = 70.0
 ϕ [mm] = 20.0
 c [cm] = 3.0
 n° de capas = 1
 n° de diámetros capa 1 = 10

- Solicitación de servicio

M_k [m·Mp] = 54.80

2. Resultados

ABERTURA DE FISURA CARACTERISTICA

w_k [mm]	S_m [cm]	ϵ_{sm} ·1.E-3	σ_{sr} [kp/cm ²]	σ_s [kp/cm ²]
0.30	14.1	1.23	1250	2859

ABERTURA DE FISURA MAXIMA ADMITIDA

AMBIENTE I (interior)	0.600 [mm]
AMBIENTE II (exterior no agresivo)	0.300 [mm]
AMBIENTE III (agresivo)	0.150 [mm]

El número de capas consideradas en el cálculo es 1

Obra : L.A.V. MADID-ZARAGOZA. Subtramo XV.
E-1516.9.1. Centro solera.
Fecha: 5/11/1998
Hora : 12:29

COMPROBACION DEL ESTADO LIMITE DE FISURACION DEBIDO
A SOLICITACIONES NORMALES

1. Datos

- Materiales

f_{ck} [kp/cm²] = 250
 f_{yk} [kp/cm²] = 5100

- Sección

b [cm] = 100.0
 h [cm] = 90.0
 ϕ [mm] = 25.0
 c [cm] = 3.5
 n° de capas = 1
 n° de diámetros capa 1 = 10

- Solicitación de servicio

M_k [m·Mp] = 85.60

2. Resultados

ABERTURA DE FISURA CARACTERISTICA

w_k [mm]	S_m [cm]	ϵ_{sm} ·1.E-3	σ_{sr} [kp/cm ²]	σ_s [kp/cm ²]
0.24	15.0	0.94	1050	2229

ABERTURA DE FISURA MAXIMA ADMITIDA

AMBIENTE I (interior)	0.560 [mm]
AMBIENTE II (exterior no agresivo)	0.280 [mm]
AMBIENTE III (agresivo)	0.140 [mm]

El número de capas consideradas en el cálculo es 1

CALCULO DE MUROS.

NOMBRE PROYECTO :	L.A.V. MADRID - ZARAGOZA. Subtramo XV.
NOMBRE OBRA :	Alas marcos con cobertura. Altura máxima.

DATOS

GEOMETRIA DE CALCULO DEL MURO

C. Canto del muro en coronación (m) :	0.300
ST. Sobreespesor muro en trasdós (m) :	0.625
SI. Sobreespesor muro en intradós (m) :	0.000
P. Puntera zapata (m) :	1.500
T. Talón zapata (m) :	4.575
Ht. Altura muro (m) :	7.500
Hx. Canto zapata (m) :	1.100
Anchura total cimentación (m) :	7.000
Angulo trasdós muro (°) :	85.236

DEFINICION TERRENO

	X	Y
0. Coordenadas base trasdós (m) :	0.000	0.000
1. Coordenadas coronación trasdós (m) :	-0.625	7.500
2. Coordenadas fin tramo 1 terreno (m) :	4.825	8.863
3. Coordenadas fin tramo 2 terreno (m) :	9.825	8.863
4. Coordenadas fin tramo 3 terreno (m) :	14.825	8.863

COEFICIENTES DE SEGURIDAD

Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
γo (coeficiente combinación variables) :	1.00

Estado Límite Ultimo	
Favorable	Desfavorable

Acciones permanentes (G)	
Peso propio, cargas muertas :	0.90
Acciones permanentes de valor no constante (G*)	
Terreno (peso propio y empujes) :	0.00
Acciones variables (Q)	
Sobrecargas :	0.00

CARACTERISTICAS DEL TERRENO

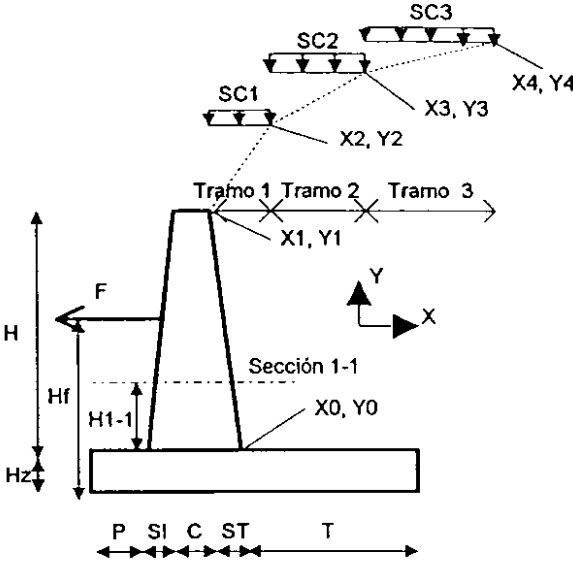
γ. Peso específico (T/m³) :	2.00
φ. Angulo rozamiento interno (°) :	30.000
δmt. Angulo rozamiento muro-tierras (°) :	0.000
δtt. Angulo rozamiento tierras-tierras (°) :	0.000
μ. Coeficiente rozamiento zapata-tierras :	0.580
Tensión admisible cimentación (T/m²) :	20.000

ARMADO

H1-1. Dist. sección 1 a sup. zapata (m) :	1.500
Recubrimiento alzado (m) :	0.050
Recubrimiento cimentación (m) :	0.050

Cuantías mínimas

Vertical muros (1/3 min. cara)(o/oo) :	0.900
Horizontal muros (1/3 min. cara)(o/oo) :	1.600
Cortante o montaje alzado (cm²/m²) :	4.500
Transversal zapata (sup+inf)(o/oo) :	1.447
Longitudinal zapata (sup+inf)(o/oo) :	1.447
Cortante zapata (cm²/m²) :	0.000
Perimetral zapata (en canto)(cm²/m) :	7.959



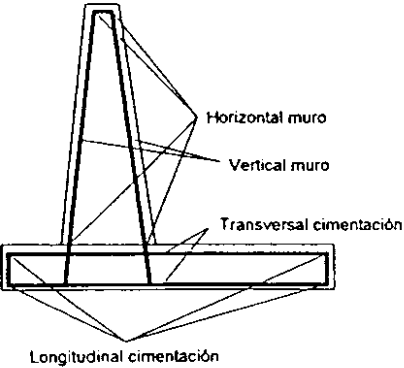
CARGAS (sin mayorar)

Acciones permanentes (G)	
Peso propio barrera coronación (T/m) :	0.000
Acciones permanentes de valor no constante (G*)	
Fg. Carga horizontal sobre muro (T/m) :	0.000
Hfg. Posición Fg a inferior zapata (m) :	0.000

Acciones variables (Q)	
SC1. Sobrecarga en tramo 1 (T/m) :	0.000
SC2. Sobrecarga en tramo 2 (T/m) :	3.000
SC3. Sobrecarga en tramo 3 (T/m) :	3.000
Fq. Carga horizontal sobre muro (T/m) :	0.000
Hfq. Posición Fq a inferior zapata (m) :	0.000

CARACTERISTICAS MATERIALES

Peso específico hormigón (T/m³) :	2.500
Hormigón alzado (T/m³) :	H - 250
Hormigón cimentación (T/m³) :	H - 250
Acero (TP) :	AEH - 500



RESUMEN ACCIONES SOBRE EL MURO

		F.vertical (T / m)	X (m)	F. Horizontal (T / m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 (ΣP i, i=1..3)	8.250	1.794	---	---
	Sobre sección base muro (ΣP i, i=1..3)	11.484	1.833	---	---
	Total peso propio (ΣP i, i=1..6)	30.734	2.877	---	---
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E1'i)	1.296	2.133	15.550	4.600
	Sobre sección base muro (E1i)	2.025	2.217	24.297	3.600
	Total tierras (E2i + ΣT)	80.073	4.613	32.942	3.300
	Verticales sobre talón (ΣT' ij)	75.287	4.765	---	---
	Verticales sobre talón (cortante) (ΣT'' ij)	58.934	5.268	---	---
Fuerza Fg	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fg	---	---	0.000	0.000
Acciones variables (Q)					
Sobrecargas sobre terreno	Sección 1 (E1'sc)	0.115	2.050	1.380	5.600
	Base muro (E1sc)	0.144	2.113	1.726	4.850
	Inf. cimentación (E2sc + ΣS)	0.000	0.000	9.450	4.950
	Verticales sobre talón (ΣS' i, i=1..3)	0.000	0.000	---	---
	Verticales sobre talón (cortante) (ΣS'' ij)	0.000	0.000	---	---
Fuerza Fq	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fq	---	---	0.000	0.000

COMPROBACIONES

SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	17.826	---
Acciones permanentes de valor no constante (G*)		
Tierras	46.442	32.942
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	9.450
Fuerza Fq	---	0.000
TOTAL	64.268	42.393

Csd= 1.516 Vale

SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	88.424	---
Acciones permanentes de valor no constante (G*)		
Tierras	369.389	108.710
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	46.779
Fuerza Fq	---	0.000
TOTAL	457.812	155.489

Csv= 2.944 Vale

TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	30.734	19.146
Acciones permanentes de valor no constante (G*)		
Tierras	80.073	19.575
Fuerza Fg	0.000	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	46.779
Fuerza Fq	0.000	0.000
TOTAL	110.807	85.500

D (m) = 7.00
 σ puntera (T / m²) = 26.30
 σ talón (T / m²) = 5.36
 σ med (T / m²) = 15.83
 σ cob (T / m²) = 20
Vale

ARMADO

Secciones

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	0.93	1.00	0.93
	1-1	1.00	0.80	1.00	0.80
PUNTERA	2-2 f	1.00	1.10	1.00	1.10
	2-2 c	1.00	1.10	1.00	1.10
TALON	3-3 f	1.00	1.10	1.00	1.10
	3-3 c	1.00	1.10	1.00	1.10

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	13.589	101.357	39.034
	0-0 (-)	10.336	1.340	0.000
	1-1 (+)	9.541	53.171	25.396
	1-1 (-)	7.425	0.787	0.000
PUNTERA	2-2 f (+)	0.000	44.140	---
	2-2 f (-)	0.000	4.374	---
	2-2 c (+)	---	---	32.308
	2-2 c (-)	---	---	3.210
TALON	3-3 f (+)	0.000	5.810	---
	3-3 f (-)	-33.348	-160.487	---
	3-3 c (+)	---	---	2.521
	3-3 c (-)	---	---	-47.731

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm ² /m	Minima cm ² /m	Control cálculo	Adoptada cm ² /m
ALZADO	Vert. trasdós	0-0 (+)	26.013	5.550	Vale	26.013
		0-0 (-)	0.000	2.775	Vale	
		1-1 (+)	15.488	4.800	Vale	15.488
		1-1 (-)	0.000	2.400	Vale	
	Vert. intrados	0-0 (+)	0.000	2.775	Vale	2.775
		0-0 (-)	0.000	2.775	Vale	
		1-1 (+)	0.000	2.400	Vale	
		1-1 (-)	0.000	2.400	Vale	
	Hor. trasdós (*)	---	5.203	9.867	Vale	9.867
	Hor. intrados (*)	---	0.000	4.933	Vale	4.933
	Cortante	0-0 (+)	0.000	4.500	Vale	4.500
		0-0 (-)	0.000	4.500	Vale	(cm ² /m ²)
		1-1 (+)	0.000	4.500	Vale	
		1-1 (-)	0.000	4.500	Vale	
PUNTERA	Trans. inferior	2-2 f (+)	9.617	7.959	Vale	9.617
		2-2 f (-)	0.941	7.959	Vale	
	Long. inf. (*)	---	1.923	7.959	Vale	7.959
	Trans. superior	2-2 f (+)	0.000	7.959	Vale	43.965
		2-2 f (-)	0.000	7.959	Vale	
	Long. sup. (*)	---	0.000	7.959	Vale	8.793
	Cortante	2-2 c (+)	0.000	0.000	Vale	0.000
		2-2 c (-)	0.000	0.000	Vale	(cm ² /m ²)
TALON	Trans. inferior	3-3 f (+)	1.250	7.959	Vale	9.617
		3-3 f (-)	0.000	7.959	Vale	
	Long. inf. (*)	---	0.250	7.959	Vale	7.959
	Trans. superior	3-3 f (+)	0.000	7.959	Vale	43.965
		3-3 f (-)	43.965	7.959	Vale	
	Long. sup. (*)	---	8.793	7.959	Vale	8.793
	Cortante	3-3 c (+)	0.000	0.000	Vale	0.000
		3-3 c (-)	0.000	0.000	Vale	(cm ² /m ²)
ZAPATA	Perimetral	---	0.000	7.959	Vale	7.959

(*) Calculada como el 20% de la armadura perpendicular a ella

CALCULO DE MUROS.

NOMBRE PROYECTO : L.A.V. MADRID - ZARAGOZA. Subtramo XV.
 NOMBRE OBRA : Aletas marcos con cobertura. Altura media.

DATOS

GEOMETRIA DE CALCULO DEL MURO

C. Canto del muro en coronación (m) :	0.300
ST. Sobreespesor muro en trasdós (m) :	0.500
SI. Sobreespesor muro en intradós (m) :	0.000
P. Puntera zapata (m) :	1.500
T. Talón zapata (m) :	3.300
H. Altura muro (m) :	6.000
H _z . Canto zapata (m) :	1.100
Anchura total cimentación (m) :	5.600
Angulo trasdós muro (°) :	85.236

DEFINICION TERRENO

	X	Y
0. Coordenadas base trasdós (m) :	0.000	0.000
1. Coordenadas coronación trasdós (m) :	-0.500	6.000
2. Coordenadas fin tramo 1 terreno (m) :	3.550	7.013
3. Coordenadas fin tramo 2 terreno (m) :	7.550	8.013
4. Coordenadas fin tramo 3 terreno (m) :	11.550	9.013

COEFICIENTES DE SEGURIDAD

Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
Ψo (coeficiente combinación variables) :	1.00

Estado Limite Ultimo

Favorable	Desfavorable
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Acciones permanentes (G)

Peso propio, cargas muertas :	0.90	1.50
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Acciones permanentes de valor no constante (G*)

Terrano (peso propio y empujes) :	0.00	1.50
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Acciones variables (Q)

Sobrecargas :	0.00	1.50
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CARACTERISTICAS DEL TERRENO

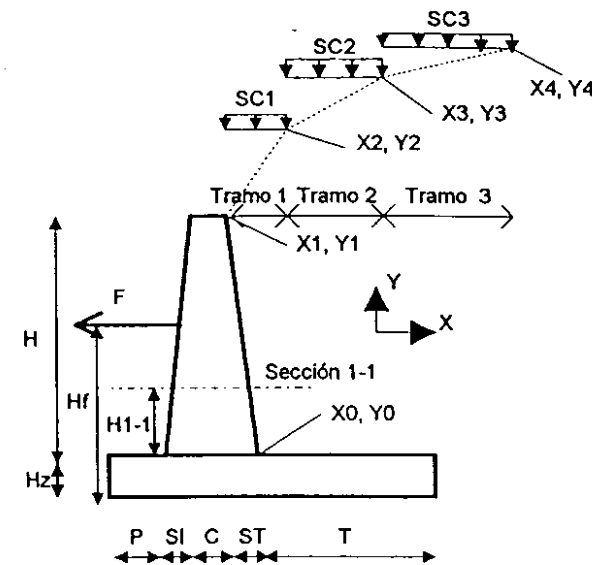
γ. Peso específico (T/m³) :	2.00
φ. Angulo rozamiento interno (°) :	30.000
δmt. Angulo rozamiento muro-tierras (°) :	0.000
φtt. Angulo rozamiento tierras-tierras (°) :	0.000
μ. Coeficiente rozamiento zapata-tierras :	0.580
Tensión admisible cimentación (T/m²) :	20.000

ARMADO

H1-1. Dist. sección 1 a sup. zapata (m) :	0.000
Recubrimiento alzado (m) :	0.050
Recubrimiento cimentación (m) :	0.050

Cuantías mínimas

Vertical muros (1/3 min. cara)(o/oo) :	0.900
Horizontal muros (1/3 min. cara)(o/oo) :	1.600
Cortante o montaje alzado (cm²/m²) :	4.500
Transversal zapata (sup+inf)(o/oo) :	1.447
Longitudinal zapata (sup+inf)(o/oo) :	1.447
Cortante zapata (cm²/m²) :	0.000
Perimetral zapata (en canto)(cm²/m) :	7.959



CARGAS (sin mayorar)

Acciones permanentes (G)

Peso propio barrera coronación (T/m) :	0.000
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Acciones permanentes de valor no constante (G*)

Fg. Carga horizontal sobre muro (T/m) :	0.000
---	-------

Hfg. Posición Fg a inferior zapata (m) :	0.000
--	-------

Acciones variables (Q)

SC1. Sobrecarga en tramo 1 (T/m) :	0.000
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SC2. Sobrecarga en tramo 2 (T/m) :	0.000
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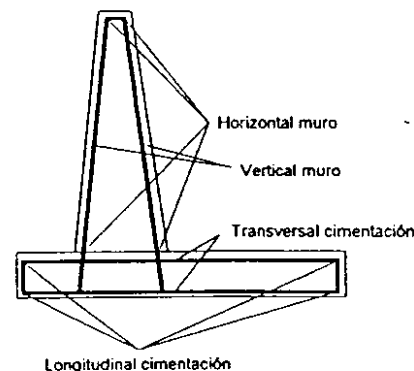
SC3. Sobrecarga en tramo 3 (T/m) :	0.000
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Fq. Carga horizontal sobre muro (T/m) :	0.000
---	-------

Hfq. Posición Fq a inferior zapata (m) :	0.000
--	-------

CARACTERISTICAS MATERIALES

Peso específico hormigón (T/m³) :	2.500
Hormigón alzado (T/m³) :	H - 250
Hormigón cimentación (T/m³) :	H - 250
Acero (T/P) :	AEH - 500



RESUMEN ACCIONES SOBRE EL MURO

		F.vertical (T / m)	X (m)	F. Horizontal (T / m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 (ΣP _i , i=1..3)	8.250	1.794	---	---
	Sobre sección base muro (ΣP _i , i=1..3)	8.250	1.794	---	---
	Total peso propio (ΣP _i , i=1..6)	23.650	2.449	---	---
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E1't)	1.309	2.133	15.706	3.100
	Sobre sección base muro (E1t)	1.309	2.133	15.706	3.100
	Total tierras (E2t + ΣT)	46.210	3.862	25.600	2.683
	Verticales sobre talón (ΣT' ij)	43.148	3.985	---	---
	Verticales sobre talón (cortante) (ΣT'' ij)	30.009	4.491	---	---
Fuerza Fg	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fg	---	---	0.000	0.000
Acciones variables (Q)					
Sobrecargas sobre terreno	Sección 1 (E1'sc)	0.000	2.050	0.000	4.100
	Base muro (E1sc)	0.000	2.050	0.000	4.100
	Inf. cimentación (E2sc + ΣS)	0.000	0.000	0.000	4.025
	Verticales sobre talón (ΣS' i, i=1..3)	0.000	0.000	---	---
	Verticales sobre talón (cortante) (ΣS'' i)	0.000	0.000	---	---
Fuerza Fq	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fq	---	---	0.000	0.000

COMPROBACIONES**SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)**

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	13.717	---
Acciones permanentes de valor no constante (G')		
Tierras	26.802	25.600
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	---	0.000
TOTAL	40.519	25.600

Csd=	1.583	Vale
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SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	57.920	---
Acciones permanentes de valor no constante (G')		
Tierras	178.463	68.694
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	---	0.000
TOTAL	236.383	68.694

Csv=	3.441	Vale
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TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	23.650	8.300
Acciones permanentes de valor no constante (G')		
Tierras	46.210	19.619
Fuerza Fg	0.000	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	0.000	0.000
TOTAL	69.860	27.919

D (m) =	5.60
σ puntera (T / m²) =	17.82
σ talón (T / m²) =	7.13
σ med (T / m²) =	12.48
σ cob (T / m²) =	14.55
Vale	

ARMADO**Secciones**

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	0.80	1.00	0.80
	1-1	1.00	0.80	1.00	0.80
PUNTERA	2-2 f	1.00	1.10	1.00	1.10
	2-2 c	1.00	1.10	1.00	1.10
TALON	3-3 f	1.00	1.10	1.00	1.10
	3-3 c	1.00	1.10	1.00	1.10

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	9.388	47.447	23.559
	0-0 (-)	7.425	0.787	0.000
	1-1 (+)	9.388	47.447	23.559
	1-1 (-)	7.425	0.787	0.000
PUNTERA	2-2 f (+)	0.000	27.628	---
	2-2 f (-)	0.000	3.254	---
	2-2 c (+)	---	---	20.675
	2-2 c (-)	---	---	2.444
TALON	3-3 f (+)	0.000	4.665	---
	3-3 f (-)	-19.468	-61.138	---
	3-3 c (+)	---	---	1.766
	3-3 c (-)	---	---	-23.683

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm2/m	Minima cm2/m	Control cálculo	Adoptada cm2/m
ALZADO	Vert. trasdós	0-0 (+)	13.655	4.800	Vale	13.655
		0-0 (-)	0.000	2.400	Vale	
		1-1 (+)	13.655	4.800	Vale	
		1-1 (-)	0.000	2.400	Vale	
	Vert. intradós	0-0 (+)	0.000	2.400	Vale	2.400
		0-0 (-)	0.000	2.400	Vale	
		1-1 (+)	0.000	2.400	Vale	
		1-1 (-)	0.000	2.400	Vale	
	Hor. trasdós (*)	---	2.731	8.533	Vale	8.533
	Hor. intradós (*)	---	0.000	4.267	Vale	4.267
	Cortante	0-0 (+)	0.000	4.500	Vale	4.500 (cm²/m²)
		0-0 (-)	0.000	4.500	Vale	
		1-1 (+)	0.000	4.500	Vale	
PUNTERA	Trans. inferior	2-2 f (+)	5.987	7.959	Vale	7.959
		2-2 f (-)	0.699	7.959	Vale	
	Long. inf. (*)	---	1.197	7.959	Vale	7.959
	Trans. superior	2-2 f (+)	0.000	7.959	Vale	17.787
		2-2 f (-)	0.000	7.959	Vale	
	Long. sup. (*)	---	0.000	7.959	Vale	7.959
	Cortante	2-2 c (+)	0.000	0.000	Vale	0.000 (cm²/m²)
		2-2 c (-)	0.000	0.000	Vale	
TALON	Trans. inferior	3-3 f (+)	1.003	7.959	Vale	7.959
		3-3 f (-)	0.000	7.959	Vale	
	Long. inf. (*)	---	0.201	7.959	Vale	7.959
	Trans. superior	3-3 f (+)	0.000	7.959	Vale	17.787
		3-3 f (-)	17.787	7.959	Vale	
	Long. sup. (*)	---	3.557	7.959	Vale	7.959
	Cortante	3-3 c (+)	0.000	0.000	Vale	0.000 (cm²/m²)
		3-3 c (-)	0.000	0.000	Vale	
ZAPATA	Perimetral	---	0.000	7.959	Vale	7.959

(*) Calculada como el 20% de la armadura perpendicular a ella

CALCULO DE MUROS.

NOMBRE PROYECTO :	L.A.V. MADRID - ZARAGOZA. Subtramo XV.
NOMBRE OBRA :	Aletas marcos con cobertura. Altura mínima.

DATOS

GEOMETRIA DE CALCULO DEL MURO	
C. Canto del muro en coronación (m) :	0.300
ST. Sobreespesor muro en trasdós (m) :	0.333
Sl. Sobreespesor muro en intradós (m) :	0.000
P. Puntera zapata (m) :	1.500
T. Talón zapata (m) :	1.867
H. Altura muro (m) :	4.000
H _z . Canto zapata (m) :	1.100
Anchura total cimentación (m) :	4.000
Angulo trasdós muro (°) :	85.236

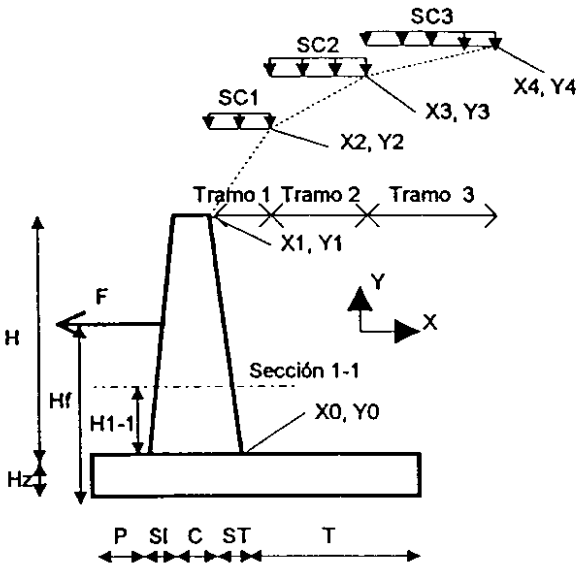
DEFINICION TERRENO		
	X	Y
0. Coordenadas base trasdós (m) :	0.000	0.000
1. Coordenadas coronación trasdós (m) :	-0.333	4.000
2. Coordenadas fin tramo 1 terreno (m) :	3.667	5.000
3. Coordenadas fin tramo 2 terreno (m) :	6.333	5.667
4. Coordenadas fin tramo 3 terreno (m) :	9.000	6.333

COEFICIENTES DE SEGURIDAD	
Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
Ψ _o (coeficiente combinación variables) :	1.00

	Estado Límite Último	
	Favorable	Desfavorable
Acciones permanentes (G)		
Peso propio, cargas muertas :	0.90	1.50
Acciones permanentes de valor no constante (G*)		
Terreno (peso propio y empujes) :	0.00	1.50
Acciones variables (Q)		
Sobrecargas :	0.00	1.50

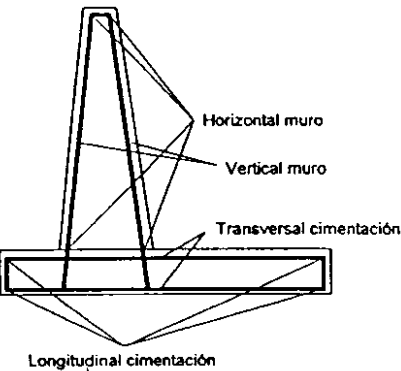
CARACTERISTICAS DEL TERRENO	
γ. Peso específico (T/m³) :	2.00
φ. Angulo rozamiento interno (°) :	30.000
δ _{mt} . Angulo rozamiento muro-terras (°) :	0.000
δ _{tt} . Angulo rozamiento tierras-terras (°) :	0.000
μ. Coeficiente rozamiento zapata-terras :	0.580
Tensión admisible cimentación (T/m²) :	20.000

ARMADO	
H1-1. Dist. sección 1 a sup. zapata (m) :	0.000
Recubrimiento alzado (m) :	0.050
Recubrimiento cimentación (m) :	0.050
Cuantías mínimas	
Vertical muros (1/3 mín. cara)(o/oo) :	0.900
Horizontal muros (1/3 mín. cara)(o/oo) :	1.600
Cortante o montaje alzado (cm²/m²) :	4.500
Transversal zapata (sup+inf)(o/oo) :	1.447
Longitudinal zapata (sup+inf)(o/oo) :	1.447
Cortante zapata (cm²/m²) :	0.000
Perimetral zapata (en canto)(cm²/m) :	7.959



CARGAS (sin mayorar)	
Acciones permanentes (G)	
Peso propio barrera coronación (T/m) :	0.000
Acciones permanentes de valor no constante (G*)	
Fg. Carga horizontal sobre muro (T/m) :	0.000
Htg. Posición Fg a inferior zapata (m) :	0.000
Acciones variables (Q)	
SC1. Sobrecarga en tramo 1 (T/m) :	0.000
SC2. Sobrecarga en tramo 2 (T/m) :	0.000
SC3. Sobrecarga en tramo 3 (T/m) :	0.000
Fq. Carga horizontal sobre muro (T/m) :	0.000
Hfq. Posición Fq a inferior zapata (m) :	0.000

CARACTERISTICAS MATERIALES	
Peso específico hormigón (T/m³) :	2.500
Hormigón alzado (T/m³) :	H - 250
Hormigón cimentación (T/m³) :	H - 250
Acero (TF) :	AEH - 500



RESUMEN ACCIONES SOBRE EL MURO

		F.vertical (T / m)	X (m)	F. Horizontal (T / m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 (ΣP i, i=1..3)	4.667	1.743	---	---
	Sobre sección base muro (ΣP i, i=1..3)	4.667	1.743	---	---
	Total peso propio (ΣP i, i=1..6)	15.667	1.924	---	---
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E1'i)	0.578	2.022	6.931	2.433
	Sobre sección base muro (E1t)	0.578	2.022	6.931	2.433
	Total tierras (E2t + ΣT)	17.477	3.001	12.622	1.883
	Verticales sobre talón (ΣT' ij)	16.116	3.083	---	---
	Verticales sobre talón (cortante) (ΣT'' ij)	11.759	3.338	---	---
Fuerza Fg	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fg	---	---	0.000	0.000
Acciones variables (Q)					
Sobrecargas sobre terreno	Sección 1 (E1'sc)	0.000	1.967	0.000	3.100
	Base muro (E1sc)	0.000	1.967	0.000	3.100
	Inf. cimentación (E2sc + ΣS)	0.000	0.000	0.000	2.825
	Verticales sobre talón (ΣS' i, i=1..3)	0.000	0.000	---	---
	Verticales sobre talón (cortante) (ΣS'' i)	0.000	0.000	---	---
Fuerza Fq	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fq	---	---	0.000	0.000

COMPROBACIONES

SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	9.087	---
Acciones permanentes de valor no constante (G*)		
Tierras	10.136	12.622
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	---	0.000

TOTAL 19.223 12.622

Csd= 1.523 Vale

SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	30.135	---
Acciones permanentes de valor no constante (G*)		
Tierras	52.445	23.771
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	---	0.000

TOTAL 82.580 23.771

Csv= 3.474 Vale

TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	15.667	1.198
Acciones permanentes de valor no constante (G*)		
Tierras	17.477	6.280
Fuerza Fg	0.000	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	0.000	0.000

TOTAL 33.143 7.478

D (m) = 4.00
 σ puntera (T / m²) = 11.09
 σ talón (T / m²) = 5.48
 σ med (T / m²) = 8.29
 σ cob (T / m²) = 9.34
 Vale

ARMADO

Secciones

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	0.63	1.00	0.63
	1-1	1.00	0.63	1.00	0.63
PUNTERA	2-2 f	1.00	1.10	1.00	1.10
	2-2 c	1.00	1.10	1.00	1.10
TALON	3-3 f	1.00	1.10	1.00	1.10
	3-3 c	1.00	1.10	1.00	1.10

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	5.066	13.993	10.397
	0-0 (-)	4.200	0.308	0.000
	1-1 (+)	5.066	13.993	10.397
	1-1 (-)	4.200	0.308	0.000
PUNTERA	2-2 f (+)	0.000	14.491	---
	2-2 f (-)	0.000	1.713	---
	2-2 c (+)	---	---	11.198
	2-2 c (-)	---	---	1.322
TALON	3-3 f (+)	0.000	2.494	---
	3-3 f (-)	-7.437	-15.733	---
	3-3 c (+)	---	---	1.747
	3-3 c (-)	---	---	-10.947

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm2/m	Minima cm2/m	Control cálculo	Adoptada cm2/m
ALZADO	Vert. trasdós	0-0 (+)	4.886	3.800	Vale	4.886
		0-0 (-)	0.000	1.900	Vale	
		1-1 (+)	4.886	3.800	Vale	4.886
		1-1 (-)	0.000	1.900	Vale	
	Vert. intradós	0-0 (+)	0.000	1.900	Vale	1.900
		0-0 (-)	0.000	1.900	Vale	
		1-1 (+)	0.000	1.900	Vale	
		1-1 (-)	0.000	1.900	Vale	
	Hor. trasdós (*)	---	0.977	6.756	Vale	6.756
		---	0.000	3.378	Vale	3.378
	Cortante	0-0 (+)	0.000	4.500	Vale	4.500
		0-0 (-)	0.000	4.500	Vale	(cm²/m²)
		1-1 (+)	0.000	4.500	Vale	
		1-1 (-)	0.000	4.500	Vale	
PUNTERA	Trans. inferior	2-2 f (+)	3.126	7.959	Vale	7.959
		2-2 f (-)	0.368	7.959	Vale	
	Long. inf. (*)	---	0.625	7.959	Vale	7.959
		---	0.000	7.959	Vale	7.959
	Trans. superior	2-2 f (+)	0.000	7.959	Vale	7.959
		2-2 f (-)	0.000	7.959	Vale	
	Long. sup. (*)	---	0.000	7.959	Vale	7.959
		---	0.000	0.000	Vale	0.000
TALON	Cortante	2-2 c (+)	0.000	0.000	Vale	(cm²/m²)
		2-2 c (-)	0.000	0.000	Vale	
	Trans. inferior	3-3 f (+)	0.536	7.959	Vale	7.959
		3-3 f (-)	0.000	7.959	Vale	
	Long. inf. (*)	---	0.107	7.959	Vale	7.959
		---	0.000	7.959	Vale	7.959
	Trans. superior	3-3 f (+)	0.000	7.959	Vale	7.959
		3-3 f (-)	5.073	7.959	Vale	
	Long. sup. (*)	---	1.015	7.959	Vale	7.959
		---	0.000	0.000	Vale	0.000
ZAPATA	Perimetral	3-3 c (+)	0.000	0.000	Vale	(cm²/m²)
		3-3 c (-)	0.000	0.000	Vale	

(*) Calculada como el 20% de la armadura perpendicular a ella

4.4.9 Pasos inferiores E-1516.9.2 y EVN3-2-7

PASOS INFERIORES E-1516.9.2 Y EVN3-2.7

INDICE

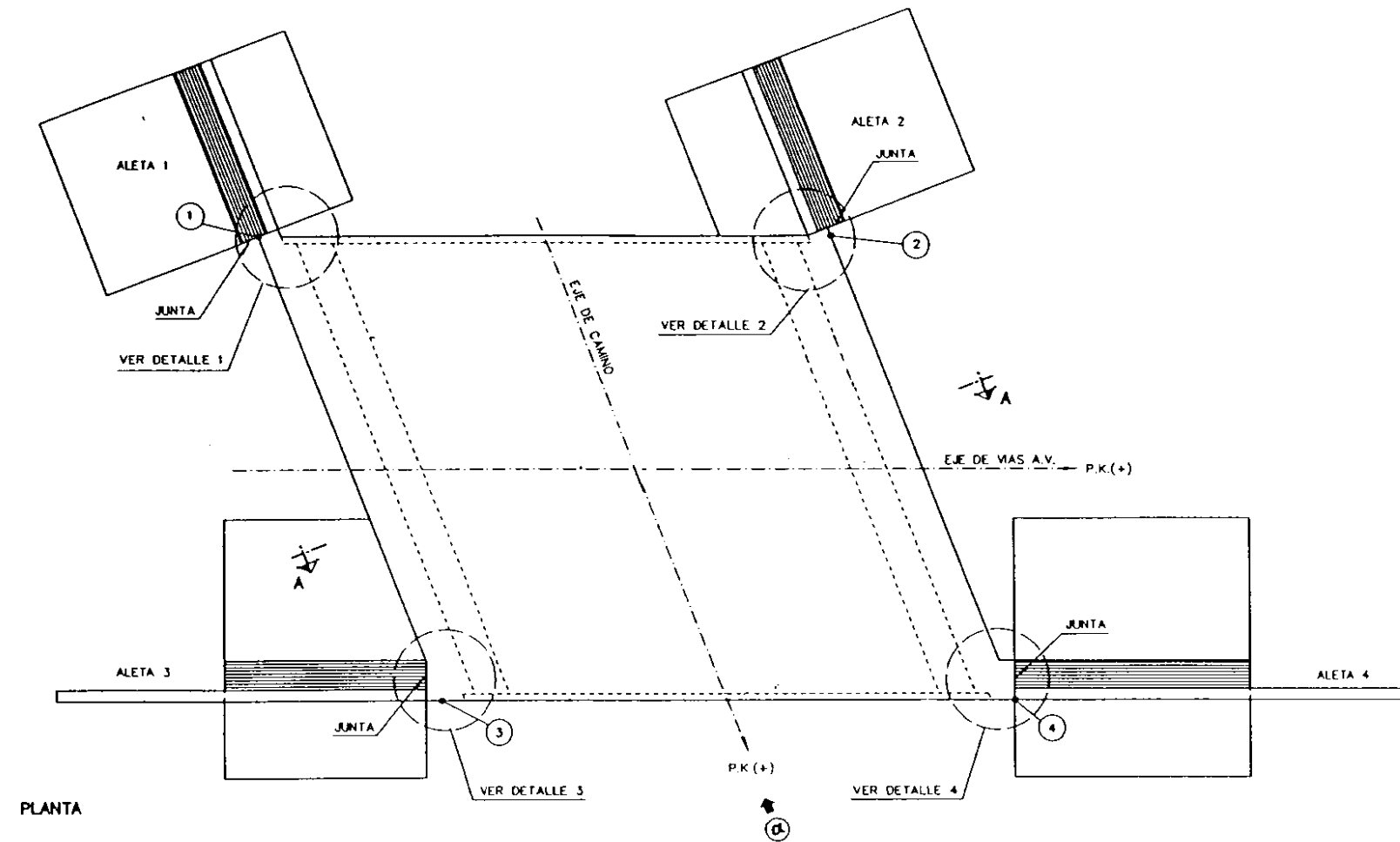
1º DEFINICION GEOMETRICA

2º CALCULOS

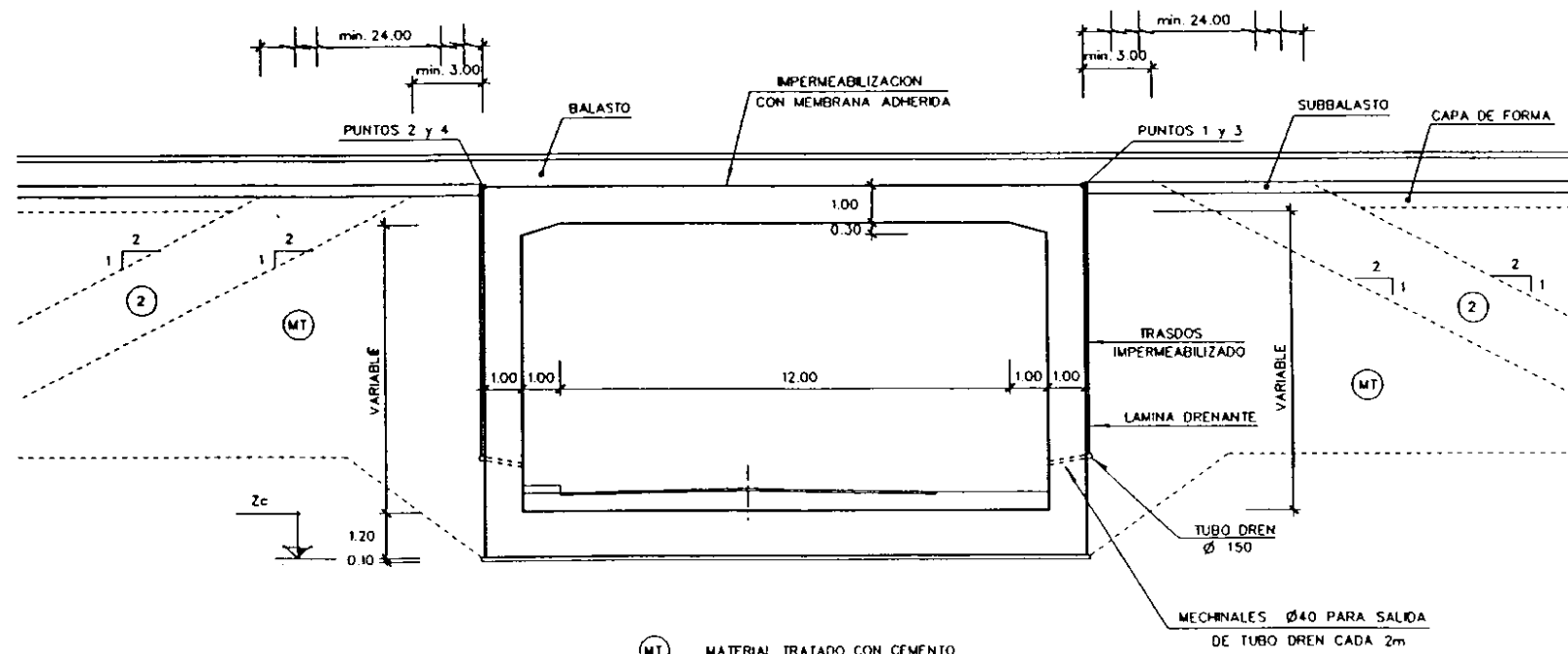
PASOS INFERIORES E-1516.9.2 Y EVN3-2.7

1º DEFINICION GEOMETRICA

DEFINICION GEOMETRICA ESTRUCTURA E-1516.9.2

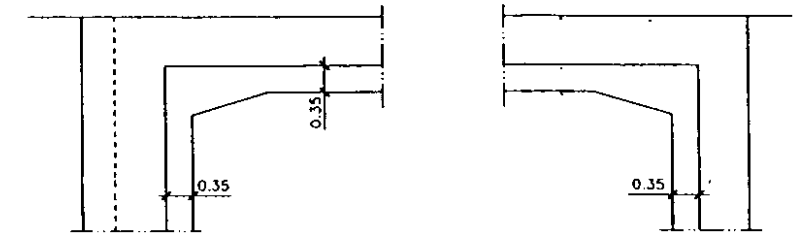


PLANTA



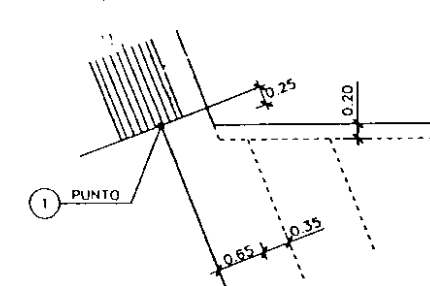
- (MT) MATERIAL TRATADO CON CEMENTO
- (2) QS3

SECCION A-A

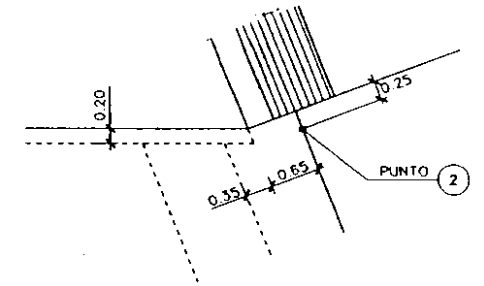


ALZADO POR α

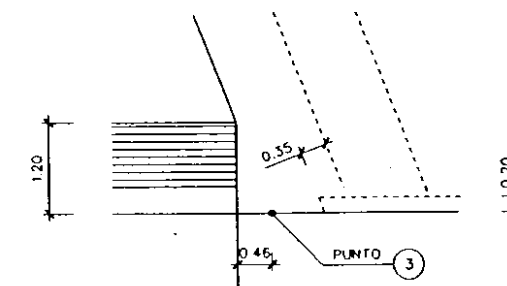
PUNTOS DE REPLANTEO			
PUNTO	X	Y	Z
1	680472.801	4607368.648	228.518
2	680488.092	4607360.869	228.518
3	680471.281	4607353.714	228.518
4	680486.572	4607345.935	228.518



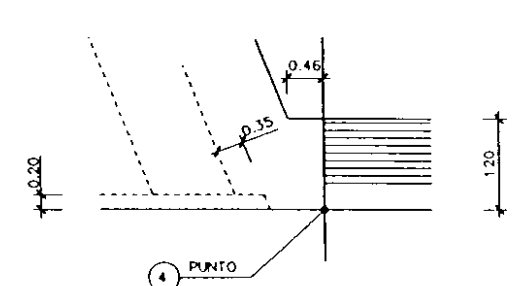
DETALLE 1. PLANTA



DETALLE 2. PLANTA

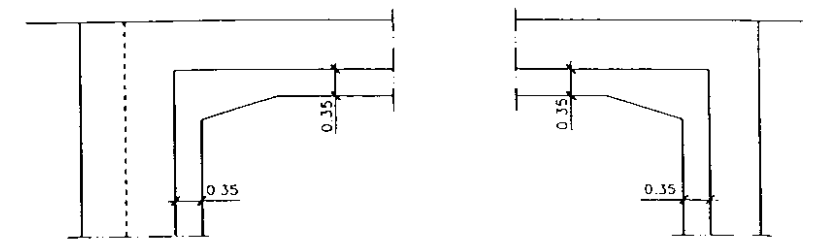
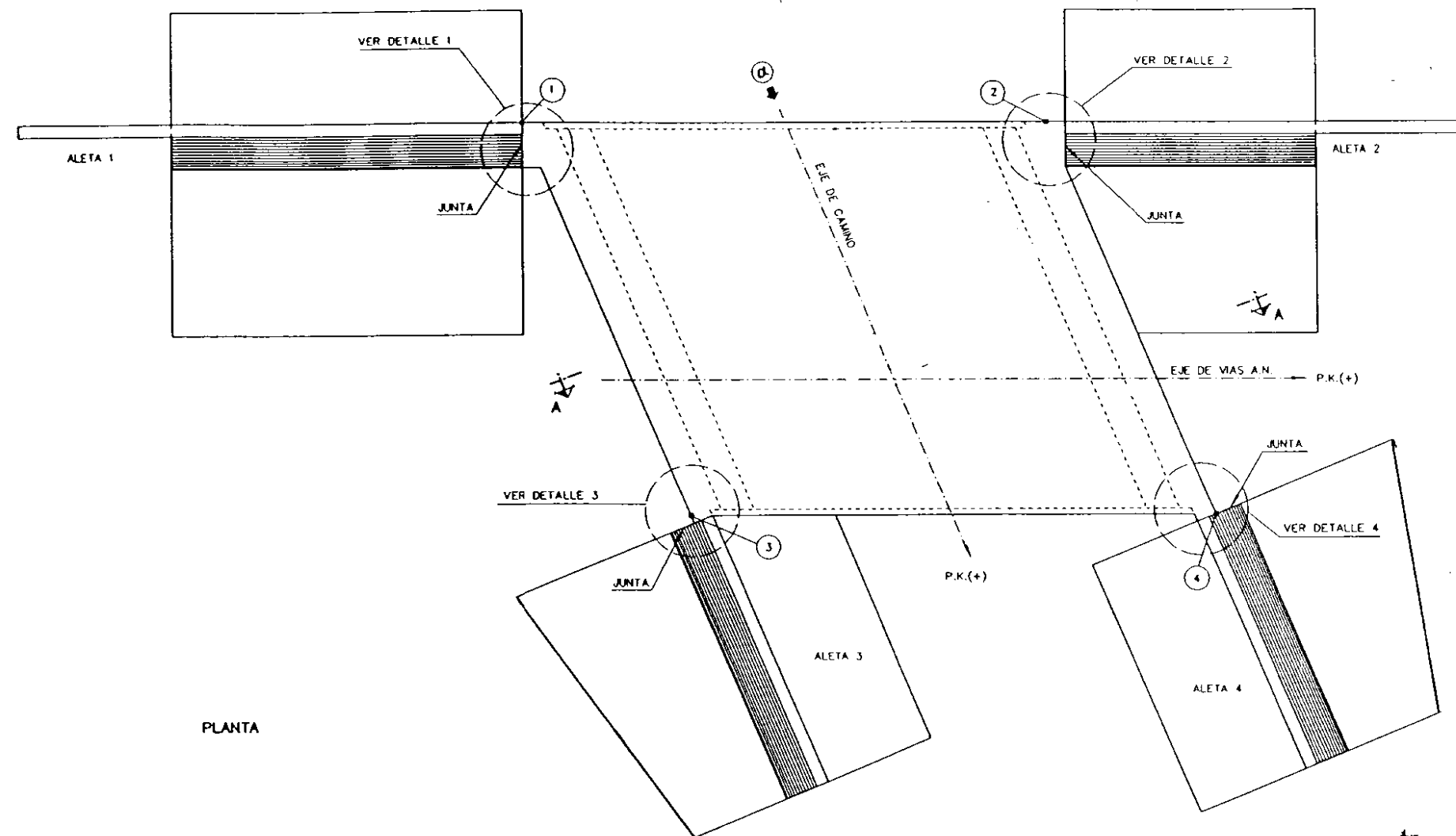


DETALLE 3. PLANTA

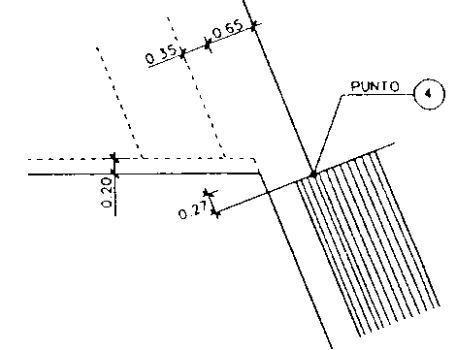
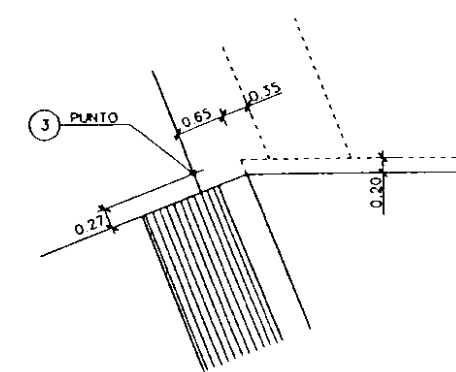
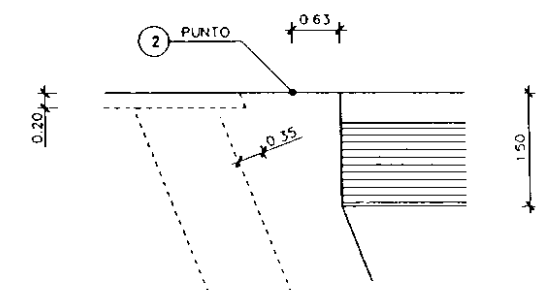
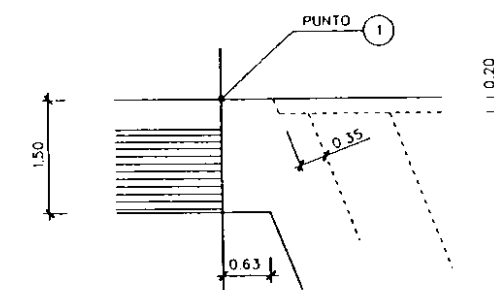
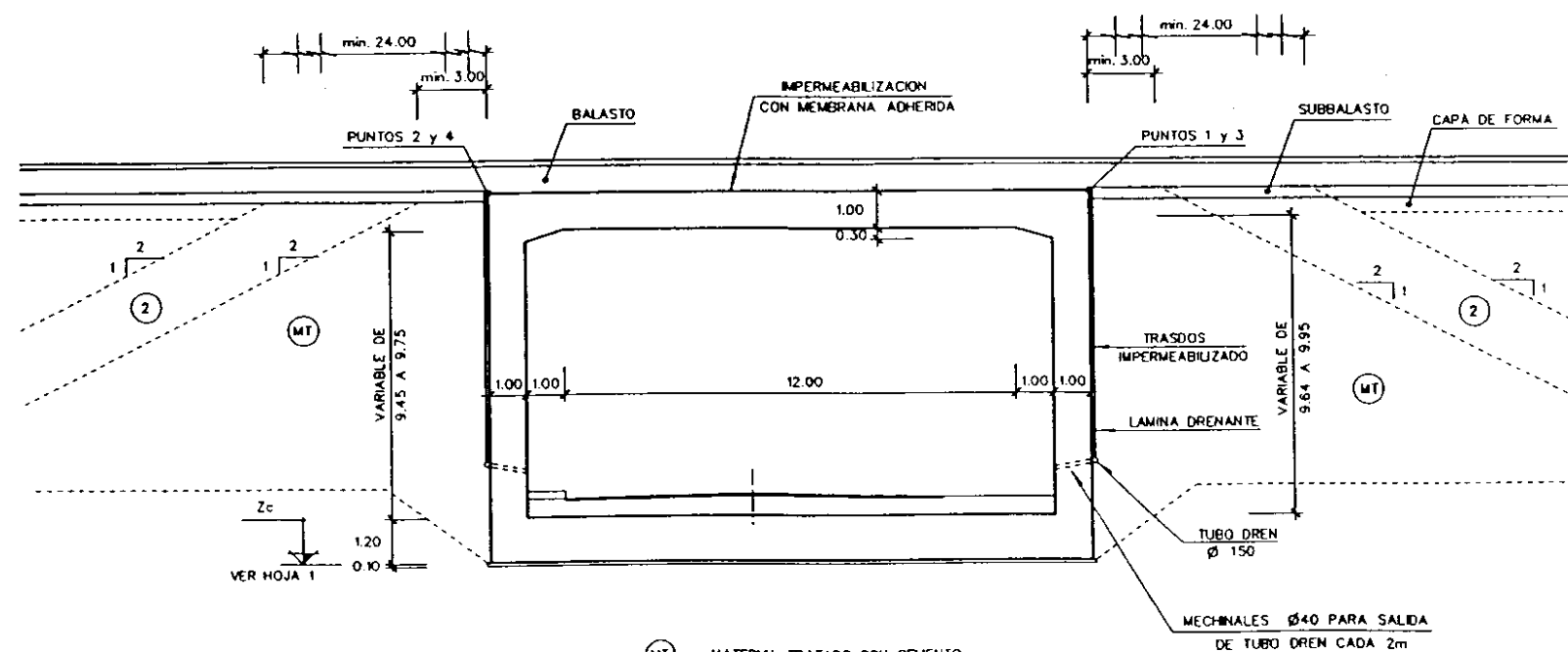


DETALLE 4. PLANTA

DEFINICION GEOMETRICA ESTRUCTURA EVN3-2.7

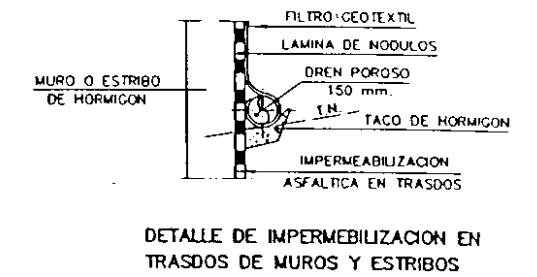
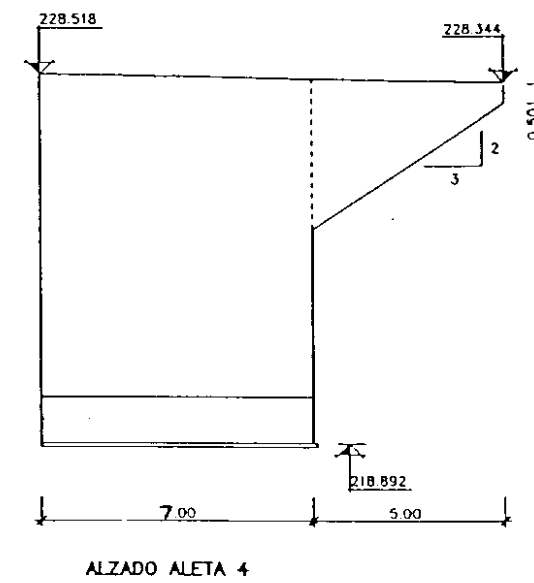
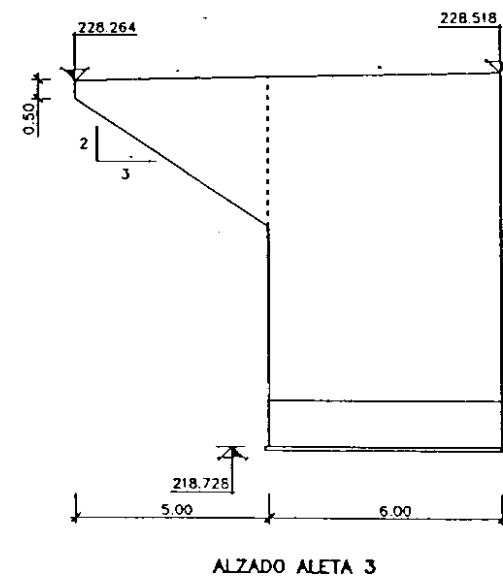
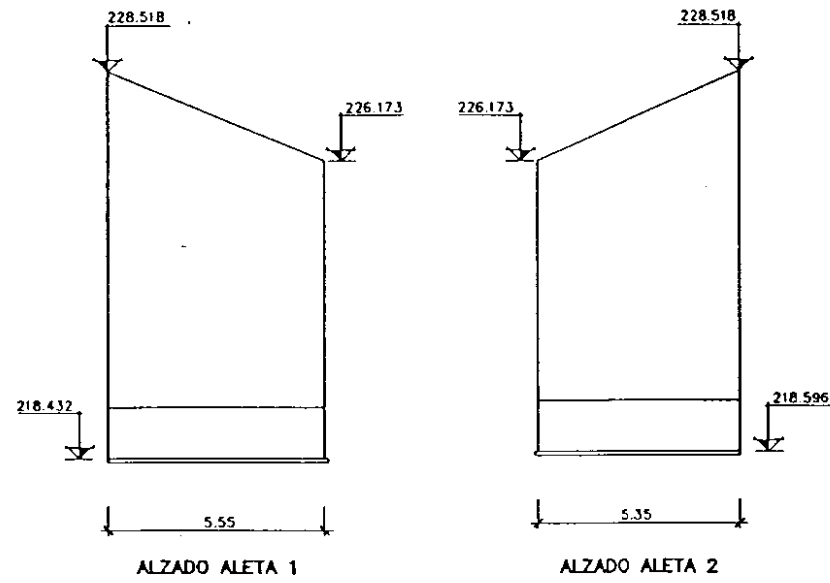


PUNTO	X	Y	Z
1	680475.731	4607397.433	230.120
2	680490.969	4607389.139	230.120
3	680474.304	4607383.415	230.120
4	680489.541	4607375.104	230.120

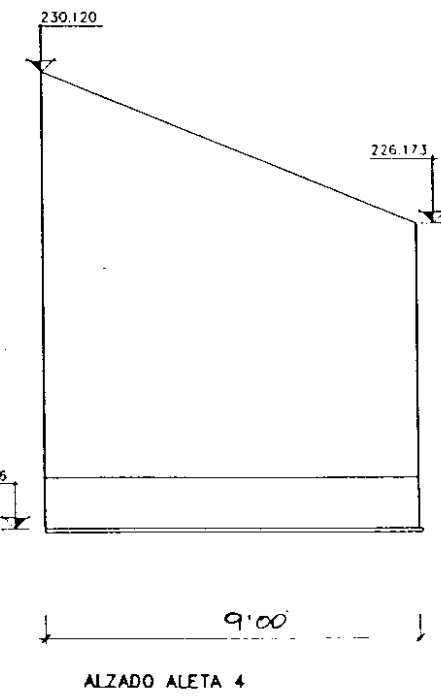
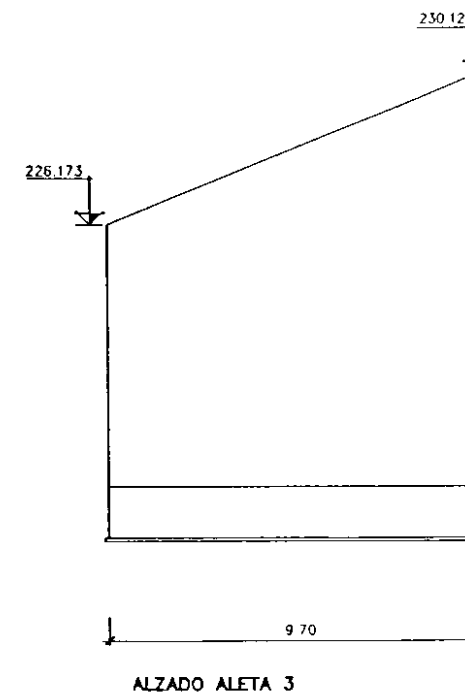
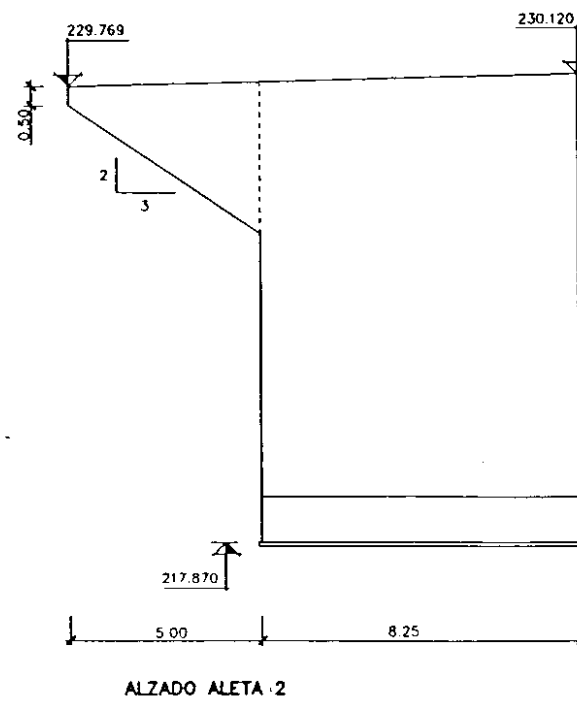
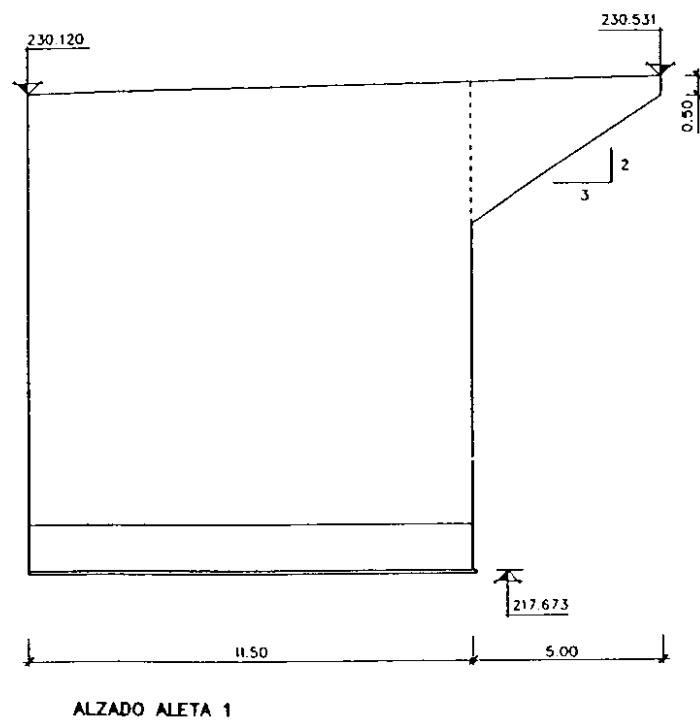


- (MT) MATERIAL TRATADO CON CEMENTO
- (2) 053

ALETAS ESTRUCTURA E-1516.9.2

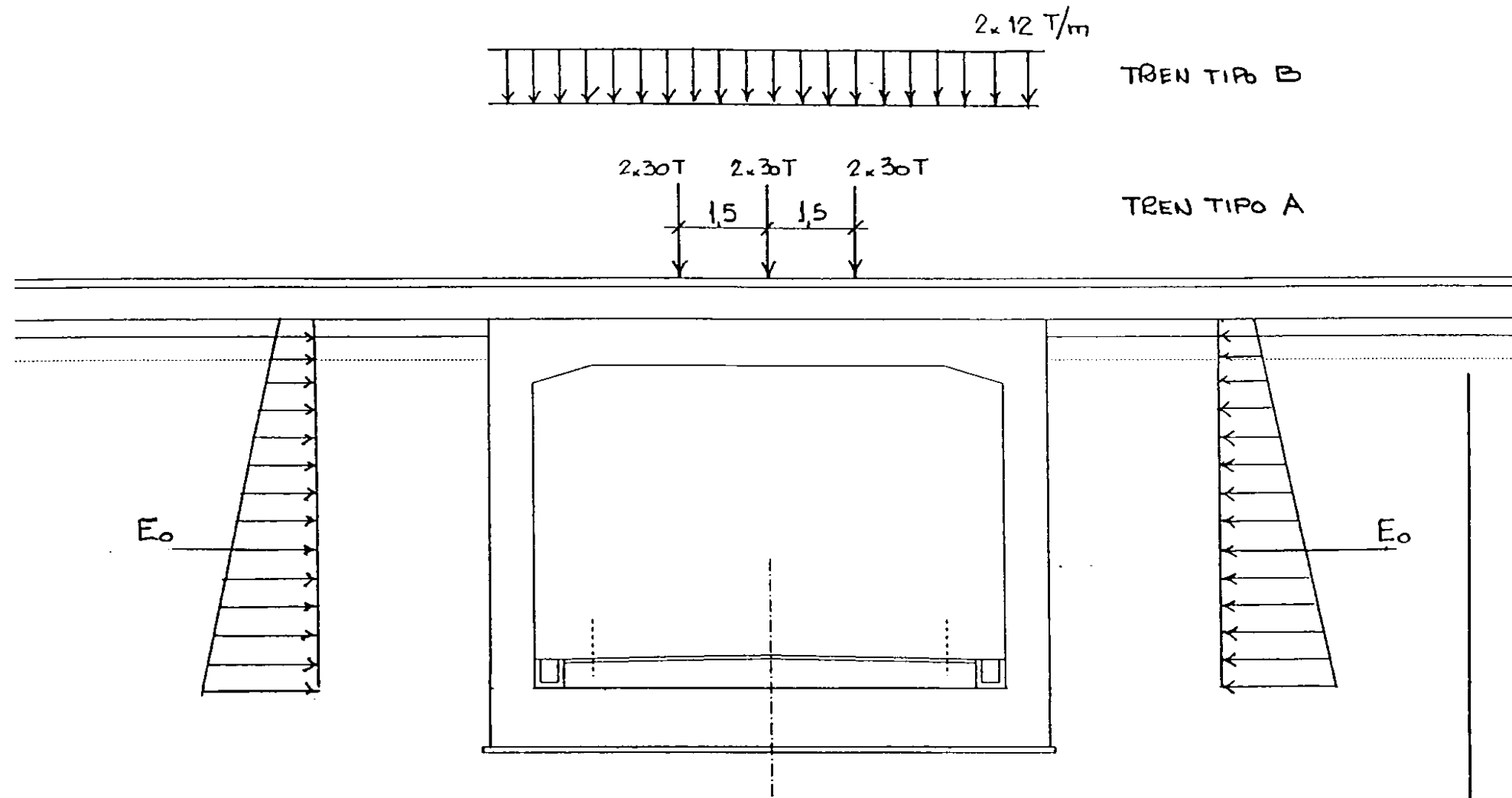


ALETAS ESTRUCTURA EVN3-2.7



PASOS INFERIORES E-1516.9.2 Y EVN3-2.7

2º CALCULOS



Coef. Impacto

$$V = 200 \text{ km/h}$$

$$T = 0,05 \text{ seg.}$$

$$L = 8,80 \text{ m}$$

$$\mu = \frac{VT}{2L} = 0,57$$

$$I = 65 \frac{\mu}{1 - \mu + \mu^2} = 50$$

$$\phi_0 = 1,50$$

CARGAS PERMANENTES (g)

$$g: \text{Riel + Travesaños: } \frac{0,12 \text{ T/m} + 0,52 \text{ T/m}}{2,4 \text{ m}} = 0,24 \text{ T/m}^2$$

$$\text{Balasto: } 0,8 \text{ m} \times 1,6 \text{ T/m}^3 = \frac{1,28 \text{ T/m}^2}{1,55 \text{ T/m}^2 + \text{Peso Propio Pórtico}}$$

SOBRECARGAS (CARGAS VARIABLES)• Tren: TREN TIPO A (Q_A)TREN TIPO B (Q_B)• Empuje Terreno: (E_0)

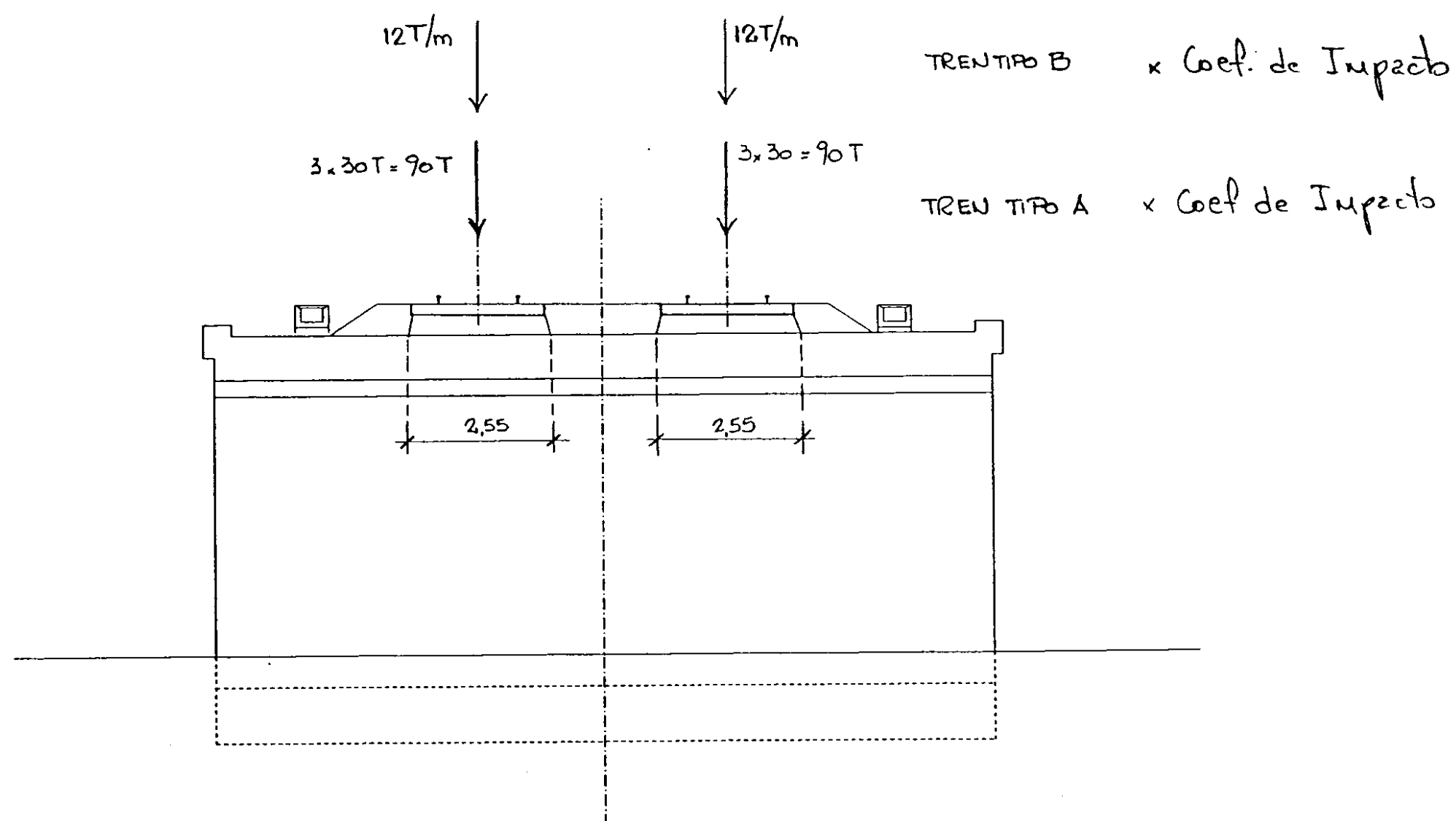
ESTADO LIMITE ULTIMO

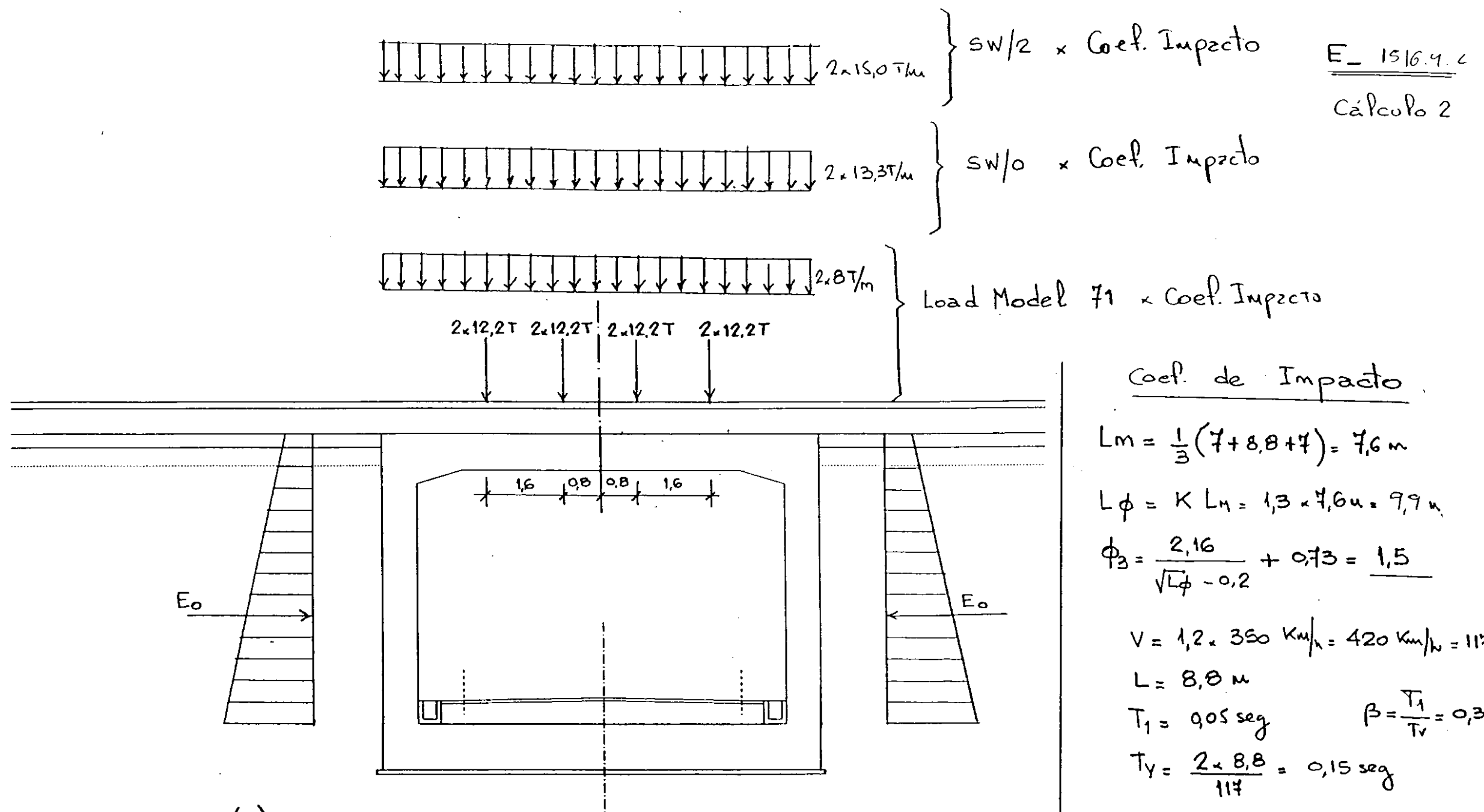
$$S_d = 1,5 [g] + 1,5 \text{ ó } 0,0 [Q_A \text{ ó } Q_B] + 1,5 \text{ ó } 0,0 [E_0]$$

ESTADOS LIMITES DE SERVICIO

$$S_k = 1,0 [g] + 1,0 \text{ ó } 0,0 [Q_A \text{ ó } Q_B] + 1,0 \text{ ó } 0,0 [E_0]$$

E - 1516.92
Cálculo 1





Coef. de Impacto

$$L_m = \frac{1}{3}(7 + 8,8 + 7) = 7,6 \text{ m}$$

$$L_\phi = K L_m = 1,3 \times 7,6 \text{ m} = 9,9 \text{ m}$$

$$\phi_3 = \frac{2,16}{\sqrt{L_\phi} - 0,2} + 0,73 = 1,5$$

$$V = 1,2 \times 350 \text{ km/h} = 420 \text{ km/h} = 117 \text{ m/s}$$

$$L = 8,8 \text{ m}$$

$$T_1 = 0,05 \text{ seg} \quad \beta = \frac{T_1}{T_v} = 0,33$$

$$T_y = \frac{2 \times 8,8}{117} = 0,15 \text{ seg}$$

$$\frac{f_{din}}{f_{est}} = \frac{1 + \beta}{1 - \beta^2} = 1,5$$

$$\text{COEF. DE IMPACTO} = 1,50$$

CARGAS PERMANENTES (g)

- Peso propio y elementos no estructurales

$$\text{RIEL Y TRAVIESAS} \quad \frac{0,12 \text{ T/m} + 0,52 \text{ T/m}}{2,4 \text{ m}} = 0,27 \text{ T/m}^2$$

$$\text{BALASTO} \quad 0,8 \text{ m} \times 1,6 \text{ T/m}^3 = 1,28 \text{ T/m}^2$$

$$1,55 \text{ T/m}^2 + \text{Peso propio pórtico}$$

- Empuje del Terreno: (E0)

SOBRECARGAS (Q)

$$\text{LOAD Model 71} \quad [Q_{LM71}]$$

$$\text{SW/0} \quad [Q_{SW/0}]$$

$$\text{SW/2} \quad [Q_{SW/2}]$$

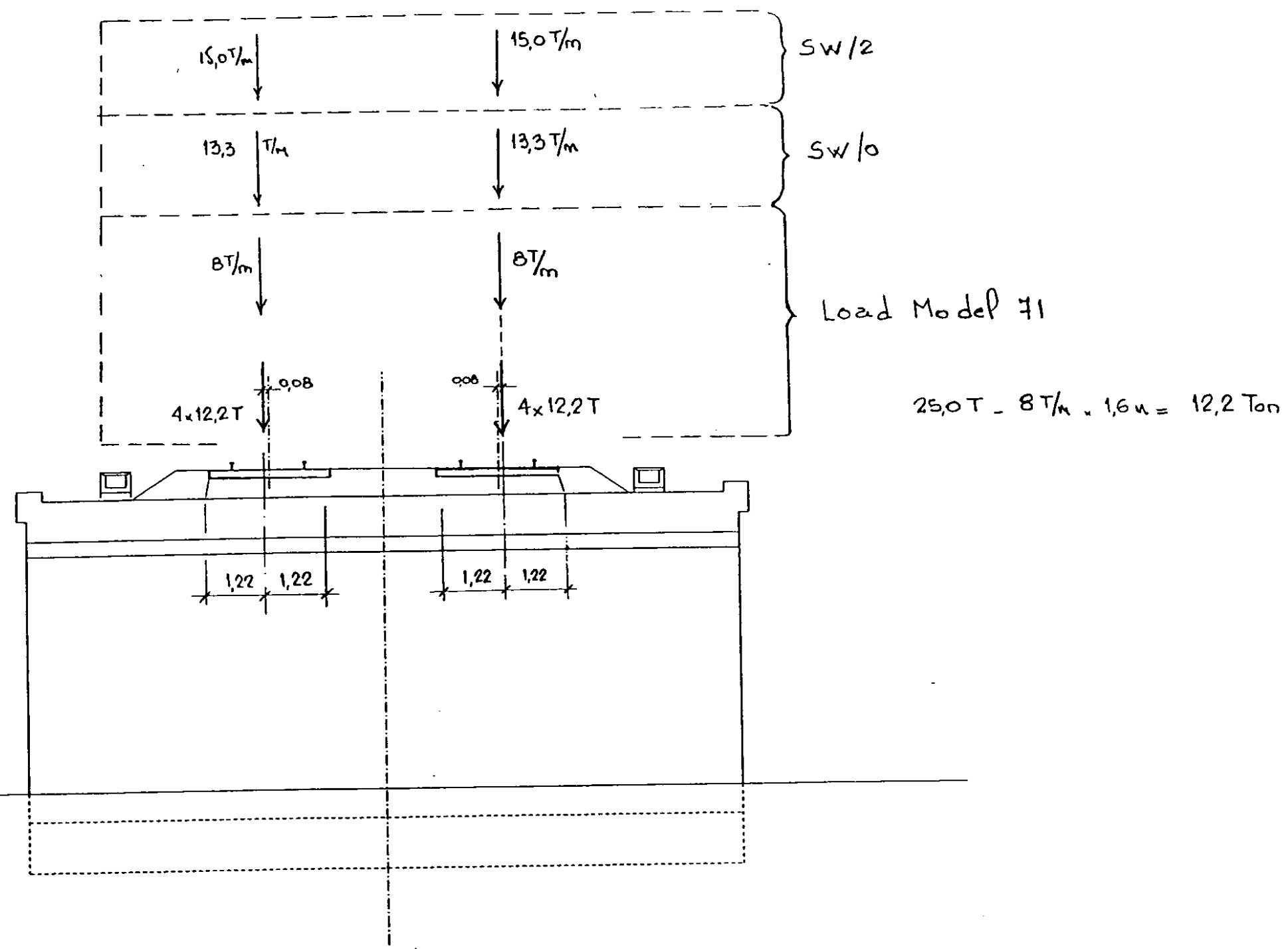
ESTADO LIMITE ÚLTIMO

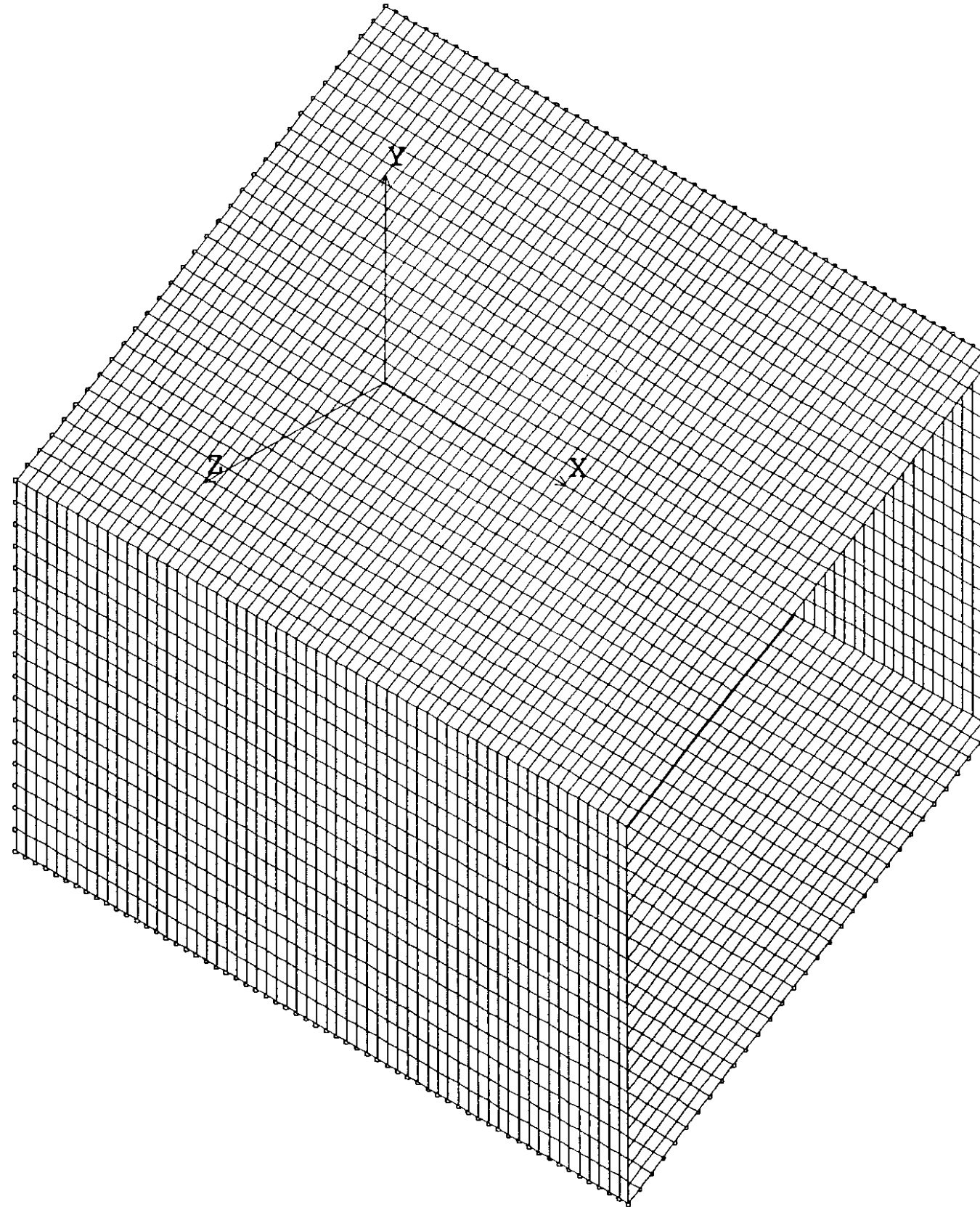
$$S_d = 1,35 [g] + \frac{1,00}{1,35} [E_0] + \begin{cases} 1,45 [Q_{LM71}] \\ 1,45 [Q_{SW/0}] \\ 1,20 [Q_{SW/2}] \end{cases}$$

ESTADOS LIMITES DE SERVICIO

$$S_k = 1,00 [g] + 1,00 [E_0] + 1,00 [Q_{LM71}]$$

E- 1516.9.2
Cálculo 2





```

*****
*****
**
**
** CCCC  OOOO  SSSS  M    M  OOOO  SSSS  /  M    M  **
** C      O  O  S      MM   MM  O  O  S      /  MM   MM  **
** C      O  O  SSSS  M M M M  O  O  SSSS  /  M M M M  **
** C      O  O      S  M  M M  O  O      S  /  M  M M  **
** CCCC  OOOO  SSSS  M      M  OOOO  SSSS  /      M    M  **
**
**
**                                VERSION: 2.00
**                                DISTRIBUTED BY:
**                                STRUCTURAL RESEARCH AND ANALYSIS CORPORATION
**                                12121 WILSHIRE BLVD. SUITE 700
**                                LOS ANGELES, CALIFORNIA 90025
**                                TEL. NO. (310) 207-2800
**                                COPYRIGHT 1988 S. R. A. C.
**
*****
*****
Problem name:
Date       :
Title      :
|
Subtitle   :

```

Element group data

Element group number= 1

Element name:

SHELL4T Four node thick shell elements

Type of Shell element= 2

EQ 0; QUAD 2 element

EQ 1; QUAD 4 element

Real constant data

Real constant set 1

Associated with:

SHELL4T Four node thick shell elements

Thickness of the plate = 1.0000

Temperature Gradient = .00000

Real constant set 2

Associated with:

SHELL4T Four node thick shell elements

Thickness of the plate = 1.3000

Temperature Gradient = .00000

Real constant set 3

Associated with:

SHELL4T Four node thick shell elements

Thickness of the plate = 1.2177

Temperature Gradient = .00000

Real constant set 4

Associated with:

SHELL4T Four node thick shell elements

Thickness of the plate = 1.0726

Temperature Gradient = .00000

Real constant set 5

Associated with:

SHELL4T Four node thick shell elements

Thickness of the plate = 1.0000

Temperature Gradient = .00000

Real constant set 6

Associated with:

SHELL4T Four node thick shell elements

Thickness of the plate = 1.2000

Temperature Gradient = .00000

Foundation stiffness = 500.00

Material property data

Material property set 1

	Value	Temp curve no.
EX : X Elastic Modulus	.35000E+07	0
NUXY : Poisson Ratio	.20000	0
DENS : Mass Density	2.5000	0

Nodal input data

NODE BOUNDARY CONDITION CODES NODAL
POINT COORDINATES
(0 = FREE ; 1 = FIXED)

	X	Y	Z	XX	YY	ZZ	X	Y	Z
1	1	0	0	0	0	0	.00000	.00000	.00000
2	1	0	0	0	0	0	.00000	.48235	.00000
3	1	0	0	0	0	0	.00000	.96471	.00000
4	1	0	0	0	0	0	.00000	1.4471	.00000
5	1	0	0	0	0	0	.00000	1.9294	.00000
6	1	0	0	0	0	0	.00000	2.4118	.00000
7	1	0	0	0	0	0	.00000	2.8941	.00000
8	1	0	0	0	0	0	.00000	3.3765	.00000
9	1	0	0	0	0	0	.00000	3.8588	.00000
10	1	0	0	0	0	0	.00000	4.3412	.00000
11	1	0	0	0	0	0	.00000	4.8235	.00000
12	1	0	0	0	0	0	.00000	5.3059	.00000
13	1	0	0	0	0	0	.00000	5.7882	.00000
14	1	0	0	0	0	0	.00000	6.2706	.00000
15	1	0	0	0	0	0	.00000	6.7529	.00000
16	1	0	0	0	0	0	.00000	7.2353	.00000
17	1	0	0	0	0	0	.00000	7.7176	.00000
18	1	0	0	0	0	0	.00000	8.2000	.00000
19	1	0	0	0	0	0	.25000	.00000	.00000
20	1	0	0	0	0	0	.25000	.48235	.00000
21	1	0	0	0	0	0	.25000	.96471	.00000
22	1	0	0	0	0	0	.25000	1.4471	.00000
23	1	0	0	0	0	0	.25000	1.9294	.00000
24	1	0	0	0	0	0	.25000	2.4118	.00000
25	1	0	0	0	0	0	.25000	2.8941	.00000
26	1	0	0	0	0	0	.25000	3.3765	.00000
27	1	0	0	0	0	0	.25000	3.8588	.00000
28	1	0	0	0	0	0	.25000	4.3412	.00000
29	1	0	0	0	0	0	.25000	4.8235	.00000
30	1	0	0	0	0	0	.25000	5.3059	.00000
31	1	0	0	0	0	0	.25000	5.7882	.00000
32	1	0	0	0	0	0	.25000	6.2706	.00000
33	1	0	0	0	0	0	.25000	6.7529	.00000
34	1	0	0	0	0	0	.25000	7.2353	.00000
35	1	0	0	0	0	0	.25000	7.7176	.00000
36	1	0	0	0	0	0	.25000	8.2000	.00000
37	1	0	0	0	0	0	.50000	.00000	.00000
38	1	0	0	0	0	0	.50000	.48235	.00000
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43	1	0	0	0	0	0	.50000	2.8941	.00000
44	1	0	0	0	0	0	.50000	3.3765	.00000
45	1	0	0	0	0	0	.50000	3.8588	.00000
46	1	0	0	0	0	0	.50000	4.3412	.00000
47	1	0	0	0	0	0	.50000	4.8235	.00000
48	1	0	0	0	0	0	.50000	5.3059	.00000
49	1	0	0	0	0	0	.50000	5.7882	.00000
50	1	0	0	0	0	0	.50000	6.2706	.00000
51	1	0	0	0	0	0	.50000	6.7529	.00000
52	1	0	0	0	0	0	.50000	7.2353	.00000
53	1	0	0	0	0	0	.50000	7.7176	.00000
54	1	0	0	0	0	0	.50000	8.2000	.00000
55	1	0	0	0	0	0	.75000	.00000	.00000
56	1	0	0	0	0	0	.75000	.48235	.00000
57	1	0	0	0	0	0	.75000	.96471	.00000
58	1	0	0	0	0	0	.75000	1.4471	.00000
59	1	0	0	0	0	0	.75000	1.9294	.00000
60	1	0	0	0	0	0	.75000	2.4118	.00000
61	1	0	0	0	0	0	.75000	2.8941	.00000
62	1	0	0	0	0	0	.75000	3.3765	.00000

63	1	0	0	0	0	0	.75000	3.8588	.00000
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66	1	0	0	0	0	0	.75000	5.3059	.00000
67	1	0	0	0	0	0	.75000	5.7882	.00000
68	1	0	0	0	0	0	.75000	6.2706	.00000
69	1	0	0	0	0	0	.75000	6.7529	.00000
70	1	0	0	0	0	0	.75000	7.2353	.00000
71	1	0	0	0	0	0	.75000	7.7176	.00000
72	1	0	0	0	0	0	.75000	8.2000	.00000
73	1	0	0	0	0	0	1.0000	.00000	.00000
74	1	0	0	0	0	0	1.0000	.48235	.00000
75	1	0	0	0	0	0	1.0000	.96471	.00000
76	1	0	0	0	0	0	1.0000	1.4471	.00000
77	1	0	0	0	0	0	1.0000	1.9294	.00000
78	1	0	0	0	0	0	1.0000	2.4118	.00000
79	1	0	0	0	0	0	1.0000	2.8941	.00000
80	1	0	0	0	0	0	1.0000	3.3765	.00000
81	1	0	0	0	0	0	1.0000	3.8588	.00000
82	1	0	0	0	0	0	1.0000	4.3412	.00000
83	1	0	0	0	0	0	1.0000	4.8235	.00000
84	1	0	0	0	0	0	1.0000	5.3059	.00000
85	1	0	0	0	0	0	1.0000	5.7882	.00000
86	1	0	0	0	0	0	1.0000	6.2706	.00000
87	1	0	0	0	0	0	1.0000	6.7529	.00000
88	1	0	0	0	0	0	1.0000	7.2353	.00000
89	1	0	0	0	0	0	1.0000	7.7176	.00000
90	1	0	0	0	0	0	1.0000	8.2000	.00000
91	1	0	0	0	0	0	1.2500	.00000	.00000
92	1	0	0	0	0	0	1.2500	.48235	.00000
93	1	0	0	0	0	0	1.2500	.96471	.00000
94	1	0	0	0	0	0	1.2500	1.4471	.00000
95	1	0	0	0	0	0	1.2500	1.9294	.00000
96	1	0	0	0	0	0	1.2500	2.4118	.00000
97	1	0	0	0	0	0	1.2500	2.8941	.00000
98	1	0	0	0	0	0	1.2500	3.3765	.00000
99	1	0	0	0	0	0	1.2500	3.8588	.00000
100	1	0	0	0	0	0	1.2500	4.3412	.00000
101	1	0	0	0	0	0	1.2500	4.8235	.00000
102	1	0	0	0	0	0	1.2500	5.3059	.00000
103	1	0	0	0	0	0	1.2500	5.7882	.00000
104	1	0	0	0	0	0	1.2500	6.2706	.00000
105	1	0	0	0	0	0	1.2500	6.7529	.00000
106	1	0	0	0	0	0	1.2500	7.2353	.00000
107	1	0	0	0	0	0	1.2500	7.7176	.00000
108	1	0	0	0	0	0	1.2500	8.2000	.00000
109	1	0	0	0	0	0	1.5000	.00000	.00000
110	1	0	0	0	0	0	1.5000	.48235	.00000
111	1	0	0	0	0	0	1.5000	.96471	.00000
112	1	0	0	0	0	0	1.5000	1.4471	.00000
113	1	0	0	0	0	0	1.5000	1.9294	.00000
114	1	0	0	0	0	0	1.5000	2.4118	.00000
115	1	0	0	0	0	0	1.5000	2.8941	.00000
116	1	0	0	0	0	0	1.5000	3.3765	.00000
117	1	0	0	0	0	0	1.5000	3.8588	.00000
118	1	0	0	0	0	0	1.5000	4.3412	.00000
119	1	0	0	0	0	0	1.5000	4.8235	.00000
120	1	0	0	0	0	0	1.5000	5.3059	.00000
121	1	0	0	0	0	0	1.5000	5.7882	.00000
122	1	0	0	0	0	0	1.5000	6.2706	.00000
123	1	0	0	0	0	0	1.5000	6.7529	.00000
124	1	0	0	0	0	0	1.5000	7.2353	.00000
125	1	0	0	0	0	0	1.5000	7.7176	.00000
126	1	0	0	0	0	0	1.5000	8.2000	.00000
127	1	0	0	0	0	0	1.7500	.00000	.00000
128	1	0	0	0	0	0	1.7500	.48235	.00000
129	1	0	0	0	0	0	1.7500	.96471	.00000
130	1	0	0	0	0	0	1.7500	1.4471	.00000

131	1	0	0	0	0	0	1.7500	1.9294	.00000
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1015	1	0	0	0	0	0	14.000	2.8941	.00000	1083	1	0	0	0	0	0	15.000	.96471	.00000	1151	0	0	0	0	0	0	.99878	8.2000	1.9355	1219	0	0	0	0	0	0	2.6220	8.2000	4.83
1016	1	0	0	0	0	0	14.000	3.3765	.00000	1084	1	0	0	0	0	0	15.000	1.4471	.00000	1152	0	0	0	0	0	0	1.1860	8.2000	2.4194	1220	0	0	0	0	0	0	2.8092	8.2000	5.32
1017	1	0	0	0	0	0	14.000	3.8588	.00000	1085	1	0	0	0	0	0	15.000	1.9294	.00000	1153	0	0	0	0	0	0	1.3732	8.2000	2.9032	1221	0	0	0	0	0	0	2.9963	8.2000	5.8065
1018	1	0	0	0	0	0	14.000	4.3412	.00000	1086	1	0	0	0	0	0	15.000	2.4118	.00000	1154	0	0	0	0	0	0	1.5604	8.2000	3.3871	1222	0	0	0	0	0	0	3.1835	8.2000	6.2903
1019	1	0	0	0	0	0	14.000	4.8235	.00000	1087	1	0	0	0	0	0	15.000	2.8941	.00000	1155	0	0	0	0	0	0	1.7476	8.2000	3.8710	1223	0	0	0	0	0	0	3.3707	8.2000	6.7742
1020	1	0	0	0	0	0	14.000	5.3059	.00000	1088	1	0	0	0	0	0	15.000	3.3765	.00000	1156	0	0	0	0	0	0	1.9348	8.2000	4.3548	1224	0	0	0	0	0	0	3.5579	8.2000	7.2581
1021	1	0	0	0	0	0	14.000	5.7882	.00000	1089	1	0	0	0	0	0	15.000	3.8588	.00000	1157	0	0	0	0	0	0	2.1220	8.2000	4.8387	1225	0	0	0	0	0	0	3.7451	8.2000	7.7419
1022	1	0	0	0	0	0	14.000	6.2706	.00000	1090	1	0	0	0	0	0	15.000	4.3412	.00000	1158	0	0	0	0	0	0	2.3092	8.2000	5.3226	1226	0	0	0	0	0	0	3.9323	8.2000	8.2258
1023	1	0	0	0	0	0	14.000	6.7529	.00000	1091	1	0	0	0	0	0	15.000	4.8235	.00000	1159	0	0	0	0	0	0	2.4963	8.2000	5.8065	1227	0	0	0	0	0	0	4.1195	8.2000	8.7097
1024	1	0	0	0	0	0	14.000	7.2353	.00000	1092	1	0	0	0	0	0	15.000	5.3059	.00000	1160	0	0	0	0	0	0	2.6835	8.2000	6.2903	1228	0	0	0	0	0	0	4.3067	8.2000	9.1935
1025	1	0	0	0	0	0	14.000	7.7176	.00000	1093	1	0	0	0	0	0	15.000	5.7882	.00000	1161	0	0	0	0	0	0	2.8707	8.2000	6.7742	1229	0	0	0	0	0	0	4.4939	8.2000	9.6774
1026	1	0	0	0	0	0	14.000	8.2000	.00000	1094	1	0	0	0	0	0	15.000	6.2706	.00000	1162	0	0	0	0	0	0	3.0579	8.2000	7.2581	1230	0	0	0	0	0	0	4.6811	8.2000	10.161
1027	1	0	0	0	0	0	14.250	.00000	.00000	1095	1	0	0	0	0	0	15.000	6.7529	.00000	1163	0	0	0	0	0	0	3.2451	8.2000	7.7419	1231	0	0	0	0	0	0	4.8683	8.2000	10.645
1028	1	0	0	0	0	0	14.250	.48235	.00000	1096	1	0	0	0	0	0	15.000	7.2353	.00000	1164	0	0	0	0	0	0	3.4323	8.2000	8.2258	1232	0	0	0	0	0	0	5.0555	8.2000	11.129
1029	1	0	0	0	0	0	14.250	.96471	.00000	1097	1	0	0	0	0	0	15.000	7.7176	.00000	1165	0	0	0	0	0	0	3.6195	8.2000	8.7097	1233	0	0	0	0	0	0	5.2427	8.2000	11.613
1030	1	0	0	0	0	0	14.250	1.4471	.00000	1098	1	0	0	0	0	0	15.000	8.2000	.00000	1166	0	0	0	0	0	0	3.8067	8.2000	9.1935	1234	0	0	0	0	0	0	5.4299	8.2000	12.097
1031	1	0	0	0	0	0	14.250	1.9294	.00000	1099	1	0	0	0	0	0	15.250	.00000	.00000	1167	0	0	0	0	0	0	3.9939	8.2000	9.6774	1235	0	0	0	0	0	0	5.6171	8.2000	12.581
1032	1	0	0	0	0	0	14.250	2.4118	.00000	1100	1	0	0	0	0	0	15.250	.48235	.00000	1168	0	0	0	0	0	0	4.1811	8.2000	10.161	1236	0	0	0	0	0	0	5.8043	8.2000	13.065
1033	1	0	0	0	0	0	14.250	2.8941	.00000	1101	1	0	0	0	0	0	15.250	.96471	.00000	1169	0	0	0	0	0	0	4.3683	8.2000	10.645	1237	0	0	0	0	0	0	5.9915	8.2000	13.548
1034	1	0	0	0	0	0	14.250	3.3765	.00000	1102	1	0	0	0	0	0	15.250	1.4471	.00000	1170	0	0	0	0	0	0	4.5555	8.2000	11.129	1238	0	0	0	0	0	0	6.1787	8.2000	14.032
1035	1	0	0	0	0	0	14.250	3.8588	.00000	1103	1	0	0	0	0	0	15.250	1.9294	.00000	1171	0	0	0	0	0	0	4.7427	8.2000	11.613	1239	0	0	0	0	0	0	6.3659	8.2000	14.516
1036	1	0	0	0	0	0	14.250	4.3412	.00000	1104	1	0	0	0	0	0	15.250	2.4118	.00000	1172	0	0	0	0	0	0	4.9299	8.2000	12.097	1240	1	0	0	0	0	0	6.5531	8.2000	15.000
1037	1	0	0	0	0	0	14.250	4.8235	.00000	1105	1	0	0	0	0	0	15.250	2.8941	.00000	1173	0	0	0	0	0	0	5.1171	8.2000	12.581	1241	0	0	0	0	0	0	1.1872	8.2000	.48387
1038	1	0	0	0	0	0	14.250	5.3059	.00000	1106	1	0	0	0	0	0	15.250	3.3765	.00000	1174	0	0	0	0	0	0	5.3043	8.2000	13.065	1242	0	0	0	0	0	0	1.3744	8.2000	.96774
1039	1	0	0	0	0	0	14.250	5.7882	.00000	1107	1	0	0	0	0	0	15.250	3.8588	.00000	1175	0	0	0	0	0	0	5.4915	8.2000	13.548	1243	0	0	0	0	0	0	1.5616	8.2000	1.4516
1040	1	0	0	0	0	0	14.250	6.2706	.00000	1108	1	0	0	0	0	0	15.250	4.3412	.00000	1176	0	0	0	0	0	0	5.6787	8.2000	14.032	1244	0	0	0	0	0	0	1.7488	8.2000	1.9355
1041	1	0	0	0	0	0	14.250	6.7529	.00000	1109	1	0	0	0	0	0	15.250	4.8235	.00000	1177	0	0	0	0	0	0	5.8659	8.2000	14.516	1245	0	0	0	0	0	0	1.9360	8.2000	2.4194
1042	1	0	0	0	0	0	14.250	7.2353	.00000	1110	1	0	0	0	0	0	15.250	5.3059	.00000	1178	1	0	0	0	0	0	6.0531	8.2000	15.000	1246	0	0	0	0	0	0	2.1232	8.2000	2.9032
1043	1	0	0	0	0	0	14.250	7.7176	.00000	1111	1	0	0	0	0	0	15.250	5.7882	.00000	1179	0	0	0	0	0	0	.68720	8.2000	.48387	1247	0	0	0	0	0	0	2.3104	8.2000	3.3871
1044	1	0	0	0	0	0	14.250	8.2000	.00000	1112	1	0	0	0	0	0	15.250	6.2706	.00000	1180	0	0	0	0	0	0	.87439	8.2000	.96774	1248	0	0	0	0	0	0	2.4976	8.2000	3.8710
1045	1	0	0	0	0	0	14.500	.00000	.00000	1113	1	0	0	0	0	0	15.250	6.7529	.00000	1181	0	0	0	0	0	0	1.0616	8.2000	1.4516	1249	0	0	0	0	0	0	2.6848	8.2000	4.3548
1046	1	0	0	0	0	0	14.500	.48235	.00000	1114	1	0	0	0	0	0	15.250	7.2353	.00000	1182	0	0	0	0	0	0	1.2488	8.2000	1.9355	1250	0	0	0	0	0	0	2.8720	8.2000	4.8387
1047	1	0	0	0	0	0	14.500	.96471	.00000	1115	1	0	0	0	0	0	15.250	7.7176	.00000	1183	0	0	0	0	0	0	1.4360	8.2000	2.4194	1251	0	0	0	0	0	0	3.0592	8.2000	5.3226
1048	1	0	0	0	0	0	14.500	1.4471	.00000	1116	1	0	0	0	0	0	15.250	8.2000	.00000	1184	0	0	0	0	0	0	1.6232	8.2000	2.9032	1252	0	0	0	0	0	0	3.2463	8.2000	5.8065
1049	1	0	0	0	0	0	14.500	1.9294	.00000	1117	0	0	0	0	0	0	18720	8.2000	.48387	1185	0	0	0	0	0	0	1.8104	8.2000	3.3871	1253	0	0	0	0	0	0	3.4335	8.2000	6.2903
1050	1	0	0	0	0	0	14.500	2.4118	.00000	1118	0	0	0	0	0	0	.37439	8.2000	.96774	1186	0	0	0	0	0	0	1.9976	8.2000	3.8710	1254	0	0	0	0	0	0	3.6207	8.2000	6.7742
1051	1	0	0	0	0	0	14.500	2.8941	.00000	1119	0	0	0	0	0	0	.56159	8.2000	1.4516	1187	0	0	0	0	0	0	2.1848	8.2000	4.3548	1255	0	0	0	0	0	0	3.8079	8.2000	7.2581
1052	1	0	0	0	0	0	14.500	3.3765	.00000	1120	0	0	0	0	0	0	.74878	8.2000	1.9355	1188	0	0	0	0	0	0	2.3720	8.2000	4.8387	1256	0	0	0	0	0	0	3.9951	8.2000	7.7419
1053	1	0	0	0	0	0	14.500	3.8588	.00000	1121	0	0	0	0	0	0	.93598	8.2000	2.4194	1189	0	0	0	0	0	0	2.5592	8.2000	5.3226	1257	0	0	0	0	0	0	4.1823	8.2000	8.2258
1054	1	0	0	0	0	0	14.500	4.3412	.00000	1122	0																												

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1559	0	0	0	0	0	5.1848	8.2000	4.3548	1627	0	0	0	0	0	6.8079	8.2000	7.2581	1695	0	0	0	0	0	8.4311	8.2000	10.161	1763	0	0	0	0	0	10.054	8.2000	13.065
1560	0	0	0	0	0	5.3720	8.2000	4.8387	1628	0	0	0	0	0	6.9951	8.2000	7.7419	1696	0	0	0	0	0	8.6183	8.2000	10.645	1764	0	0	0	0	0	10.241	8.2000	13.548
1561	0	0	0	0	0	5.5591	8.2000	5.3226	1629	0	0	0	0	0	7.1823	8.2000	8.2258	1697	0	0	0	0	0	8.8055	8.2000	11.129	1765	0	0	0	0	0	10.429	8.2000	14.032
1562	0	0	0	0	0	5.7463	8.2000	5.8065	1630	0	0	0	0	0	7.3695	8.2000	8.7097	1698	0	0	0	0	0	8.9927	8.2000	11.613	1766	0	0	0	0	0	10.616	8.2000	14.516
1563	0	0	0	0	0	5.9335	8.2000	6.2903	1631	0	0	0	0	0	7.5567	8.2000	9.1935	1699	0	0	0	0	0	9.1799	8.2000	12.097	1767	1	0	0	0	0	10.803	8.2000	15.000
1564	0	0	0	0	0	6.1207	8.2000	6.7742	1632	0	0	0	0	0	7.7439	8.2000	9.6774	1700	0	0	0	0	0	9.3671	8.2000	12.581	1768	0	0	0	0	0	5.4372	8.2000	48387
1565	0	0	0	0	0	6.3079	8.2000	7.2581	1633	0	0	0	0	0	7.9311	8.2000	10.161	1701	0	0	0	0	0	9.5543	8.2000	13.065	1769	0	0	0	0	0	5.6244	8.2000	96774
1566	0	0	0	0	0	6.4951	8.2000	7.7419	1634	0	0	0	0	0	8.1183	8.2000	10.645	1702	0	0	0	0	0	9.7415	8.2000	13.548	1770	0	0	0	0	0	5.8116	8.2000	1.4516
1567	0	0	0	0	0	6.6823	8.2000	8.2258	1635	0	0	0	0	0	8.3055	8.2000	11.129	1703	0	0	0	0	0	9.9287	8.2000	14.032	1771	0	0	0	0	0	5.9988	8.2000	1.9355
1568	0	0	0	0	0	6.8695	8.2000	8.7097	1636	0	0	0	0	0	8.4927	8.2000	11.613	1704	0	0	0	0	0	10.116	8.2000	14.516	1772	0	0	0	0	0	6.1860	8.2000	2.4194
1569	0	0	0	0	0	7.0567	8.2000	9.1935	1637	0	0	0	0	0	8.6799	8.2000	12.097	1705	1	0	0	0	0	10.303	8.2000	15.000	1773	0	0	0	0	0	6.3732	8.2000	2.9032
1570	0	0	0	0	0	7.2439	8.2000	9.6774	1638	0	0	0	0	0	8.8671	8.2000	12.581	1706	0	0	0	0	0	4.9372	8.2000	48387	1774	0	0	0	0	0	6.5604	8.2000	3.3871
1571	0	0	0	0	0	7.4311	8.2000	10.161	1639	0	0	0	0	0	9.0543	8.2000	13.065	1707	0	0	0	0	0	5.1244	8.2000	96774	1775	0	0	0	0	0	6.7476	8.2000	3.8710
1572	0	0	0	0	0	7.6183	8.2000	10.645	1640	0	0	0	0	0	9.2415	8.2000	13.548	1708	0	0	0	0	0	5.3116	8.2000	1.4516	1776	0	0	0	0	0	6.9348	8.2000	4.3548
1573	0	0	0	0	0	7.8055	8.2000	11.129	1641	0	0	0	0	0	9.4287	8.2000	14.032	1709	0	0	0	0	0	5.4988	8.2000	1.9355	1777	0	0	0	0	0	7.1220	8.2000	4.8387
1574	0	0	0	0	0	7.9927	8.2000	11.613	1642	0	0	0	0	0	9.6159	8.2000	14.516	1710	0	0	0	0	0	5.6860	8.2000	2.4194	1778	0	0	0	0	0	7.3092	8.2000	5.3226
1575	0	0	0	0	0	8.1799	8.2000	12.097	1643	1	0	0	0	0	9.8031	8.2000	15.000	1711	0	0	0	0	0	5.8732	8.2000	2.9032	1779	0	0	0	0	0	7.4963	8.2000	5.8065
1576	0	0	0	0	0	8.3671	8.2000	12.581	1644	0	0	0	0	0	4.4372	8.2000	48387	1712	0	0	0	0	0	6.0604	8.2000	3.3871	1780	0	0	0	0	0	7.6835	8.2000	6.2903
1577	0	0	0	0	0	8.5543	8.2000	13.065	1645	0	0	0	0	0	4.6244	8.2000	96774	1713	0	0	0	0	0	6.2476	8.2000	3.8710	1781	0	0	0	0	0	7.8707	8.2000	6.7742
1578	0	0	0	0	0	8.7415	8.2000	13.548	1646	0	0	0	0	0	4.8116	8.2000	1.4516	1714	0	0	0	0	0	6.4348	8.2000	4.3548	1782	0	0	0	0	0	8.0579	8.2000	7.2581
1579	0	0	0	0	0	8.9287	8.2000	14.032	1647	0	0	0	0	0	4.9988	8.2000	1.9355	1715	0	0	0	0	0	6.6220	8.2000	4.8387	1783	0	0	0	0	0	8.2451	8.2000	7.7419
1580	0	0	0	0	0	9.1159	8.2000	14.516	1648	0	0	0	0	0	5.1860	8.2000	2.4194	1716	0	0	0	0	0	6.8092	8.2000	5.3226	1784	0	0	0	0	0	8.4323	8.2000	8.2258
1581	1	0	0	0	0	9.3031	8.2000	15.000	1649	0	0	0	0	0	5.3732	8.2000	2.9032	1717	0	0	0	0	0	6.9963	8.2000	5.8065	1785	0	0	0	0	0	8.6195	8.2000	8.7097
1582	0	0	0	0	0	3.9372	8.2000	48387	1650	0	0	0	0	0	5.5604	8.2000	3.3871	1718	0	0	0	0	0	7.1835	8.2000	6.2903	1786	0	0	0	0	0	8.8067	8.2000	9.1935
1583	0	0	0	0	0	4.1244	8.2000	96774	1651	0	0	0	0	0	5.7476	8.2000	3.8710	1719	0	0	0	0	0	7.3707	8.2000	6.7742	1787	0	0	0	0	0	8.9939	8.2000	9.6774
1584	0	0	0	0	0	4.3116	8.2000	1.4516	1652	0	0	0	0	0	5.9348	8.2000	4.3548	1720	0	0	0	0	0	7.5579	8.2000	7.2581	1788	0	0	0	0	0	9.1811	8.2000	10.161
1585	0	0	0	0	0	4.4988	8.2000	1.9355	1653	0	0	0	0	0	6.1220	8.2000	4.8387	1721	0	0	0	0	0	7.7451	8.2000	7.7419	1789	0	0	0	0	0	9.3683	8.2000	10.645
1586	0	0	0	0	0	4.6860	8.2000	2.4194	1654	0	0	0	0	0	6.3092	8.2000	5.3226	1722	0	0	0	0	0	7.9323	8.2000	8.2258	1790	0	0	0	0	0	9.5555	8.2000	11.129
1587	0	0	0	0	0	4.8732	8.2000	2.9032	1655	0	0	0	0	0	6.4963	8.2000	5.8065	1723	0	0	0	0	0	8.1195	8.2000	8.7097	1791	0	0	0	0	0	9.7427	8.2000	11.613
1588	0	0	0	0	0	5.0604	8.2000	3.3871	1656	0	0	0	0	0	6.6835	8.2000	6.2903	1724	0	0	0	0	0	8.3067	8.2000	9.1935	1792	0	0	0	0	0	9.9299	8.2000	12.097
1589	0	0	0	0	0	5.2476	8.2000	3.8710	1657	0	0	0	0	0	6.8707	8.2000	6.7742	1725	0	0	0	0	0	8.4939	8.2000	9.6774	1793	0	0	0	0	0	10.117	8.2000	12.581
1590	0	0	0	0	0	5.4348	8.2000	4.3548	1658	0	0	0	0	0	7.0579	8.2000	7.2581	1726	0	0	0	0	0	8.6811	8.2000	10.161	1794	0	0	0	0	0	10.304	8.2000	13.065
1591	0	0	0	0	0	5.6220	8.2000	4.8387	1659	0	0	0	0	0	7.2451	8.2000	7.7419	1727	0	0	0	0	0	8.8683	8.2000	10.645	1795	0	0	0	0	0	10.491	8.2000	13.548
1592	0	0	0	0	0	5.8091	8.2000	5.3226	1660	0	0	0	0	0	7.4323	8.2000	8.2258	1728	0	0	0	0	0	9.0555	8.2000	11.129	1796	0	0	0	0	0	10.679	8.2000	14.032
1593	0	0	0	0	0	5.9963	8.2000	5.8065	1661	0	0	0	0	0	7.6195	8.2000	8.7097	1729	0	0	0	0	0	9.2427	8.2000	11.613	1797	0	0	0	0	0	10.866	8.2000	14.516
1594	0	0	0	0	0	6.1835	8.2000	6.2903	1662	0	0	0	0	0	7.8067	8.2000	9.1935	1730	0	0	0	0	0	9.4299	8.2000	12.097	1798	1	0	0	0	0	11.053	8.2000	15.000
1595	0	0	0	0	0	6.3707	8.2000	6.7742	1663	0	0	0	0	0	7.9939	8.2000	9.6774	1731	0	0	0	0	0	9.6171	8.2000	12.581	1799	0	0	0	0	0	5.6872	8.2000	48387
1596	0	0	0	0	0	6.5579	8.2000	7.2581	1664	0	0	0	0	0	8.1811	8.2000	10.161	1732	0	0	0	0	0	9.8043	8.2000	13.065	1800	0	0	0	0	0	5.8744	8.2000	96774
1597	0	0	0	0	0	6.7451	8.2000	7.7419	1665	0	0	0	0	0	8.3683	8.2000	10.645	1733	0	0	0	0	0	9.9915	8.2000	13.548	1801	0	0	0	0	0	6.0616	8.2000	1.4516
1598	0	0	0	0	0	6.9323	8.2000	8.2258	1666	0	0	0	0	0	8.5555	8.2000	11.129	1734	0	0	0	0	0	10.179	8.2000	14.032	1802	0	0	0	0	0	6.2488	8.2000	1.9355
1599	0	0	0	0	0	7.1195	8.2000	8.7097	1667	0	0	0	0	0	8.7427	8.2000	11.613	1735	0	0	0	0	0	10.366	8.2000	14.516	1803	0	0	0	0	0	6.4360	8.2000	2.4194
1600	0	0	0	0	0	7.3067	8.2000	9.1935	1668	0	0	0	0	0	8.9299	8.2000	12.097	1736	1	0	0	0	0	10.553	8.2000	15.000	1804	0	0	0	0	0	6.6232	8.2000	2.9032
1601	0	0	0	0	0	7.4939	8.2																												

1831	0	0	0	0	0	6.1244	8.2000	96774	1899	0	0	0	0	0	7.7476	8.2000	3.8710	1967	0	0	0	0	0	9.3707	8.2000	6.7742	2035	0	0	0	0	0	10.994	8.2000	9.6774
1832	0	0	0	0	0	6.3116	8.2000	1.4516	1900	0	0	0	0	0	7.9348	8.2000	4.3548	1968	0	0	0	0	0	9.5579	8.2000	7.2581	2036	0	0	0	0	0	11.181	8.2000	10.161
1833	0	0	0	0	0	6.4988	8.2000	1.9355	1901	0	0	0	0	0	8.1220	8.2000	4.8387	1969	0	0	0	0	0	9.7451	8.2000	7.7419	2037	0	0	0	0	0	11.368	8.2000	10.645
1834	0	0	0	0	0	6.6860	8.2000	2.4194	1902	0	0	0	0	0	8.3092	8.2000	5.3226	1970	0	0	0	0	0	9.9323	8.2000	8.2258	2038	0	0	0	0	0	11.555	8.2000	11.129
1835	0	0	0	0	0	6.8732	8.2000	2.9032	1903	0	0	0	0	0	8.4963	8.2000	5.8065	1971	0	0	0	0	0	10.120	8.2000	8.7097	2039	0	0	0	0	0	11.743	8.2000	11.613
1836	0	0	0	0	0	7.0604	8.2000	3.3871	1904	0	0	0	0	0	8.6835	8.2000	6.2903	1972	0	0	0	0	0	10.307	8.2000	9.1935	2040	0	0	0	0	0	11.930	8.2000	12.097
1837	0	0	0	0	0	7.2476	8.2000	3.8710	1905	0	0	0	0	0	8.8707	8.2000	6.7742	1973	0	0	0	0	0	10.494	8.2000	9.6774	2041	0	0	0	0	0	12.117	8.2000	12.581
1838	0	0	0	0	0	7.4348	8.2000	4.3548	1906	0	0	0	0	0	9.0579	8.2000	7.2581	1974	0	0	0	0	0	10.681	8.2000	10.161	2042	0	0	0	0	0	12.304	8.2000	13.065
1839	0	0	0	0	0	7.6220	8.2000	4.8387	1907	0	0	0	0	0	9.2451	8.2000	7.7419	1975	0	0	0	0	0	10.868	8.2000	10.645	2043	0	0	0	0	0	12.491	8.2000	13.548
1840	0	0	0	0	0	7.8092	8.2000	5.3226	1908	0	0	0	0	0	9.4323	8.2000	8.2258	1976	0	0	0	0	0	11.055	8.2000	11.129	2044	0	0	0	0	0	12.679	8.2000	14.032
1841	0	0	0	0	0	7.9963	8.2000	5.8065	1909	0	0	0	0	0	9.6195	8.2000	8.7097	1977	0	0	0	0	0	11.243	8.2000	11.613	2045	0	0	0	0	0	12.866	8.2000	14.516
1842	0	0	0	0	0	8.1835	8.2000	6.2903	1910	0	0	0	0	0	9.8067	8.2000	9.1935	1978	0	0	0	0	0	11.430	8.2000	12.097	2046	1	0	0	0	0	13.053	8.2000	15.000
1843	0	0	0	0	0	8.3707	8.2000	6.7742	1911	0	0	0	0	0	9.9939	8.2000	9.6774	1979	0	0	0	0	0	11.617	8.2000	12.581	2047	0	0	0	0	0	7.6872	8.2000	48387
1844	0	0	0	0	0	8.5579	8.2000	7.2581	1912	0	0	0	0	0	10.181	8.2000	10.161	1980	0	0	0	0	0	11.804	8.2000	13.065	2048	0	0	0	0	0	7.8744	8.2000	96774
1845	0	0	0	0	0	8.7451	8.2000	7.7419	1913	0	0	0	0	0	10.368	8.2000	10.645	1981	0	0	0	0	0	11.991	8.2000	13.548	2049	0	0	0	0	0	8.0616	8.2000	1.4516
1846	0	0	0	0	0	8.9323	8.2000	8.2258	1914	0	0	0	0	0	10.555	8.2000	11.129	1982	0	0	0	0	0	12.179	8.2000	14.032	2050	0	0	0	0	0	8.2488	8.2000	1.9355
1847	0	0	0	0	0	9.1195	8.2000	8.7097	1915	0	0	0	0	0	10.743	8.2000	11.613	1983	0	0	0	0	0	12.366	8.2000	14.516	2051	0	0	0	0	0	8.4360	8.2000	2.4194
1848	0	0	0	0	0	9.3067	8.2000	9.1935	1916	0	0	0	0	0	10.930	8.2000	12.097	1984	1	0	0	0	0	12.553	8.2000	15.000	2052	0	0	0	0	0	8.6232	8.2000	2.9032
1849	0	0	0	0	0	9.4939	8.2000	9.6774	1917	0	0	0	0	0	11.117	8.2000	12.581	1985	0	0	0	0	0	7.1872	8.2000	48387	2053	0	0	0	0	0	8.8104	8.2000	3.3871
1850	0	0	0	0	0	9.6811	8.2000	10.161	1918	0	0	0	0	0	11.304	8.2000	13.065	1986	0	0	0	0	0	7.3744	8.2000	96774	2054	0	0	0	0	0	8.9976	8.2000	3.8710
1851	0	0	0	0	0	9.8683	8.2000	10.645	1919	0	0	0	0	0	11.491	8.2000	13.548	1987	0	0	0	0	0	7.5616	8.2000	1.4516	2055	0	0	0	0	0	9.1848	8.2000	4.3548
1852	0	0	0	0	0	10.055	8.2000	11.129	1920	0	0	0	0	0	11.679	8.2000	14.032	1988	0	0	0	0	0	7.7488	8.2000	1.9355	2056	0	0	0	0	0	9.3720	8.2000	4.8387
1853	0	0	0	0	0	10.243	8.2000	11.613	1921	0	0	0	0	0	11.866	8.2000	14.516	1989	0	0	0	0	0	7.9360	8.2000	2.4194	2057	0	0	0	0	0	9.5592	8.2000	5.3226
1854	0	0	0	0	0	10.430	8.2000	12.097	1922	1	0	0	0	0	12.053	8.2000	15.000	1990	0	0	0	0	0	8.1232	8.2000	2.9032	2058	0	0	0	0	0	9.7463	8.2000	5.8065
1855	0	0	0	0	0	10.617	8.2000	12.581	1923	0	0	0	0	0	6.6872	8.2000	48387	1991	0	0	0	0	0	8.3104	8.2000	3.3871	2059	0	0	0	0	0	9.9335	8.2000	6.2903
1856	0	0	0	0	0	10.804	8.2000	13.065	1924	0	0	0	0	0	6.8744	8.2000	96774	1992	0	0	0	0	0	8.4976	8.2000	3.8710	2060	0	0	0	0	0	10.121	8.2000	6.7742
1857	0	0	0	0	0	10.991	8.2000	13.548	1925	0	0	0	0	0	7.0616	8.2000	1.4516	1993	0	0	0	0	0	8.6848	8.2000	4.3548	2061	0	0	0	0	0	10.308	8.2000	7.2581
1858	0	0	0	0	0	11.179	8.2000	14.032	1926	0	0	0	0	0	7.2488	8.2000	1.9355	1994	0	0	0	0	0	8.8720	8.2000	4.8387	2062	0	0	0	0	0	10.495	8.2000	7.7419
1859	0	0	0	0	0	11.366	8.2000	14.516	1927	0	0	0	0	0	7.4360	8.2000	2.4194	1995	0	0	0	0	0	9.0592	8.2000	5.3226	2063	0	0	0	0	0	10.682	8.2000	8.2258
1860	1	0	0	0	0	11.553	8.2000	15.000	1928	0	0	0	0	0	7.6232	8.2000	2.9032	1996	0	0	0	0	0	9.2463	8.2000	5.8065	2064	0	0	0	0	0	10.870	8.2000	8.7097
1861	0	0	0	0	0	6.1872	8.2000	48387	1929	0	0	0	0	0	7.8104	8.2000	3.3871	1997	0	0	0	0	0	9.4335	8.2000	6.2903	2065	0	0	0	0	0	11.057	8.2000	9.1935
1862	0	0	0	0	0	6.3744	8.2000	96774	1930	0	0	0	0	0	7.9976	8.2000	3.8710	1998	0	0	0	0	0	9.6207	8.2000	6.7742	2066	0	0	0	0	0	11.244	8.2000	9.6774
1863	0	0	0	0	0	6.5616	8.2000	1.4516	1931	0	0	0	0	0	8.1848	8.2000	4.3548	1999	0	0	0	0	0	9.8079	8.2000	7.2581	2067	0	0	0	0	0	11.431	8.2000	10.161
1864	0	0	0	0	0	6.7488	8.2000	1.9355	1932	0	0	0	0	0	8.3720	8.2000	4.8387	2000	0	0	0	0	0	9.9951	8.2000	7.7419	2068	0	0	0	0	0	11.618	8.2000	10.645
1865	0	0	0	0	0	6.9360	8.2000	2.4194	1933	0	0	0	0	0	8.5592	8.2000	5.3226	2001	0	0	0	0	0	10.182	8.2000	8.2258	2069	0	0	0	0	0	11.805	8.2000	11.129
1866	0	0	0	0	0	7.1232	8.2000	2.9032	1934	0	0	0	0	0	8.7463	8.2000	5.8065	2002	0	0	0	0	0	10.370	8.2000	8.7097	2070	0	0	0	0	0	11.993	8.2000	11.613
1867	0	0	0	0	0	7.3104	8.2000	3.3871	1935	0	0	0	0	0	8.9335	8.2000	6.2903	2003	0	0	0	0	0	10.557	8.2000	9.1935	2071	0	0	0	0	0	12.180	8.2000	12.097
1868	0	0	0	0	0	7.4976	8.2000	3.8710	1936	0	0	0	0	0	9.1207	8.2000	6.7742	2004	0	0	0	0	0	10.744	8.2000	9.6774	2072	0	0	0	0	0	12.367	8.2000	12.581
1869	0	0	0	0	0	7.6848	8.2000	4.3548	1937	0	0	0	0	0	9.3079	8.2000	7.2581	2005	0	0	0	0	0	10.931	8.2000	10.161	2073	0	0	0	0	0	12.554	8.2000	13.065
1870	0	0	0	0	0	7.8720	8.2000	4.8387	1938	0	0	0	0	0	9.4951	8.2000	7.7419	2006	0	0	0	0	0	11.118	8.2000	10.645	2074	0	0	0	0	0	12.741	8.2000	13.548
1871	0	0	0	0	0	8.0592	8.2000	5.3226	1939	0	0	0	0	0	9.6823	8.2000	8.2258	2007	0	0	0	0	0	11.305	8.2000	11.129	2075	0	0	0	0	0	12.929	8.2000	14.032
1872	0	0	0	0	0	8.2463	8.2000	5.8065	1940	0	0	0	0	0	9.8695	8.2000	8.7097	2008	0	0	0	0	0	11.493	8.2000	11.613	2076	0	0	0	0	0	13.116	8.2000	14.516
1873	0	0	0	0	0	8.4335	8.200																												

2103	0	0	0	0	0	0	12.617	8.2000	12.581	2171	0	0	0	0	0	0	8.6872	8.2000	.48387	2239	0	0	0	0	0	0	10.310	8.2000	3.3871	2307	0	0	0	0	0	0	11.934	8.2000	6.2903
2104	0	0	0	0	0	0	12.804	8.2000	13.065	2172	0	0	0	0	0	0	8.8744	8.2000	.96774	2240	0	0	0	0	0	0	10.498	8.2000	3.8710	2308	0	0	0	0	0	0	12.121	8.2000	6.7742
2105	0	0	0	0	0	0	12.991	8.2000	13.548	2173	0	0	0	0	0	0	9.0616	8.2000	1.4516	2241	0	0	0	0	0	0	10.685	8.2000	4.3548	2309	0	0	0	0	0	0	12.308	8.2000	7.2581
2106	0	0	0	0	0	0	13.179	8.2000	14.032	2174	0	0	0	0	0	0	9.2488	8.2000	1.9355	2242	0	0	0	0	0	0	10.872	8.2000	4.8387	2310	0	0	0	0	0	0	12.495	8.2000	7.7419
2107	0	0	0	0	0	0	13.366	8.2000	14.516	2175	0	0	0	0	0	0	9.4360	8.2000	2.4194	2243	0	0	0	0	0	0	11.059	8.2000	5.3226	2311	0	0	0	0	0	0	12.682	8.2000	8.2258
2108	1	0	0	0	0	0	13.553	8.2000	15.000	2176	0	0	0	0	0	0	9.6232	8.2000	2.9032	2244	0	0	0	0	0	0	11.246	8.2000	5.8065	2312	0	0	0	0	0	0	12.870	8.2000	8.7097
2109	0	0	0	0	0	0	8.1872	8.2000	.48387	2177	0	0	0	0	0	0	9.8104	8.2000	3.3871	2245	0	0	0	0	0	0	11.434	8.2000	6.2903	2313	0	0	0	0	0	0	13.057	8.2000	9.1935
2110	0	0	0	0	0	0	8.3744	8.2000	.96774	2178	0	0	0	0	0	0	9.9976	8.2000	3.8710	2246	0	0	0	0	0	0	11.621	8.2000	6.7742	2314	0	0	0	0	0	0	13.244	8.2000	9.6774
2111	0	0	0	0	0	0	8.5616	8.2000	1.4516	2179	0	0	0	0	0	0	10.185	8.2000	4.3548	2247	0	0	0	0	0	0	11.808	8.2000	7.2581	2315	0	0	0	0	0	0	13.431	8.2000	10.161
2112	0	0	0	0	0	0	8.7488	8.2000	1.9355	2180	0	0	0	0	0	0	10.372	8.2000	4.8387	2248	0	0	0	0	0	0	11.995	8.2000	7.7419	2316	0	0	0	0	0	0	13.618	8.2000	10.645
2113	0	0	0	0	0	0	8.9360	8.2000	2.4194	2181	0	0	0	0	0	0	10.559	8.2000	5.3226	2249	0	0	0	0	0	0	12.182	8.2000	8.2258	2317	0	0	0	0	0	0	13.805	8.2000	11.129
2114	0	0	0	0	0	0	9.1232	8.2000	2.9032	2182	0	0	0	0	0	0	10.746	8.2000	5.8065	2250	0	0	0	0	0	0	12.370	8.2000	8.7097	2318	0	0	0	0	0	0	13.993	8.2000	11.613
2115	0	0	0	0	0	0	9.3104	8.2000	3.3871	2183	0	0	0	0	0	0	10.934	8.2000	6.2903	2251	0	0	0	0	0	0	12.557	8.2000	9.1935	2319	0	0	0	0	0	0	14.180	8.2000	12.097
2116	0	0	0	0	0	0	9.4976	8.2000	3.8710	2184	0	0	0	0	0	0	11.121	8.2000	6.7742	2252	0	0	0	0	0	0	12.744	8.2000	9.6774	2320	0	0	0	0	0	0	14.367	8.2000	12.581
2117	0	0	0	0	0	0	9.6848	8.2000	4.3548	2185	0	0	0	0	0	0	11.308	8.2000	7.2581	2253	0	0	0	0	0	0	12.931	8.2000	10.161	2321	0	0	0	0	0	0	14.554	8.2000	13.065
2118	0	0	0	0	0	0	9.8720	8.2000	4.8387	2186	0	0	0	0	0	0	11.495	8.2000	7.7419	2254	0	0	0	0	0	0	13.118	8.2000	10.645	2322	0	0	0	0	0	0	14.741	8.2000	13.548
2119	0	0	0	0	0	0	10.059	8.2000	5.3226	2187	0	0	0	0	0	0	11.682	8.2000	8.2258	2255	0	0	0	0	0	0	13.305	8.2000	11.129	2323	0	0	0	0	0	0	14.929	8.2000	14.032
2120	0	0	0	0	0	0	10.246	8.2000	5.8065	2188	0	0	0	0	0	0	11.870	8.2000	8.7097	2256	0	0	0	0	0	0	13.493	8.2000	11.613	2324	0	0	0	0	0	0	15.116	8.2000	14.516
2121	0	0	0	0	0	0	10.434	8.2000	6.2903	2189	0	0	0	0	0	0	12.057	8.2000	9.1935	2257	0	0	0	0	0	0	13.680	8.2000	12.097	2325	1	0	0	0	0	0	15.303	8.2000	15.000
2122	0	0	0	0	0	0	10.621	8.2000	6.7742	2190	0	0	0	0	0	0	12.244	8.2000	9.6774	2258	0	0	0	0	0	0	13.867	8.2000	12.581	2326	0	0	0	0	0	0	9.9372	8.2000	.48387
2123	0	0	0	0	0	0	10.808	8.2000	7.2581	2191	0	0	0	0	0	0	12.431	8.2000	10.161	2259	0	0	0	0	0	0	14.054	8.2000	13.065	2327	0	0	0	0	0	0	10.124	8.2000	.96774
2124	0	0	0	0	0	0	10.995	8.2000	7.7419	2192	0	0	0	0	0	0	12.618	8.2000	10.645	2260	0	0	0	0	0	0	14.241	8.2000	13.548	2328	0	0	0	0	0	0	10.312	8.2000	1.4516
2125	0	0	0	0	0	0	11.182	8.2000	8.2258	2193	0	0	0	0	0	0	12.805	8.2000	11.129	2261	0	0	0	0	0	0	14.429	8.2000	14.032	2329	0	0	0	0	0	0	10.499	8.2000	1.9355
2126	0	0	0	0	0	0	11.370	8.2000	8.7097	2194	0	0	0	0	0	0	12.993	8.2000	11.613	2262	0	0	0	0	0	0	14.616	8.2000	14.516	2330	0	0	0	0	0	0	10.686	8.2000	2.4194
2127	0	0	0	0	0	0	11.557	8.2000	9.1935	2195	0	0	0	0	0	0	13.180	8.2000	12.097	2263	1	0	0	0	0	0	14.803	8.2000	15.000	2331	0	0	0	0	0	0	10.873	8.2000	2.9032
2128	0	0	0	0	0	0	11.744	8.2000	9.6774	2196	0	0	0	0	0	0	13.367	8.2000	12.581	2264	0	0	0	0	0	0	9.4372	8.2000	.48387	2332	0	0	0	0	0	0	11.060	8.2000	3.3871
2129	0	0	0	0	0	0	11.931	8.2000	10.161	2197	0	0	0	0	0	0	13.554	8.2000	13.065	2265	0	0	0	0	0	0	9.6244	8.2000	.96774	2333	0	0	0	0	0	0	11.248	8.2000	3.8710
2130	0	0	0	0	0	0	12.118	8.2000	10.645	2198	0	0	0	0	0	0	13.741	8.2000	13.548	2266	0	0	0	0	0	0	9.8116	8.2000	1.4516	2334	0	0	0	0	0	0	11.435	8.2000	4.3548
2131	0	0	0	0	0	0	12.305	8.2000	11.129	2199	0	0	0	0	0	0	13.929	8.2000	14.032	2267	0	0	0	0	0	0	9.9988	8.2000	1.9355	2335	0	0	0	0	0	0	11.622	8.2000	4.8387
2132	0	0	0	0	0	0	12.493	8.2000	11.613	2200	0	0	0	0	0	0	14.116	8.2000	14.516	2268	0	0	0	0	0	0	10.186	8.2000	2.4194	2336	0	0	0	0	0	0	11.809	8.2000	5.3226
2133	0	0	0	0	0	0	12.680	8.2000	12.097	2201	1	0	0	0	0	0	14.303	8.2000	15.000	2269	0	0	0	0	0	0	10.373	8.2000	2.9032	2337	0	0	0	0	0	0	11.996	8.2000	5.8065
2134	0	0	0	0	0	0	12.867	8.2000	12.581	2202	0	0	0	0	0	0	8.9372	8.2000	.48387	2270	0	0	0	0	0	0	10.560	8.2000	3.3871	2338	0	0	0	0	0	0	12.184	8.2000	6.2903
2135	0	0	0	0	0	0	13.054	8.2000	13.065	2203	0	0	0	0	0	0	9.1244	8.2000	.96774	2271	0	0	0	0	0	0	10.748	8.2000	3.8710	2339	0	0	0	0	0	0	12.371	8.2000	6.7742
2136	0	0	0	0	0	0	13.241	8.2000	13.548	2204	0	0	0	0	0	0	9.3116	8.2000	1.4516	2272	0	0	0	0	0	0	10.935	8.2000	4.3548	2340	0	0	0	0	0	0	12.558	8.2000	7.2581
2137	0	0	0	0	0	0	13.429	8.2000	14.032	2205	0	0	0	0	0	0	9.4988	8.2000	1.9355	2273	0	0	0	0	0	0	11.122	8.2000	4.8387	2341	0	0	0	0	0	0	12.745	8.2000	7.7419
2138	0	0	0	0	0	0	13.616	8.2000	14.516	2206	0	0	0	0	0	0	9.6860	8.2000	2.4194	2274	0	0	0	0	0	0	11.309	8.2000	5.3226	2342	0	0	0	0	0	0	12.932	8.2000	8.2258
2139	1	0	0	0	0	0	13.803	8.2000	15.000	2207	0	0	0	0	0	0	9.8732	8.2000	2.9032	2275	0	0	0	0	0	0	11.496	8.2000	5.8065	2343	0	0	0	0	0	0	13.120	8.2000	8.7097
2140	0	0	0	0	0	0	8.4372	8.2000	.48387	2208	0	0	0	0	0	0	10.060	8.2000	3.3871	2276	0	0	0	0	0	0	11.684	8.2000	6.2903	2344	0	0	0	0	0	0	13.307	8.2000	9.1935
2141	0	0	0	0	0	0	8.6244	8.2000	.96774	2209	0	0	0	0	0	0	10.248	8.2000	3.8710	2277	0	0	0	0	0	0	11.871	8.2000	6.7742	2345	0	0	0	0	0	0	13.494	8.2000	9.6774
2																																							

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2919	0	0	0	0	0	0	15.436	8.2000	2.4194	2987	0	0	0	0	0	0	17.059	8.2000	5.3226	3055	1	0	0	0	0	0	5.8031	.00000	15.000	3123	1	0	0	0	0	0	6.8031	.00000	15.00
2920	0	0	0	0	0	0	15.623	8.2000	2.9032	2988	0	0	0	0	0	0	17.246	8.2000	5.8065	3056	1	0	0	0	0	0	6.0531	7.7176	15.000	3124	1	0	0	0	0	0	7.0531	7.7176	15.000
2921	0	0	0	0	0	0	15.810	8.2000	3.3871	2989	0	0	0	0	0	0	17.434	8.2000	6.2903	3057	1	0	0	0	0	0	6.0531	7.2353	15.000	3125	1	0	0	0	0	0	7.0531	7.2353	15.000
2922	0	0	0	0	0	0	15.998	8.2000	3.8710	2990	0	0	0	0	0	0	17.621	8.2000	6.7742	3058	1	0	0	0	0	0	6.0531	6.7529	15.000	3126	1	0	0	0	0	0	7.0531	6.7529	15.000
2923	0	0	0	0	0	0	16.185	8.2000	4.3548	2991	0	0	0	0	0	0	17.808	8.2000	7.2581	3059	1	0	0	0	0	0	6.0531	6.2706	15.000	3127	1	0	0	0	0	0	7.0531	6.2706	15.000
2924	0	0	0	0	0	0	16.372	8.2000	4.8387	2992	0	0	0	0	0	0	17.995	8.2000	7.7419	3060	1	0	0	0	0	0	6.0531	5.7882	15.000	3128	1	0	0	0	0	0	7.0531	5.7882	15.000
2925	0	0	0	0	0	0	16.559	8.2000	5.3226	2993	0	0	0	0	0	0	18.182	8.2000	8.2258	3061	1	0	0	0	0	0	6.0531	5.3059	15.000	3129	1	0	0	0	0	0	7.0531	5.3059	15.000
2926	0	0	0	0	0	0	16.746	8.2000	5.8065	2994	0	0	0	0	0	0	18.370	8.2000	8.7097	3062	1	0	0	0	0	0	6.0531	4.8235	15.000	3130	1	0	0	0	0	0	7.0531	4.8235	15.000
2927	0	0	0	0	0	0	16.934	8.2000	6.2903	2995	0	0	0	0	0	0	18.557	8.2000	9.1935	3063	1	0	0	0	0	0	6.0531	4.3412	15.000	3131	1	0	0	0	0	0	7.0531	4.3412	15.000
2928	0	0	0	0	0	0	17.121	8.2000	6.7742	2996	0	0	0	0	0	0	18.744	8.2000	9.6774	3064	1	0	0	0	0	0	6.0531	3.8588	15.000	3132	1	0	0	0	0	0	7.0531	3.8588	15.000
2929	0	0	0	0	0	0	17.308	8.2000	7.2581	2997	0	0	0	0	0	0	18.931	8.2000	10.161	3065	1	0	0	0	0	0	6.0531	3.3765	15.000	3133	1	0	0	0	0	0	7.0531	3.3765	15.000
2930	0	0	0	0	0	0	17.495	8.2000	7.7419	2998	0	0	0	0	0	0	19.118	8.2000	10.645	3066	1	0	0	0	0	0	6.0531	2.8941	15.000	3134	1	0	0	0	0	0	7.0531	2.8941	15.000
2931	0	0	0	0	0	0	17.682	8.2000	8.2258	2999	0	0	0	0	0	0	19.305	8.2000	11.129	3067	1	0	0	0	0	0	6.0531	2.4118	15.000	3135	1	0	0	0	0	0	7.0531	2.4118	15.000
2932	0	0	0	0	0	0	17.870	8.2000	8.7097	3000	0	0	0	0	0	0	19.493	8.2000	11.613	3068	1	0	0	0	0	0	6.0531	1.9294	15.000	3136	1	0	0	0	0	0	7.0531	1.9294	15.000
2933	0	0	0	0	0	0	18.057	8.2000	9.1935	3001	0	0	0	0	0	0	19.680	8.2000	12.097	3069	1	0	0	0	0	0	6.0531	1.4471	15.000	3137	1	0	0	0	0	0	7.0531	1.4471	15.000
2934	0	0	0	0	0	0	18.244	8.2000	9.6774	3002	0	0	0	0	0	0	19.867	8.2000	12.581	3070	1	0	0	0	0	0	6.0531	.96471	15.000	3138	1	0	0	0	0	0	7.0531	.96471	15.000
2935	0	0	0	0	0	0	18.431	8.2000	10.161	3003	0	0	0	0	0	0	20.054	8.2000	13.065	3071	1	0	0	0	0	0	6.0531	.48235	15.000	3139	1	0	0	0	0	0	7.0531	.48235	15.000
2936	0	0	0	0	0	0	18.618	8.2000	10.645	3004	0	0	0	0	0	0	20.241	8.2000	13.548	3072	1	0	0	0	0	0	6.0531	.00000	15.000	3140	1	0	0	0	0	0	7.0531	.00000	15.000
2937	0	0	0	0	0	0	18.805	8.2000	11.129	3005	0	0	0	0	0	0	20.429	8.2000	14.032	3073	1	0	0	0	0	0	6.3031	7.7176	15.000	3141	1	0	0	0	0	0	7.3031	7.7176	15.000
2938	0	0	0	0	0	0	18.993	8.2000	11.613	3006	0	0	0	0	0	0	20.616	8.2000	14.516	3074	1	0	0	0	0	0	6.3031	7.2353	15.000	3142	1	0	0	0	0	0	7.3031	7.2353	15.000
2939	0	0	0	0	0	0	19.180	8.2000	12.097	3007	1	0	0	0	0	0	20.803	8.2000	15.000	3075	1	0	0	0	0	0	6.3031	6.7529	15.000	3143	1	0	0	0	0	0	7.3031	6.7529	15.000
2940	0	0	0	0	0	0	19.367	8.2000	12.581	3008	0	0	0	0	0	0	15.437	8.2000	.48387	3076	1	0	0	0	0	0	6.3031	6.2706	15.000	3144	1	0	0	0	0	0	7.3031	6.2706	15.000
2941	0	0	0	0	0	0	19.554	8.2000	13.065	3009	0	0	0	0	0	0	15.624	8.2000	.96774	3077	1	0	0	0	0	0	6.3031	5.7882	15.000	3145	1	0	0	0	0	0	7.3031	5.7882	15.000
2942	0	0	0	0	0	0	19.741	8.2000	13.548	3010	0	0	0	0	0	0	15.812	8.2000	1.4516	3078	1	0	0	0	0	0	6.3031	5.3059	15.000	3146	1	0	0	0	0	0	7.3031	5.3059	15.000
2943	0	0	0	0	0	0	19.929	8.2000	14.032	3011	0	0	0	0	0	0	15.999	8.2000	1.9355	3079	1	0	0	0	0	0	6.3031	4.8235	15.000	3147	1	0	0	0	0	0	7.3031	4.8235	15.000
2944	0	0	0	0	0	0	20.116	8.2000	14.516	3012	0	0	0	0	0	0	16.186	8.2000	2.4194	3080	1	0	0	0	0	0	6.3031	4.3412	15.000	3148	1	0	0	0	0	0	7.3031	4.3412	15.000
2945	1	0	0	0	0	0	20.303	8.2000	15.000	3013	0	0	0	0	0	0	16.373	8.2000	2.9032	3081	1	0	0	0	0	0	6.3031	3.8588	15.000	3149	1	0	0	0	0	0	7.3031	3.8588	15.000
2946	0	0	0	0	0	0	14.937	8.2000	.48387	3014	0	0	0	0	0	0	16.560	8.2000	3.3871	3082	1	0	0	0	0	0	6.3031	3.3765	15.000	3150	1	0	0	0	0	0	7.3031	3.3765	15.000
2947	0	0	0	0	0	0	15.124	8.2000	.96774	3015	0	0	0	0	0	0	16.748	8.2000	3.8710	3083	1	0	0	0	0	0	6.3031	2.8941	15.000	3151	1	0	0	0	0	0	7.3031	2.8941	15.000
2948	0	0	0	0	0	0	15.312	8.2000	1.4516	3016	0	0	0	0	0	0	16.935	8.2000	4.3548	3084	1	0	0	0	0	0	6.3031	2.4118	15.000	3152	1	0	0	0	0	0	7.3031	2.4118	15.000
2949	0	0	0	0	0	0	15.499	8.2000	1.9355	3017	0	0	0	0	0	0	17.122	8.2000	4.8387	3085	1	0	0	0	0	0	6.3031	1.9294	15.000	3153	1	0	0	0	0	0	7.3031	1.9294	15.000
2950	0	0	0	0	0	0	15.686	8.2000	2.4194	3018	0	0	0	0	0	0	17.309	8.2000	5.3226	3086	1	0	0	0	0	0	6.3031	1.4471	15.000	3154	1	0	0	0	0	0	7.3031	1.4471	15.000
2951	0	0	0	0	0	0	15.873	8.2000	2.9032	3019	0	0	0	0	0	0	17.496	8.2000	5.8065	3087	1	0	0	0	0	0	6.3031	.96471	15.000	3155	1	0	0	0	0	0	7.3031	.96471	15.000
2952	0	0	0	0	0	0	16.060	8.2000	3.3871	3020	0	0	0	0	0	0	17.684	8.2000	6.2903	3088	1	0	0	0	0	0	6.3031	.48235	15.000	3156	1	0	0	0	0	0	7.3031	.48235	15.000
2953	0	0	0	0	0	0	16.248	8.2000	3.8710	3021	0	0	0	0	0	0	17.871	8.2000	6.7742	3089	1	0	0	0	0	0	6.3031	.00000	15.000	3157	1	0	0	0	0	0	7.3031	.00000	15.000
2954	0	0	0	0	0	0	16.435	8.2000	4.3548	3022	0	0	0	0	0	0	18.058	8.2000	7.2581	3090	1	0	0	0	0	0	6.5531	7.7176	15.000	3158	1	0	0	0	0	0	7.5531	7.7176	15.000
2955	0	0	0	0	0	0	16.622	8.2000	4.8387	3023	0	0	0	0	0	0	18.245	8.2000	7.7419	3091	1	0	0	0	0	0	6.5531	7.2353	15.000	3159	1	0	0	0	0	0	7.5531	7.2353	15.000
2956	0	0	0	0	0	0	16.809	8.2000	5.3226	3024	0	0	0	0	0	0	18.432	8.2000	8.2258	3092	1	0	0	0	0	0	6.5531	6.7529	15.000	3160	1	0	0	0	0	0	7.5531	6.7529	15.000
2957	0	0	0	0	0	0	16.996	8.2000	5.8065	3025	0	0	0	0	0	0	18.620	8.2000	8.7097	3093	1	0	0	0	0	0	6.5531	6.2706	15.000	3161	1	0	0	0	0	0	7.5531	6.2706	15.000
2958																																							

3735	1	0	0	0	0	15.803	.00000	15.000	3803	1	0	0	0	0	16.803	.00000	15.000	3871	1	0	0	0	0	17.803	.00000	15.000	3939	1	0	0	0	0	18.803	.00000	15.000
3736	1	0	0	0	0	16.053	7.7176	15.000	3804	1	0	0	0	0	17.053	7.7176	15.000	3872	1	0	0	0	0	18.053	7.7176	15.000	3940	1	0	0	0	0	19.053	7.7176	15.000
3737	1	0	0	0	0	16.053	7.2353	15.000	3805	1	0	0	0	0	17.053	7.2353	15.000	3873	1	0	0	0	0	18.053	7.2353	15.000	3941	1	0	0	0	0	19.053	7.2353	15.000
3738	1	0	0	0	0	16.053	6.7529	15.000	3806	1	0	0	0	0	17.053	6.7529	15.000	3874	1	0	0	0	0	18.053	6.7529	15.000	3942	1	0	0	0	0	19.053	6.7529	15.000
3739	1	0	0	0	0	16.053	6.2706	15.000	3807	1	0	0	0	0	17.053	6.2706	15.000	3875	1	0	0	0	0	18.053	6.2706	15.000	3943	1	0	0	0	0	19.053	6.2706	15.000
3740	1	0	0	0	0	16.053	5.7882	15.000	3808	1	0	0	0	0	17.053	5.7882	15.000	3876	1	0	0	0	0	18.053	5.7882	15.000	3944	1	0	0	0	0	19.053	5.7882	15.000
3741	1	0	0	0	0	16.053	5.3059	15.000	3809	1	0	0	0	0	17.053	5.3059	15.000	3877	1	0	0	0	0	18.053	5.3059	15.000	3945	1	0	0	0	0	19.053	5.3059	15.000
3742	1	0	0	0	0	16.053	4.8235	15.000	3810	1	0	0	0	0	17.053	4.8235	15.000	3878	1	0	0	0	0	18.053	4.8235	15.000	3946	1	0	0	0	0	19.053	4.8235	15.000
3743	1	0	0	0	0	16.053	4.3412	15.000	3811	1	0	0	0	0	17.053	4.3412	15.000	3879	1	0	0	0	0	18.053	4.3412	15.000	3947	1	0	0	0	0	19.053	4.3412	15.000
3744	1	0	0	0	0	16.053	3.8588	15.000	3812	1	0	0	0	0	17.053	3.8588	15.000	3880	1	0	0	0	0	18.053	3.8588	15.000	3948	1	0	0	0	0	19.053	3.8588	15.000
3745	1	0	0	0	0	16.053	3.3765	15.000	3813	1	0	0	0	0	17.053	3.3765	15.000	3881	1	0	0	0	0	18.053	3.3765	15.000	3949	1	0	0	0	0	19.053	3.3765	15.000
3746	1	0	0	0	0	16.053	2.8941	15.000	3814	1	0	0	0	0	17.053	2.8941	15.000	3882	1	0	0	0	0	18.053	2.8941	15.000	3950	1	0	0	0	0	19.053	2.8941	15.000
3747	1	0	0	0	0	16.053	2.4118	15.000	3815	1	0	0	0	0	17.053	2.4118	15.000	3883	1	0	0	0	0	18.053	2.4118	15.000	3951	1	0	0	0	0	19.053	2.4118	15.000
3748	1	0	0	0	0	16.053	1.9294	15.000	3816	1	0	0	0	0	17.053	1.9294	15.000	3884	1	0	0	0	0	18.053	1.9294	15.000	3952	1	0	0	0	0	19.053	1.9294	15.000
3749																																			

4007	1	0	0	0	0	0	19.803	.00000	15.000	4075	1	0	0	0	0	0	20.803	.00000	15.000	4143	0	0	0	0	0	0	4.1811	.00000	10.161	4211	0	0	0	0	0	0	6.1787	.00000	14.032
4008	1	0	0	0	0	0	20.053	7.7176	15.000	4076	1	0	0	0	0	0	21.053	7.7176	15.000	4144	0	0	0	0	0	0	4.3683	.00000	10.645	4212	0	0	0	0	0	0	6.3659	.00000	14.516
4009	1	0	0	0	0	0	20.053	7.2353	15.000	4077	1	0	0	0	0	0	21.053	7.2353	15.000	4145	0	0	0	0	0	0	4.5555	.00000	11.129	4213	0	0	0	0	0	0	1.1872	.00000	.48387
4010	1	0	0	0	0	0	20.053	6.7529	15.000	4078	1	0	0	0	0	0	21.053	6.7529	15.000	4146	0	0	0	0	0	0	4.7427	.00000	11.613	4214	0	0	0	0	0	0	1.3744	.00000	.96774
4011	1	0	0	0	0	0	20.053	6.2706	15.000	4079	1	0	0	0	0	0	21.053	6.2706	15.000	4147	0	0	0	0	0	0	4.9299	.00000	12.097	4215	0	0	0	0	0	0	1.5616	.00000	1.4516
4012	1	0	0	0	0	0	20.053	5.7882	15.000	4080	1	0	0	0	0	0	21.053	5.7882	15.000	4148	0	0	0	0	0	0	5.1171	.00000	12.581	4216	0	0	0	0	0	0	1.7488	.00000	1.9355
4013	1	0	0	0	0	0	20.053	5.3059	15.000	4081	1	0	0	0	0	0	21.053	5.3059	15.000	4149	0	0	0	0	0	0	5.3043	.00000	13.065	4217	0	0	0	0	0	0	1.9360	.00000	2.4194
4014	1	0	0	0	0	0	20.053	4.8235	15.000	4082	1	0	0	0	0	0	21.053	4.8235	15.000	4150	0	0	0	0	0	0	5.4915	.00000	13.548	4218	0	0	0	0	0	0	2.1232	.00000	2.9032
4015	1	0	0	0	0	0	20.053	4.3412	15.000	4083	1	0	0	0	0	0	21.053	4.3412	15.000	4151	0	0	0	0	0	0	5.6787	.00000	14.032	4219	0	0	0	0	0	0	2.3104	.00000	3.3871
4016	1	0	0	0	0	0	20.053	3.8588	15.000	4084	1	0	0	0	0	0	21.053	3.8588	15.000	4152	0	0	0	0	0	0	5.8659	.00000	14.516	4220	0	0	0	0	0	0	2.4976	.00000	3.8710
4017	1	0	0	0	0	0	20.053	3.3765	15.000	4085	1	0	0	0	0	0	21.053	3.3765	15.000	4153	0	0	0	0	0	0	6.8720	.00000	.48387	4221	0	0	0	0	0	0	2.6848	.00000	4.3548
4018	1	0	0	0	0	0	20.053	2.8941	15.000	4086	1	0	0	0	0	0	21.053	2.8941	15.000	4154	0	0	0	0	0	0	8.7439	.00000	.96774	4222	0	0	0	0	0	0	2.8720	.00000	4.8387
4019	1	0	0	0	0	0	20.053	2.4118	15.000	4087	1	0	0	0	0	0	21.053	2.4118	15.000	4155	0	0	0	0	0	0	1.0616	.00000	1.4516	4223	0	0	0	0	0	0	3.0592	.00000	5.3226
4020	1	0	0	0	0	0	20.053	1.9294	15.000	4088	1	0	0	0	0	0	21.053	1.9294	15.000	4156	0	0	0	0	0	0	1.2488	.00000	1.9355	4224	0	0	0	0	0	0	3.2463	.00000	5.8065
4021	1	0	0	0	0	0	20.053	1.4471	15.000	4089	1	0	0	0	0	0	21.053	1.4471	15.000	4157	0	0	0	0	0	0	1.4360	.00000	2.4194	4225	0	0	0	0	0	0	3.4335	.00000	6.2903
4022	1	0	0	0	0	0	20.053	.96471	15.000	4090	1	0	0	0	0	0	21.053	.96471	15.000	4158	0	0	0	0	0	0	1.6232	.00000	2.9032	4226	0	0	0	0	0	0	3.6207	.00000	6.7742
4023	1	0	0	0	0	0	20.053	.48235	15.000	4091	1	0	0	0	0	0	21.053	.48235	15.000	4159	0	0	0	0	0	0	1.8104	.00000	3.3871	4227	0	0	0	0	0	0	3.8079	.00000	7.2581
4024	1	0	0	0	0	0	20.053	.00000	15.000	4092	1	0	0	0	0	0	21.053	.00000	15.000	4160	0	0	0	0	0	0	1.9976	.00000	3.8710	4228	0	0	0	0	0	0	3.9951	.00000	7.7419
4025	1	0	0	0	0	0	20.303	7.7176	15.000	4093	0	0	0	0	0	0	18720	.00000	48387	4161	0	0	0	0	0	0	2.1848	.00000	4.3548	4229	0	0	0	0	0	0	4.1823	.00000	8.2258
4026	1	0	0	0	0	0	20.303	7.2353	15.000	4094	0	0	0	0	0	0	37439	.00000	.96774	4162	0	0	0	0	0	0	2.3720	.00000	4.8387	4230	0	0	0	0	0	0	4.3695	.00000	8.7097
4027	1	0	0	0	0	0	20.303	6.7529	15.000	4095	0	0	0	0	0	0	56159	.00000	1.4516	4163	0	0	0	0	0	0	2.5592	.00000	5.3226	4231	0	0	0	0	0	0	4.5567	.00000	9.1935
4028	1	0	0	0	0	0	20.303	6.2706	15.000	4096	0	0	0	0	0	0	74878	.00000	1.9355	4164	0	0	0	0	0	0	2.7463	.00000	5.8065	4232	0	0	0	0	0	0	4.7439	.00000	9.6774
4029	1	0	0	0	0	0	20.303	5.7882	15.000	4097	0	0	0	0	0	0	93598	.00000	2.4194	4165	0	0	0	0	0	0	2.9335	.00000	6.2903	4233	0	0	0	0	0	0	4.9311	.00000	10.161
4030	1	0	0	0	0	0	20.303	5.3059	15.000	4098	0	0	0	0	0	0	1.1232	.00000	2.9032	4166	0	0	0	0	0	0	3.1207	.00000	6.7742	4234	0	0	0	0	0	0	5.1183	.00000	10.645
4031	1	0	0	0	0	0	20.303	4.8235	15.000	4099	0	0	0	0	0	0	1.3104	.00000	3.3871	4167	0	0	0	0	0	0	3.3079	.00000	7.2581	4235	0	0	0	0	0	0	5.3055	.00000	11.129
4032	1	0	0	0	0	0	20.303	4.3412	15.000	4100	0	0	0	0	0	0	1.4976	.00000	3.8710	4168	0	0	0	0	0	0	3.4951	.00000	7.7419	4236	0	0	0	0	0	0	5.4927	.00000	11.613
4033	1	0	0	0	0	0	20.303	3.8588	15.000	4101	0	0	0	0	0	0	1.6848	.00000	4.3548	4169	0	0	0	0	0	0	3.6823	.00000	8.2258	4237	0	0	0	0	0	0	5.6799	.00000	12.097
4034	1	0	0	0	0	0	20.303	3.3765	15.000	4102	0	0	0	0	0	0	1.8720	.00000	4.8387	4170	0	0	0	0	0	0	3.8695	.00000	8.7097	4238	0	0	0	0	0	0	5.8671	.00000	12.581
4035	1	0	0	0	0	0	20.303	2.8941	15.000	4103	0	0	0	0	0	0	2.0592	.00000	5.3226	4171	0	0	0	0	0	0	4.0567	.00000	9.1935	4239	0	0	0	0	0	0	6.0543	.00000	13.065
4036	1	0	0	0	0	0	20.303	2.4118	15.000	4104	0	0	0	0	0	0	2.2463	.00000	5.8065	4172	0	0	0	0	0	0	4.2439	.00000	9.6774	4240	0	0	0	0	0	0	6.2415	.00000	13.548
4037	1	0	0	0	0	0	20.303	1.9294	15.000	4105	0	0	0	0	0	0	2.4335	.00000	6.2903	4173	0	0	0	0	0	0	4.4311	.00000	10.161	4241	0	0	0	0	0	0	6.4287	.00000	14.032
4038	1	0	0	0	0	0	20.303	1.4471	15.000	4106	0	0	0	0	0	0	2.6207	.00000	6.7742	4174	0	0	0	0	0	0	4.6183	.00000	10.645	4242	0	0	0	0	0	0	6.6159	.00000	14.516
4039	1	0	0	0	0	0	20.303	.96471	15.000	4107	0	0	0	0	0	0	2.8079	.00000	7.2581	4175	0	0	0	0	0	0	4.8055	.00000	11.129	4243	0	0	0	0	0	0	1.4372	.00000	.48387
4040	1	0	0	0	0	0	20.303	.48235	15.000	4108	0	0	0	0	0	0	2.9951	.00000	7.7419	4176	0	0	0	0	0	0	4.9927	.00000	11.613	4244	0	0	0	0	0	0	1.6244	.00000	.96774
4041	1	0	0	0	0	0	20.303	.00000	15.000	4109	0	0	0	0	0	0	3.1823	.00000	8.2258	4177	0	0	0	0	0	0	5.1799	.00000	12.097	4245	0	0	0	0	0	0	1.8116	.00000	1.4516
4042	1	0	0	0	0	0	20.553	7.7176	15.000	4110	0	0	0	0	0	0	3.3695	.00000	8.7097	4178	0	0	0	0	0	0	5.3671	.00000	12.581	4246	0	0	0	0	0	0	1.9988	.00000	1.9355
4043	1	0	0	0	0	0	20.553	7.2353	15.000	4111	0	0	0	0	0	0	3.5567	.00000	9.1935	4179	0	0	0	0	0	0	5.5543	.00000	13.065	4247	0	0	0	0	0	0	2.1860	.00000	2.4194
4044	1	0	0	0	0	0	20.553	6.7529	15.000	4112	0	0	0	0	0	0	3.7439	.00000	9.6774	4180	0	0	0	0	0	0	5.7415	.00000	13.548	4248	0	0	0	0	0	0	2.3732	.00000	2.9032
4045	1	0	0	0	0	0	20.553	6.2706	15.000	4113	0	0	0	0	0	0	3.9311	.00000	10.161	4181	0	0	0	0	0	0	5.9287	.00000	14.032	4249	0	0	0	0	0	0	2.5604	.00000	3.3871
4046	1	0	0	0	0	0	20.553	5.7882	15.000	4114	0	0	0	0	0																								

4279	0	0	0	0	0	2.8104	.00000	3.3871	4347	0	0	0	0	0	4.8079	.00000	7.2581	4415	0	0	0	0	0	6.8055	.00000	11.129	4483	0	0	0	0	0	3.4372	.00000	48387
4280	0	0	0	0	0	2.9976	.00000	3.8710	4348	0	0	0	0	0	4.9951	.00000	7.7419	4416	0	0	0	0	0	6.9927	.00000	11.613	4484	0	0	0	0	0	3.6244	.00000	96774
4281	0	0	0	0	0	3.1848	.00000	4.3548	4349	0	0	0	0	0	5.1823	.00000	8.2258	4417	0	0	0	0	0	7.1799	.00000	12.097	4485	0	0	0	0	0	3.8116	.00000	1.4516
4282	0	0	0	0	0	3.3720	.00000	4.8387	4350	0	0	0	0	0	5.3695	.00000	8.7097	4418	0	0	0	0	0	7.3671	.00000	12.581	4486	0	0	0	0	0	3.9988	.00000	1.9355
4283	0	0	0	0	0	3.5592	.00000	5.3226	4351	0	0	0	0	0	5.5567	.00000	9.1935	4419	0	0	0	0	0	7.5543	.00000	13.065	4487	0	0	0	0	0	4.1860	.00000	2.4194
4284	0	0	0	0	0	3.7463	.00000	5.8065	4352	0	0	0	0	0	5.7439	.00000	9.6774	4420	0	0	0	0	0	7.7415	.00000	13.548	4488	0	0	0	0	0	4.3732	.00000	2.9032
4285	0	0	0	0	0	3.9335	.00000	6.2903	4353	0	0	0	0	0	5.9311	.00000	10.161	4421	0	0	0	0	0	7.9287	.00000	14.032	4489	0	0	0	0	0	4.5604	.00000	3.3871
4286	0	0	0	0	0	4.1207	.00000	6.7742	4354	0	0	0	0	0	6.1183	.00000	10.645	4422	0	0	0	0	0	8.1159	.00000	14.516	4490	0	0	0	0	0	4.7476	.00000	3.8710
4287	0	0	0	0	0	4.3079	.00000	7.2581	4355	0	0	0	0	0	6.3055	.00000	11.129	4423	0	0	0	0	0	2.9372	.00000	48387	4491	0	0	0	0	0	4.9348	.00000	4.3548
4288	0	0	0	0	0	4.4951	.00000	7.7419	4356	0	0	0	0	0	6.4927	.00000	11.613	4424	0	0	0	0	0	3.1244	.00000	96774	4492	0	0	0	0	0	5.1220	.00000	4.8387
4289	0	0	0	0	0	4.6823	.00000	8.2258	4357	0	0	0	0	0	6.6799	.00000	12.097	4425	0	0	0	0	0	3.3116	.00000	1.4516	4493	0	0	0	0	0	5.3091	.00000	5.3226
4290	0	0	0	0	0	4.8695	.00000	8.7097	4358	0	0	0	0	0	6.8671	.00000	12.581	4426	0	0	0	0	0	3.4988	.00000	1.9355	4494	0	0	0	0	0	5.4963	.00000	5.8065
4291	0	0	0	0	0	5.0567	.00000	9.1935	4359	0	0	0	0	0	7.0543	.00000	13.065	4427	0	0	0	0	0	3.6860	.00000	2.4194	4495	0	0	0	0	0	5.6835	.00000	6.2903
4292	0	0	0	0	0	5.2439	.00000	9.6774	4360	0	0	0	0	0	7.2415	.00000	13.548	4428	0	0	0	0	0	3.8732	.00000	2.9032	4496	0	0	0	0	0	5.8707	.00000	6.7742
4293	0	0	0	0	0	5.4311	.00000	10.161	4361	0	0	0	0	0	7.4287	.00000	14.032	4429	0	0	0	0	0	4.0604	.00000	3.3871	4497	0	0	0	0	0	6.0579	.00000	7.2581
4294	0	0	0	0	0	5.6183	.00000	10.645	4362	0	0	0	0	0	7.6159	.00000	14.516	4430	0	0	0	0	0	4.2476	.00000	3.8710	4498	0	0	0	0	0	6.2451	.00000	7.7419
4295	0	0	0	0	0	5.8055	.00000	11.129	4363	0	0	0	0	0	7.8031	.00000	14.999	4431	0	0	0	0	0	4.4348	.00000	4.3548	4499	0	0	0	0	0	6.4323	.00000	8.2258
4296	0	0	0	0	0	5.9927	.00000	11.613	4364	0	0	0	0	0	7.9903	.00000	15.483	4432	0	0	0	0	0	4.6220	.00000	4.8387	4500	0	0	0	0	0	6.6195	.00000	8.7097
4297	0	0	0	0	0	6.1799	.00000	12.097	4365	0	0	0	0	0	8.1779	.00000	15.967	4433	0	0	0	0	0	4.8091	.00000	5.3226	4501	0	0	0	0	0	6.8067	.00000	9.1935
4298	0	0	0	0	0	6.3671	.00000	12.581	4366	0	0	0	0	0	8.3659	.00000	16.451	4434	0	0	0	0	0	4.9963	.00000	5.8065	4502	0	0	0	0	0	6.9939	.00000	9.6774
4299	0	0	0	0	0	6.5543	.00000	13.065	4367	0	0	0	0	0	8.5543	.00000	16.935	4435	0	0	0	0	0	5.1835	.00000	6.2903	4503	0	0	0	0	0	7.1811	.00000	10.161
4300	0	0	0	0	0	6.7415	.00000	13.548	4368	0	0	0	0	0	8.7427	.00000	17.419	4436	0	0	0	0	0	5.3707	.00000	6.7742	4504	0	0	0	0	0	7.3683	.00000	10.645
4301	0	0	0	0	0	6.9287	.00000	14.032	4369	0	0	0	0	0	8.9311	.00000	17.903	4437	0	0	0	0	0	5.5579	.00000	7.2581	4505	0	0	0	0	0	7.5555	.00000	11.129
4302	0	0	0	0	0	7.1159	.00000	14.516	4370	0	0	0	0	0	9.1183	.00000	18.387	4438	0	0	0	0	0	5.7451	.00000	7.7419	4506	0	0	0	0	0	7.7427	.00000	11.613
4303	0	0	0	0	0	7.3031	.00000	14.999	4371	0	0	0	0	0	9.3003	.00000	18.871	4439	0	0	0	0	0	5.9323	.00000	8.2258	4507	0	0	0	0	0	7.9299	.00000	12.097
4304	0	0	0	0	0	7.4903	.00000	15.483	4372	0	0	0	0	0	9.4927	.00000	19.355	4440	0	0	0	0	0	6.1195	.00000	8.7097	4508	0	0	0	0	0	8.1171	.00000	12.581
4305	0	0	0	0	0	7.6775	.00000	15.967	4373	0	0	0	0	0	9.6751	.00000	19.839	4441	0	0	0	0	0	6.3067	.00000	9.1935	4509	0	0	0	0	0	8.3043	.00000	13.065
4306	0	0	0	0	0	7.8647	.00000	16.451	4374	0	0	0	0	0	9.8575	.00000	20.323	4442	0	0	0	0	0	6.4939	.00000	9.6774	4510	0	0	0	0	0	8.4915	.00000	13.548
4307	0	0	0	0	0	8.0519	.00000	16.935	4375	0	0	0	0	0	10.0403	.00000	20.807	4443	0	0	0	0	0	6.6811	.00000	10.161	4511	0	0	0	0	0	8.6787	.00000	14.032
4308	0	0	0	0	0	8.2391	.00000	17.419	4376	0	0	0	0	0	10.2275	.00000	21.291	4444	0	0	0	0	0	6.8683	.00000	10.645	4512	0	0	0	0	0	8.8659	.00000	14.516
4309	0	0	0	0	0	8.4263	.00000	17.903	4377	0	0	0	0	0	10.4147	.00000	21.775	4445	0	0	0	0	0	7.0555	.00000	11.129	4513	0	0	0	0	0	9.0531	.00000	15.000
4310	0	0	0	0	0	8.6135	.00000	18.387	4378	0	0	0	0	0	10.6020	.00000	22.259	4446	0	0	0	0	0	7.2427	.00000	11.613	4514	0	0	0	0	0	9.2403	.00000	15.483
4311	0	0	0	0	0	8.8007	.00000	18.871	4379	0	0	0	0	0	10.7892	.00000	22.743	4447	0	0	0	0	0	7.4299	.00000	12.097	4515	0	0	0	0	0	9.4275	.00000	15.967
4312	0	0	0	0	0	8.9879	.00000	19.355	4380	0	0	0	0	0	10.9764	.00000	23.227	4448	0	0	0	0	0	7.6171	.00000	12.581	4516	0	0	0	0	0	9.6151	.00000	16.451
4313	0	0	0	0	0	9.1751	.00000	19.839	4381	0	0	0	0	0	11.1636	.00000	23.711	4449	0	0	0	0	0	7.8043	.00000	13.065	4517	0	0	0	0	0	9.8027	.00000	16.935
4314	0	0	0	0	0	9.3623	.00000	20.323	4382	0	0	0	0	0	11.3508	.00000	24.195	4450	0	0	0	0	0	7.9915	.00000	13.548	4518	0	0	0	0	0	10.0000	.00000	17.419
4315	0	0	0	0	0	9.5495	.00000	20.807	4383	0	0	0	0	0	11.5380	.00000	24.679	4451	0	0	0	0	0	8.1787	.00000	14.032	4519	0	0	0	0	0	10.1875	.00000	17.903
4316	0	0	0	0	0	9.7367	.00000	21.291	4384	0	0	0	0	0	11.7252	.00000	25.163	4452	0	0	0	0	0	8.3659	.00000	14.516	4520	0	0	0	0	0	10.3751	.00000	18.387
4317	0	0	0	0	0	9.9239	.00000	21.775	4385	0	0	0	0	0	11.9124	.00000	25.647	4453	0	0	0	0	0	8.5531	.00000	15.000	4521	0	0	0	0	0	10.5627	.00000	18.871
4318	0	0	0	0	0	10.1111	.00000	22.259	4386	0	0	0	0	0	12.1000	.00000	26.131	4454	0	0	0	0	0	8.7403	.00000	15.483	4522	0	0	0	0	0	10.7503	.00000	19.355
4319	0	0	0	0	0	10.2983	.00000	22.743	4387	0	0	0	0	0	12.2872	.00000	26.615	4455	0	0	0	0	0	8.9275	.00000	15.967	4523	0	0	0	0	0	10.9379	.00000	19.839
4320	0	0	0	0	0	10.4855	.00000	23.227	4388	0	0	0	0	0	12.4744	.00000	27.100	4456	0	0	0	0	0	9.1147	.00000	16.451	4524	0	0	0	0	0	11.1255	.00000	20.323
4321	0	0	0	0	0	10.6727	.00000	23.711	4389	0	0	0	0	0	12.6616	.00000	27.584	4457	0	0	0	0	0	9.3019											

4551	0	0	0	0	0	5.4348	.00000	4.3548	4619	0	0	0	0	0	7.4323	.00000	8.2258	4687	0	0	0	0	0	9.4299	.00000	12.097	4755	0	0	0	0	0	6.0616	.00000	1.4516
4552	0	0	0	0	0	5.6220	.00000	4.8387	4620	0	0	0	0	0	7.6195	.00000	8.7097	4688	0	0	0	0	0	9.6171	.00000	12.581	4756	0	0	0	0	0	6.2488	.00000	1.9355
4553	0	0	0	0	0	5.8091	.00000	5.3226	4621	0	0	0	0	0	7.8067	.00000	9.1935	4689	0	0	0	0	0	9.8043	.00000	13.065	4757	0	0	0	0	0	6.4360	.00000	2.4194
4554	0	0	0	0	0	5.9963	.00000	5.8065	4622	0	0	0	0	0	7.9939	.00000	9.6774	4690	0	0	0	0	0	9.9915	.00000	13.548	4758	0	0	0	0	0	6.6232	.00000	2.9032
4555	0	0	0	0	0	6.1835	.00000	6.2903	4623	0	0	0	0	0	8.1811	.00000	10.161	4691	0	0	0	0	0	10.179	.00000	14.032	4759	0	0	0	0	0	6.8104	.00000	3.3871
4556	0	0	0	0	0	6.3707	.00000	6.7742	4624	0	0	0	0	0	8.3683	.00000	10.645	4692	0	0	0	0	0	10.366	.00000	14.516	4760	0	0	0	0	0	6.9976	.00000	3.8710
4557	0	0	0	0	0	6.5579	.00000	7.2581	4625	0	0	0	0	0	8.5555	.00000	11.129	4693	0	0	0	0	0	5.1872	.00000	48387	4761	0	0	0	0	0	7.1848	.00000	4.3548
4558	0	0	0	0	0	6.7451	.00000	7.7419	4626	0	0	0	0	0	8.7427	.00000	11.613	4694	0	0	0	0	0	5.3744	.00000	96774	4762	0	0	0	0	0	7.3720	.00000	4.8387
4559	0	0	0	0	0	6.9323	.00000	8.2258	4627	0	0	0	0	0	8.9299	.00000	12.097	4695	0	0	0	0	0	5.5616	.00000	1.4516	4763	0	0	0	0	0	7.5592	.00000	5.3226
4560	0	0	0	0	0	7.1195	.00000	8.7097	4628	0	0	0	0	0	9.1171	.00000	12.581	4696	0	0	0	0	0	5.7488	.00000	1.9355	4764	0	0	0	0	0	7.7463	.00000	5.8065
4561	0	0	0	0	0	7.3067	.00000	9.1935	4629	0	0	0	0	0	9.3043	.00000	13.065	4697	0	0	0	0	0	5.9360	.00000	2.4194	4765	0	0	0	0	0	7.9335	.00000	6.2903
4562	0	0	0	0	0	7.4939	.00000	9.6774	4630	0	0	0	0	0	9.4915	.00000	13.548	4698	0	0	0	0	0	6.1232	.00000	2.9032	4766	0	0	0	0	0	8.1207	.00000	6.7742
4563	0	0	0	0	0	7.6811	.00000	10.161	4631	0	0	0	0	0	9.6787	.00000	14.032	4699	0	0	0	0	0	6.3104	.00000	3.3871	4767	0	0	0	0	0	8.3079	.00000	7.2581
4564	0	0	0	0	0	7.8683	.00000	10.645	4632	0	0	0	0	0	9.8659	.00000	14.516	4700	0	0	0	0	0	6.4976	.00000	3.8710	4768	0	0	0	0	0	8.4951	.00000	7.7419
4565	0	0	0	0	0	8.0555	.00000	11.129	4633	0	0	0	0	0	4.6872	.00000	.48387	4701	0	0	0	0	0	6.6848	.00000	4.3548	4769	0	0	0	0	0	8.6823	.00000	8.2258
4566	0	0	0	0	0	8.2427	.00000	11.613	4634	0	0	0	0	0	4.8744	.00000	.96774	4702	0	0	0	0	0	6.8720	.00000	4.8387	4770	0	0	0	0	0	8.8695	.00000	8.7097
4567	0	0	0	0	0	8.4299	.00000	12.097	4635	0	0	0	0	0	5.0616	.00000	1.4516	4703	0	0	0	0	0	7.0592	.00000	5.3226	4771	0	0	0	0	0	9.0567	.00000	9.1935
4568	0	0	0	0	0	8.6171	.00000	12.581	4636	0	0	0	0	0	5.2488	.00000	1.9355	4704	0	0	0	0	0	7.2463	.00000	5.8065	4772	0	0	0	0	0	9.2439	.00000	9.6774
4569	0	0	0	0	0	8.8043	.00000	13.065	4637	0	0	0	0	0	5.4360	.00000	2.4194	4705	0	0	0	0	0	7.4335	.00000	6.2903	4773	0	0	0	0	0	9.4311	.00000	10.161
4570	0	0	0	0	0	8.9915	.00000	13.548	4638	0	0	0	0	0	5.6232	.00000	2.9032	4706	0	0	0	0	0	7.6207	.00000	6.7742	4774	0	0	0	0	0	9.6183	.00000	10.645
4571	0	0	0	0	0	9.1787	.00000	14.032	4639	0	0	0	0	0	5.8104	.00000	3.3871	4707	0	0	0	0	0	7.8079	.00000	7.2581	4775	0	0	0	0	0	9.8055	.00000	11.129
4572	0	0	0	0	0	9.3659	.00000	14.516	4640	0	0	0	0	0	5.9976	.00000	3.8710	4708	0	0	0	0	0	7.9951	.00000	7.7419	4776	0	0	0	0	0	9.9927	.00000	11.613
4573	0	0	0	0	0	4.1872	.00000	.48387	4641	0	0	0	0	0	6.1848	.00000	4.3548	4709	0	0	0	0	0	8.1823	.00000	8.2258	4777	0	0	0	0	0	10.180	.00000	12.097
4574	0	0	0	0	0	4.3744	.00000	.96774	4642	0	0	0	0	0	6.3720	.00000	4.8387	4710	0	0	0	0	0	8.3695	.00000	8.7097	4778	0	0	0	0	0	10.367	.00000	12.581
4575	0	0	0	0	0	4.5616	.00000	1.4516	4643	0	0	0	0	0	6.5592	.00000	5.3226	4711	0	0	0	0	0	8.5567	.00000	9.1935	4779	0	0	0	0	0	10.554	.00000	13.065
4576	0	0	0	0	0	4.7488	.00000	1.9355	4644	0	0	0	0	0	6.7463	.00000	5.8065	4712	0	0	0	0	0	8.7439	.00000	9.6774	4780	0	0	0	0	0	10.741	.00000	13.548
4577	0	0	0	0	0	4.9360	.00000	2.4194	4645	0	0	0	0	0	6.9335	.00000	6.2903	4713	0	0	0	0	0	8.9311	.00000	10.161	4781	0	0	0	0	0	10.929	.00000	14.032
4578	0	0	0	0	0	5.1232	.00000	2.9032	4646	0	0	0	0	0	7.1207	.00000	6.7742	4714	0	0	0	0	0	9.1183	.00000	10.645	4782	0	0	0	0	0	11.116	.00000	14.516
4579	0	0	0	0	0	5.3104	.00000	3.3871	4647	0	0	0	0	0	7.3079	.00000	7.2581	4715	0	0	0	0	0	9.3055	.00000	11.129	4783	0	0	0	0	0	5.9372	.00000	.48387
4580	0	0	0	0	0	5.4976	.00000	3.8710	4648	0	0	0	0	0	7.4951	.00000	7.7419	4716	0	0	0	0	0	9.4927	.00000	11.613	4784	0	0	0	0	0	6.1244	.00000	.96774
4581	0	0	0	0	0	5.6848	.00000	4.3548	4649	0	0	0	0	0	7.6823	.00000	8.2258	4717	0	0	0	0	0	9.6799	.00000	12.097	4785	0	0	0	0	0	6.3116	.00000	1.4516
4582	0	0	0	0	0	5.8720	.00000	4.8387	4650	0	0	0	0	0	7.8695	.00000	8.7097	4718	0	0	0	0	0	9.8671	.00000	12.581	4786	0	0	0	0	0	6.4988	.00000	1.9355
4583	0	0	0	0	0	6.0592	.00000	5.3226	4651	0	0	0	0	0	8.0567	.00000	9.1935	4719	0	0	0	0	0	10.054	.00000	13.065	4787	0	0	0	0	0	6.6860	.00000	2.4194
4584	0	0	0	0	0	6.2463	.00000	5.8065	4652	0	0	0	0	0	8.2439	.00000	9.6774	4720	0	0	0	0	0	10.241	.00000	13.548	4788	0	0	0	0	0	6.8732	.00000	2.9032
4585	0	0	0	0	0	6.4335	.00000	6.2903	4653	0	0	0	0	0	8.4311	.00000	10.161	4721	0	0	0	0	0	10.429	.00000	14.032	4789	0	0	0	0	0	7.0604	.00000	3.3871
4586	0	0	0	0	0	6.6207	.00000	6.7742	4654	0	0	0	0	0	8.6183	.00000	10.645	4722	0	0	0	0	0	10.616	.00000	14.516	4790	0	0	0	0	0	7.2476	.00000	3.8710
4587	0	0	0	0	0	6.8079	.00000	7.2581	4655	0	0	0	0	0	8.8055	.00000	11.129	4723	0	0	0	0	0	5.4372	.00000	.48387	4791	0	0	0	0	0	7.4348	.00000	4.3548
4588	0	0	0	0	0	6.9951	.00000	7.7419	4656	0	0	0	0	0	8.9927	.00000	11.613	4724	0	0	0	0	0	5.6244	.00000	.96774	4792	0	0	0	0	0	7.6220	.00000	4.8387
4589	0	0	0	0	0	7.1823	.00000	8.2258	4657	0	0	0	0	0	9.1799	.00000	12.097	4725	0	0	0	0	0	5.8116	.00000	1.4516	4793	0	0	0	0	0	7.8092	.00000	5.3226
4590	0	0	0	0	0	7.3695	.00000	8.7097	4658	0	0	0	0	0	9.3671	.00000	12.581	4726	0	0	0	0	0	5.9988	.00000	1.9355	4794	0	0	0	0	0	7.9963	.00000	5.8065
4591	0	0	0	0	0	7.5567	.00000	9.1935	4659	0	0	0	0	0	9.5543	.00000	13.065	4727	0	0	0	0	0	6.1860	.00000	2.4194	4795	0	0	0	0	0	8.1835	.00000	6.2903
4592	0	0	0	0	0	7.7439	.00000	9.6774	4660	0	0	0	0	0	9.7415	.00000	13.548	4728	0	0	0	0	0	6.3732	.00000	2.9032	4796	0	0	0	0	0	8.3707	.00000	6.7742
4593	0	0	0	0	0	7.9311	.00000	10.161	4661	0	0	0	0	0	9.9287	.00000	14.032	4729	0	0	0	0	0	6.5604	.00000	3.3871	4797								

5095	0	0	0	0	0	0	10.684	.00000	6.2903	5163	0	0	0	0	0	12.681	.00000	10.161	5231	0	0	0	0	0	14.679	.00000	14.032	5299	0	0	0	0	0	11.310	.00000	3.3871
5096	0	0	0	0	0	0	10.871	.00000	6.7742	5164	0	0	0	0	0	12.868	.00000	10.645	5232	0	0	0	0	0	14.866	.00000	14.516	5300	0	0	0	0	0	11.498	.00000	3.8710
5097	0	0	0	0	0	0	11.058	.00000	7.2581	5165	0	0	0	0	0	13.055	.00000	11.129	5233	0	0	0	0	0	9.6872	.00000	48387	5301	0	0	0	0	0	11.685	.00000	4.3548
5098	0	0	0	0	0	0	11.245	.00000	7.7419	5166	0	0	0	0	0	13.243	.00000	11.613	5234	0	0	0	0	0	9.8744	.00000	.96774	5302	0	0	0	0	0	11.872	.00000	4.8387
5099	0	0	0	0	0	0	11.432	.00000	8.2258	5167	0	0	0	0	0	13.430	.00000	12.097	5235	0	0	0	0	0	10.062	.00000	1.4516	5303	0	0	0	0	0	12.059	.00000	5.3226
5100	0	0	0	0	0	0	11.620	.00000	8.7097	5168	0	0	0	0	0	13.617	.00000	12.581	5236	0	0	0	0	0	10.249	.00000	1.9355	5304	0	0	0	0	0	12.246	.00000	5.8065
5101	0	0	0	0	0	0	11.807	.00000	9.1935	5169	0	0	0	0	0	13.804	.00000	13.065	5237	0	0	0	0	0	10.436	.00000	2.4194	5305	0	0	0	0	0	12.434	.00000	6.2903
5102	0	0	0	0	0	0	11.994	.00000	9.6774	5170	0	0	0	0	0	13.991	.00000	13.548	5238	0	0	0	0	0	10.623	.00000	2.9032	5306	0	0	0	0	0	12.621	.00000	6.7742
5103	0	0	0	0	0	0	12.181	.00000	10.161	5171	0	0	0	0	0	14.179	.00000	14.032	5239	0	0	0	0	0	10.810	.00000	3.3871	5307	0	0	0	0	0	12.808	.00000	7.2581
5104	0	0	0	0	0	0	12.368	.00000	10.645	5172	0	0	0	0	0	14.366	.00000	14.516	5240	0	0	0	0	0	10.998	.00000	3.8710	5308	0	0	0	0	0	12.995	.00000	7.7419
5105	0	0	0	0	0	0	12.555	.00000	11.129	5173	0	0	0	0	0	9.1872	.00000	48387	5241	0	0	0	0	0	11.185	.00000	4.3548	5309	0	0	0	0	0	13.182	.00000	8.2258
5106	0	0	0	0	0	0	12.743	.00000	11.613	5174	0	0	0	0	0	9.3744	.00000	96774	5242	0	0	0	0	0	11.372	.00000	4.8387	5310	0	0	0	0	0	13.370	.00000	8.7097
5107	0	0	0	0	0	0	12.930	.00000	12.097	5175	0	0	0	0	0	9.5616	.00000	1.4516	5243	0	0	0	0	0	11.559	.00000	5.3226	5311	0	0	0	0	0	13.557	.00000	9.1935
5108	0	0	0	0	0	0	13.117	.00000	12.581	5176	0	0	0	0	0	9.7488	.00000	1.9355	5244	0	0	0	0	0	11.746	.00000	5.8065	5312	0	0	0	0	0	13.744	.00000	9.6774
5109	0	0	0	0	0	0	13.304	.00000	13.065	5177	0	0	0	0	0	9.9360	.00000	2.4194	5245	0	0	0	0	0	11.934	.00000	6.2903	5313	0	0	0	0	0	13.931	.00000	10.161
5110	0	0	0	0	0	0	13.491	.00000	13.548	5178	0	0	0	0	0	10.123	.00000	2.9032	5246	0	0	0	0	0	12.121	.00000	6.7742	5314	0	0	0	0	0	14.118	.00000	10.645
5111	0	0	0	0	0	0	13.679	.00000	14.032	5179	0	0	0	0	0	10.310	.00000	3.3871	5247	0	0	0	0	0	12.308	.00000	7.2581	5315	0	0	0	0	0	14.305	.00000	11.129
5112	0	0	0	0	0	0	13.866	.00000	14.516	5180	0	0	0	0	0	10.498	.00000	3.8710	5248	0	0	0	0	0	12.495	.00000	7.7419	5316	0	0	0	0	0	14.493	.00000	11.613
5113	0	0	0	0	0	0	8.6872	.00000	48387	5181	0	0	0	0	0	10.685	.00000	4.3548	5249	0	0	0	0	0	12.682	.00000	8.2258	5317	0	0	0	0	0	14.680	.00000	12.097
5114	0	0	0	0	0	0	8.8744	.00000	96774	5182	0	0	0	0	0	10.872	.00000	4.8387	5250	0	0	0	0	0	12.870	.00000	8.7097	5318	0	0	0	0	0	14.867	.00000	12.581
5115	0	0	0	0	0	0	9.0616	.00000	1.4516	5183	0	0	0	0	0	11.059	.00000	5.3226	5251	0	0	0	0	0	13.057	.00000	9.1935	5319	0	0	0	0	0	15.054	.00000	13.065
5116	0	0	0	0	0	0	9.2488	.00000	1.9355	5184	0	0	0	0	0	11.246	.00000	5.8065	5252	0	0	0	0	0	13.244	.00000	9.6774	5320	0	0	0	0	0	15.241	.00000	13.548
5117	0	0	0	0	0	0	9.4360	.00000	2.4194	5185	0	0	0	0	0	11.434	.00000	6.2903	5253	0	0	0	0	0	13.431	.00000	10.161	5321	0	0	0	0	0	15.429	.00000	14.032
5118	0	0	0	0	0	0	9.6232	.00000	2.9032	5186	0	0	0	0	0	11.621	.00000	6.7742	5254	0	0	0	0	0	13.618	.00000	10.645	5322	0	0	0	0	0	15.616	.00000	14.516
5119	0	0	0	0	0	0	9.8104	.00000	3.3871	5187	0	0	0	0	0	11.808	.00000	7.2581	5255	0	0	0	0	0	13.805	.00000	11.129	5323	0	0	0	0	0	10.437	.00000	48387
5120	0	0	0	0	0	0	9.9976	.00000	3.8710	5188	0	0	0	0	0	11.995	.00000	7.7419	5256	0	0	0	0	0	13.993	.00000	11.613	5324	0	0	0	0	0	10.624	.00000	.96774
5121	0	0	0	0	0	0	10.185	.00000	4.3548	5189	0	0	0	0	0	12.182	.00000	8.2258	5257	0	0	0	0	0	14.180	.00000	12.097	5325	0	0	0	0	0	10.812	.00000	1.4516
5122	0	0	0	0	0	0	10.372	.00000	4.8387	5190	0	0	0	0	0	12.370	.00000	8.7097	5258	0	0	0	0	0	14.367	.00000	12.581	5326	0	0	0	0	0	10.999	.00000	1.9355
5123	0	0	0	0	0	0	10.559	.00000	5.3226	5191	0	0	0	0	0	12.557	.00000	9.1935	5259	0	0	0	0	0	14.554	.00000	13.065	5327	0	0	0	0	0	11.186	.00000	2.4194
5124	0	0	0	0	0	0	10.746	.00000	5.8065	5192	0	0	0	0	0	12.744	.00000	9.6774	5260	0	0	0	0	0	14.741	.00000	13.548	5328	0	0	0	0	0	11.373	.00000	2.9032
5125	0	0	0	0	0	0	10.934	.00000	6.2903	5193	0	0	0	0	0	12.931	.00000	10.161	5261	0	0	0	0	0	14.929	.00000	14.032	5329	0	0	0	0	0	11.560	.00000	3.3871
5126	0	0	0	0	0	0	11.121	.00000	6.7742	5194	0	0	0	0	0	13.118	.00000	10.645	5262	0	0	0	0	0	15.116	.00000	14.516	5330	0	0	0	0	0	11.748	.00000	3.8710
5127	0	0	0	0	0	0	11.308	.00000	7.2581	5195	0	0	0	0	0	13.305	.00000	11.129	5263	0	0	0	0	0	9.9372	.00000	48387	5331	0	0	0	0	0	11.935	.00000	4.3548
5128	0	0	0	0	0	0	11.495	.00000	7.7419	5196	0	0	0	0	0	13.493	.00000	11.613	5264	0	0	0	0	0	10.124	.00000	.96774	5332	0	0	0	0	0	12.122	.00000	4.8387
5129	0	0	0	0	0	0	11.682	.00000	8.2258	5197	0	0	0	0	0	13.680	.00000	12.097	5265	0	0	0	0	0	10.312	.00000	1.4516	5333	0	0	0	0	0	12.309	.00000	5.3226
5130	0	0	0	0	0	0	11.870	.00000	8.7097	5198	0	0	0	0	0	13.867	.00000	12.581	5266	0	0	0	0	0	10.499	.00000	1.9355	5334	0	0	0	0	0	12.496	.00000	5.8065
5131	0	0	0	0	0	0	12.057	.00000	9.1935	5199	0	0	0	0	0	14.054	.00000	13.065	5267	0	0	0	0	0	10.686	.00000	2.4194	5335	0	0	0	0	0	12.684	.00000	6.2903
5132	0	0	0	0	0	0	12.244	.00000	9.6774	5200	0	0	0	0	0	14.241	.00000	13.548	5268	0	0	0	0	0	10.873	.00000	2.9032	5336	0	0	0	0	0	12.871	.00000	6.7742
5133	0	0	0	0	0	0	12.431	.00000	10.161	5201	0	0	0	0	0	14.429	.00000	14.032	5269	0	0	0	0	0	11.060	.00000	3.3871	5337	0	0	0	0	0	13.058	.00000	7.2581
5134	0	0	0	0	0	0	12.618	.00000	10.645	5202	0	0	0	0	0	14.616	.00000	14.516	5270	0	0	0	0	0	11.248	.00000	3.8710	5338	0	0	0	0	0	13.245	.00000	7.7419
5135	0	0	0	0	0	0	12.805	.00000	11.129	5203	0	0	0	0	0	9.4372	.00000	48387	5271	0	0	0	0	0	11.435	.00000	4.3548	5339	0	0	0	0	0	13.432	.00000	8.2258
5136	0	0	0	0	0	0	12.993	.00000	11.613	5204	0	0	0	0	0	9.6244	.00000	96774	5272	0	0	0	0	0	11.622	.00000	4.8387	5340	0	0	0	0	0	13.620		

5367	0	0	0	0	0	0	13.308	.00000	7.2581	5435	0	0	0	0	0	15.305	.00000	11.129	5503	0	0	0	0	0	11.937	.00000	48387	5571	0	0	0	0	0	13.935	.00000	4.3548
5368	0	0	0	0	0	0	13.495	.00000	7.7419	5436	0	0	0	0	0	15.493	.00000	11.613	5504	0	0	0	0	0	12.124	.00000	96774	5572	0	0	0	0	0	14.122	.00000	4.8387
5369	0	0	0	0	0	0	13.682	.00000	8.2258	5437	0	0	0	0	0	15.680	.00000	12.097	5505	0	0	0	0	0	12.312	.00000	1.4516	5573	0	0	0	0	0	14.309	.00000	5.3226
5370	0	0	0	0	0	0	13.870	.00000	8.7097	5438	0	0	0	0	0	15.867	.00000	12.581	5506	0	0	0	0	0	12.499	.00000	1.9355	5574	0	0	0	0	0	14.496	.00000	5.8065
5371	0	0	0	0	0	0	14.057	.00000	9.1935	5439	0	0	0	0	0	16.054	.00000	13.065	5507	0	0	0	0	0	12.686	.00000	2.4194	5575	0	0	0	0	0	14.684	.00000	6.2903
5372	0	0	0	0	0	0	14.244	.00000	9.6774	5440	0	0	0	0	0	16.241	.00000	13.548	5508	0	0	0	0	0	12.873	.00000	2.9032	5576	0	0	0	0	0	14.871	.00000	6.7742
5373	0	0	0	0	0	0	14.431	.00000	10.161	5441	0	0	0	0	0	16.429	.00000	14.032	5509	0	0	0	0	0	13.060	.00000	3.3871	5577	0	0	0	0	0	15.058	.00000	7.2581
5374	0	0	0	0	0	0	14.618	.00000	10.645	5442	0	0	0	0	0	16.616	.00000	14.516	5510	0	0	0	0	0	13.248	.00000	3.8710	5578	0	0	0	0	0	15.245	.00000	7.7419
5375	0	0	0	0	0	0	14.805	.00000	11.129	5443	0	0	0	0	0	11.437	.00000	48387	5511	0	0	0	0	0	13.435	.00000	4.3548	5579	0	0	0	0	0	15.432	.00000	8.2258
5376	0	0	0	0	0	0	14.993	.00000	11.613	5444	0	0	0	0	0	11.624	.00000	96774	5512	0	0	0	0	0	13.622	.00000	4.8387	5580	0	0	0	0	0	15.620	.00000	8.7097
5377	0	0	0	0	0	0	15.180	.00000	12.097	5445	0	0	0	0	0	11.812	.00000	1.4516	5513	0	0	0	0	0	13.809	.00000	5.3226	5581	0	0	0	0	0	15.807	.00000	9.1935
5378	0	0	0	0	0	0	15.367	.00000	12.581	5446	0	0	0	0	0	11.999	.00000	1.9355	5514	0	0	0	0	0	13.996	.00000	5.8065	5582	0	0	0	0	0	15.994	.00000	9.6774
5379	0	0	0	0	0	0	15.554	.00000	13.065	5447	0	0	0	0	0	12.186	.00000	2.4194	5515	0	0	0	0	0	14.184	.00000	6.2903	5583	0	0	0	0	0	16.181	.00000	10.161
5380	0	0	0	0	0	0	15.741	.00000	13.548	5448	0	0	0	0	0	12.373	.00000	2.9032	5516	0	0	0	0	0	14.371	.00000	6.7742	5584	0	0	0	0	0	16.368	.00000	10.645
5381	0	0	0	0	0	0	15.929	.00000	14.032	5449	0	0	0	0	0	12.560	.00000	3.3871	5517	0	0	0	0	0	14.558	.00000	7.2581	5585	0	0	0	0	0	16.555	.00000	11.129
5382	0	0	0	0	0	0	16.116	.00000	14.516	5450	0	0	0	0	0	12.748	.00000	3.8710	5518	0	0	0	0	0	14.745	.00000	7.7419	5586	0	0	0	0	0	16.743	.00000	11.613
5383	0	0	0	0	0	0	10.937	.00000	48387	5451	0	0	0	0	0	12.935	.00000	4.3548	5519	0	0	0	0	0	14.932	.00000	8.2258	5587	0	0	0	0	0	16.930	.00000	12.097
5384	0	0	0	0	0	0	11.124	.00000	96774	5452	0	0	0	0	0	13.122	.00000	4.8387	5520	0	0	0	0	0	15.120	.00000	8.7097	5588	0	0	0	0	0	17.117	.00000	12.581
5385	0	0	0	0	0	0	11.312	.00000	1.4516	5453	0	0	0	0	0	13.309	.00000	5.3226	5521	0	0	0	0	0	15.307	.00000	9.1935	5589	0	0	0	0	0	17.304	.00000	13.065
5386	0	0	0	0	0	0	11.499	.00000	1.9355	5454	0	0	0	0	0	13.496	.00000	5.8065	5522	0	0	0	0	0	15.494	.00000	9.6774	5590	0	0	0	0	0	17.491	.00000	13.548
5387	0	0	0	0	0	0	11.686	.00000	2.4194	5455	0	0	0	0	0	13.684	.00000	6.2903	5523	0	0	0	0	0	15.681	.00000	10.161	5591	0	0	0	0	0	17.679	.00000	14.032
5388	0	0	0	0	0	0	11.873	.00000	2.9032	5456	0	0	0	0	0	13.871	.00000	6.7742	5524	0	0	0	0	0	15.868	.00000	10.645	5592	0	0	0	0	0	17.866	.00000	14.516
5389	0	0	0	0	0	0	12.060	.00000	3.3871	5457	0	0	0	0	0	14.058	.00000	7.2581	5525	0	0	0	0	0	16.055	.00000	11.129	5593	0	0	0	0	0	12.687	.00000	48387
5390	0	0	0	0	0	0	12.248	.00000	3.8710	5458	0	0	0	0	0	14.245	.00000	7.7419	5526	0	0	0	0	0	16.243	.00000	11.613	5594	0	0	0	0	0	12.874	.00000	96774
5391	0	0	0	0	0	0	12.435	.00000	4.3548	5459	0	0	0	0	0	14.432	.00000	8.2258	5527	0	0	0	0	0	16.430	.00000	12.097	5595	0	0	0	0	0	13.062	.00000	1.4516
5392	0	0	0	0	0	0	12.622	.00000	4.8387	5460	0	0	0	0	0	14.620	.00000	8.7097	5528	0	0	0	0	0	16.617	.00000	12.581	5596	0	0	0	0	0	13.249	.00000	1.9355
5393	0	0	0	0	0	0	12.809	.00000	5.3226	5461	0	0	0	0	0	14.807	.00000	9.1935	5529	0	0	0	0	0	16.804	.00000	13.065	5597	0	0	0	0	0	13.436	.00000	2.4194
5394	0	0	0	0	0	0	12.996	.00000	5.8065	5462	0	0	0	0	0	14.994	.00000	9.6774	5530	0	0	0	0	0	16.991	.00000	13.548	5598	0	0	0	0	0	13.623	.00000	2.9032
5395	0	0	0	0	0	0	13.184	.00000	6.2903	5463	0	0	0	0	0	15.181	.00000	10.161	5531	0	0	0	0	0	17.179	.00000	14.032	5599	0	0	0	0	0	13.810	.00000	3.3871
5396	0	0	0	0	0	0	13.371	.00000	6.7742	5464	0	0	0	0	0	15.368	.00000	10.645	5532	0	0	0	0	0	17.366	.00000	14.516	5600	0	0	0	0	0	13.998	.00000	3.8710
5397	0	0	0	0	0	0	13.558	.00000	7.2581	5465	0	0	0	0	0	15.555	.00000	11.129	5533	0	0	0	0	0	12.187	.00000	48387	5601	0	0	0	0	0	14.185	.00000	4.3548
5398	0	0	0	0	0	0	13.745	.00000	7.7419	5466	0	0	0	0	0	15.743	.00000	11.613	5534	0	0	0	0	0	12.374	.00000	96774	5602	0	0	0	0	0	14.372	.00000	4.8387
5399	0	0	0	0	0	0	13.932	.00000	8.2258	5467	0	0	0	0	0	15.930	.00000	12.097	5535	0	0	0	0	0	12.562	.00000	1.4516	5603	0	0	0	0	0	14.559	.00000	5.3226
5400	0	0	0	0	0	0	14.120	.00000	8.7097	5468	0	0	0	0	0	16.117	.00000	12.581	5536	0	0	0	0	0	12.749	.00000	1.9355	5604	0	0	0	0	0	14.746	.00000	5.8065
5401	0	0	0	0	0	0	14.307	.00000	9.1935	5469	0	0	0	0	0	16.304	.00000	13.065	5537	0	0	0	0	0	12.936	.00000	2.4194	5605	0	0	0	0	0	14.934	.00000	6.2903
5402	0	0	0	0	0	0	14.494	.00000	9.6774	5470	0	0	0	0	0	16.491	.00000	13.548	5538	0	0	0	0	0	13.123	.00000	2.9032	5606	0	0	0	0	0	15.121	.00000	6.7742
5403	0	0	0	0	0	0	14.681	.00000	10.161	5471	0	0	0	0	0	16.679	.00000	14.032	5539	0	0	0	0	0	13.310	.00000	3.3871	5607	0	0	0	0	0	15.308	.00000	7.2581
5404	0	0	0	0	0	0	14.868	.00000	10.645	5472	0	0	0	0	0	16.866	.00000	14.516	5540	0	0	0	0	0	13.498	.00000	3.8710	5608	0	0	0	0	0	15.495	.00000	7.7419
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5406	0	0	0	0	0	0	15.243	.00000	11.613	5474	0	0	0	0	0	11.874	.00000	96774	5542	0	0	0	0	0	13.872	.00000	4.8387	5610	0	0	0	0	0	15.870	.00000	8.7097
5407	0	0	0	0	0	0	15.430	.00000	12.097	5475	0	0	0	0	0	12.062	.00000	1.4516	5543	0	0	0	0	0	14.059	.00000	5.3226	5611	0	0	0	0	0	16.057	.00000	9.1935
5408	0	0	0	0	0	0	15.617	.00000	12.581	5476	0	0	0	0	0	12.249	.00000	1.9355	5544	0	0	0	0	0	14.246	.00000	5.8065	5612	0	0	0	0	0	16.244		


```

Element input data
-----
ELEM EGRP MP REAL ECS  NODE 1  NODE 2  NODE 3
NODE 4  NODE 5  NODE 6
      NODE 7  NODE 8  NODE 9  NODE10
NODE11  NODE12
      NODE13  NODE14  NODE15  NODE16
NODE17  NODE18
      NODE19  NODE20
  1  1  1  1 -1    1    2    20    19
  2  1  1  1 -1    2    3    21    20
  3  1  1  1 -1    3    4    22    21
  4  1  1  1 -1    4    5    23    22
  5  1  1  1 -1    5    6    24    23
  6  1  1  1 -1    6    7    25    24
  7  1  1  1 -1    7    8    26    25
  8  1  1  1 -1    8    9    27    26
  9  1  1  1 -1    9   10    28    27
 10  1  1  1 -1   10   11    29    28
 11  1  1  1 -1   11   12    30    29
 12  1  1  1 -1   12   13    31    30
 13  1  1  1 -1   13   14    32    31
 14  1  1  1 -1   14   15    33    32
 15  1  1  1 -1   15   16    34    33
 16  1  1  1 -1   16   17    35    34
 17  1  1  1 -1   17   18    36    35
 18  1  1  1 -1   19   20    38    37
 19  1  1  1 -1   20   21    39    38
 20  1  1  1 -1   21   22    40    39
 21  1  1  1 -1   22   23    41    40
 22  1  1  1 -1   23   24    42    41
 23  1  1  1 -1   24   25    43    42
 24  1  1  1 -1   25   26    44    43
 25  1  1  1 -1   26   27    45    44
 26  1  1  1 -1   27   28    46    45
 27  1  1  1 -1   28   29    47    46
 28  1  1  1 -1   29   30    48    47
 29  1  1  1 -1   30   31    49    48
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 31  1  1  1 -1   32   33    51    50
 32  1  1  1 -1   33   34    52    51
 33  1  1  1 -1   34   35    53    52
 34  1  1  1 -1   35   36    54    53
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 37  1  1  1 -1   39   40    58    57
 38  1  1  1 -1   40   41    59    58
 39  1  1  1 -1   41   42    60    59
 40  1  1  1 -1   42   43    61    60
 41  1  1  1 -1   43   44    62    61
 42  1  1  1 -1   44   45    63    62
 43  1  1  1 -1   45   46    64    63
 44  1  1  1 -1   46   47    65    64
 45  1  1  1 -1   47   48    66    65
 46  1  1  1 -1   48   49    67    66
 47  1  1  1 -1   49   50    68    67
 48  1  1  1 -1   50   51    69    68
 49  1  1  1 -1   51   52    70    69
 50  1  1  1 -1   52   53    71    70
 51  1  1  1 -1   53   54    72    71
 52  1  1  1 -1   55   56    74    73
 53  1  1  1 -1   56   57    75    74
 54  1  1  1 -1   57   58    76    75
 55  1  1  1 -1   58   59    77    76
 56  1  1  1 -1   59   60    78    77
 57  1  1  1 -1   60   61    79    78
 58  1  1  1 -1   61   62    80    79
 59  1  1  1 -1   62   63    81    80

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128	1	1	1	-1	135	136	154	153
129	1	1	1	-1	136	137	155	154
130	1	1	1	-1	137	138	156	155
131	1	1	1	-1	138	139	157	156
132	1	1	1	-1	139	140	158	157
133	1	1	1	-1	140	141	159	158
134	1	1	1	-1	141	142	160	159
135	1	1	1	-1	142	143	161	160
136	1	1	1	-1	143	144	162	161
137	1	1	1	-1	145	146	164	163
138	1	1	1	-1	146	147	165	164
139	1	1	1	-1	147	148	166	165
140	1	1	1	-1	148	149	167	166
141	1	1	1	-1	149	150	168	167
142	1	1	1	-1	150	151	169	168
143	1	1	1	-1	151	152	170	169
144	1	1	1	-1	152	153	171	170
145	1	1	1	-1	153	154	172	171
146	1	1	1	-1	154	155	173	172
147	1	1	1	-1	155	156	174	173
148	1	1	1	-1	156	157	175	174
149	1	1	1	-1	157	158	176	175
150	1	1	1	-1	158	159	177	176
151	1	1	1	-1	159	160	178	177
152	1	1	1	-1	160	161	179	178
153	1	1	1	-1	161	162	180	179
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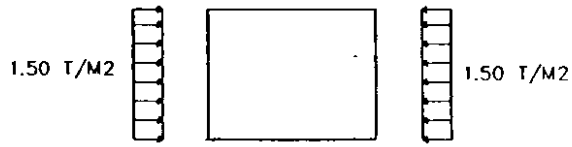
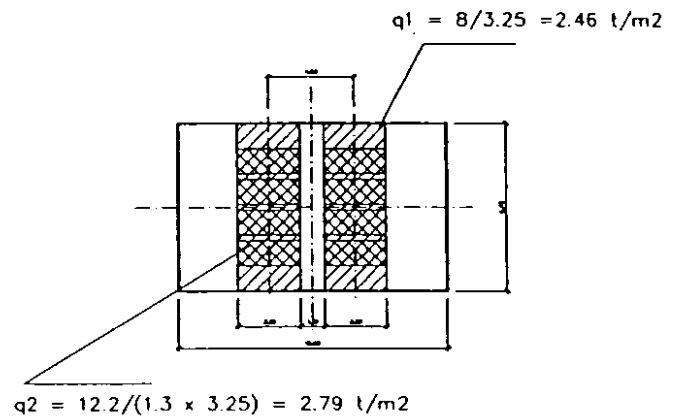
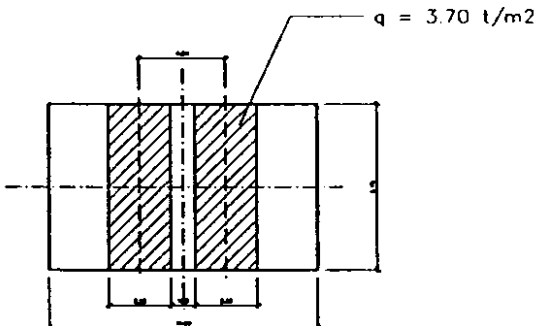
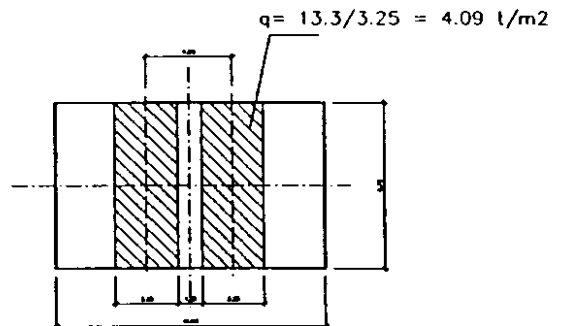
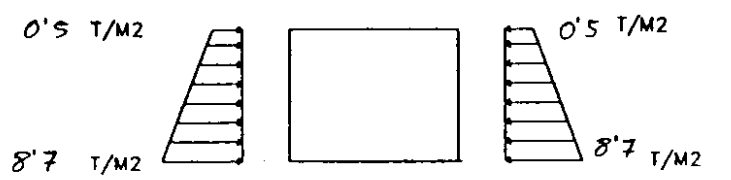
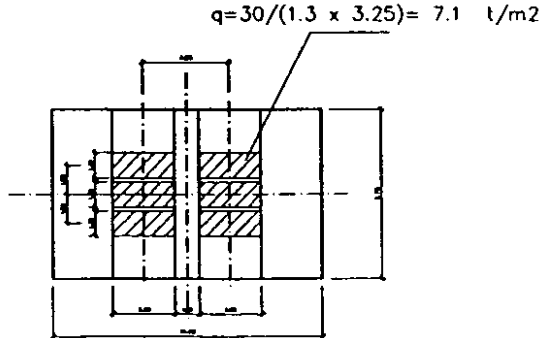
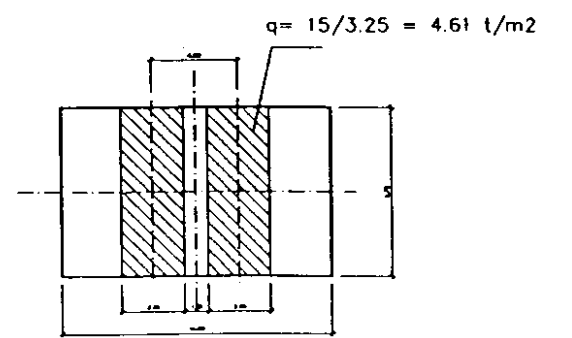
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5401	1	1	6	-1	5481	5482	5512	5511	5469	1	1	6	-1	5547	5548	5578	5577	5537	1	1	6	-1	5613	5614	5644	5643	5605	1	1	6	-1	5679	5680	5710	5709
5402	1	1	6	-1	5482	5483	5513	5512	5470	1	1	6	-1	5548	5549	5579	5578	5538	1	1	6	-1	5614	5615	5645	5644	5606	1	1	6	-1	5680	5681	5711	5710
5403	1	1	6	-1	5483	5484	5514	5513	5471	1	1	6	-1	5549	5550	5580	5579	5539	1	1	6	-1	5615	5616	5646	5645	5607	1	1	6	-1	5681	5682	5712	5711
5404	1	1	6	-1	5484	5485	5515	5514	5472	1	1	6	-1	5550	5551	5581	5580	5540	1	1	6	-1	5616	5617	5647	5646	5608	1	1	6	-1	5682	3939	3956	5712
5405	1	1	6	-1	5485	5486	5516	5515	5473	1	1	6	-1	5551	5552	5582	5581	5541	1	1	6	-1	5617	5618	5648	5647	5609	1	1	6	-1	955	5683	5713	973
5406	1	1	6	-1	5486	5487	5517	5516	5474	1	1	6	-1	5552	5553	5583	5582	5542	1	1	6	-1	5618	5619	5649	5648	5610	1	1	6	-1	5683	5684	5714	5713
5407	1	1	6	-1	5487	5488	5518	5517	5475	1	1	6	-1	5553	5554	5584	5583	5543	1	1	6	-1	5619	5620	5650	5649	5611	1	1	6	-1	5684	5685	5715	5714

5636	1	1	6	-1	5709	5710	5740	5739
5637	1	1	6	-1	5710	5711	5741	5740
5638	1	1	6	-1	5711	5712	5742	5741
5639	1	1	6	-1	5712	3956	3973	5742
5640	1	1	6	-1	973	5713	5743	991
5641	1	1	6	-1	5713	5714	5744	5743
5642	1	1	6	-1	5714	5715	5745	5744
5643	1	1	6	-1	5715	5716	5746	5745
5644	1	1	6	-1	5716	5717	5747	5746
5645	1	1	6	-1	5717	5718	5748	5747
5646	1	1	6	-1	5718	5719	5749	5748
5647	1	1	6	-1	5719	5720	5750	5749
5648	1	1	6	-1	5720	5721	5751	5750
5649	1	1	6	-1	5721	5722	5752	5751
5650	1	1	6	-1	5722	5723	5753	5752
5651	1	1	6	-1	5723	5724	5754	5753
5652	1	1	6	-1	5724	5725	5755	5754
5653	1	1	6	-1	5725	5726	5756	5755
5654	1	1	6	-1	5726	5727	5757	5756
5655	1	1	6	-1	5727	5728	5758	5757
5656	1	1	6	-1	5728	5729	5759	5758
5657	1	1	6	-1	5729	5730	5760	5759
5658	1	1	6	-1	5730	5731	5761	5760
5659	1	1	6	-1	5731	5732	5762	5761
5660	1	1	6	-1	5732	5733	5763	5762
5661	1	1	6	-1	5733	5734	5764	5763
5662	1	1	6	-1	5734	5735	5765	5764
5663	1	1	6	-1	5735	5736	5766	5765
5664	1	1	6	-1	5736	5737	5767	5766
5665	1	1	6	-1	5737	5738	5768	5767
5666	1	1	6	-1	5738	5739	5769	5768
5667	1	1	6	-1	5739	5740	5770	5769
5668	1	1	6	-1	5740	5741	5771	5770
5669	1	1	6	-1	5741	5742	5772	5771
5670	1	1	6	-1	5742	3973	3990	5772
5671	1	1	6	-1	991	5743	5773	1009
5672	1	1	6	-1	5743	5744	5774	5773
5673	1	1	6	-1	5744	5745	5775	5774
5674	1	1	6	-1	5745	5746	5776	5775
5675	1	1	6	-1	5746	5747	5777	5776
5676	1	1	6	-1	5747	5748	5778	5777
5677	1	1	6	-1	5748	5749	5779	5778
5678	1	1	6	-1	5749	5750	5780	5779
5679	1	1	6	-1	5750	5751	5781	5780
5680	1	1	6	-1	5751	5752	5782	5781
5681	1	1	6	-1	5752	5753	5783	5782
5682	1	1	6	-1	5753	5754	5784	5783
5683	1	1	6	-1	5754	5755	5785	5784
5684	1	1	6	-1	5755	5756	5786	5785
5685	1	1	6	-1	5756	5757	5787	5786
5686	1	1	6	-1	5757	5758	5788	5787
5687	1	1	6	-1	5758	5759	5789	5788
5688	1	1	6	-1	5759	5760	5790	5789
5689	1	1	6	-1	5760	5761	5791	5790
5690	1	1	6	-1	5761	5762	5792	5791
5691	1	1	6	-1	5762	5763	5793	5792
5692	1	1	6	-1	5763	5764	5794	5793
5693	1	1	6	-1	5764	5765	5795	5794
5694	1	1	6	-1	5765	5766	5796	5795
5695	1	1	6	-1	5766	5767	5797	5796
5696	1	1	6	-1	5767	5768	5798	5797
5697	1	1	6	-1	5768	5769	5799	5798
5698	1	1	6	-1	5769	5770	5800	5799
5699	1	1	6	-1	5770	5771	5801	5800
5700	1	1	6	-1	5771	5772	5802	5801
5701	1	1	6	-1	5772	3990	4007	5802
5702	1	1	6	-1	1009	5773	5803	1027
5703	1	1	6	-1	5773	5774	5804	5803

5704	1	1	6	-1	5774	5775	5805	5804
5705	1	1	6	-1	5775	5776	5806	5805
5706	1	1	6	-1	5776	5777	5807	5806
5707	1	1	6	-1	5777	5778	5808	5807
5708	1	1	6	-1	5778	5779	5809	5808
5709	1	1	6	-1	5779	5780	5810	5809
5710	1	1	6	-1	5780	5781	5811	5810
5711	1	1	6	-1	5781	5782	5812	5811
5712	1	1	6	-1	5782	5783	5813	5812
5713	1	1	6	-1	5783	5784	5814	5813
5714	1	1	6	-1	5784	5785	5815	5814
5715	1	1	6	-1	5785	5786	5816	5815
5716	1	1	6	-1	5786	5787	5817	5816
5717	1	1	6	-1	5787	5788	5818	5817
5718	1	1	6	-1	5788	5789	5819	5818
5719	1	1	6	-1	5789	5790	5820	5819
5720	1	1	6	-1	5790	5791	5821	5820
5721	1	1	6	-1	5791	5792	5822	5821
5722	1	1	6	-1	5792	5793	5823	5822
5723	1	1	6	-1	5793	5794	5824	5823
5724	1	1	6	-1	5794	5795	5825	5824
5725	1	1	6	-1	5795	5796	5826	5825
5726	1	1	6	-1	5796	5797	5827	5826
5727	1	1	6	-1	5797	5798	5828	5827
5728	1	1	6	-1	5798	5799	5829	5828
5729	1	1	6	-1	5799	5800	5830	5829
5730	1	1	6	-1	5800	5801	5831	5830
5731	1	1	6	-1	5801	5802	5832	5831
5732	1	1	6	-1	5802	4007	4024	5832
5733	1	1	6	-1	1027	5803	5833	1045
5734	1	1	6	-1	5803	5804	5834	5833
5735	1	1	6	-1	5804	5805	5835	5834
5736	1	1	6	-1	5805	5806	5836	5835
5737	1	1	6	-1	5806	5807	5837	5836
5738	1	1	6	-1	5807	5808	5838	5837
5739	1	1	6	-1	5808	5809	5839	5838
5740	1	1	6	-1	5809	5810	5840	5839
5741	1	1	6	-1	5810	5811	5841	5840
5742	1	1	6	-1	5811	5812	5842	5841
5743	1	1	6	-1	5812	5813	5843	5842
5744	1	1	6	-1	5813	5814	5844	5843
5745	1	1	6	-1	5814	5815	5845	5844
5746	1	1	6	-1	5815	5816	5846	5845
5747	1	1	6	-1	5816	5817	5847	5846
5748	1	1	6	-1	5817	5818	5848	5847
5749	1	1	6	-1	5818	5819	5849	5848
5750	1	1	6	-1	5819	5820	5850	5849
5751	1	1	6	-1	5820	5821	5851	5850
5752	1	1	6	-1	5821	5822	5852	5851
5753	1	1	6	-1	5822	5823	5853	5852
5754	1	1	6	-1	5823	5824	5854	5853
5755	1	1	6	-1	5824	5825	5855	5854
5756	1	1	6	-1	5825	5826	5856	5855
5757	1	1	6	-1	5826	5827	5857	5856
5758	1	1	6	-1	5827	5828	5858	5857
5759	1	1	6	-1	5828	5829	5859	5858
5760	1	1	6	-1	5829	5830	5860	5859
5761	1	1	6	-1	5830	5831	5861	5860
5762	1	1	6	-1	5831	5832	5862	5861
5763	1	1	6	-1	5832	4024	4041	5862
5764	1	1	6	-1	1045	5833	5863	1063
5765	1	1	6	-1	5833	5834	5864	5863
5766	1	1	6	-1	5834	5835	5865	5864
5767	1	1	6	-1	5835	5836	5866	5865
5768	1	1	6	-1	5836	5837	5867	5866
5769	1	1	6	-1	5837	5838	5868	5867
5770	1	1	6	-1	5838	5839	5869	5868
5771	1	1	6	-1	5839	5840	5870	5869

5772	1	1	6	-1	5840	5841	5871	5870
5773	1	1	6	-1	5841	5842	5872	5871
5774	1	1	6	-1	5842	5843	5873	5872
5775	1	1	6	-1	5843	5844	5874	5873
5776	1	1	6	-1	5844	5845	5875	5874
5777	1	1	6	-1	5845	5846	5876	5875
5778	1	1	6	-1	5846	5847	5877	5876
5779	1	1	6	-1	5847	5848	5878	5877
5780	1	1	6	-1	5848	5849	5879	5878
5781	1	1	6	-1	5849	5850	5880	5879
5782	1	1	6	-1	5850	5851	5881	5880
5783	1	1	6	-1	5851	5852	5882	5881
5784	1	1	6	-1	5852	5853	5883	5882
5785	1	1	6	-1	5853	5854	5884	5883
5786	1	1	6	-1	5854	5855	5885	5884
5787	1	1	6	-1	5855	5856	5886	5885
5788	1	1	6	-1	5856	5857	5887	5886
5789	1	1	6	-1	5857	5858	5888	5887
5790	1	1	6	-1	5858	5859	5889	5888
5791	1	1	6	-1	5859	5860	5890	5889
5792	1	1	6	-1	5860	5861	5891	5890
5793	1	1	6	-1	5861	5862	5892	5891
5794	1	1	6	-1	5862	4041	4058	5892
5795	1	1	6	-1	1063	5863	5893	1081
5796	1	1	6	-1	5863	5864	5894	5893
5797	1	1	6	-1	5864	5865	5895	5894
5798	1	1	6	-1	5865	5866	5896	5895
5799	1	1	6	-1	5866	5867	5897	5896
5800	1	1	6	-1	5867	5868	5898	5897
5801	1	1	6	-1	5868	5869	5899	5898
5802	1	1	6	-1	5869	5870	5900	5899
5803	1	1	6	-1	5870	5871	5901	5900
5804	1	1	6	-1				

E-1516.9.2. HIPOTESIS DE CARGA CONSIDERADAS EN EL MODELO 3D

HIPOTESIS 1: PESO PROPIO (PESO ESPECIFICO 2.5 t/m³)	HIPOTESIS 4: EMPUJE DEL TERRENO DEBIDO A UNA SOBRECARGA DE 3 T/M² 	HIPOTESIS 7: TREN LM-71 
HIPOTESIS 2: CARGA MUERTA (PESO DE BALASTO, TRAMESAS Y CARRILES) q= 1'55 T/m²	HIPOTESIS 5: TREN TIPO B (2 x 12 t/m) 	HIPOTESIS 8: TREN TIPO SW/0 
HIPOTESIS 3: EMPUJE DEL TERRENO 	HIPOTESIS 6: TREN TIPO A 	HIPOTESIS 9: TREN TIPO SW/2 

RESULTADOS COSMOS. Esfuerzos característicos en hastiales y dintel.

Proyecto: L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
 Estructura: E-1516.9.2

Hipotesis→ Elem	PESO PROPIO			CARGA MUERTA			EMPUJE TIERRAS			EMPUJE SC			TREN TIPO B			TREN TIPO A			TREN LM-71			TREN SW/D			TREN SW/2		
	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)			
511	-37.1	52.4	-3.2	-10.9	13.4	0.8	-0.7	9.0	-23.1	-0.2	3.0	-5.9	-12.8	15.4	1.2	-6.0	6.4	1.4	-11.5	13.5	1.4	-14.2	17.0	1.3	-16.0	19.2	1.5
512	-35.9	50.9	-3.1	-10.9	13.8	0.8	-0.7	-1.2	-19.1	-0.2	0.3	-5.2	-13.1	16.0	1.2	-6.1	7.1	1.4	-11.7	14.2	1.4	-14.4	17.7	1.3	-16.3	19.9	1.4
513	-34.8	49.5	-3.1	-10.9	14.2	0.8	-0.6	-9.6	-15.4	-0.2	-2.0	-4.5	-13.3	16.5	1.2	-6.2	7.7	1.4	-11.9	14.8	1.4	-14.7	18.2	1.3	-16.6	20.6	1.4
514	-33.7	48.0	-3.1	-10.9	14.6	0.8	-0.6	-16.2	-11.9	-0.2	-4.0	-3.8	-13.5	17.0	1.2	-6.2	8.4	1.4	-12.1	15.5	1.4	-14.9	18.8	1.3	-16.8	21.2	1.4
515	-32.5	46.6	-3.1	-10.9	15.0	0.8	-0.6	-21.1	-8.6	-0.2	-5.7	-3.1	-13.8	17.6	1.2	-6.3	9.0	1.4	-12.3	16.1	1.4	-15.2	19.4	1.3	-17.1	21.9	1.5
516	-31.4	45.1	-3.1	-10.9	15.4	0.8	-0.6	-24.6	-5.6	-0.2	-7.0	-2.3	-14.0	18.1	1.2	-6.4	9.7	1.4	-12.5	16.8	1.5	-15.5	20.0	1.3	-17.5	22.5	1.5
517	-30.3	43.7	-3.0	-10.9	15.9	0.9	-0.6	-26.7	-2.8	-0.2	-8.0	-1.6	-14.3	18.6	1.3	-6.5	10.3	1.4	-12.7	17.4	1.5	-15.8	20.6	1.4	-17.8	23.2	1.6
518	-29.2	42.2	-3.0	-11.0	16.3	0.9	-0.6	-27.4	-0.3	-0.2	-8.6	-0.9	-14.5	19.2	1.3	-6.5	11.0	1.5	-12.9	18.1	1.6	-16.1	21.2	1.5	-18.1	23.9	1.6
519	-28.0	40.8	-2.9	-11.0	16.7	0.9	-0.5	-27.0	2.0	-0.2	-8.8	-0.2	-14.8	19.8	1.4	-6.6	11.7	1.5	-13.2	18.9	1.6	-16.4	21.9	1.5	-18.5	24.6	1.7
520	-26.9	39.4	-2.9	-11.0	17.1	0.9	-0.5	-25.5	4.1	-0.2	-8.8	0.5	-15.1	20.4	1.5	-6.7	12.4	1.5	-13.4	19.6	1.7	-16.7	22.6	1.6	-18.8	25.5	1.8
521	-25.8	38.0	-2.8	-11.0	17.6	0.9	-0.5	-23.1	6.0	-0.2	-8.3	1.2	-15.4	21.1	1.6	-6.8	13.1	1.6	-13.6	20.4	1.8	-17.0	23.4	1.7	-19.2	26.3	2.0
522	-24.6	36.6	-2.8	-11.0	18.0	1.0	-0.5	-19.8	7.6	-0.2	-7.5	2.0	-15.7	21.9	1.7	-6.9	13.9	1.7	-13.9	21.3	1.9	-17.4	24.2	1.9	-19.6	27.3	2.1
523	-23.5	35.3	-2.7	-11.0	18.5	1.0	-0.5	-15.8	9.0	-0.2	-6.4	2.7	-16.0	22.7	1.8	-7.0	14.7	1.7	-14.2	22.3	2.0	-17.7	25.1	2.0	-19.9	28.3	2.3
524	-22.3	33.9	-2.7	-11.0	18.9	1.0	-0.5	-11.1	10.1	-0.2	-4.9	3.4	-16.3	23.7	1.9	-7.1	15.6	1.8	-14.4	23.3	2.2	-18.0	26.2	2.2	-20.3	29.5	2.4
525	-21.2	32.5	-2.7	-11.0	19.4	1.0	-0.5	-6.0	11.1	-0.2	-3.1	4.1	-16.5	24.7	2.1	-7.3	16.5	1.9	-14.6	24.4	2.3	-18.3	27.3	2.3	-20.6	30.8	2.6
526	-20.0	31.2	-2.7	-11.0	19.9	1.0	-0.5	-0.4	11.8	-0.2	-0.9	4.8	-16.7	25.9	2.2	-7.4	17.5	2.0	-14.8	25.7	2.4	-18.5	28.6	2.4	-20.8	32.3	2.7
527	-18.9	29.9	-2.6	-11.0	20.3	1.0	-0.5	5.4	12.2	-0.2	1.6	5.6	-16.8	27.0	2.2	-7.5	18.5	2.0	-14.9	26.9	2.4	-18.5	29.9	2.4	-20.9	33.7	2.7
1021	-142.9	70.7	18.8	-44.7	17.7	8.9	18.1	10.7	-30.5	5.6	3.4	-8.0	-52.2	21.0	9.5	-26.2	8.1	6.6	-47.6	18.0	9.5	-57.7	23.2	10.5	-65.0	26.1	11.8
1022	-95.2	66.0	4.7	-29.8	17.6	4.8	9.0	-1.0	-26.1	2.8	0.3	-7.2	-34.5	20.7	5.0	-17.2	8.8	4.4	-31.5	18.2	5.4	-38.2	22.9	5.5	-43.0	25.9	6.2
1023	-78.9	60.2	4.3	-25.1	17.0	4.8	6.2	-9.5	-22.4	1.9	-2.1	-6.5	-28.8	20.0	5.0	-14.4	9.1	4.5	-26.3	17.8	5.4	-31.9	22.1	5.5	-35.9	24.9	6.2
1024	-68.6	56.6	2.5	-22.4	17.0	4.4	4.6	-16.3	-18.3	1.4	-4.1	-5.7	-25.3	20.0	4.5	-12.8	9.6	4.3	-23.2	18.0	5.0	-28.0	22.1	4.9	-31.6	24.9	5.6
1025	-61.7	54.0	0.6	-20.7	17.2	3.9	3.6	-21.5	-14.0	1.1	-5.8	-4.8	-23.1	20.2	3.8	-11.8	10.4	4.1	-21.2	18.6	4.5	-25.6	22.4	4.3	-28.8	25.2	4.8
1026	-56.6	51.7	-1.1	-19.7	17.6	3.4	3.0	-25.1	-9.7	1.0	-7.2	-3.7	-21.6	20.7	3.2	-11.2	11.1	3.8	-19.9	19.2	3.9	-23.8	22.9	3.5	-26.9	25.8	4.0
1027	-52.7	49.7	-2.7	-19.1	18.0	2.9	2.6	-27.3	-5.4	0.8	-8.2	-2.6	-20.4	21.2	2.6	-10.8	12.0	3.4	-18.9	19.9	3.3	-22.6	23.4	2.8	-25.4	26.4	3.2
1028	-49.6	47.9	-4.2	-18.7	18.5	2.4	2.4	-28.1	-1.4	0.8	-8.8	-1.5	-19.5	21.7	1.9	-10.6	12.8	3.0	-18.1	20.7	2.7	-21.6	24.0	2.1	-24.3	27.1	2.4
1029	-47.1	46.2	-5.5	-18.5	19.0	1.8	2.3	-27.7	2.4	0.7	-9.1	-0.3	-18.8	22.3	1.2	-10.4	13.7	2.6	-17.6	21.5	2.0	-20.8	24.7	1.4	-23.4	27.8	1.5
1030	-45.2	44.6	-6.8	-18.6	19.6	1.3	2.2	-26.2	5.9	0.7	-9.0	0.9	-18.2	22.9	0.5	-10.4	14.6	2.2	-17.1	22.3	1.3	-20.1	25.3	0.6	-22.7	28.5	0.7
1031	-43.8	43.2	-8.0	-18.9	20.2	0.7	2.3	-23.7	9.0	0.8	-8.5	2.1	-17.7	23.5	-0.2	-10.4	15.5	1.7	-16.8	23.1	0.6	-19.5	26.0	-0.3	-22.0	29.3	-0.3
1032	-43.0	41.8	-9.2	-19.5	20.9	0.1	2.5	-20.4	11.6	0.8	-7.7	3.2	-17.2	24.0	-1.1	-10.5	16.4	1.1	-16.5	23.9	-0.2	-19.0	26.6	-1.2	-21.4	30.0	-1.3
1033	-42.9	40.6	-10.5	-20.5	21.7	-0.6	2.9	-16.3	13.8	1.0	-6.6	4.3	-16.8	24.6	-2.0	-10.7	17.3	0.4	-16.3	24.6	-1.2	-18.6	27.1	-2.2	-20.9	30.6	-2.5
1034	-43.9	39.7	-11.6	-22.0	22.6	-1.4	3.5	-11.6	15.5	1.2	-5.1	5.3	-16.5	25.0	-3.0	-11.0	18.3	-0.4	-16.2	25.3	-2.3	-18.2	27.6	-3.4	-20.5	31.1	-3.8
1035	-47.0	39.4	-12.6	-24.6	24.0	-2.1	4.6	-6.4	16.6	1.6	-3.2	6.2	-16.2	25.3	-4.3	-11.5	19.3	-1.3	-16.2	26.0	-3.5	-17.9	28.0	-4.8	-20.2	31.6	-5.4
1036	-5																										

RESULTADOS COSMOS. Esfuerzos característicos en solera.

Proyecto : L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
Estructura: E-1516.9.2

Hipotesis→ Elem	PESO PROPIO			CARGA MUERTA			EMPUJE TIERRAS			EMPUJE SC			TREN TIPO B			TREN TIPO A			TREN LM-71			TREN SW/0			TREN SW/2		
	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)	NX (t/m)	MX (m.t/m)	VX (t/m)
4896	-3.5	-44.3	33.1	0.7	-10.6	9.5	-25.7	-14.5	0.3	-6.5	-4.4	0.1	1.1	-12.1	11.0	1.3	-4.7	5.1	1.3	-10.4	9.8	1.2	-13.4	12.2	1.4	-15.1	13.7
4897	-3.6	-27.2	31.1	0.7	-5.7	9.0	-28.9	-14.3	0.5	-7.3	-4.4	0.1	1.2	-6.4	10.5	1.4	-2.0	4.9	1.4	-5.3	9.4	1.3	-7.1	11.6	1.5	-8.0	13.0
4898	-3.8	-11.3	28.8	0.7	-1.2	8.3	-28.9	-14.1	0.5	-7.3	-4.3	0.2	1.1	-1.4	9.7	1.4	0.8	4.6	1.4	-1.0	8.7	1.3	-1.5	10.7	1.4	-1.7	12.1
4899	-2.8	3.7	26.3	0.7	3.3	7.6	-28.9	-13.9	0.6	-7.3	-4.3	0.2	1.1	4.1	8.9	1.4	3.0	4.2	1.4	4.1	8.0	1.2	4.5	9.8	1.4	5.0	11.0
4900	-3.4	17.2	23.9	0.7	7.2	6.9	-28.9	-13.7	0.6	-7.3	-4.2	0.2	1.1	8.6	8.0	1.4	5.2	3.8	1.4	8.2	7.2	1.2	9.5	8.9	1.3	10.7	10.0
4901	-3.5	29.5	21.6	0.7	10.8	6.2	-28.9	-13.6	0.6	-7.3	-4.2	0.2	1.0	12.7	7.3	1.4	7.1	3.4	1.3	11.9	6.5	1.2	14.1	8.0	1.3	15.8	9.0
4902	-3.5	40.7	19.3	0.7	14.0	5.5	-29.0	-13.4	0.6	-7.3	-4.1	0.2	1.0	16.5	6.5	1.4	8.9	3.0	1.3	15.3	5.8	1.1	18.2	7.2	1.3	20.5	8.1
4903	-3.5	50.8	17.1	0.7	16.9	4.9	-25.8	-13.2	0.5	-6.5	-4.0	0.2	0.9	19.8	5.7	1.2	10.5	2.7	1.2	18.3	5.1	1.0	21.9	6.3	1.2	24.7	7.1
4904	-3.6	59.6	14.9	0.7	19.5	4.3	-25.7	-13.0	0.5	-6.5	-4.0	0.2	0.9	22.8	5.0	1.3	11.9	2.3	1.2	21.0	4.5	1.0	25.2	5.5	1.2	28.4	6.2
4905	-3.6	67.3	12.7	0.7	21.7	3.6	-25.7	-12.9	0.4	-6.4	-3.9	0.1	0.9	25.4	4.2	1.3	13.1	2.0	1.2	23.3	3.8	1.0	28.1	4.7	1.2	31.7	5.3
4906	-3.5	73.8	10.5	0.7	23.5	3.0	-25.7	-12.7	0.4	-6.4	-3.9	0.1	1.0	27.6	3.5	1.3	14.1	1.6	1.2	25.3	3.2	1.1	30.5	3.9	1.2	34.4	4.4
4907	-3.5	79.1	8.4	0.7	25.1	2.4	-25.6	-12.6	0.3	-6.4	-3.9	0.1	1.0	29.4	2.8	1.3	14.9	1.3	1.3	26.9	2.5	1.1	32.5	3.1	1.2	36.6	3.5
4908	-3.5	83.3	6.3	0.8	26.3	1.8	-25.6	-12.5	0.2	-6.4	-3.8	0.1	1.0	30.8	2.1	1.3	15.6	1.0	1.3	28.1	1.9	1.1	34.0	2.3	1.2	38.3	2.6
4909	-3.5	86.2	4.2	0.8	27.1	1.2	-25.6	-12.5	0.2	-6.4	-3.8	0.0	1.0	31.8	1.4	1.3	16.1	0.7	1.3	29.0	1.3	1.1	35.1	1.5	1.2	39.6	1.7
4910	-3.5	88.0	2.1	0.8	27.6	0.6	-25.6	-12.4	0.1	-6.4	-3.8	0.0	1.0	32.4	0.7	1.3	16.3	0.3	1.3	29.6	0.6	1.1	35.8	0.8	1.2	40.3	0.9
4911	-3.5	88.6	0.0	0.8	27.8	0.0	-25.6	-12.4	0.0	-6.4	-3.8	0.0	1.0	32.5	0.0	1.3	16.4	0.0	1.3	29.7	0.0	1.1	36.0	0.0	1.2	40.6	0.0
5826	24.6	-44.1	102.5	10.3	-9.9	32.7	-33.1	-14.7	-17.1	-8.4	-4.4	-5.3	11.2	-11.7	38.2	7.2	-3.7	19.6	10.9	-9.7	35.1	12.4	-13.0	42.3	14.0	-14.6	47.7
5827	8.4	-9.7	82.7	5.1	-0.2	26.4	-30.6	-13.8	-14.3	-7.7	-4.1	-4.4	5.5	-0.3	30.9	4.1	1.5	15.9	5.6	0.5	28.4	6.1	-0.3	34.2	6.8	-0.3	38.5
5828	2.8	8.7	82.6	3.3	5.0	26.2	-29.7	-13.1	-12.9	-7.5	-4.0	-4.0	3.5	5.8	30.6	3.0	4.2	15.6	3.7	5.9	28.0	3.8	6.4	33.8	4.3	7.3	38.1
5829	0.4	25.1	80.8	2.4	9.6	25.4	-29.2	-12.8	-11.8	-7.4	-3.9	-3.6	2.5	11.3	29.7	2.4	6.7	15.0	2.8	10.8	27.1	2.8	12.5	32.8	3.2	14.1	37.0
5830	-1.0	39.5	77.3	1.9	13.7	24.2	-29.0	-12.6	-10.9	-7.3	-3.8	-3.4	2.0	16.2	28.3	2.1	8.9	14.3	2.3	15.1	25.8	2.2	17.9	31.3	2.5	20.2	35.3
5831	-1.8	51.7	73.2	1.6	17.2	22.9	-28.8	-12.4	-10.3	-7.3	-3.8	-3.2	1.7	20.3	26.7	1.9	10.8	13.5	2.0	18.8	24.4	1.8	22.4	29.6	2.1	25.3	33.3
5832	-2.3	61.9	68.8	1.4	20.1	21.5	-28.7	-12.2	-9.7	-7.2	-3.7	-3.0	1.4	23.7	25.1	1.7	12.4	12.6	1.7	21.8	22.9	1.6	26.1	27.7	1.8	29.5	31.3
5833	-2.6	70.1	64.1	1.3	22.5	20.1	-28.7	-12.1	-9.3	-7.2	-3.7	-2.9	1.3	26.4	23.4	1.6	13.6	11.7	1.6	24.3	21.3	1.4	29.2	25.9	1.6	32.9	29.1
5834	-2.8	76.6	59.2	1.2	24.3	18.6	-28.6	-12.0	-8.9	-7.2	-3.7	-2.8	1.1	28.5	21.6	1.5	14.6	10.9	1.4	26.2	19.7	1.2	31.6	23.9	1.4	35.6	27.0
5835	-2.9	81.5	54.1	1.1	25.7	17.1	-28.6	-11.9	-8.6	-7.2	-3.6	-2.7	1.0	30.2	19.8	1.4	15.4	10.0	1.3	27.6	18.1	1.1	33.3	21.9	1.3	37.6	24.7
5836	-2.9	84.9	48.9	1.1	26.7	15.5	-28.6	-11.8	-8.4	-7.2	-3.6	-2.6	0.9	31.3	18.0	1.3	15.9	9.1	1.2	28.6	16.4	1.0	34.6	19.9	1.2	39.0	22.4
5837	-2.9	86.9	43.7	1.1	27.2	13.9	-28.6	-11.8	-8.2	-7.2	-3.6	-2.5	0.9	31.9	16.1	1.2	16.1	8.2	1.1	29.2	14.8	0.9	35.3	17.8	1.1	39.8	20.1
5838	-2.9	87.7	38.3	1.0	27.4	12.3	-28.6	-11.8	-8.0	-7.2	-3.6	-2.5	0.8	32.1	14.3	1.2	16.2	7.2	1.1	29.4	13.1	0.9	35.5	15.8	1.0	40.0	17.8
5839	-2.8	87.2	32.8	1.0	27.3	10.7	-28.6	-11.8	-7.8	-7.2	-3.6	-2.4	0.7	32.0	12.4	1.1	16.1	6.3	1.0	29.2	11.3	0.8	35.3	13.7	0.9	39.8	15.4
5840	-2.7	85.6	27.3	1.0	26.8	9.1	-28.6	-11.8	-7.7	-7.2	-3.6	-2.4	0.7	31.4	10.4	1.1	15.8	5.4	1.0	28.7	9.6	0.8	34.7	11.5	0.9	39.1	13.0
5841	-2.5	82.9	21.8	1.1	26.0	7.4	-28.6	-11.9	-7.5	-7.2	-3.7	-2.3	0.7	30.4	8.5	1.0	15.3	4.5	0.9	27.8	7.8	0.7	33.6	9.4	0.8	37.9	10.6

RESULTADOS COSMOS. Tensiones en cimentación.

Proyecto : L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
Estructura: E-1516.9.2

Hipotesis→ Elem	PESO PROPIO Tensión cim. (T/m²)	CARGA MUERTA Tensión cim. (T/m²)	EMPUJE TIERRAS Tensión cim. (T/m²)	EMPUJE SC Tensión cim. (T/m²)	TREN TIPO B Tensión cim. (T/m²)	TREN TIPO A Tensión cim. (T/m²)	TREN LM-71 Tensión cim. (T/m²)	TREN SW/0 Tensión cim. (T/m²)	TREN SW/2 Tensión cim. (T/m²)
4896	9.4	1.9	-0.2	-0.1	2.2	1.1	2.0	2.5	2.8
4897	9.3	1.9	-0.2	-0.1	2.2	1.0	2.0	2.4	2.7
4898	9.1	1.8	-0.1	0.0	2.1	1.0	1.9	2.3	2.6
4899	8.9	1.7	-0.1	0.0	2.0	1.0	1.8	2.3	2.6
4900	8.8	1.7	-0.1	0.0	2.0	0.9	1.8	2.2	2.5
4901	8.6	1.6	0.0	0.0	1.9	0.9	1.7	2.1	2.4
4902	8.4	1.6	0.0	0.0	1.9	0.9	1.7	2.1	2.3
4903	8.3	1.5	0.0	0.0	1.8	0.9	1.6	2.0	2.2
4904	8.2	1.5	0.0	0.0	1.8	0.8	1.6	1.9	2.2
4905	8.0	1.5	0.1	0.0	1.7	0.8	1.5	1.9	2.1
4906	7.9	1.4	0.1	0.0	1.7	0.8	1.5	1.8	2.1
4907	7.8	1.4	0.1	0.0	1.6	0.8	1.5	1.8	2.0
4908	7.8	1.4	0.1	0.0	1.6	0.8	1.4	1.8	2.0
4909	7.7	1.4	0.1	0.0	1.6	0.7	1.4	1.8	2.0
4910	7.7	1.3	0.1	0.0	1.6	0.7	1.4	1.7	2.0
4911	7.7	1.3	0.1	0.0	1.6	0.7	1.4	1.7	2.0
5826	9.4	1.9	-0.2	-0.1	2.2	1.1	2.0	2.5	2.8
5827	9.2	1.8	-0.2	-0.1	2.1	1.0	1.9	2.4	2.7
5828	8.9	1.8	-0.1	0.0	2.1	1.0	1.9	2.3	2.6
5829	8.7	1.7	-0.1	0.0	2.0	0.9	1.8	2.2	2.5
5830	8.5	1.6	0.0	0.0	1.9	0.9	1.7	2.1	2.4
5831	8.3	1.6	0.0	0.0	1.8	0.9	1.6	2.0	2.3
5832	8.1	1.5	0.0	0.0	1.8	0.8	1.6	1.9	2.2
5833	8.0	1.4	0.1	0.0	1.7	0.8	1.5	1.9	2.1
5834	7.8	1.4	0.1	0.0	1.6	0.8	1.5	1.8	2.0
5835	7.7	1.4	0.1	0.0	1.6	0.7	1.4	1.8	2.0
5836	7.6	1.3	0.1	0.0	1.6	0.7	1.4	1.7	1.9
5837	7.5	1.3	0.1	0.0	1.5	0.7	1.4	1.7	1.9
5838	7.5	1.3	0.1	0.0	1.5	0.7	1.3	1.7	1.9
5839	7.4	1.3	0.2	0.0	1.5	0.7	1.3	1.6	1.9
5840	7.4	1.3	0.2	0.0	1.5	0.7	1.3	1.6	1.9
5841	7.4	1.3	0.2	0.0	1.5	0.7	1.3	1.6	1.9

CALCULO DE ARMADURAS

Proyecto : L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
Estructura: E-1516.9.2

Notación: PP= Peso propio
CM= Carga muerta de traviesas, carriles y balasto
E.t.= Empuje de tierras

E.sc= Empuje de tierras debido a una sobrecarga de 3 t/m²
Tren A= Tren de cargas tipo A de la norma española.
Tren B= Tren de cargas tipo B de la norma española.

LM-71= Load model 71 del Eurocodigo 1
SW/D= Tren pesado tipo SW/D del Eurocodigo 1
SW/2= Tren pesado tipo SW/2 del Eurocodigo 1

Envoltorio de M(+) en E.L.U. (Tracciones en cara interior de hastiales y dintel e inferior en solera).

Sección	Situación el.	Elemento	Cálculo	Coeficientes				Nd T/m	Md mT/m
				PP+CM	E.t	E.sc	Sobrecarga		
Empotramiento inferior de hastial	Eje de estructura	511	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	-43.15	-59.22
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	-43.15	-59.22
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-48.61	-74.80
			Cálculo 2. SW/D	1.00	1.00	0.00	0.00	-48.61	-74.80
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-48.61	-74.80
	Borde estructura	1021	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	-168.85	-79.58
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	-168.85	-79.58
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-169.51	-99.10
			Cálculo 2. SW/D	1.00	1.00	0.00	0.00	-169.51	-99.10
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-169.51	-99.10
			Combinación pésima. Cálculo 1. Tren A						

Media del hastial	Eje de estructura	519	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-36.17	-24.33
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-36.17	-42.53
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-39.97	-47.32
			Cálculo 2. SVV/0	1.00	1.35	1.35	0.00	-39.97	-53.42
			Cálculo 2. SVV/2	1.00	1.35	1.35	0.00	-39.97	-59.05
	Borde estructura	1029	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-54.59	-34.30
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-54.59	-53.74
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-61.60	-59.06
			Cálculo 2. SVV/0	1.00	1.35	1.35	0.00	-61.60	-65.52
			Cálculo 2. SVV/2	1.00	1.35	1.35	0.00	-61.60	-71.87
	Combinación pésima. Cálculo 1. Tren A								-36.17

Empotramiento superior de hastial	Eje de estructura	527	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	-26.96	-45.15
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	-26.96	-45.15
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-30.41	-55.54
			Cálculo 2. SVV/0	1.00	1.00	0.00	0.00	-30.41	-55.54
			Cálculo 2. SVV/2	1.00	1.00	0.00	0.00	-30.41	-55.54
	Borde estructura	1037	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	-109.09	-61.18
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	-109.09	-61.18
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-107.97	-73.88
			Cálculo 2. SVV/0	1.00	1.00	0.00	0.00	-107.97	-73.88
			Cálculo 2. SVV/2	1.00	1.00	0.00	0.00	-107.97	-73.88
			Combinación pésima. Cálculo 1. Tren A						

Empotramiento de dintel	Eje de estructura	1968	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	1.23	-38.54
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	1.23	-38.54
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-11.48	-51.11
			Cálculo 2. SW/D	1.00	1.00	0.00	0.00	-11.48	-51.11
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-11.48	-51.11
	Borde estructura	2898	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	32.13	-41.97
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	32.13	-41.97
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	17.48	-54.76
			Cálculo 2. SW/D	1.00	1.00	0.00	0.00	17.48	-54.76
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	17.48	-54.76
				Combinación pésima. Cálculo 1. Tren A					32.13

Centro de dintel	Eje de estructura	1983	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	-1.19	164.00
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-0.71	168.32
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-14.18	153.52
			Cálculo 2. SW/D	1.35	1.00	0.00	1.45	-13.85	155.19
			Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-13.62	150.21
	Borde estructura	2913	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	3.71	131.33
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	5.25	143.01
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-10.34	125.59
			Cálculo 2. SW/D	1.35	1.00	0.00	1.45	-9.68	129.38
			Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-9.71	125.78
				Combinación pésima. Cálculo 1. Tren B					-0.71

Empotramiento solera	Eje de estructura	4896	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	-49.82	121.29
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-50.04	138.06
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-44.38	122.36
			Cálculo 2. SW/D	1.35	1.35	1.35	1.45	-44.62	128.85
			Cálculo 2. SW/2	1.35	1.35	1.35	1.20	-44.80	126.89
	Borde estructura	5826	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	8.31	117.95
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	15.44	135.98
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	14.91	119.79
			Cálculo 2. SW/D	1.35	1.35	1.35	1.45	18.15	126.84
			Cálculo 2. SW/2	1.35	1.35	1.35	1.20	16.33	124.93
	Combinación pésima. Cálculo 1. Tren B							15.44	135.98

Centro solera	Eje de estructura	4911	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-50.49	-80.42
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-50.49	-80.42
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-45.95	-94.48
			Cálculo 2. SW/D	1.00	1.35	1.35	0.00	-45.95	-94.48
			Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-45.95	-94.48
	Borde estructura	5841	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-55.07	-74.59
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-55.07	-74.59
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-49.85	-87.82
			Cálculo 2. SW/D	1.00	1.35	1.35	0.00	-49.85	-87.82
			Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-49.85	-87.82
			Combinación pésima. Cálculo 1. Tren A						

Envoltorio de M(+) en E.L.S. (Tracciones en cara interior de hastiales y dintel e inferior en solera).

Sección	Situación el.	Elemento	Cálculo	Coeficientes				N T/m	M mT/m
				PP+CM	E _t	E _{sc}	Sobrecarga		
Empotramiento inferior de hastial	Eje de estructura	511	Cálculo 1. Tren A	1.00	0.00	0.00	0.00	-47.94	-65.80
			Cálculo 1. Tren B	1.00	0.00	0.00	0.00	-47.94	-65.80
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-48.61	-74.80
			Cálculo 2. SW/D	1.00	1.00	0.00	0.00	-48.61	-74.80
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-48.61	-74.80
	Borde estructura	1021	Cálculo 1. Tren A	1.00	0.00	0.00	0.00	-187.81	-88.42
			Cálculo 1. Tren B	1.00	0.00	0.00	0.00	-187.81	-88.42
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-169.51	-99.10
			Cálculo 2. SW/D	1.00	1.00	0.00	0.00	-169.51	-99.10
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-169.51	-99.10
			Combinación pésima. Cálculo 1. Tren A				-47.94	-65.80	

Media del hastial	Eje de estructura	519	Cálculo 1. Tren A	1.00	1.00	1.00	0.00	-39.72	-39.23
			Cálculo 1. Tren B	1.00	1.00	1.00	0.00	-39.72	-51.36
			Cálculo 2. LM-71	1.00	1.00	1.00	0.00	-39.72	-49.97
			Cálculo 2. SW/0	1.00	1.00	1.00	0.00	-39.72	-54.48
			Cálculo 2. SW/2	1.00	1.00	1.00	0.00	-39.72	-58.85
	Borde estructura	1029	Cálculo 1. Tren A	1.00	1.00	1.00	0.00	-62.66	-48.95
			Cálculo 1. Tren B	1.00	1.00	1.00	0.00	-62.66	-61.91
			Cálculo 2. LM-71	1.00	1.00	1.00	0.00	-62.66	-60.65
			Cálculo 2. SW/0	1.00	1.00	1.00	0.00	-62.66	-65.44
			Cálculo 2. SW/2	1.00	1.00	1.00	0.00	-62.66	-70.15
	Combinación pésima. Cálculo 1. Tren A								-39.72

Empotramiento superior de hastial	Eje de estructura	527	Cálculo 1. Tren A	1.00	0.00	0.00	0.00	-29.95	-50.17
			Cálculo 1. Tren B	1.00	0.00	0.00	0.00	-29.95	-50.17
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-30.41	-55.54
			Cálculo 2. SW/D	1.00	1.00	0.00	0.00	-30.41	-55.54
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-30.41	-55.54
	Borde estructura	1037	Cálculo 1. Tren A	1.00	0.00	0.00	0.00	-121.21	-67.98
			Cálculo 1. Tren B	1.00	0.00	0.00	0.00	-121.21	-67.98
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-107.97	-73.88
			Cálculo 2. SW/D	1.00	1.00	0.00	0.00	-107.97	-73.88
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-107.97	-73.88
Combinación pésima. Cálculo 1. Tren A								-29.95	-50.17

CALCULO DE ARMADURAS

Proyecto : L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
Estructura: E-1516.9.2

Notación: PP= Peso propio
CM= Carga muerta de traviesas, carriles y balasto
E, E_{sc}= Empuje de tierras

E_{sc}= Empuje de tierras debido a una sobrecarga de 3 t/m²
Tren A= Tren de cargas tipo A de la norma española
Tren B= Tren de cargas tipo B de la norma española

LM-71= Load model 71 del Eurocodigo 1
SW0= Tren pesado tipo SW0 del Eurocodigo 1
SW2= Tren pesado tipo SW2 del Eurocodigo 1

Envoltorio de M_x en E.L.U. (Tracciones en cara exterior de hastiales y dintel y superior en solera).

Sección	Situación el.	Elemento	Cálculo	Coeficientes				Nd T/m	Md mT/m
				PP+CM	E _l	E _{sc}	Sobrecarga		
Empotramiento inferior de hastial	Eje de estructura	511	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	-86.81	-131.21
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-102.12	-151.41
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-90.98	-134.36
			Cálculo 2. SW0	1.35	1.35	1.35	1.45	-96.79	-142.13
			Cálculo 2. SW/2	1.35	1.35	1.35	1.20	-94.70	-139.62
	Borde estructura	1021	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	-304.83	-172.05
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-363.29	-200.96
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-324.84	-177.66
			Cálculo 2. SW0	1.35	1.35	1.35	1.45	-346.74	-188.81
			Cálculo 2. SW/2	1.35	1.35	1.35	1.20	-338.32	-185.42
Combinación pésima. Cálculo 1. Tren B								-363.29	-200.96

Medía del hastial	Eje de estructura	519	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	-73.38	-86.28
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-91.82	-86.28
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-81.79	-50.66
			Cálculo 2. SW/0	1.35	1.00	0.00	1.45	-88.80	-50.66
			Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-86.40	-50.66
	Borde estructura	1029	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	-121.91	-97.83
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-140.77	-97.83
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-124.61	-60.34
			Cálculo 2. SW/0	1.35	1.00	0.00	1.45	-131.55	-60.34
			Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-128.51	-60.34
Combinación pésima. Cálculo 1. Tren A								-121.91	-97.83

Empotramiento superior de hastial	Eje de estructura	527	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	-62.83	-127.27	
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-83.54	-146.53	
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-73.76	-135.72	
			Cálculo 2. SW/0	1.35	1.35	1.35	1.45	-81.52	-142.13	
			Cálculo 2. SW/2	1.35	1.35	1.35	1.20	-78.83	-137.76	
	Borde estructura	1037	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	-188.89	-161.84	
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-193.89	-170.97	
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-179.64	-161.69	
			Cálculo 2. SW/0	1.35	1.35	1.35	1.45	-181.07	-163.55	
			Cálculo 2. SW/2	1.35	1.35	1.35	1.20	-178.28	-159.43	
			Combinación pésima. Cálculo 1. Tren B						-193.89	-170.97

Empotramiento de dintel	Eje de estructura	1968	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	-30.43	-120.48
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	-30.60	-135.08
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	-28.33	-126.08
			Cálculo 2. SW/0	1.35	1.35	1.35	1.45	-28.25	-130.70
			Cálculo 2. SW/2	1.35	1.35	1.35	1.20	-27.95	-126.81
	Borde estructura	2898	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	30.43	-121.57
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	39.90	-125.42
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	36.99	-118.68
			Cálculo 2. SW/0	1.35	1.35	1.35	1.45	40.36	-119.42
			Cálculo 2. SW/2	1.35	1.35	1.35	1.20	38.46	-116.64
Combinación pésima. Cálculo 1. Tren B								39.90	-125.42

Centro de dintel	Eje de estructura	1983	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-26.60	43.06
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-26.60	43.06
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-23.63	51.28
			Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-23.63	51.28
			Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-23.63	51.28
	Borde estructura	2913	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-29.00	39.96
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-29.00	39.96
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-25.48	47.72
			Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-25.48	47.72
			Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-25.48	47.72
			Combinación pésima. Cálculo 1. Tren A					-29.00	39.96

Empotramiento solera	Eje de estructura	4896	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	-2.58	49.44
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	-2.58	49.44
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	-28.54	69.39
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	-28.54	69.39
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	-28.54	69.39
	Borde estructura	5826	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	31.45	48.53
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	31.45	48.53
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	1.81	68.64
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	1.81	68.64
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	1.81	68.64
Combinación pésima. Cálculo 1. Tren A								31.45	48.53

Centro solera	Eje de estructura	4911	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	-1.06	-211.54
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-1.82	-247.79
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-26.46	-209.37
			Cálculo 2. SW0	1.35	1.00	0.00	1.45	-26.86	-222.95
			Cálculo 2. SW2	1.35	1.00	0.00	1.20	-27.02	-217.69
	Borde estructura	5841	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	0.05	-197.84
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-0.72	-231.77
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-28.61	-195.47
			Cálculo 2. SW0	1.35	1.00	0.00	1.45	-29.00	-208.17
			Cálculo 2. SW2	1.35	1.00	0.00	1.20	-29.11	-203.27
Combinación pésima. Cálculo 1. Tren B								-1.82	-247.79

Envoltorio de M_x en E.L.S. (Tracciones en cara exterior de hastiales y dintel y superior en solera).

				Coeficientes				N	M
Sección	Situación el.	Elemento	Cálculo	PP+CM	E _t	E _{sc}	Sobrecarga	T/m	mT/m
Empotramiento inferior de hastial	Eje de estructura	511	Cálculo 1. Tren A	1.00	1.00	1.00	1.00	-57.87	-87.47
			Cálculo 1. Tren B	1.00	1.00	1.00	1.00	-68.08	-100.94
			Cálculo 2. LM-71	1.00	1.00	1.00	1.00	-66.11	-98.03
			Cálculo 2. SW/0	1.00	1.00	1.00	1.00	-70.12	-103.39
			Cálculo 2. SW/2	1.00	1.00	1.00	1.00	-72.82	-106.63
	Borde estructura	1021	Cálculo 1. Tren A	1.00	1.00	1.00	1.00	-203.22	-114.70
			Cálculo 1. Tren B	1.00	1.00	1.00	1.00	-242.19	-133.87
			Cálculo 2. LM-71	1.00	1.00	1.00	1.00	-235.34	-129.59
			Cálculo 2. SW/0	1.00	1.00	1.00	1.00	-250.44	-137.29
			Cálculo 2. SW/2	1.00	1.00	1.00	1.00	-261.44	-141.70
Combinación pésima. Cálculo 2. SW/2								-261.44	-141.70

Media del hastial	Eje de estructura	519	Cálculo 1. Tren A	1.00	0.00	0.00	1.00	-48.92	-57.52
			Cálculo 1. Tren B	1.00	0.00	0.00	1.00	-61.22	-57.52
			Cálculo 2. LM-71	1.00	1.00	0.00	1.00	-59.27	-30.53
			Cálculo 2. SW/0	1.00	1.00	0.00	1.00	-64.10	-30.53
			Cálculo 2. SW/2	1.00	1.00	0.00	1.00	-67.22	-30.53
	Borde estructura	1029	Cálculo 1. Tren A	1.00	0.00	0.00	1.00	-81.28	-65.22
			Cálculo 1. Tren B	1.00	0.00	0.00	1.00	-93.85	-65.22
			Cálculo 2. LM-71	1.00	1.00	0.00	1.00	-89.76	-37.51
			Cálculo 2. SW/0	1.00	1.00	0.00	1.00	-94.55	-37.51
			Cálculo 2. SW/2	1.00	1.00	0.00	1.00	-98.51	-37.51
Combinación pésima. Cálculo 1. Tren A								-81.28	-65.22

Empotramiento superior de hastial	Eje de estructura	527	Cálculo 1. Tren A	1.00	1.00	1.00	1.00	-41.89	-84.85
			Cálculo 1. Tren B	1.00	1.00	1.00	1.00	-55.69	-97.69
			Cálculo 2. LM-71	1.00	1.00	1.00	1.00	-52.98	-97.54
			Cálculo 2. SW/0	1.00	1.00	1.00	1.00	-58.33	-101.96
			Cálculo 2. SW/2	1.00	1.00	1.00	1.00	-61.87	-107.66
	Borde estructura	1037	Cálculo 1. Tren A	1.00	1.00	1.00	1.00	-125.93	-107.89
			Cálculo 1. Tren B	1.00	1.00	1.00	1.00	-129.26	-113.98
			Cálculo 2. LM-71	1.00	1.00	1.00	1.00	-131.01	-116.32
			Cálculo 2. SW/0	1.00	1.00	1.00	1.00	-132.00	-118.02
			Cálculo 2. SW/2	1.00	1.00	1.00	1.00	-135.65	-123.39
Combinación pésima. Cálculo 2. SW/2							-135.65	-123.39	

CÁLCULO DE ARMADURAS

Proyecto : L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
Estructura: E-1516.9.2

Notación: PP= Paso propio
CM= Carga muerta de traviesas, carriles y balasto
E,t= Empuje de tierras

E,sc= Empuje de tierras debido a una sobrecarga de 3 t/m²
Tren A= Tren de cargas tipo A de la norma española.
Tren B= Tren de cargas tipo B de la norma española.

LM-71= Load model 71 del Eurocódigo 1
SW/0= Tren pesado tipo SW/0 del Eurocódigo 1
SW/2= Tren pesado tipo SW/2 del Eurocódigo 1

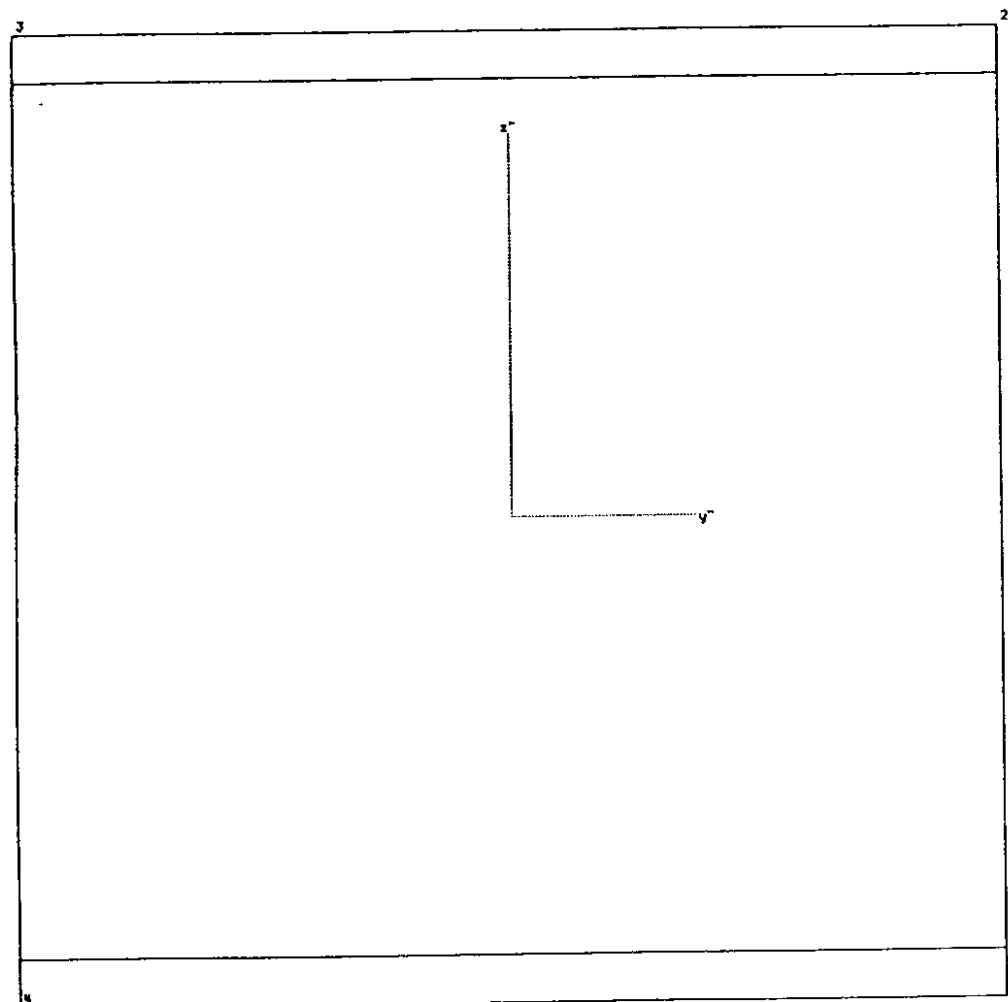
Envoltorio de V(+) en E.L.U.

Sección	Situación el.	Elemento	Cálculo	Coeficientes				Vd mT/m
				PP+CM	E _t	E _{sc}	Sobrecarga	
Empotramiento inferior de hastial	Eje de estructura	511	Cálculo 1. Tren A	0.90	0.00	0.00	1.50	0.90
			Cálculo 1. Tren B	0.90	0.00	0.00	1.50	0.47
			Cálculo 2. LM-71	1.00	1.00	0.00	1.45	-22.37
			Cálculo 2. SW/0	1.00	1.00	0.00	1.45	-22.65
			Cálculo 2. SW/2	1.00	1.00	0.00	1.20	-22.84
	Borde estructura	1021	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	56.38
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	62.92
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	27.48
			Cálculo 2. SW/0	1.35	1.00	0.00	1.45	29.71
			Cálculo 2. SW/2	1.35	1.00	0.00	1.20	28.17
Combinación pésima. Cálculo 1. Tren B								62.92
Media del hastial	Eje de estructura	519	Cálculo 1. Tren A	0.90	1.50	0.00	1.50	4.57
			Cálculo 1. Tren B	0.90	1.50	0.00	1.50	4.34
			Cálculo 2. LM-71	1.00	1.35	0.00	1.45	4.26
			Cálculo 2. SW/0	1.00	1.35	0.00	1.45	4.05
			Cálculo 2. SW/2	1.00	1.35	0.00	1.20	3.82
	Borde estructura	1029	Cálculo 1. Tren A	0.90	1.50	0.00	1.50	6.22
			Cálculo 1. Tren B	0.90	1.50	0.00	1.50	3.08
			Cálculo 2. LM-71	1.00	1.35	0.00	1.45	3.97
			Cálculo 2. SW/0	1.00	1.35	0.00	1.45	2.55
			Cálculo 2. SW/2	1.00	1.35	0.00	1.20	2.35
Combinación pésima. Cálculo 1. Tren A								6.22
Empotramiento superior de hastial	Eje de estructura	527	Cálculo 1. Tren A	0.90	1.50	1.50	1.50	29.65
			Cálculo 1. Tren B	0.90	1.50	1.50	1.50	30.08
			Cálculo 2. LM-71	1.00	1.35	1.35	1.45	27.59
			Cálculo 2. SW/0	1.00	1.35	1.35	1.45	27.59
			Cálculo 2. SW/2	1.00	1.35	1.35	1.20	27.24
	Borde estructura	1037	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	11.76
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	11.76
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	4.91
			Cálculo 2. SW/0	1.00	1.35	1.35	0.00	4.91
			Cálculo 2. SW/2	1.00	1.35	1.35	0.00	4.91
Combinación pésima. Cálculo 1. Tren B								30.08
Empotramiento de dintel	Eje de estructura	1968	Cálculo 1. Tren A	0.90	1.50	0.00	0.00	-22.63
			Cálculo 1. Tren B	0.90	1.50	0.00	0.00	-22.63
			Cálculo 2. LM-71	1.00	1.35	0.00	0.00	-25.14
			Cálculo 2. SW/0	1.00	1.35	0.00	0.00	-25.14
			Cálculo 2. SW/2	1.00	1.35	0.00	0.00	-25.14
	Borde estructura	2898	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-45.90
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-45.90
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-56.11
			Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-56.11
			Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-56.11
Combinación pésima. Cálculo 1. Tren A								-22.63
Centro de dintel	Eje de estructura	1983	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	0.00
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	0.00
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	0.00
			Cálculo 2. SW/0	1.35	1.35	1.35	1.45	0.00
			Cálculo 2. SW/2	1.35	1.35	1.35	1.20	0.00
	Borde estructura	2913	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-5.24
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-5.24
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-8.06
			Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-8.06
			Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-8.06
Combinación pésima. Cálculo 1. Tren A								0.00
Empotramiento solera	Eje de estructura	4896	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	75.88
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	89.22
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	79.45
			Cálculo 2. SW/0	1.35	1.35	1.35	1.45	84.47
			Cálculo 2. SW/2	1.35	1.35	1.35	1.20	82.70
	Borde estructura	5826	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	246.76
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	288.77
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	241.59
			Cálculo 2. SW/0	1.35	1.00	0.00	1.45	257.27
			Cálculo 2. SW/2	1.35	1.00	0.00	1.20	251.10
Combinación pésima. Cálculo 1. Tren B								288.77
Centro solera	Eje de estructura	4911	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	0.00
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	0.00
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	0.00
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	0.00
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	0.00
	Borde estructura	5841	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	53.91
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	62.98
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	49.01
			Cálculo 2. SW/0	1.35	1.00	0.00	1.45	52.38
			Cálculo 2. SW/2	1.35	1.00	0.00	1.20	51.01
Combinación pésima. Cálculo 1. Tren B								62.98

Envoltorio de V(-) en E.L.U.

Sección	Situación el.	Elemento	Cálculo	Coeficientes				Vd mT/m
				PP+CM	E,t	E,sc	Sobrecarga	
Empotramiento inferior de hastial	Eje de estructura	511	Cálculo 1. Tren A	1.50	1.50	1.50	0.00	-47.12
			Cálculo 1. Tren B	1.50	1.50	1.50	0.00	-47.12
			Cálculo 2. LM-71	1.35	1.35	1.35	0.00	-42.41
			Cálculo 2. SW/0	1.35	1.35	1.35	0.00	-42.41
			Cálculo 2. SW/2	1.35	1.35	1.35	0.00	-42.41
	Borde estructura	1021	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	-32.84
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	-32.84
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	-24.31
			Cálculo 2. SW/0	1.00	1.35	1.35	0.00	-24.31
			Cálculo 2. SW/2	1.00	1.35	1.35	0.00	-24.31
Combinación pésima. Cálculo 1. Tren A								-47.12
Media del hastial	Eje de estructura	519	Cálculo 1. Tren A	1.50	0.00	1.50	0.00	-3.33
			Cálculo 1. Tren B	1.50	0.00	1.50	0.00	-3.33
			Cálculo 2. LM-71	1.35	1.00	1.35	0.00	-0.97
			Cálculo 2. SW/0	1.35	1.00	1.35	0.00	-0.97
			Cálculo 2. SW/2	1.35	1.00	1.35	0.00	-0.97
	Borde estructura	1029	Cálculo 1. Tren A	1.50	0.00	1.50	0.00	-5.91
			Cálculo 1. Tren B	1.50	0.00	1.50	0.00	-5.91
			Cálculo 2. LM-71	1.35	1.00	1.35	0.00	-2.91
			Cálculo 2. SW/0	1.35	1.00	1.35	0.00	-2.91
			Cálculo 2. SW/2	1.35	1.00	1.35	0.00	-2.91
Combinación pésima. Cálculo 1. Tren A								-5.91
Empotramiento superior de hastial	Eje de estructura	527	Cálculo 1. Tren A	1.50	0.00	0.00	0.00	-2.39
			Cálculo 1. Tren B	1.50	0.00	0.00	0.00	-2.39
			Cálculo 2. LM-71	1.35	1.00	0.00	0.00	10.07
			Cálculo 2. SW/0	1.35	1.00	0.00	0.00	10.07
			Cálculo 2. SW/2	1.35	1.00	0.00	0.00	10.07
	Borde estructura	1037	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	-59.03
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-69.51
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-45.06
			Cálculo 2. SW/0	1.35	1.00	0.00	1.45	-48.85
			Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-47.06
Combinación pésima. Cálculo 1. Tren B								-69.51
Empotramiento de dintel	Eje de estructura	1968	Cálculo 1. Tren A	1.50	0.00	1.50	1.50	-48.86
			Cálculo 1. Tren B	1.50	0.00	1.50	1.50	-66.26
			Cálculo 2. LM-71	1.35	1.00	1.35	1.45	-57.83
			Cálculo 2. SW/0	1.35	1.00	1.35	1.45	-64.42
			Cálculo 2. SW/2	1.35	1.00	1.35	1.20	-62.37
	Borde estructura	2898	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	-134.58
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-141.08
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-116.89
			Cálculo 2. SW/0	1.35	1.00	0.00	1.45	-119.11
			Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-117.38
Combinación pésima. Cálculo 1. Tren B								-141.08
Centro de dintel	Eje de estructura	1983	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	0.00
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	0.00
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	0.00
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	0.00
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	0.00
	Borde estructura	2913	Cálculo 1. Tren A	1.50	0.00	0.00	1.50	-37.58
			Cálculo 1. Tren B	1.50	0.00	0.00	1.50	-43.25
			Cálculo 2. LM-71	1.35	1.00	0.00	1.45	-34.56
			Cálculo 2. SW/0	1.35	1.00	0.00	1.45	-36.53
			Cálculo 2. SW/2	1.35	1.00	0.00	1.20	-35.32
Combinación pésima. Cálculo 1. Tren B								-43.25
Empotramiento solera	Eje de estructura	4896	Cálculo 1. Tren A	0.90	0.00	0.00	0.00	38.37
			Cálculo 1. Tren B	0.90	0.00	0.00	0.00	38.37
			Cálculo 2. LM-71	1.00	1.00	0.00	0.00	42.92
			Cálculo 2. SW/0	1.00	1.00	0.00	0.00	42.92
			Cálculo 2. SW/2	1.00	1.00	0.00	0.00	42.92
	Borde estructura	5826	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	88.08
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	88.08
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	104.95
			Cálculo 2. SW/0	1.00	1.35	1.35	0.00	104.95
			Cálculo 2. SW/2	1.00	1.35	1.35	0.00	104.95
Combinación pésima. Cálculo 1. Tren A								38.37
Centro solera	Eje de estructura	4911	Cálculo 1. Tren A	1.50	1.50	1.50	1.50	0.00
			Cálculo 1. Tren B	1.50	1.50	1.50	1.50	0.00
			Cálculo 2. LM-71	1.35	1.35	1.35	1.45	0.00
			Cálculo 2. SW/0	1.35	1.35	1.35	1.45	0.00
			Cálculo 2. SW/2	1.35	1.35	1.35	1.20	0.00
	Borde estructura	5841	Cálculo 1. Tren A	0.90	1.50	1.50	0.00	11.56
			Cálculo 1. Tren B	0.90	1.50	1.50	0.00	11.56
			Cálculo 2. LM-71	1.00	1.35	1.35	0.00	15.96
			Cálculo 2. SW/0	1.00	1.35	1.35	0.00	15.96
			Cálculo 2. SW/2	1.00	1.35	1.35	0.00	15.96
Combinación pésima. Cálculo 1. Tren B								0.00

Mstb. 1 : 7.0



Sección : "DINTEL" Armadura : "B1"
Tipo : tipo viga/ Rectángulo Unidades : [cm]
Material : "H250"

Ancho = 100.00 cm Canto = 100.00 cm

Características mecánicas de la sección:
Area : Ax= 1.000 [m2]
Momentos de inercia : Iy= 0.083333 [m4] Iz= 0.083333 [m4]
Inercia a torsión : Ix= 0.140667 [m4]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.500000 [m]

	I: R=dist.borde [m]	W=I/R [m3]	W/Ax [m]
izq. Iz	-0.500	-0.166667	0.167
dch. Iz	0.500	0.166667	-0.167
abajo Iy	-0.500	-0.166667	0.167
arriba Iy	0.500	0.166667	-0.167

Armadura: "B1"

Nº	Nom.mat	Cod.dim.	Area [cm2]	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]
1	AEH500	(2)	0.00	-50.00	5.00	50.00	5.00
2	AEH500	(2)	0.00	-50.00	95.00	50.00	95.00
Total:			0.00	Cuantía de armadura: 0.000 [o/o]			

Cód. dimensionamiento: (0) = As constante
Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada
Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero"AEH500"/Hormigón"H250")

Cortante	Area mín.cercos	Ancho alma ideal	Canto útil	Incl.bielas
Vz	0.00 [cm2/m]	100.00 [cm]	96.00 [cm]	0.00
Vy	0.00 [cm2/m]	100.00 [cm]	96.00 [cm]	0.00

Características del material:

Nom.Mat.	Módulo E [N/mm2]	0.85*fcd,fyd [N/mm2]	eps-fc [o/oo]	fct [N/mm2]	fcv [N/mm2]	fcw,min [N/mm2]
"H250"	30000.0	-14.160	-2.000	0.0	0.646000	25.000
"AEH500"	210000.0	443.470				

Leyenda:

fcd,fyd resistencia de cálculo del hormigón,acero
eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)
fct resistencia de cálculo a tracción del hormigón
fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Dimensionamiento : Viga "DINTEL"/"B1"

Esfuerzos (Rotura)							Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	Alpha	
-0.710000				168.320		45.0	

Armadura	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]	dado [cm2]	dimens. [cm2]	As-nuevo [cm2]
Longitudinal:							
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	43.20	43.20
2 "AEH500"	-50.0	95.0	50.0	95.0	0.00	-	0.00
Cuantía arm. 0.43 [o/o] Suma							43.20

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INF. DINTEL

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas y [cm] z [cm]		Eps [o/oo]	Estado-II [kp/cm2]	
Hormigón-Min	-50.00	100.00	-2.454	-141.600	"H250"
Armadura-Min	-50.00	95.00	-1.799	-3777.597	"AEH500"
Hormigón-Max	50.00	0.00	10.655	0.000	"H250"
Armadura-Max	50.00	5.00	10.000	4434.700	"AEH500"

Fibra neutra	zn	81.28 cm	yn	-0.00 cm	Angulo	0.0
Ancho zona comprim.		18.72 cm	Zona comprimida/Canto útil			0.20

Dimensionamiento : Viga "DINTEL"/"B1"

Esfuerzos (Rotura)							Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	Alpha	
5.250				143.010		45.0	

Armadura	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]	dado [cm2]	dimens. [cm2]	As-nuevo [cm2]
Longitudinal:							
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	36.90	36.90
2 "AEH500"	-50.0	95.0	50.0	95.0	0.00	-	0.00
Cuantía arm. 0.37 [o/o] Suma							36.90

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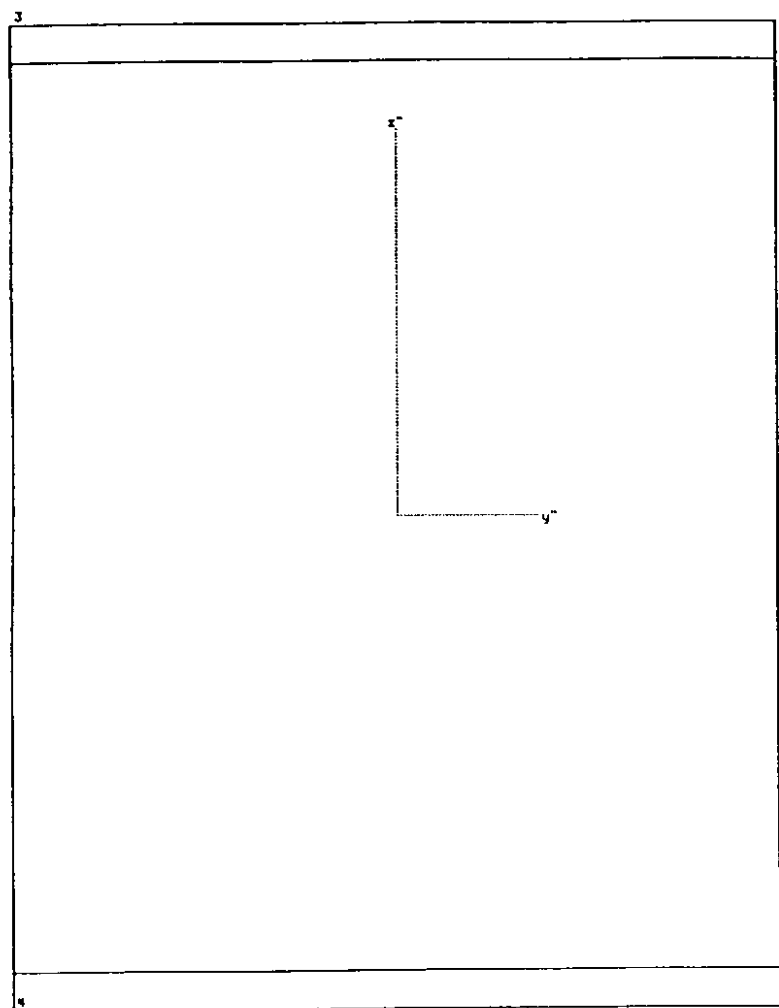
INF. DINTEL BORDE

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas y [cm] z [cm]		Eps [o/oo]	Estado-II [kp/cm2]	
Hormigón-Min	-50.00	100.00	-2.093	-141.600	"H250"
Armadura-Min	-50.00	95.00	-1.456	-3058.494	"AEH500"
Hormigón-Max	50.00	0.00	10.636	0.000	"H250"
Armadura-Max	50.00	5.00	10.000	4434.700	"AEH500"

Fibra neutra	zn	83.56 cm	yn	-0.00 cm	Angulo	0.0
Ancho zona comprim.		16.44 cm	Zona comprimida/Canto útil			0.17

Mstb. 1 : 9.0



Sección : "CARTELA" Armadura : "B1"
Tipo : tipo viga/ Rectángulo Unidades : [cm]
Material : "H250"

Ancho = 100.00 cm Canto = 130.00 cm

Características mecánicas de la sección:
Area : Ax= 1.300 [m2]
Momentos de inercia : Iy= 0.183083 [m4] Iz= 0.108333 [m4]
Inercia a torsión : Ix= 0.229402 [m4]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.650000 [m]

	I:	R=dist.borde [m]	W=I/R [m3]	W/Ax [m]
izq.	Iz	-0.500	-0.216667	0.167
dch.	Iz	0.500	0.216667	-0.167
abajo	Iy	-0.650	-0.281666	0.217
arriba	Iy	0.650	0.281666	-0.217

Armadura: "B1"

N°	Nom.mat	Cod.dim.	Area [cm2]	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]
1	AEH500	(2)	0.00	-50.00	5.00	50.00	5.00
2	AEH500	(2)	0.00	-50.00	125.00	50.00	125.00
Total:			0.00	Cuantía de armadura: 0.000 [o/o]			

Cód. dimensionamiento: (0) = As constante
Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada
Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero"AEH500"/Hormigón"H250")
Cortante Area mín.cercos Ancho alma ideal Canto útil Incl.bielas

Vz	0.00 [cm2/m]	100.00 [cm]	126.00 [cm]	0.00
Vy	0.00 [cm2/m]	130.00 [cm]	96.00 [cm]	0.00

Características del material:

Nom.Mat.	Módulo E [kp/cm2]	0.85*fcd,fyd [kp/cm2]	eps-fc [o/oo]	fct [kp/cm2]	fcv [kp/cm2]	fcw,mín [kp/cm2]
"H250"	300000.0	-141.600	-2.000	0.0	6.460	250.000
"AEH500"	2.10E+06	4434.700				

Leyenda:

fcd,fyd resistencia de cálculo del hormigón,acero
eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)
fct resistencia de cálculo a tracción del hormigón
fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Dimensionamiento : Viga "CARTELA"/"B1"

Esfuerzos (Rotura)							Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	Alpha	
-30.600				-135.080			45.0

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	-	0.00
2 "AEH500"	-50.0	125.0	50.0	125.0	0.00	22.14	22.14
Cuantía arm. 0.17 [o/o] Suma							22.14

SUP. DINTEL

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas		Eps	Estado-11	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	
Hormigón-Min	50.00	0.00	-1.492	-132.480	"H250"
Armadura-Min	50.00	5.00	-1.033	-2168.766	"AEH500"
Hormigón-Max	-50.00	130.00	10.460	0.000	"H250"
Armadura-Max	-50.00	125.00	10.000	4434.700	"AEH500"

Fibra neutra	zn	16.23 cm	yn	0.00 cm	Angulo	0.0
Ancho zona comprim.		16.23 cm		Zona comprimida/Canto útil		0.13

Dimensionamiento : Viga "CARTELA"/"B1"

Esfuerzos (Rotura)							Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	Alpha	
39.900				-125.420			45.0

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	-	0.00
2 "AEH500"	-50.0	125.0	50.0	125.0	0.00	27.99	27.99
Cuantía arm. 0.22 [o/o] Suma							27.99

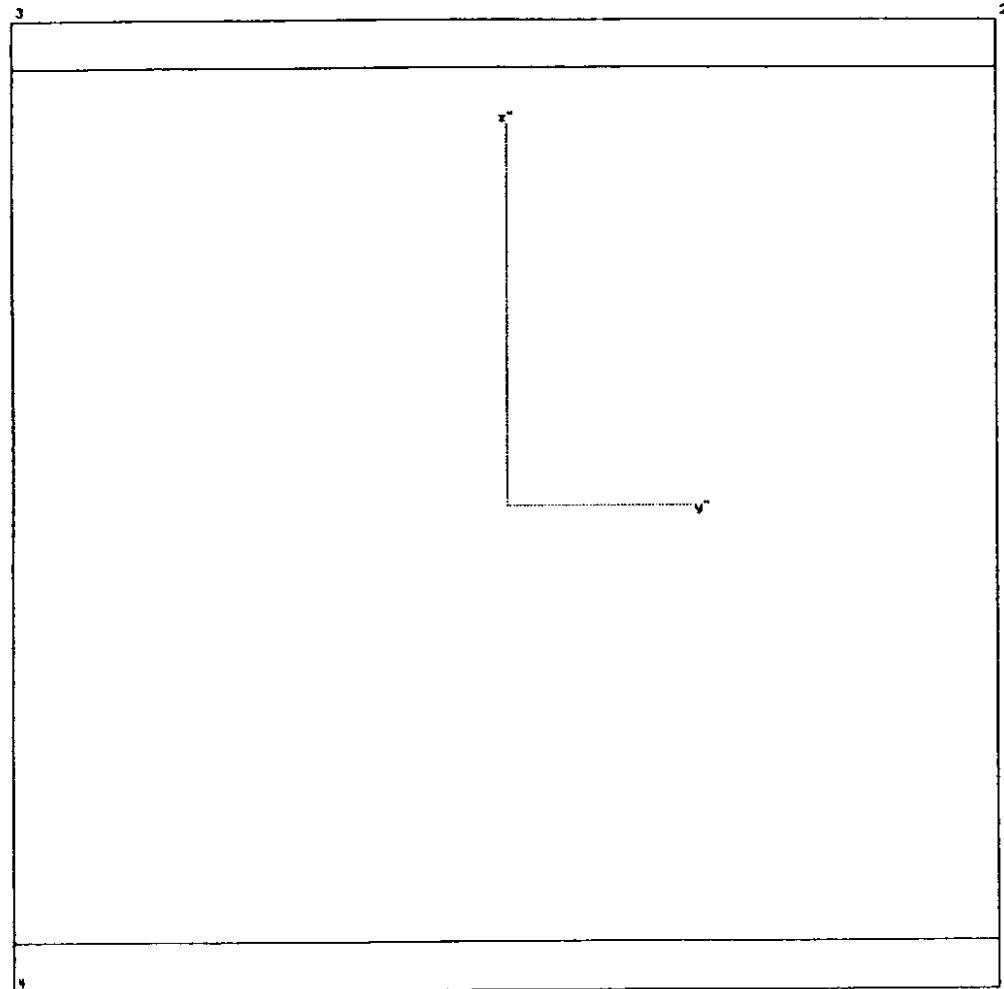
SUP. DINTEL BORDE

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas		Eps	Estado-11	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	
Hormigón-Min	50.00	0.00	-1.145	-115.752	"H250"
Armadura-Min	50.00	5.00	-0.700	-1469.315	"AEH500"
Hormigón-Max	-50.00	130.00	10.446	0.000	"H250"
Armadura-Max	-50.00	125.00	10.000	4434.700	"AEH500"

Fibra neutra	zn	12.85 cm	yn	0.00 cm	Angulo	0.0
Ancho zona comprim.		12.85 cm		Zona comprimida/Canto útil		0.10

Mstb. 1 : 7.0



Sección : "HASTIAL" Armadura : "B1"
Tipo : tipo viga/ Rectángulo Unidades : [cm]
Material : "H250"

Ancho = 100.00 cm Canto = 100.00 cm

Características mecánicas de la sección:

Area : Ax= 1.000 [m2]
Momentos de inercia : Iy= 0.083333 [m4] Iz= 0.083333 [m4]
Inercia a torsión : Ix= 0.140667 [m4]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.500000 [m]

I: R=dist.borde [m] W=I/R [m3] W/Ax [m]
izq. Iz -0.500 -0.166667 0.167
dch. Iz 0.500 0.166667 -0.167
abajo Iy -0.500 -0.166667 0.167
arriba Iy 0.500 0.166667 -0.167

Armadura: "B1"

N°	Nom.mat	Cod.dim.	Area [cm2]	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]
1	AEH500	(2)	0.00	-50.00	5.00	50.00	5.00
2	AEH500	(2)	0.00	-50.00	95.00	50.00	95.00
Total:			0.00	Cuantía de armadura: 0.000 [o/o]			

Cód. dimensionamiento: (0) = As constante

Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada

Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero"AEH500"/Hormigón"H250")

Cortante	Area mín.cercos	Ancho alma ideal	Canto útil	Incl.bielas
Vz	0.00 [cm2/m]	100.00 [cm]	96.00 [cm]	0.00
Vy	0.00 [cm2/m]	100.00 [cm]	96.00 [cm]	0.00

Características del material:

Nom.Mat.	Módulo E	0.85*fcd,fyd	eps-fc	fct	fcv	fcw,min
	[kp/cm2]	[kp/cm2]	[o/oo]	[kp/cm2]	[kp/cm2]	[kp/cm2]
"H250"	300000.0	-141.600	-2.000	0.0	6.460	250.000
"AEH500"	2.10E+06	4434.700				

Leyenda:

fcd,fyd resistencia de cálculo del hormigón,acero
eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)
fct resistencia de cálculo a tracción del hormigón
fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Dimensionamiento : Viga "HASTIAL"/"B1"

Esfuerzos (Rotura)							Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	Alpha	
-102.120				-151.410		45.0	

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	-	0.00
2 "AEH500"	-50.0	95.0	50.0	95.0	0.00	28.42	28.42
Cuantía arm. 0.28 [o/o] Suma							28.42

EXT. HASTIAL INF

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas		Eps	Estado-II	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	
Hormigón-Min	50.00	0.00	-2.867	-141.600	"H250"
Armadura-Min	50.00	5.00	-2.190	-4434.700	"AEH500"
Hormigón-Max	-50.00	100.00	10.677	0.000	"H250"
Armadura-Max	-50.00	95.00	10.000	4434.700	"AEH500"

Fibra neutra zn 21.17 cm yn 0.00 cm Angulo 0.0
Ancho zona comprim. 21.17 cm Zona comprimida/Canto útil 0.22

Dimensionamiento : Viga "HASTIAL"/"B1"

Esfuerzos (Rotura)							Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	Alpha	
-363.290				-200.960		45.0	

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	-	0.00
2 "AEH500"	-50.0	95.0	50.0	95.0	0.00	23.65	23.65
Cuantía arm. 0.24 [o/o] Suma							23.65

EXT. HASTIAL INF BORDE

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas		Eps	Estado-II	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	
Hormigón-Min	50.00	0.00	-3.500	-141.600	"H250"
Armadura-Min	50.00	5.00	-3.076	-4434.700	"AEH500"
Hormigón-Max	-50.00	100.00	4.986	0.000	"H250"
Armadura-Max	-50.00	95.00	4.562	4434.700	"AEH500"

Fibra neutra zn 41.24 cm yn 0.00 cm Angulo 0.0
Ancho zona comprim. 41.24 cm Zona comprimida/Canto útil 0.43

Dimensionamiento : Viga "HASTIAL"/"B1"

Esfuerzos (Rotura)		Unidades : [tm]				
N	Vy	Vz	Mx	My	Mz	Alpha
-73.380				-86.280		45.0

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	-	0.00
2 "AEH500"	-50.0	95.0	50.0	95.0	0.00	13.50	13.50

Cuantía arm. 0.14 [o/o] Suma 13.50

EXT. HASTIAL MEDIO

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas		Eps	Estado-II	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	
Hormigón-Min	50.00	0.00	-1.841	-140.704	"H250"
Armadura-Min	50.00	5.00	-1.218	-2557.100	"AEH500"
Hormigón-Max	-50.00	100.00	10.623	0.000	"H250"
Armadura-Max	-50.00	95.00	10.000	4434.700	"AEH500"

Fibra neutra zn 14.77 cm yn 0.00 cm Angulo 0.0
Ancho zona comprim. 14.77 cm Zona comprimida/Canto útil 0.16

Dimensionamiento : Viga "HASTIAL"/"B1"

Esfuerzos (Rotura)		Unidades : [tm]				
N	Vy	Vz	Mx	My	Mz	Alpha
-121.910				-97.830		45.0

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	-	0.00
2 "AEH500"	-50.0	95.0	50.0	95.0	0.00	11.49	11.49

Cuantía arm. 0.11 [o/o] Suma 11.49

EXT. HASTIAL MEDIO BORDE

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas		Eps	Estado-II	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	
Hormigón-Min	50.00	0.00	-2.246	-141.600	"H250"
Armadura-Min	50.00	5.00	-1.601	-3362.837	"AEH500"
Hormigón-Max	-50.00	100.00	10.645	0.000	"H250"
Armadura-Max	-50.00	95.00	10.000	4434.700	"AEH500"

Fibra neutra zn 17.42 cm yn 0.00 cm Angulo 0.0
Ancho zona comprim. 17.42 cm Zona comprimida/Canto útil 0.18

Dimensionamiento : Viga "HASTIAL"/"B1"

Esfuerzos (Rotura)		Unidades : [tm]				
N	Vy	Vz	Mx	My	Mz	Alpha
-83.540				-146.530		45.0

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	-	0.00
2 "AEH500"	-50.0	95.0	50.0	95.0	0.00	28.84	28.84

Cuantía arm. 0.29 [o/o] Suma 28.84

EXT. HASTIAL SUP

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas		Eps	Estado-II	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	
Hormigón-Min	50.00	0.00	-2.665	-141.600	"H250"
Armadura-Min	50.00	5.00	-1.999	-4197.517	"AEH500"
Hormigón-Max	-50.00	100.00	10.667	0.000	"H250"
Armadura-Max	-50.00	95.00	10.000	4434.700	"AEH500"

Fibra neutra zn 19.99 cm yn 0.00 cm Angulo 0.0
Ancho zona comprim. 19.99 cm Zona comprimida/Canto útil 0.21

Dimensionamiento : Viga "HASTIAL"/"B1"

Esfuerzos (Rotura)		Unidades : [tm]				
N	Vy	Vz	Mx	My	Mz	Alpha
-193.890				-170.970		45.0

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	-	0.00
2 "AEH500"	-50.0	95.0	50.0	95.0	0.00	25.77	25.77

Cuantía arm. 0.26 [o/o] Suma 25.77

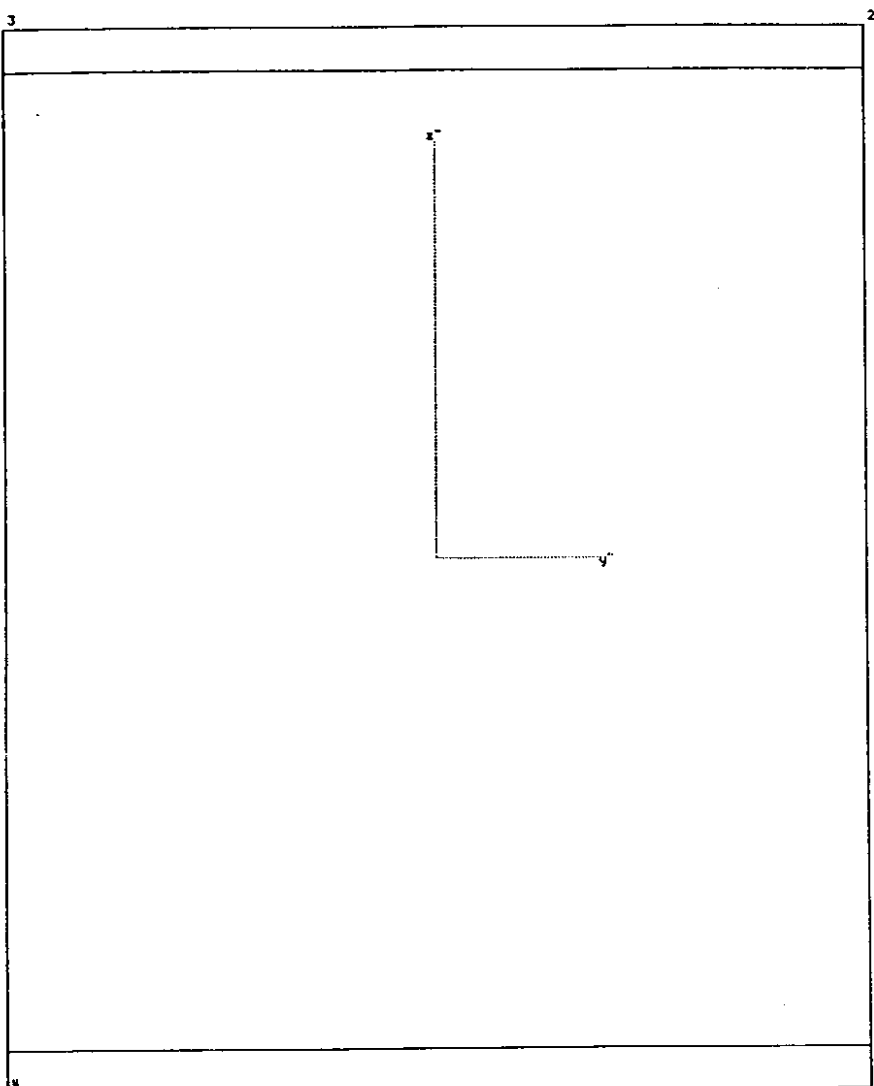
EXT. HASTIAL SUP BORDE

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas		Eps	Estado-II	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	
Hormigón-Min	50.00	0.00	-3.500	-141.600	"H250"
Armadura-Min	50.00	5.00	-2.851	-4434.700	"AEH500"
Hormigón-Max	-50.00	100.00	9.475	0.000	"H250"
Armadura-Max	-50.00	95.00	8.826	4434.700	"AEH500"

Fibra neutra zn 26.98 cm yn 0.00 cm Angulo 0.0
Ancho zona comprim. 26.98 cm Zona comprimida/Canto útil 0.28

Mstb. 1 : 8.0



Sección : "SOLERA" Armadura : "B1"
Tipo : tipo viga/ Rectángulo Unidades : [cm]
Material : "H250"

Ancho = 100.00 cm Canto = 125.00 cm

Características mecánicas de la sección:

Area : Ax= 1.250 [m2]
Momentos de inercia : Iy= 0.162760 [m4] Iz= 0.104167 [m4]
Inercia a torsión : Ix= 0.213766 [m4]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.625000 [m]

I: R=dist.borde [m] W=I/R [m3] W/Ax [m]
izq. Iz -0.500 -0.208333 0.167
dch. Iz 0.500 0.208333 -0.167
abajo Iy -0.625 -0.260416 0.208

arriba Iy 0.625 0.260416 -0.208

Armadura: "B1"

Nº	Nom.mat	Cod.dim.	Area [cm2]	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]
1	AEH500	(2)	0.00	-50.00	5.00	50.00	5.00
2	AEH500	(2)	0.00	-50.00	120.00	50.00	120.00
Total:			0.00	Cuantía de armadura: 0.000 [o/o]			

Cód. dimensionamiento: (0) = As constante

Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada

Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero"AEH500"/Hormigón"H250")

Cortante Area mín.cercos Ancho alma ideal Canto útil Incl.bielas

Vz	0.00 [cm2/m]	100.00 [cm]	121.00 [cm]	0.00
Vy	0.00 [cm2/m]	125.00 [cm]	96.00 [cm]	0.00

Características del material:

Nom.Mat.	Módulo E [kp/cm2]	0.85*fcd,fyd [kp/cm2]	eps-fc [o/o]	fct [kp/cm2]	fcv [kp/cm2]	fcw,min [kp/cm2]
"H250"	300000.0	-141.600	-2.000	0.0	6.460	250.000
"AEH500"	2.10E+06	4434.700				

Leyenda:

fcd,fyd resistencia de cálculo del hormigón,acero

eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)

fct resistencia de cálculo a tracción del hormigón

fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Dimensionamiento : Viga "SOLERA"/"B1"

Esfuerzos (Rotura)							Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	Alpha	
-50.040				138.060		45.0	

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	21.80	21.80
2 "AEH500"	-50.0	120.0	50.0	120.0	0.00	-	0.00

Cuantía arm. 0.17 [o/o] Suma 21.80

INF SOLERA

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas		Eps	Estado-II	
	y [cm]	z [cm]	[o/o]	[kp/cm2]	
Hormigón-Min	-50.00	125.00	-1.674	-137.839	"H250"
Armadura-Min	-50.00	120.00	-1.188	-2494.050	"AEH500"
Hormigón-Max	50.00	0.00	10.486	0.000	"H250"
Armadura-Max	50.00	5.00	10.000	4434.700	"AEH500"

Fibra neutra zn 107.79 cm yn -0.00 cm Angulo 0.0
Ancho zona comprim. 17.21 cm Zona comprimida/Canto útil 0.14

Dimensionamiento : Viga "SOLERA"/"B1"

Esfuerzos (Rotura)							Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	Alpha	
15.440				135.980		45.0	

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	28.46	28.46
2 "AEH500"	-50.0	120.0	50.0	120.0	0.00	-	0.00

Cuantía arm. 0.23 [o/o] Suma 28.46

INF SOLERA BORDE

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas		Eps	Estado-II	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	
Hormigón-Min	-50.00	125.00	-1.393	-128.562	"H250"
Armadura-Min	-50.00	120.00	-0.918	-1928.672	"AEH500"
Hormigón-Max	50.00	0.00	10.475	0.000	"H250"
Armadura-Max	50.00	5.00	10.000	4434.700	"AEH500"

Fibra neutra zn 110.33 cm yn -0.00 cm Angulo 0.0
Ancho zona comprim. 14.67 cm Zona comprimida/Canto útil 0.12

Dimensionamiento : Viga "SOLERA"/"B1"

Esfuerzos (Rotura)						Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	Alpha
-1.820				-247.790		45.0

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	-	0.00
2 "AEH500"	-50.0	120.0	50.0	120.0	0.00	49.95	49.95

Cuantía arm. 0.40 [o/o] Suma 49.95
SUP SOLERA

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas		Eps	Estado-II	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	
Hormigón-Min	50.00	0.00	-2.286	-141.600	"H250"
Armadura-Min	50.00	5.00	-1.774	-3725.749	"AEH500"
Hormigón-Max	-50.00	125.00	10.512	0.000	"H250"
Armadura-Max	-50.00	120.00	10.000	4434.700	"AEH500"

Fibra neutra zn 22.33 cm yn 0.00 cm Angulo 0.0
Ancho zona comprim. 22.33 cm Zona comprimida/Canto útil 0.19

Dimensionamiento : Viga "SOLERA"/"B1"

Esfuerzos (Rotura)						Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	Alpha
-0.720000				-231.770		45.0

Armadura	y1	z1	y2	z2	dado	dimens.	As-nuevo
Longitudinal:	[cm]	[cm]	[cm]	[cm]	[cm2]	[cm2]	[cm2]
1 "AEH500"	-50.0	5.0	50.0	5.0	0.00	-	0.00
2 "AEH500"	-50.0	120.0	50.0	120.0	0.00	46.62	46.62

Cuantía arm. 0.37 [o/o] Suma 46.62
SUP SOLERA BORDE

Deformaciones y tensiones extremas (Rotura):

1	Coordenadas		Eps	Estado-II	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	
Hormigón-Min	50.00	0.00	-2.153	-141.600	"H250"
Armadura-Min	50.00	5.00	-1.647	-3458.693	"AEH500"
Hormigón-Max	-50.00	125.00	10.506	0.000	"H250"
Armadura-Max	-50.00	120.00	10.000	4434.700	"AEH500"

Fibra neutra zn 21.26 cm yn 0.00 cm Angulo 0.0
Ancho zona comprim. 21.26 cm Zona comprimida/Canto útil 0.18

PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA TT1 Obra : L.A.V. MADRID - ZARAGOZA. Subtramo XV. E-1516.9.2. BORDE DINTEL. Fecha: 30/6/1998 Hora : 10:18	PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA TT1 Obra : L.A.V. MADRID - ZARAGOZA. Subtramo XV. E-1516.9.2. EMPOTRAMIENTO DINTEL. Fecha: 30/6/1998 Hora : 10:19	PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA TT1 Obra : L.A.V. MADRID - ZARAGOZA. Subtramo XV. E-1516.9.2. EMPOTRAMIENTO DINTEL EN BORDE. Fecha: 30/6/1998 Hora : 10:20	PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA TT1 Obra : L.A.V. MADRID - ZARAGOZA. Subtramo XV. E-1516.9.2. HSTIAL. Fecha: 30/6/1998 Hora : 10:15
CALCULO A CORTANTE DE SECCIONES RECTANGULARES	CALCULO A CORTANTE DE SECCIONES RECTANGULARES	CALCULO A CORTANTE DE SECCIONES RECTANGULARES	CALCULO A CORTANTE DE SECCIONES RECTANGULARES
1. Datos - Materiales: fck [kp/cm²] = 250 fyk [kp/cm²] = 5100 GammaC = 1.50 GammaS = 1.15 - Tipo de Elemento Estructural: Tipo: viga En el cálculo no se considera la armadura comprimida - Sección b [cm] = 100.0 h [cm] = 100.0 r [cm] = 5.0 2. Dimensionamiento con cercos a 90° Vd [Mp] = 43.25 A90_est [cm²/m] = 0.00 Vcu [Mp] = 61.32 Vu1 [Mp] = 475.00	1. Datos - Materiales: fck [kp/cm²] = 250 fyk [kp/cm²] = 5100 GammaC = 1.50 GammaS = 1.15 - Tipo de Elemento Estructural: Tipo: viga En el cálculo no se considera la armadura comprimida - Sección b [cm] = 100.0 h [cm] = 130.0 r [cm] = 5.0 2. Dimensionamiento con cercos a 90° Vd [Mp] = 66.26 A90_est [cm²/m] = 0.00	1. Datos - Materiales: fck [kp/cm²] = 250 fyk [kp/cm²] = 5100 GammaC = 1.50 GammaS = 1.15 - Tipo de Elemento Estructural: Tipo: viga En el cálculo no se considera la armadura comprimida - Sección b [cm] = 100.0 h [cm] = 130.0 r [cm] = 5.0 2. Dimensionamiento con cercos a 90° Vd [Mp] = 141.08 A90_est [cm²/m] = 12.78 → 2CØ12/0'20	1. Datos - Materiales: fck [kp/cm²] = 250 fyk [kp/cm²] = 5100 GammaC = 1.50 GammaS = 1.15 - Tipo de Elemento Estructural: Tipo: viga En el cálculo no se considera la armadura comprimida - Sección b [cm] = 100.0 h [cm] = 100.0 r [cm] = 5.0 2. Dimensionamiento con cercos a 90° Vd [Mp] = 47.12 A90_est [cm²/m] = 0.00
PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA TT1 Obra : L.A.V. MADRID - ZARAGOZA. Subtramo XV. E-1516.9.2. BORDE HASTIAL. Fecha: 30/6/1998 Hora : 10:18	PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA TT1 Obra : L.A.V. MADRID - ZARAGOZA. Subtramo XV. E-1516.9.2. BORDE SOLERA. Fecha: 30/6/1998 Hora : 10:21	PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA TT1 Obra : L.A.V. MADRID - ZARAGOZA. Subtramo XV. E-1516.9.2. EMPOTRAMIENTO SOLERA. Fecha: 30/6/1998 Hora : 10:21	PRONTUARIO INFORMATICO DEL HORMIGON. PROGRAMA TT1 Obra : L.A.V. MADRID - ZARAGOZA. Subtramo XV. E-1516.9.2. EMPOTRAMIENTO BORDE SOLERA. Fecha: 30/6/1998 Hora : 10:21
CALCULO A CORTANTE DE SECCIONES RECTANGULARES	CALCULO A CORTANTE DE SECCIONES RECTANGULARES	CALCULO A CORTANTE DE SECCIONES RECTANGULARES	CALCULO A CORTANTE DE SECCIONES RECTANGULARES
1. Datos - Materiales: fck [kp/cm²] = 250 fyk [kp/cm²] = 5100 GammaC = 1.50 GammaS = 1.15 - Tipo de Elemento Estructural: Tipo: viga En el cálculo no se considera la armadura comprimida - Sección b [cm] = 100.0 h [cm] = 100.0 r [cm] = 5.0 2. Dimensionamiento con cercos a 90° Vd [Mp] = 69.51 A90_est [cm²/m] = 2.28 Vcu [Mp] = 61.32 Vu1 [Mp] = 475.00	1. Datos - Materiales: fck [kp/cm²] = 250 fyk [kp/cm²] = 5100 GammaC = 1.50 GammaS = 1.15 - Tipo de Elemento Estructural: Tipo: viga En el cálculo no se considera la armadura comprimida - Sección b [cm] = 100.0 h [cm] = 120.0 r [cm] = 5.0 2. Dimensionamiento con cercos a 90° Vd [Mp] = 62.98 A90_est [cm²/m] = 0.00 Vcu [Mp] = 74.23 Vu1 [Mp] = 575.00	1. Datos - Materiales: fck [kp/cm²] = 250 fyk [kp/cm²] = 5100 GammaC = 1.50 GammaS = 1.15 - Tipo de Elemento Estructural: Tipo: viga En el cálculo no se considera la armadura comprimida - Sección b [cm] = 100.0 h [cm] = 120.0 r [cm] = 5.0 2. Dimensionamiento con cercos a 90° Vd [Mp] = 89.22 A90_est [cm²/m] = 3.45 Vcu [Mp] = 74.23 Vu1 [Mp] = 575.00	1. Datos - Materiales: fck [kp/cm²] = 250 fyk [kp/cm²] = 5100 GammaC = 1.50 GammaS = 1.15 - Tipo de Elemento Estructural: Tipo: viga En el cálculo no se considera la armadura comprimida - Sección b [cm] = 100.0 h [cm] = 120.0 r [cm] = 5.0 2. Dimensionamiento con cercos a 90° Vd [Mp] = 288.77 A90_est [cm²/m] = 49.35 → 2CØ16/0'15. Vcu [Mp] = 74.23 Vu1 [Mp] = 575.00

COMPROBACION DEL ESTADO LIMITE DE FISURACION DEBIDO A TENSIONES NORMALES	
Proyecto :	L.A.V. MADRID-ZARAGOZA. SUBTRAMO XV
Estructura:	E-1516.9.2

DATOS

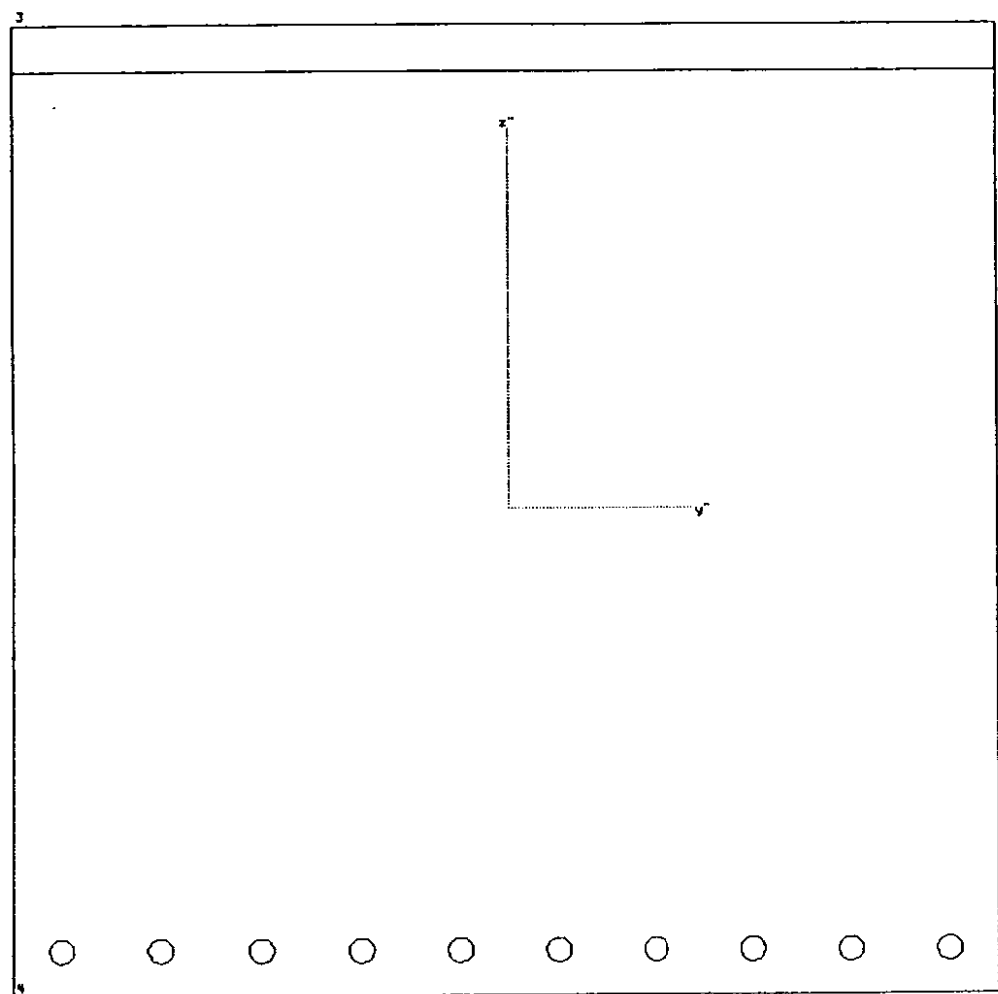
	Dintel (vano)	Dintel (empotramiento)	Hastial	Solera (vano)	Solera (empotramiento)
Axil de servicio (T) :	-13.67	30.92	-135.65	-1.21	14.43
Momento de servicio (mT) :	115.60	-89.99	-123.39	-165.19	94.97
Ambiente	II	II	II	II	II
Recubrimiento armaduras de tracción (cm) (c) :	3.500	3.500	3.500	3.500	3.500
Diámetro de la barra traccionada más gruesa (mm) (Φ) :	25.000	25.000	25.000	20.000	20.000
Distancia mínima entre barras (m) (s) :	0.100	0.150	0.150	0.100	0.100
Deformación fibra traccionada max (o/oo) (ϵ_1) :	1.283	1.376	1.226	1.246	1.481
Deformación fibra traccionada min (o/oo) (ϵ_2) :	0.000	0.000	0.000	0.000	0.000
Ac eficaz (m²) :	0.235	0.235	0.235	0.205	0.195
Armadura traccionada (cm²)(As) :	49.100	42.783	65.467	62.800	31.400
Tensión en armadura al fisurarse la sección (Kp/cm²)(σ_{sr}) :	1034.090	1960.620	1537.380	980.490	1879.730
Tensión de servicio armadura en hipótesis de sección fisurada (Kp/cm²)(σ_s) :	2531.190	2767.330	2404.560	2492.020	2975.100
Módulo elasticidad acero (Es) (T/m²) :	21000000.000	21000000.000	21000000.000	21000000.000	21000000.000
Fck (Kp/cm²) :	250.000	250.000	250.000	250.000	250.000
Inercia sección (m4) :	0.083	0.183	0.083	0.144	0.144
Distancia cdg seccion a fibra traccionada (m) :	0.500	0.650	0.500	0.600	0.600

RESULTADOS

	1	2	3	4	5
Wk max (mm) =	0.200	0.200	0.200	0.200	0.200
Corrección Wk max por recubrimiento (mm) =	0.280	0.280	0.280	0.300	0.300
Corrección separación barras (m) =	0.100	0.150	0.150	0.100	0.100
K1 (se supone barras corrugadas) =	0.400	0.400	0.400	0.400	0.400
K2 =	0.125	0.125	0.125	0.125	0.125
K3 (se supone no carga noval) =	0.500	0.500	0.500	0.500	0.500
fctm (T/m²) =	269.858	269.858	269.858	269.858	269.858
Momento de fisuración (mT) =	44.976	76.010	44.976	64.766	64.766
S m (mm) =	149.827	168.660	144.870	122.643	152.102
ϵ_{sm} =	0.00110	0.00099	0.00091	0.00109	0.00113

Wk (mm) =	0.28	0.28	0.224	0.228	0.293
	Vale	Vale	Vale	Vale	Vale

Mstb. 1 : 7.0



Sección : "FISUDINT" Armadura : "B1"
Tipo : tipo viga/ Rectángulo Unidades : [cm]
Material : "H250"

Ancho = 100.00 cm Canto = 100.00 cm

Características mecánicas de la sección:

Area : Ax= 1.000 [m2]
Momentos de inercia : Iy= 0.083333 [m4] Iz= 0.083333 [m4]
Inercia a torsión : Ix= 0.140667 [m4]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.500000 [m]

I: R=dist.borde [m] W=I/R [m3] W/Ax [m]
izq. Iz -0.500 -0.166667 0.167
dch. Iz 0.500 0.166667 -0.167
abajo Iy -0.500 -0.166667 0.167
arriba Iy 0.500 0.166667 -0.167

Armadura: "B1"

Nº	Nom.mat	Cod.dim.	Area [cm2]	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]
1	AEH500	(2)	49.09	-45.00	4.75	45.00	4.75
2	AEH500	(2)	32.73	-50.00	95.25	50.00	95.25
Total:			81.82	Cuantía de armadura: 0.818 [o/o]			

Cód. dimensionamiento: (0) = As constante

Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada

Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero"AEH500"/Hormigón"H250")

Cortante Area mín.cercos Ancho alma ideal Canto útil Incl.bielas

Vz	0.00 [cm2/m]	100.00 [cm]	96.00 [cm]	0.00
Vy	0.00 [cm2/m]	100.00 [cm]	96.00 [cm]	0.00

Características del material:

Nom.Mat.	Módulo E	0.85*fcd,fyd	eps-fc	fct	fcv	fcw,min
[kp/cm2]	[kp/cm2]	[o/oo]	[kp/cm2]	[kp/cm2]	[kp/cm2]	[kp/cm2]
"H250"	300000.0	-141.600	-2.000	0.0	6.460	250.000
"AEH500"	2.10E+06	4434.700				

Leyenda:

fcd,fyd resistencia de cálculo del hormigón,acero
eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)
fct resistencia de cálculo a tracción del hormigón
fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Comprobación de las tensiones en el estado II: Viga "FISUDINT"/"B1"

Esfuerzos (E.L.S.)						Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	
-13.670				115.600		

Deformaciones y tensiones extremas:

3	Coordenadas		Eps	Estado-II	Estado-I	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	
Hormigón-Min	-50.00	100.00	-0.360	-108.115	-70.727	"H250"
Armadura-Min	-50.00	95.25	-0.282	-592.834		"AEH500"
Hormigón-Max	50.00	0.00	1.283	0.000	67.993	"H250"
Armadura-Max	45.00	4.75	1.205	2531.191		"AEH500"

Fibra neutra	zn	78.08 cm	yn	-0.00 cm	Angulo	0.0
Ancho zona comprim.		21.92 cm	Zona comprimida/Canto útil			0.23

Esfuerzos			Rigideces secantes:		Deformaciones:	
N =	-13.670 [t]	EAx=	29619.9 [t]	4.615136E-04		
My=	115.600 [tm]	EIy=	70325.2 [tm2]	1.643791E-03 [1/m]		
Mz=	0.000 [tm]	*EIz=	67496.0 [tm2]	-1.233471E-13 [1/m]		
(*) Rigidez tangencial !						

Deformaciones y tensiones en vertices de la sección:

Coordenadas		Eps	Est. I	Est. II	Dist.Fuerz.Compr.	
y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	[t]	[cm]
50.00	0.00	1.283	67.993	0.000	-118.514	42.69
50.00	100.00	-0.360	-70.727	-108.115		
-50.00	100.00	-0.360	-70.727	-108.115		
-50.00	0.00	1.283	67.993	0.000		

Deformaciones y tensiones de la armadura pasiva (Estado II):

Nº	Coordenadas		Eps	Sigma-s
	y [cm]	z [cm]	[o/oo]	[kp/cm2]
1	-45.000	4.750	1.205	2531.19
	45.000	4.750	1.205	2531.19
2	-50.000	95.250	-0.282	-592.83
	50.000	95.250	-0.282	-592.83

Comprobación de las tensiones en el estado II: Viga "FISUDINT"/"B1"

Esfuerzos (E.L.S.)						Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	
						44.976

Deformaciones y tensiones extremas:

3	Coordenadas	Eps	Estado-II	Estado-I	
	y [cm] z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	
Hormigón-Min	-50.00 100.00	-0.138	-41.533	-26.986	"H250"
Armatura-Min	-50.00 95.25	-0.107	-224.663		"AEH500"
Hormigón-Max	50.00 0.00	0.524	0.000	26.986	"H250"
Armatura-Max	45.00 4.75	0.492	1034.091		"AEH500"

Fibra neutra	zn	79.10 cm	yn	-0.00 cm	Angulo	0.0
Ancho zona comprim.		20.90 cm	Zona comprimida/Canto útil			0.22

Esfuerzos	: Rigideces secantes:		Deformaciones:	
N =	0.000 [t]	*EAX= 798896.9 [t]	1.927210E-04	
My=	44.976 [tm]	Ely= 67906.0 [tm2]	6.623277E-04 [1/m]	
Mz=	0.000 [tm]	*Elz= 64942.6 [tm2]	-5.573014E-14 [1/m]	

(*) Rigidez tangencial !

Deformaciones y tensiones en vertices de la sección:

Coordenadas	Eps	Est. I	Est. II	Dist.Fuerz.Compr.	
y [cm] z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	[t]	[cm]
50.00 0.00	0.524	26.986	0.000	-43.407	43.03
50.00 100.00	-0.138	-26.986	-41.533		
-50.00 100.00	-0.138	-26.986	-41.533		
-50.00 0.00	0.524	26.986	0.000		

Deformaciones y tensiones de la armadura pasiva (Estado II):

Nº	Coordenadas	Eps	Sigma-s	
	y [cm] z [cm]	[o/oo]	[kp/cm2]	
1	-45.000 4.750	0.492	1034.09	
	45.000 4.750	0.492	1034.09	
2	-50.000 95.250	-0.107	-224.66	
	50.000 95.250	-0.107	-224.66	

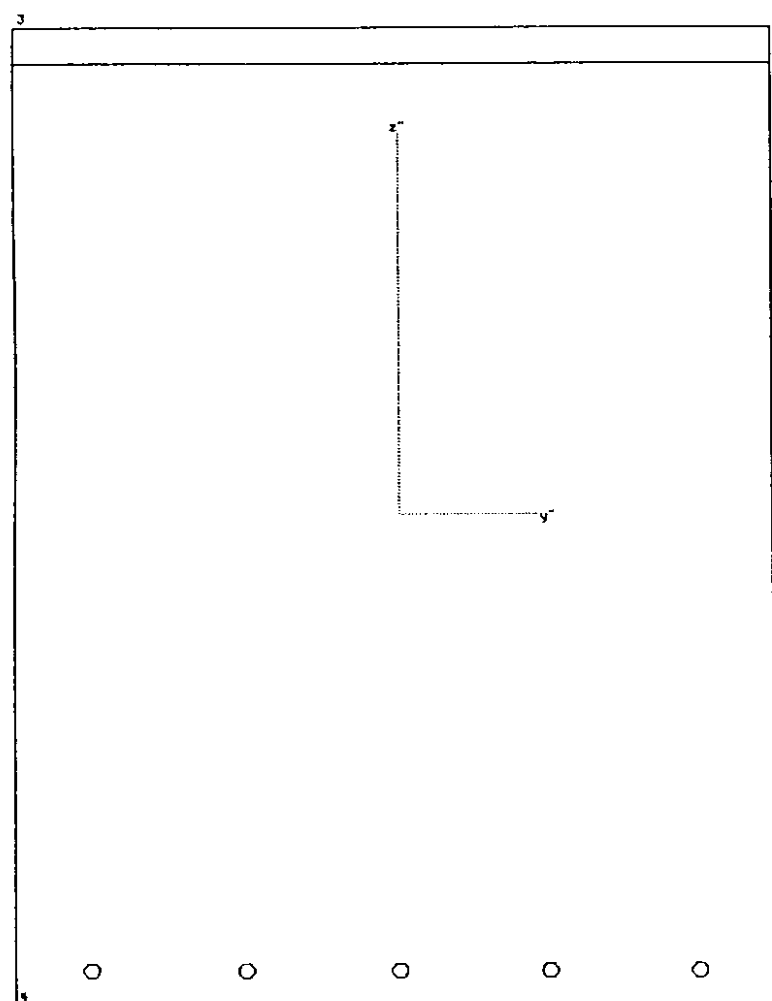
Parámetros globales de cálculo :

Norma : EH-1991
Inclinación estándar bielas comprimidas hormigón : 45.00 [Grados]
Coeficiente de fluencia phi : 0.00
Factor minoración de la resistencia de la sección : 1.00
Def. máxima en compresión centrada del hormigón : -2.00 [o/oo]
Deformación máxima en flexión en vigas : -3.50 [o/oo]
Def. máxima en tracción del acero en vigas : 10.00 [o/oo]
Modo de análisis / Inclinación del eje neutro : flexión esviada
Cuantía mínima de armadura long. para pilas : 0.40 [o/o]
Cuantía máxima de armadura long. : 8.00 [o/o]
Modo de pretensado : adherente
NO se usaron coef. de homogeneización para calcular las caract. mecánicas

Modelo para dimensionamiento a cortante:

Usar un canto útil constante en los cálculos a cortante
Cálculo separado para la arm. longitudinal adicional debida a cortante

Mstb. 1 : 9.0



Sección : "FISUCART" Armadura : "B1"
Tipo : tipo viga/ Rectángulo Unidades : [cm]
Material : "H250"

Ancho = 100.00 cm Canto = 130.00 cm

Características mecánicas de la sección:

Area : Ax= 1.300 [m2]
Momentos de inercia : Iy= 0.183083 [m4] Iz= 0.108333 [m4]
Inercia a torsión : Ix= 0.229402 [m4]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.650000 [m]

I:	R=dist.borde [m]	W=I/R [m3]	W/Ax [m]
izq.	Iz -0.500	-0.216667	0.167
dch.	Iz 0.500	0.216667	-0.167
abajo	Iy -0.650	-0.281666	0.217
arriba	Iy 0.650	0.281666	-0.217

Armadura: "B1"

Nº	Nom.mat	Cod.dim.	Area	y1	z1	y2	z2
			[cm2]	[cm]	[cm]	[cm]	[cm]
1	AEH500	(2)	15.71	-40.00	4.50	40.00	4.50
2	AEH500	(2)	32.73	-50.00	125.25	50.00	125.25
Total:			48.44	Cuantía de armadura: 0.373 [o/o]			

Cód. dimensionamiento: (0) = As constante

Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada

Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero"AEH500"/Hormigón"H250")

Cortante Area mín.cercos Ancho alma ideal Canto útil Incl.biélas

Vz	0.00 [cm2/m]	100.00 [cm]	126.00 [cm]	0.00
Vy	0.00 [cm2/m]	130.00 [cm]	96.00 [cm]	0.00

Características del material:

Nom.Mat.	Módulo E	0.85*fcd,fyd	eps-fc	fct	fcv	fcw,min
	[kp/cm2]	[kp/cm2]	[o/oo]	[kp/cm2]	[kp/cm2]	[kp/cm2]
"H250"	300000.0	-141.600	-2.000	0.0	6.460	250.000
"AEH500"	2.10E+06	4434.700				

Leyenda:

fcd,fyd resistencia de cálculo del hormigón,acero

eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)

fct resistencia de cálculo a tracción del hormigón

fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Comprobación de las tensiones en el estado II: Viga "FISUCART"/"B1"

Esfuerzos (E.L.S.)						Unidades : [tm]	
N	Vy	Vz	Hx	My	Mz		
30.920				-89.990			

Deformaciones y tensiones extremas:

3	Coordenadas		Eps	Estado-II	Estado-I	
	y [cm]	z [cm]				
Hormigón-Min	50.00	0.00	-0.211	-63.185	-29.571	"H250"
Armadura-Min	40.00	4.50	-0.156	-326.978		"AEH500"
Hormigón-Max	-50.00	130.00	1.376	0.000	34.328	"H250"
Armadura-Max	-50.00	125.25	1.318	2767.329		"AEH500"

Fibra neutra	zn	17.26 cm	yn	0.00 cm	Angulo	0.0
Ancho zona comprim.		17.26 cm	Zona comprimida/Canto útil			0.14

Esfuerzos		Rigideces secantes:		Deformaciones:	
N =	30.920 [t]	EAX=	53075.9 [t]	S.825615E-04	
My=	-89.990 [tm]	Ely=	73745.8 [tm2]	-1.220273E-03 [1/m]	
Mz=	0.000 [tm]	EIz=	50637.0 [tm2]	1.631981E-14 [1/m]	

(*) Rigidez tangencial !

Deformaciones y tensiones en vertices de la sección:

Coordenadas		Eps	Est. I	Est. II	Dist.Fuerz.Compr.	
y [cm]	z [cm]					
50.00	0.00	-0.211	-29.571	-63.185	-54.528	59.25
50.00	130.00	1.376	34.328	0.000		
-50.00	130.00	1.376	34.328	0.000		
-50.00	0.00	-0.211	-29.571	-63.185		

Deformaciones y tensiones de la armadura pasiva (Estado II):

Nº	Coordenadas		Eps	Sigma-s
	y [cm]	z [cm]		
1	-40.000	4.500	-0.156	-326.98
	40.000	4.500	-0.156	-326.98
2	-50.000	125.250	1.318	2767.33
	50.000	125.250	1.318	2767.33

Comprobación de las tensiones en el estado II: Viga "FISUCART"/"B1"

Esfuerzos (E.L.S.)						Unidades : [tm]	
N	Vy	Vz	Hx	My	Mz		
				-76.010			

Deformaciones y tensiones extremas:

3	Coordenadas		Eps	Estado-II	Estado-I	
	y [cm]	z [cm]				
Hormigón-Min	50.00	0.00	-0.188	-56.451	-26.986	"H250"
Armadura-Min	40.00	4.50	-0.148	-310.518		"AEH500"
Hormigón-Max	-50.00	130.00	0.976	0.000	26.986	"H250"
Armadura-Max	-50.00	125.25	0.934	1960.619		"AEH500"

Fibra neutra	zn	21.01 cm	yn	0.00 cm	Angulo	0.0
Ancho zona comprim.		21.01 cm	Zona comprimida/Canto útil			0.17

Esfuerzos		Rigideces secantes:		Deformaciones:	
N =	0.000 [t]	*EAX=	732007.5 [t]	3.940007E-04	
My=	-76.010 [tm]	Ely=	84866.0 [tm2]	-8.956468E-04 [1/m]	
Mz=	0.000 [tm]	EIz=	60011.0 [tm2]	2.539017E-15 [1/m]	

(*) Rigidez tangencial !

Deformaciones y tensiones en vertices de la sección:

Coordenadas		Eps	Est. I	Est. II	Dist.Fuerz.Compr.	
y [cm]	z [cm]					
50.00	0.00	-0.188	-26.986	-56.451	-59.300	58.00
50.00	130.00	0.976	26.986	0.000		
-50.00	130.00	0.976	26.986	0.000		
-50.00	0.00	-0.188	-26.986	-56.451		

Deformaciones y tensiones de la armadura pasiva (Estado II):

Nº	Coordenadas		Eps	Sigma-s
	y [cm]	z [cm]		
1	-40.000	4.500	-0.148	-310.52
	40.000	4.500	-0.148	-310.52
2	-50.000	125.250	0.934	1960.62
	50.000	125.250	0.934	1960.62

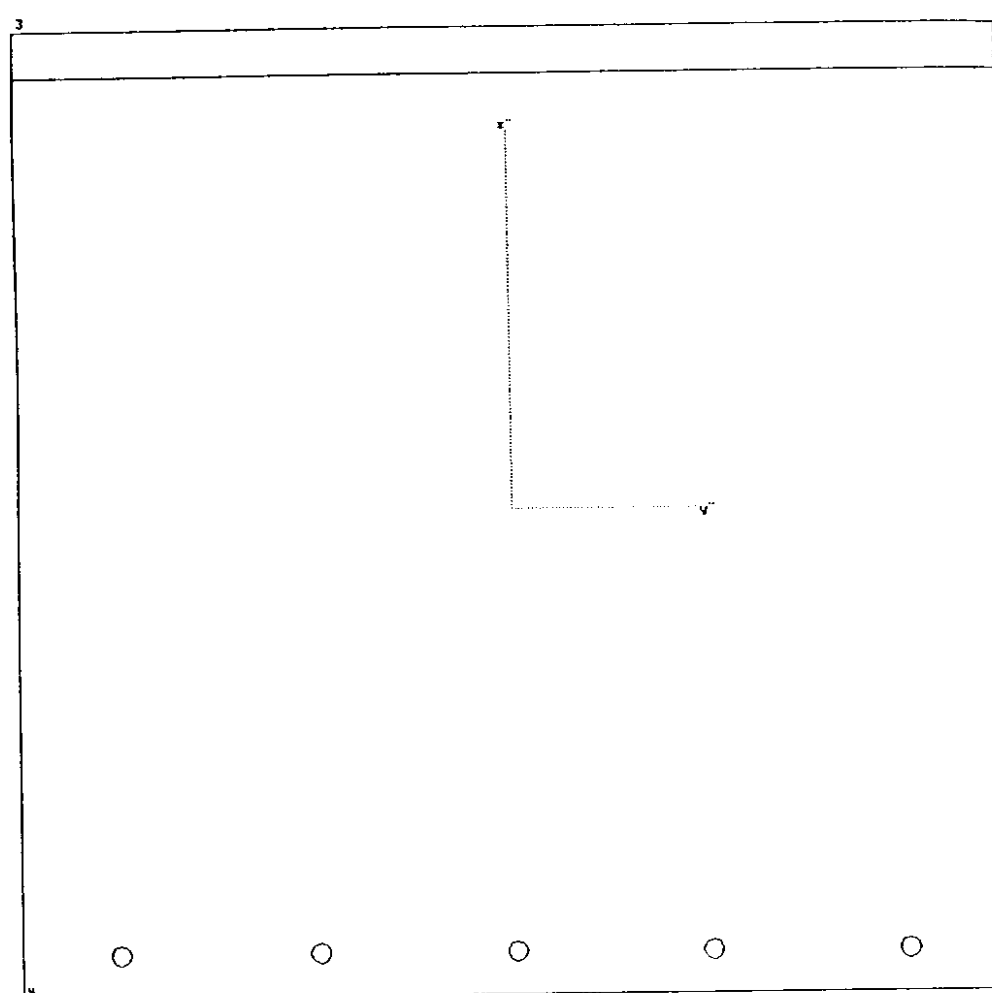
Parámetros globales de cálculo :

Norma: EH-1991
Inclinación estándar bielas comprimidas hormigón ..: 45.00 [Grados]
Coeficiente de fluencia phi: 0.00
Factor minoración de la resistencia de la sección ..: 1.00
Def. máxima en compresión centrada del hormigón ..: -2.00 [o/oo]
Deformación máxima en flexión en vigas: -3.50 [o/oo]
Def. máxima en tracción del acero en vigas: 10.00 [o/oo]
Modo de análisis / Inclinación del eje neutro: flexión esviada
Cuantía mínima de armadura long. para pilas: 0.40 [o/o]
Cuantía máxima de armadura long.: 8.00 [o/o]
Modo de pretensado: adherente
NO se usaron coef. de homogeneización para calcular las caract. mecánicas

Modelo para dimensionamiento a cortante:

Usar un canto útil constante en los cálculos a cortante
Cálculo separado para la arm. longitudinal adicional debida a cortante

Mstb. 1 : 7.0



Sección : "FISUHAST" Armadura : "B1"
Tipo : tipo viga/ Rectángulo Unidades : [cm]
Material : "H250"

Ancho = 100.00 cm Canto = 100.00 cm

Características mecánicas de la sección:

Area : Ax= 1.000 [m2]
Momentos de inercia : Iy= 0.083333 [m4] Iz= 0.083333 [m4]
Inercia a torsión : Ix= 0.140667 [m4]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.500000 [m]

	I:	R=dist.borde [m]	W=I/R [m3]	W/Ax [m]
izq. Iz	-0.500		-0.166667	0.167
dch. Iz	0.500		0.166667	-0.167
abajo Iy	-0.500		-0.166667	0.167
arriba Iy	0.500		0.166667	-0.167

Armadura: "B1"

Nº	Nom.mat	Cod.dim.	Area [cm2]	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]
1	AEH500	(2)	15.71	-40.00	4.50	40.00	4.50
2	AEH500	(2)	32.73	-50.00	95.25	50.00	95.25
Total:			48.44	Cuantía de armadura: 0.484 [o/o]			

Cód. dimensionamiento: (0) = As constante

Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada

Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero"AEH500"/Hormigón"H250")

Cortante	Area mín.	cercos	Ancho alma ideal	Canto útil	Incl.bielas
Vz	0.00 [cm2/m]	100.00 [cm]	96.00 [cm]	0.00	
Vy	0.00 [cm2/m]	100.00 [cm]	96.00 [cm]	0.00	

Características del material:

Nom.Mat.	Módulo E	0.85*fcd,fyd	eps-fc	fct	fcv	fcw,min
	[kp/cm2]	[kp/cm2]	[o/oo]	[kp/cm2]	[kp/cm2]	[kp/cm2]
"H250"	300000.0	-141.600	-2.000	0.0	6.460	250.000
"AEH500"	2.10E+06	4434.700				

Leyenda:

fcd,fyd resistencia de cálculo del hormigón,acero

eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)

fct resistencia de cálculo a tracción del hormigón

fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Comprobación de las tensiones en el estado II: Viga "FISUHAST"/"B1"

Esfuerzos (E.L.S.)						Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	
-135.650				-123.390		

Deformaciones y tensiones extremas:

3	Coordenadas		Eps	Estado-II	Estado-I	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	
Hormigón-Min	50.00	0.00	-0.478	-141.600	-87.599	"H250"
Armadura-Min	40.00	4.50	-0.401	-842.826		"AEH500"
Hormigón-Max	-50.00	100.00	1.226	0.000	60.469	"H250"
Armadura-Max	-50.00	95.25	1.145	2404.564		"AEH500"

Fibra neutra	zn	28.05 cm	yn	0.00 cm	Angulo	0.0
Ancho zona comprim.		28.05 cm	Zona comprimida/Canto útil			0.29

Esfuerzos		: Rigideces secantes:		Deformaciones:	
N =	-135.650 [t]	EAx=	362727.4 [t]	3.739723E-04	
My=	-123.390 [tm]	Ely=	72412.2 [tm2]	-1.703995E-03 [1/m]	
Mz=	0.000 [tm]	*Elz=	76736.6 [tm2]	8.765972E-17 [1/m]	
(*) Rigidez tangencial !					

Deformaciones y tensiones en vertices de la sección:

Coordenadas		Eps	Est. I	Est. II	Dist.Fuerz.Compr.	
y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	[t]	[cm]
50.00	0.00	-0.478	-87.599	-141.600	-201.120	40.65
50.00	100.00	1.226	60.469	0.000		
-50.00	100.00	1.226	60.469	0.000		
-50.00	0.00	-0.478	-87.599	-141.600		

Deformaciones y tensiones de la armadura pasiva (Estado II):

Nº	Coordenadas		Eps	Sigma-s
	y [cm]	z [cm]	[o/oo]	[kp/cm2]
1	-40.000	4.500	-0.401	-842.83
	40.000	4.500	-0.401	-842.83
2	-50.000	95.250	1.145	2404.56
	50.000	95.250	1.145	2404.56

Comprobación de las tensiones en el estado II: Viga "FISUHAST"/"B1"

Esfuerzos (E.L.S.)						Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	
				-44.976		

Deformaciones y tensiones extremas:

3	Coordenadas		Eps	Estado-II	Estado-I	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	
Hormigón-Min	50.00	0.00	-0.171	-51.201	-26.986	"H250"
Armadura-Min	40.00	4.50	-0.128	-268.845		"AEH500"
Hormigón-Max	-50.00	100.00	0.777	0.000	26.986	"H250"
Armadura-Max	-50.00	95.25	0.732	1537.382		"AEH500"

Fibra neutra	zn	18.01 cm	yn	0.00 cm	Angulo	0.0
Ancho zona comprim.		18.01 cm	Zona comprimida/Canto útil			0.19

Esfuerzos		: Rigideces secantes:		Deformaciones:	
N =	0.000 [t]	*EAx=	641952.7 [t]	3.032174E-04	
My=	-44.976 [tm]	Ely=	47454.2 [tm2]	-9.477778E-04 [1/m]	
Mz=	0.000 [tm]	*Elz=	52506.4 [tm2]	1.852006E-18 [1/m]	
(*) Rigidez tangencial !					

Deformaciones y tensiones en vertices de la sección:

Coordenadas		Eps	Est. I	Est. II	Dist.Fuerz.Compr.	
y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	[t]	[cm]
50.00	0.00	-0.171	-26.986	-51.201	-46.101	44.00
50.00	100.00	0.777	26.986	0.000		
-50.00	100.00	0.777	26.986	0.000		
-50.00	0.00	-0.171	-26.986	-51.201		

Deformaciones y tensiones de la armadura pasiva (Estado II):

Nº	Coordenadas		Eps	Sigma-s
	y [cm]	z [cm]	[o/oo]	[kp/cm2]
1	-40.000	4.500	-0.128	-268.85
	40.000	4.500	-0.128	-268.85
2	-50.000	95.250	0.732	1537.38
	50.000	95.250	0.732	1537.38

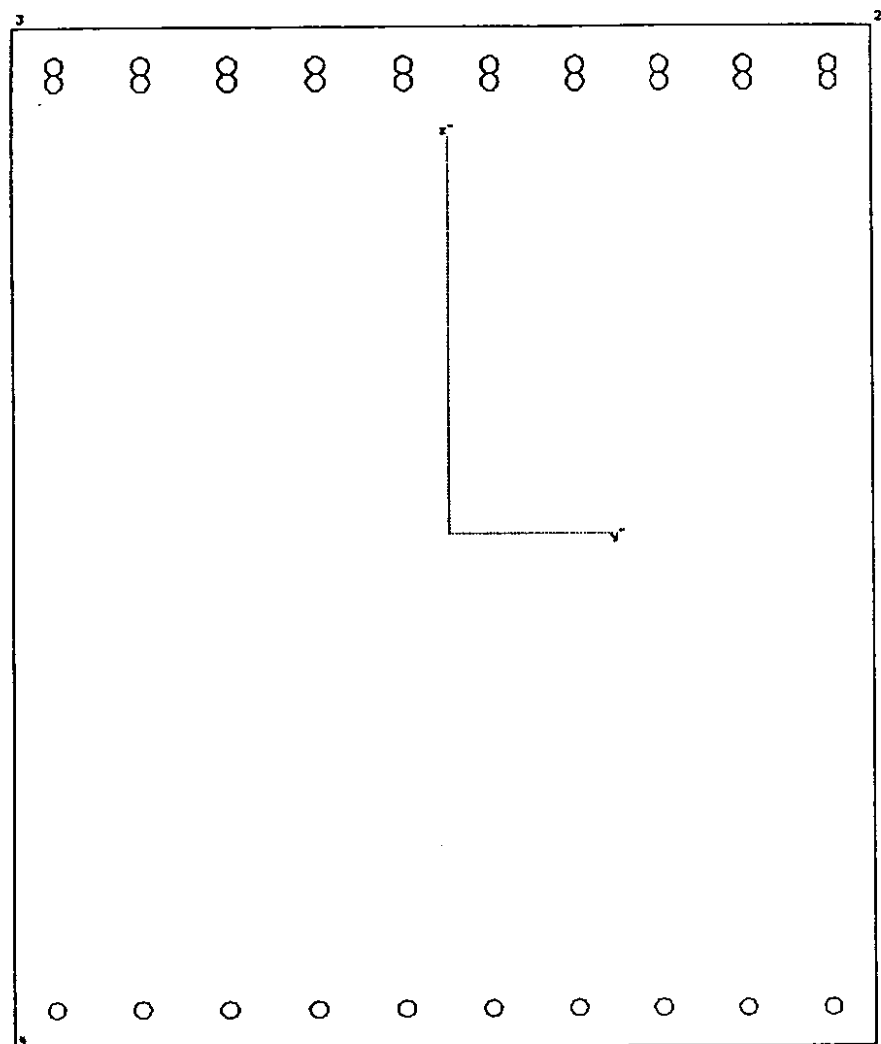
Parámetros globales de cálculo :

Norma		EN-1991
Inclinación estándar bielas comprimidas hormigón	..	45.00 [Grados]
Coefficiente de fluencia phi		0.00
Factor minoración de la resistencia de la sección	..	1.00
Def. máxima en compresión centrada del hormigón	..	-2.00 [o/oo]
Deformación máxima en flexión en vigas		-3.50 [o/oo]
Def. máxima en tracción del acero en vigas		10.00 [o/oo]
Modo de análisis / Inclinación del eje neutro		flexión esviada
Cuantía mínima de armadura long. para pilas		0.40 [o/o]
Cuantía máxima de armadura long.		8.00 [o/o]
Modo de pretensado		adherente
NO se usaron coef. de homogeneización para calcular las caract. mecánicas		

Modelo para dimensionamiento a cortante:

Usar un canto útil constante en los cálculos a cortante
Cálculo separado para la arm. longitudinal adicional debida a cortante

Mstb. 1 : 8.0



Sección : "FISUSOLE" Armadura : "B1"
Tipo : tipo viga/ Rectángulo Unidades : [cm]
Material : "H250"

Ancho = 100.00 cm Canto = 120.00 cm

Características mecánicas de la sección:

Area : Ax= 1.200 [m²]
Momentos de inercia : Iy= 0.144000 [m⁴] Iz= 0.100000 [m⁴]
Inercia a torsión : Ix= 0.198359 [m⁴]

Posición del centro de gravedad: ys= 0.000 [m] zs= 0.600000 [m]

I: R=dist.borde [m] W=I/R [m³] W/Ax [m]
izq. Iz -0.500 -0.200000 0.167
dch. Iz 0.500 0.200000 -0.167
abajo Iy -0.600 -0.240000 0.200
arriba Iy 0.600 0.240000 -0.200

Armadura: "B1"

Nº	Nom.mat	Cod.dim.	Area [cm ²]	y1 [cm]	z1 [cm]	y2 [cm]	z2 [cm]
1	AEH500	(2)	31.42	-45.00	4.50	45.00	4.50
2	AEH500	(2)	31.42	-45.00	115.50	45.00	115.50
3	AEH500	(2)	31.42	-45.00	113.50	45.00	113.50

Total: 94.25 Cuantía de armadura: 0.785 [o/o]

Cód. dimensionamiento: (0) = As constante

Cód. dimensionamiento: (1) = Aumentar As en zonas comprimida y traccionada

Cód. dimensionamiento: (2) = Aumentar As solo en zona traccionada

Dimens. a cortante (valores por defecto): (Acero "AEH500"/Hormigón "H250")

Cortante Area mín.cercos Ancho alma ideal Canto útil Incl.bielas

Vz	0.00 [cm ² /m]	100.00 [cm]	116.00 [cm]	0.00
Vy	0.00 [cm ² /m]	120.00 [cm]	96.00 [cm]	0.00

Características del material:

Nom.Mat. Módulo E 0.85*fcd,fyd eps-fc fct fcv fcv,min
[kp/cm²] [kp/cm²] [o/oo] [kp/cm²] [kp/cm²] [kp/cm²]

"H250" 300000.0 -141.600 -2.000 0.0 6.460 250.000
"AEH500" 2.10E+06 4434.700

Leyenda:

fcd,fyd resistencia de cálculo del hormigón,acero

eps-fc deformación al final de la parábola (fig.2.3, cap.2.2)

fct resistencia de cálculo a tracción del hormigón

fcv resistencia virtual de cálculo del hormigón a esfuerzo cortante

Comprobación de las tensiones en el estado II: Viga "FISUSOLE"/"B1"

Esfuerzos (E.L.S.)						Unidades : [tm]
N	Vy	Vz	Mx	My	Mz	
-1.210				-165.190		

Deformaciones y tensiones extremas:

3	Coordenadas		Eps [o/oo]	Estado-II [kp/cm ²]	Estado-I [kp/cm ²]	
	y [cm]	z [cm]				
Hormigón-Min	50.00	0.00	-0.348	-104.521	-68.930	"H250"
Armadura-Min	45.00	4.50	-0.289	-606.047		"AEH500"
Hormigón-Max	-50.00	120.00	1.246	0.000	68.728	"H250"
Armadura-Max	-45.00	115.50	1.187	2492.016		"AEH500"

Fibra neutra zn 26.21 cm yn 0.00 cm Angulo 0.0
Ancho zona comprim. 26.21 cm Zona comprimida/Canto útil 0.23

Esfuerzos		Rigideces secantes:		Deformaciones:	
N =	-1.210 [t]	EAx=	2694.636 [t]		4.490403E-04
My=	-165.190 [tm]	EIy=	124289.9 [tm ²]		-1.329070E-03 [1/m]
Mz=	0.000 [tm]	*EIz=	78894.5 [tm ²]		3.267679E-15 [1/m]
(*) Rigidez tangencial I					

Deformaciones y tensiones en vertices de la sección:

Coordenadas		Eps [o/oo]	Est. I [kp/cm ²]	Est. II [kp/cm ²]	Dist.Fuerz.Compr. [t]	
y [cm]	z [cm]					
50.00	0.00	-0.348	-68.930	-104.521	-136.995	51.26
50.00	120.00	1.246	68.728	0.000		
-50.00	120.00	1.246	68.728	0.000		
-50.00	0.00	-0.348	-68.930	-104.521		

Deformaciones y tensiones de la armadura pasiva (Estado II):

Nº	Coordenadas		Eps [o/oo]	Sigma-s [kp/cm ²]
	y [cm]	z [cm]		
1	-45.000	4.500	-0.289	-606.05
	45.000	4.500	-0.289	-606.05
2	-45.000	115.500	1.187	2492.02
	45.000	115.500	1.187	2492.02
3	-45.000	113.500	1.160	2436.19
	45.000	113.500	1.160	2436.19

Comprobación de las tensiones en el estado II: Viga "FISUSOLE"/"B1"

Esfuerzos (E.L.S.)						Unidades : [tm]
N	Vy	Vz	Hx	My	Mz	
						-64.766

Deformaciones y tensiones extremas:						
3	Coordenadas		Eps	Estado-II	Estado-I	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	
Hormigón-Min	50.00	0.00	-0.136	-40.936	-26.986	"H250"
Armadura-Min	45.00	4.50	-0.113	-237.188		"AEH500"
Hormigón-Max	-50.00	120.00	0.490	0.000	26.986	"H250"
Armadura-Max	-45.00	115.50	0.467	980.491		"AEH500"

Fibra neutra	zn	26.12 cm	yn	0.00 cm	Angulo	0.0
Ancho zona comprim.		26.12 cm	Zona comprimida/Canto útil			0.23

Esfuerzos		: Rigideces secantes:		Deformaciones:	
N =	0.000 [t]	*EAX=	981560.5 [t]	1.769769E-04	
My=	-64.766 [tm]	Ely=	123981.5 [tm2]	-5.223845E-04 [1/m]	
Mz=	0.000 [tm]	*Elz=	78663.0 [tm2]	2.900712E-15 [1/m]	
(*) Rigidez tangencial I					

Deformaciones y tensiones en vertices de la sección:						
	Coordenadas		Eps	Est. I	Est. II	Dist.Fuerz.Compr.
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	[t] [cm]
	50.00	0.00	-0.136	-26.986	-40.936	-53.465 51.29
	50.00	120.00	0.490	26.986	0.000	
	-50.00	120.00	0.490	26.986	0.000	
	-50.00	0.00	-0.136	-26.986	-40.936	

Deformaciones y tensiones de la armadura pasiva (Estado II):				
Nº	Coordenadas		Eps	Sigma-s
	y [cm]	z [cm]	[o/oo]	[kp/cm2]
1	-45.000	4.500	-0.113	-237.19
	45.000	4.500	-0.113	-237.19
2	-45.000	115.500	0.467	980.49
	45.000	115.500	0.467	980.49
3	-45.000	113.500	0.456	958.55
	45.000	113.500	0.456	958.55

Comprobación de las tensiones en el estado II: Viga "FISUSOLE"/"B1"

Esfuerzos (E.L.S.)						Unidades : [tm]
N	Vy	Vz	Hx	My	Mz	
						14.430 94.970

Deformaciones y tensiones extremas:						
3	Coordenadas		Eps	Estado-II	Estado-I	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	
Hormigón-Min	-50.00	120.00	-0.236	-70.746	-38.368	"H250"
Armadura-Min	-45.00	115.50	-0.171	-360.018		"AEH500"
Hormigón-Max	50.00	0.00	1.481	0.000	40.773	"H250"
Armadura-Max	45.00	4.50	1.417	2975.098		"AEH500"

Fibra neutra	zn	103.52 cm	yn	-0.00 cm	Angulo	0.0
Ancho zona comprim.		16.48 cm	Zona comprimida/Canto útil			0.14

Esfuerzos		: Rigideces secantes:		Deformaciones:	
N =	14.430 [t]	EAX=	23175.6 [t]	6.226382E-04	
My=	94.970 [tm]	Ely=	66377.0 [tm2]	1.430766E-03 [1/m]	
Mz=	0.000 [tm]	*Elz=	54565.1 [tm2]	-1.314813E-17 [1/m]	
(*) Rigidez tangencial I					

Deformaciones y tensiones en vertices de la sección:						
	Coordenadas		Eps	Est. I	Est. II	Dist.Fuerz.Compr.
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	[t] [cm]
	50.00	0.00	1.481	40.773	0.000	-58.303 54.51
	50.00	120.00	-0.236	-38.368	-70.746	
	-50.00	120.00	-0.236	-38.368	-70.746	
	-50.00	0.00	1.481	40.773	0.000	

Deformaciones y tensiones de la armadura pasiva (Estado II):				
Nº	Coordenadas		Eps	Sigma-s
	y [cm]	z [cm]	[o/oo]	[kp/cm2]
1	-45.000	4.500	1.417	2975.10
	45.000	4.500	1.417	2975.10
2	-45.000	115.500	-0.171	-360.02
	45.000	115.500	-0.171	-360.02
3	-45.000	113.500	-0.143	-299.93
	45.000	113.500	-0.143	-299.93

Comprobación de las tensiones en el estado II: Viga "FISUSOLE"/"B1"

Esfuerzos (E.L.S.)						Unidades : [tm]
N	Vy	Vz	Hx	My	Mz	
						64.766

Deformaciones y tensiones extremas:						
3	Coordenadas		Eps	Estado-II	Estado-I	
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	
Hormigón-Min	-50.00	120.00	-0.164	-49.235	-26.986	"H250"
Armadura-Min	-45.00	115.50	-0.123	-257.980		"AEH500"
Hormigón-Max	50.00	0.00	0.936	0.000	26.986	"H250"
Armadura-Max	45.00	4.50	0.895	1879.731		"AEH500"

Fibra neutra	zn	102.10 cm	yn	-0.00 cm	Angulo	0.0
Ancho zona comprim.		17.90 cm	Zona comprimida/Canto útil			0.15

Esfuerzos		: Rigideces secantes:		Deformaciones:	
N =	0.000 [t]	*EAX=	734786.3 [t]	3.861311E-04	
My=	64.766 [tm]	Ely=	70622.1 [tm2]	9.170788E-04 [1/m]	
Mz=	0.000 [tm]	*Elz=	58098.4 [tm2]	-1.293910E-15 [1/m]	
(*) Rigidez tangencial I					

Deformaciones y tensiones en vertices de la sección:						
	Coordenadas		Eps	Est. I	Est. II	Dist.Fuerz.Compr.
	y [cm]	z [cm]	[o/oo]	[kp/cm2]	[kp/cm2]	[t] [cm]
	50.00	0.00	0.936	26.986	0.000	-44.054 54.03
	50.00	120.00	-0.164	-26.986	-49.235	
	-50.00	120.00	-0.164	-26.986	-49.235	
	-50.00	0.00	0.936	26.986	0.000	

Deformaciones y tensiones de la armadura pasiva (Estado II):				
Nº	Coordenadas		Eps	Sigma-s
	y [cm]	z [cm]	[o/oo]	[kp/cm2]
1	-45.000	4.500	0.895	1879.73
	45.000	4.500	0.895	1879.73
2	-45.000	115.500	-0.123	-257.98
	45.000	115.500	-0.123	-257.98
3	-45.000	113.500	-0.105	-219.46
	45.000	113.500	-0.105	-219.46

Parámetros globales de cálculo :

Norma: EH-1991
Inclinación estándar bielas comprimidas hormigón ..: 45.00 [Grados]
Coeficiente de fluencia phi: 0.00
Factor minoración de la resistencia de la sección ..: 1.00
Def. máxima en compresión centrada del hormigón ...: -2.00 [o/oo]
Deformación máxima en flexión en vigas: -3.50 [o/oo]
Def. máxima en tracción del acero en vigas: 10.00 [o/oo]
Modo de análisis / Inclinación del eje neutro: flexión esviada
Cuantía mínima de armadura long. para pilas: 0.40 [o/o]
Cuantía máxima de armadura long.: 8.00 [o/o]
Modo de pretensado: adherente
NO se usaron coef. de homogeneización para calcular las caract. mecánicas

Modelo para dimensionamiento a cortante:

Usar un canto útil constante en los cálculos a cortante
Cálculo separado para la arm. longitudinal adicional debida a cortante

CALCULO DE MUROS.

NOMBRE PROYECTO : L.A.V. MADRID - ZARAGOZA. Subtramo XV.
 NOMBRE OBRA : Aléas E-1516.9.2

DATOS

GEOMETRIA DE CALCULO DEL MURO

C. Canto del muro en coronación (m) :	0.350
ST. Sobreepesor muro en trasdós (m) :	0.850
SI. Sobreepesor muro en intradós (m) :	0.000
P. Puntera zapata (m) :	2.350
T. Talón zapata (m) :	4.300
H. Altura muro (m) :	8.800
H _z . Canto zapata (m) :	1.200
Anchura total cimentación (m) :	7.850
Angulo trasdós muro (°) :	84.483

DEFINICION TERRENO

	X	Y
0. Coordenadas base trasdós (m) :	0.000	0.000
1. Coordenadas coronación trasdós (m) :	-0.850	8.800
2. Coordenadas fin tramo 1 terreno (m) :	4.400	8.800
3. Coordenadas fin tramo 2 terreno (m) :	8.800	8.800
4. Coordenadas fin tramo 3 terreno (m) :	13.200	8.800

COEFICIENTES DE SEGURIDAD

Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
γ _o (coeficiente combinación variables) :	1.00

Estado Límite Ultimo	
Favorable	Desfavorable

Acciones permanentes (G)

Peso propio, cargas muertas :	0.90	1.50
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Acciones permanentes de valor no constante (G*)

Tierras (peso propio y empujes) :	0.00	1.50
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Acciones variables (Q)

Sobrecargas :	0.00	1.50
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CARACTERISTICAS DEL TERRENO

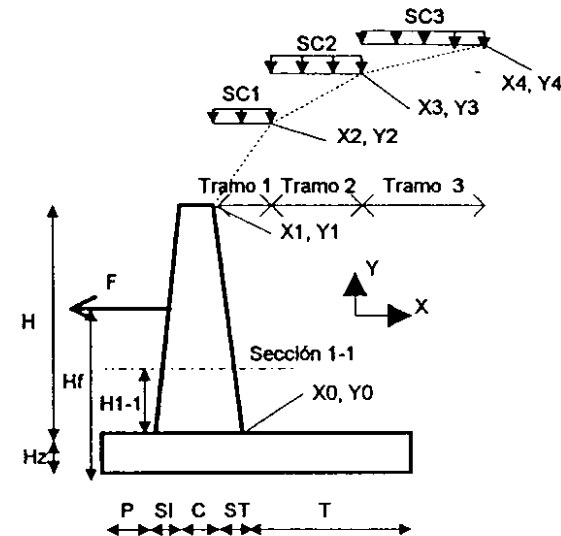
γ. Peso específico (T/m³) :	2.00
φ. Angulo rozamiento interno (°) :	30.000
δ _{mt} . Angulo rozamiento muro-tierras (°) :	0.000
φ _{tt} . Angulo rozamiento tierras-tierras (°) :	0.000
μ. Coeficiente rozamiento zapata-tierras :	0.580
Tensión admisible cimentación (T/m²) :	20.000

ARMADO

H1-1. Dist. sección 1 a sup. zapata (m) :	2.700
Recubrimiento alzado (m) :	0.050
Recubrimiento cimentación (m) :	0.050

Cuantías mínimas

Vertical muros (1/3 mín. cara)(o/o) :	0.900
Horizontal muros (1/3 mín. cara)(o/o) :	1.600
Cortante o montaje alzado (cm²/m²) :	4.500
Transversal zapata (sup+inf)(o/o) :	1.447
Longitudinal zapata (sup+inf)(o/o) :	1.447
Cortante zapata (cm²/m²) :	0.000
Perimetral zapata (en canto)(cm²/m) :	8.682



CARGAS (sin mayorar)

Acciones permanentes (G)

Peso propio barrera coronación (T/m) :	0.750
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Acciones permanentes de valor no constante (G*)

Fg. Carga horizontal sobre muro (T/m) :	1.559
---	-------

Hf _g . Posición Fg a inferior zapata (m) :	8.081
---	-------

Acciones variables (Q)

SC1. Sobrecarga en tramo 1 (T/m) :	3.000
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SC2. Sobrecarga en tramo 2 (T/m) :	3.000
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SC3. Sobrecarga en tramo 3 (T/m) :	3.000
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Fq. Carga horizontal sobre muro (T/m) :	1.804
---	-------

Hf _q . Posición Fq a inferior zapata (m) :	8.704
---	-------

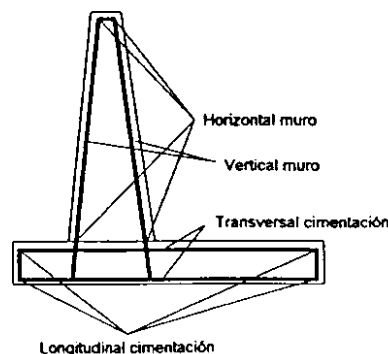
CARACTERISTICAS MATERIALES

Peso específico hormigón (T/m³) :	2.500
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Hormigón alzado (T/m³) :	H - 250
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Hormigón cimentación (T/m³) :	H - 250
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Acero (T/P) :	AEH - 500
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RESUMEN ACCIONES SOBRE EL MURO

		F. vertical (T / m)	X (m)	F. Horizontal (T / m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 (ΣP _i , i=1..3)	10.580	2.683	---	---
	Sobre sección base muro (ΣP _i , i=1..3)	17.800	2.766	---	---
	Total peso propio (ΣP _i , i=1..6)	41.350	3.426	---	---
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E1 ₁)	1.331	3.093	13.778	5.933
	Sobre sección base muro (E1 ₁)	2.770	3.267	28.675	4.133
	Total tierras (E2 ₁ + ΣT ₁)	83.160	5.481	33.318	3.333
	Verticales sobre talón (ΣT ₁ i _j)	75.680	5.700	---	---
	Verticales sobre talón (cortante) (ΣT ₁ i _j)	55.440	6.275	---	---
Fuerza Fg	Sobre sección 1	---	---	1.559	8.081
	Sobre sección base muro	---	---	1.559	8.081
	Total Fg	---	---	1.559	8.081
Acciones variables (Q)					
Sobrecargas sobre terreno	Sección 1 (E1 ₁ sc)	0.655	2.995	6.776	6.950
	Base muro (E1 ₁ sc)	0.944	3.125	9.776	5.600
	Inf. cimentación (E2sc + ΣS)	15.450	5.275	9.995	5.000
	Verticales sobre talón (ΣS ₁ i, i=1..3)	12.900	5.700	---	---
	Verticales sobre talón (cortante) (ΣS ₁ i)	9.450	6.275	---	---
Fuerza Fq	Sobre sección 1	---	---	1.804	8.704
	Sobre sección base muro	---	---	1.804	8.704
	Total Fq	---	---	1.804	8.704

COMPROBACIONES**SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)**

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	23.983	---
Acciones permanentes de valor no constante (G*)		
Tierras	48.233	33.318
Fuerza Fg	---	1.559
Acciones variables (Q)		
Sobrecargas sobre terreno	8.961	9.995
Fuerza Fq	---	1.804
TOTAL	81.177	46.676

Csd=	1.739	Vale
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SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	141.664	---
Acciones permanentes de valor no constante (G*)		
Tierras	455.811	111.060
Fuerza Fg	---	12.596
Acciones variables (Q)		
Sobrecargas sobre terreno	---	---
Fuerza Fq	---	15.703
TOTAL	597.475	139.359

Csv=	4.287	Vale
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TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	41.350	20.635
Acciones permanentes de valor no constante (G*)		
Tierras	83.160	-18.347
Fuerza Fg	0.000	12.596
Acciones variables (Q)		
Sobrecargas sobre terreno	15.450	29.120
Fuerza Fq	0.000	15.703
TOTAL	139.960	69.706

D (m) =	7.85
σ puntera (T / m²) =	23.64
σ talón (T / m²) =	12.02
σ med (T / m²) =	17.83
σ cob (T / m²) =	20.00
Vale	

ARMADO**Secciones**

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	1.20	1.00	1.20
	1-1	1.00	0.94	1.00	0.94
PUNTERA	2-2 f	1.00	1.20	1.00	1.20
	2-2 c	1.00	1.20	1.00	1.20
TALON	3-3 f	1.00	1.20	1.00	1.20
	3-3 c	1.00	1.20	1.00	1.20

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	21.591	228.472	62.720
	0-0 (-)	16.020	2.952	0.000
	1-1 (+)	12.500	96.388	35.876
	1-1 (-)	9.522	1.304	0.000
PUNTERA	2-2 f (+)	0.000	93.102	---
	2-2 f (-)	0.000	11.075	---
	2-2 c (+)	---	---	51.461
	2-2 c (-)	---	---	6.106
TALON	3-3 f (+)	-1.761	-10.300	---
	3-3 f (-)	-34.796	-121.041	---
	3-3 c (+)	---	---	-2.765
	3-3 c (-)	---	---	-37.930

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm2/m	Minima cm2/m	Control cálculo	Adoptada cm2/m
ALZADO	Vert. trasdós	0-0 (+)	45.745	7.200	Vale	45.745
		0-0 (-)	0.000	3.600	Vale	
		1-1 (+)	24.243	5.635	Vale	
		1-1 (-)	0.000	2.818	Vale	
	Vert. intradós	0-0 (+)	0.000	3.600	Vale	3.600
		0-0 (-)	0.000	3.600	Vale	
		1-1 (+)	0.000	2.818	Vale	
		1-1 (-)	0.000	2.818	Vale	
	Hor. trasdós (*)	---	9.149	12.800	Vale	12.800
	Hor. intradós (*)	---	0.000	6.400	Vale	6.400
	Cortante	0-0 (+)	0.000	4.500	Vale	4.500 (cm²/m²)
		0-0 (-)	0.000	4.500	Vale	
		1-1 (+)	0.000	4.500	Vale	
		1-1 (-)	0.000	4.500	Vale	
PUNTERA	Trans. inferior	2-2 f (+)	18.733	8.682	Vale	18.733
		2-2 f (-)	2.178	8.682	Vale	
	Long. inf. (*)	---	3.747	8.682	Vale	8.682
		---	---	---	---	
	Trans. superior	2-2 f (+)	0.000	8.682	Vale	32.400
		2-2 f (-)	0.000	8.682	Vale	
	Long. sup. (*)	---	0.000	8.682	Vale	8.682
		---	---	---	---	
TALON	Cortante	2-2 c (+)	0.000	0.000	Vale	0.000 (cm²/m²)
		2-2 c (-)	0.000	0.000	Vale	
	Trans. inferior	3-3 f (+)	0.000	8.682	Vale	18.733
		3-3 f (-)	0.000	8.682	Vale	
	Long. inf. (*)	---	0.000	8.682	Vale	8.682
		---	---	---	---	
	Trans. superior	3-3 f (+)	2.422	8.682	Vale	32.400
		3-3 f (-)	32.400	8.682	Vale	
ZAPATA	Long. sup. (*)	---	6.480	8.682	Vale	8.682
		---	---	---	---	
	Cortante	3-3 c (+)	0.000	0.000	Vale	0.000 (cm²/m²)
		3-3 c (-)	0.000	0.000	Vale	
ZAPATA	Perimetral	---	0.000	8.682	Vale	8.682
		---	---	---	---	

(*) Calculada como el 20% de la armadura perpendicular a ella

CALCULO DE MUROS.

NOMBRE PROYECTO : L.A.V. MADRID - ZARAGOZA. Subtramo XV.
 NOMBRE OBRA : EVN3-2.7. Aletas 1 Y 2

DATOS

GEOMETRIA DE CALCULO DEL MURO

C. Canto del muro en coronación (m) :	0.400
ST. Sobreespesor muro en trasdós (m) :	1.125
SI. Sobreespesor muro en intradós (m) :	0.000
P. Puntera zapata (m) :	3.750
T. Talón zapata (m) :	5.475
H. Altura muro (m) :	11.250
H _z . Canto zapata (m) :	1.500
Anchura total cimentación (m) :	10.750
Angulo trasdós muro (°) :	84.289

DEFINICION TERRENO

	X	Y
0. Coordenadas base trasdós (m) :	0.000	0.000
1. Coordenadas coronación trasdós (m) :	-1.125	11.250
2. Coordenadas fin tramo 1 terreno (m) :	5.625	11.250
3. Coordenadas fin tramo 2 terreno (m) :	11.250	11.250
4. Coordenadas fin tramo 3 terreno (m) :	16.875	11.250

COEFICIENTES DE SEGURIDAD

Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
ψ _o (coeficiente combinación variables) :	1.00

	Estado Limite Ultimo	
	Favorable	Desfavorable

Acciones permanentes (G)		
Peso propio, cargas muertas :	0.90	1.50
Acciones permanentes de valor no constante (G*)		
Terreno (peso propio y empujes) :	0.00	1.50
Acciones variables (Q)		
Sobrecargas :	0.00	1.50

CARACTERISTICAS DEL TERRENO

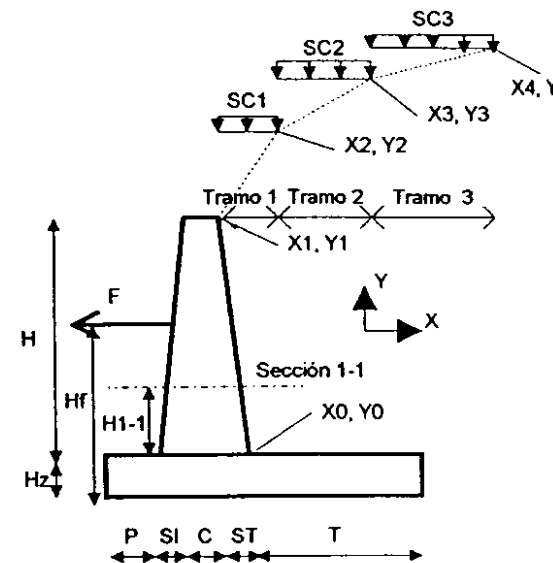
γ. Peso específico (T/m³) :	2.00
φ. Angulo rozamiento interno (°) :	30.000
δmL. Angulo rozamiento muro-tierras (°) :	0.000
δtL. Angulo rozamiento tierras-tierras (°) :	0.000
μ. Coeficiente rozamiento zapata-tierras :	0.580
Tensión admisible cimentación (T/m²) :	20.000

ARMADO

H1-1. Dist. sección 1 a sup. zapata (m) :	3.500
Recubrimiento alzado (m) :	0.050
Recubrimiento cimentación (m) :	0.050

Cuantías mínimas

Vertical muros (1/3 mín. cara)(o/o) :	0.900
Horizontal muros (1/3 mín. cara)(o/o) :	1.600
Cortante o montaje alzado (cm³/m³) :	4.500
Transversal zapata (sup+inf)(o/o) :	1.447
Longitudinal zapata (sup+inf)(o/o) :	1.447
Cortante zapata (cm³/m³) :	0.000
Perimetral zapata (en canto)(cm³/m) :	10.853

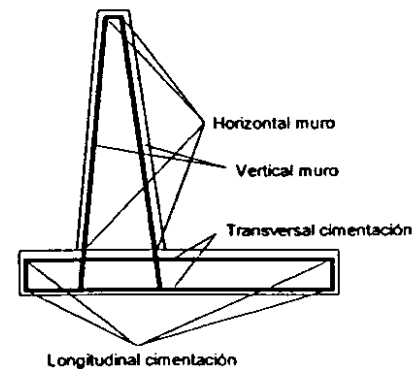


CARGAS (sin mayorar)

Acciones permanentes (G)	
Peso propio barrera coronación (T/m) :	0.750
Acciones permanentes de valor no constante (G*)	
Fg. Carga horizontal sobre muro (T/m) :	1.134
Hf. Posición Fg a inferior zapata (m) :	10.831
Acciones variables (Q)	
SC1. Sobrecarga en tramo 1 (T/m) :	3.000
SC2. Sobrecarga en tramo 2 (T/m) :	3.000
SC3. Sobrecarga en tramo 3 (T/m) :	3.000
Fq. Carga horizontal sobre muro (T/m) :	1.312
Hf. Posición Fq a inferior zapata (m) :	11.454

CARACTERISTICAS MATERIALES

Peso específico hormigón (T/m³) :	2.500
Hormigón alzado (T/m³) :	H - 250
Hormigón cimentación (T/m³) :	H - 250
Acero (T/m) :	AEH - 500



RESUMEN ACCIONES SOBRE EL MURO

		F. vertical (T/m)	X (m)	F. Horizontal (T/m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 (ΣP _i , i=1..3)	16.008	4.165	—	—
	Sobre sección base muro (ΣP _i , i=1..3)	27.820	4.277	—	—
	Total peso propio (ΣP _i , i=1..6)	68.133	4.927	—	—
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E11)	2.232	4.667	22.320	7.583
	Sobre sección base muro (E11)	4.703	4.900	47.033	5.250
	Total tierras (E21 + ΣT _i)	135.844	7.723	54.171	4.250
	Verticales sobre talón (ΣT _i)	123.188	8.013	—	—
	Verticales sobre talón (cortante) (ΣT _i)	90.563	8.738	—	—
Fuerza Fg	Sobre sección 1	—	—	1.134	10.831
	Sobre sección base muro	—	—	1.134	10.831
	Total Fg	—	—	1.134	10.831
Acciones variables (Q)					
Sobrecargas sobre terreno	Sección 1 (E1sc)	0.864	4.538	8.640	8.875
	Base muro (E1sc)	1.254	4.713	12.542	7.125
	Inf. cimentación (E2sc + ΣS)	19.800	7.450	12.746	6.375
	Verticales sobre talón (ΣS _i , i=1..3)	16.425	8.013	—	—
	Verticales sobre talón (cortante) (ΣS _i)	12.075	8.738	—	—
Fuerza Fq	Sobre sección 1	—	—	1.312	11.454
	Sobre sección base muro	—	—	1.312	11.454
	Total Fq	—	—	1.312	11.454

COMPROBACIONES**SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)**

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	39.517	---
Acciones permanentes de valor no constante (G*)		
Tierras	78.789	54.171
Fuerza Fg	---	1.134
Acciones variables (Q)		
Sobrecargas sobre terreno	11.484	12.746
Fuerza Fq	---	1.312
TOTAL	129.790	69.363
Csd=	1.871	Vale

SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	335.667	---
Acciones permanentes de valor no constante (G*)		
Tierras	1049.055	230.227
Fuerza Fg	---	12.278
Acciones variables (Q)		
Sobrecargas sobre terreno	---	---
Fuerza Fq	---	15.029
TOTAL	1384.722	257.534
Csv=	5.377	Vale

TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	68.133	30.547
Acciones permanentes de valor no constante (G*)		
Tierras	135.844	-88.668
Fuerza Fg	0.000	12.278
Acciones variables (Q)		
Sobrecargas sobre terreno	0.000	0.000
Fuerza Fq	0.000	0.000
TOTAL	203.977	-45.843
D (m) =	10.75	
σ puntera (T / m²) =	16.59	
σ talón (T / m²) =	21.35	
σ med (T / m²) =	18.97	
σ cob (T / m²) =	19.80	
Vale		

ARMADO**Secciones**

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	1.53	1.00	1.53
	1-1	1.00	1.18	1.00	1.18
PUNTERA	2-2 f	1.00	1.50	1.00	1.50
	2-2 c	1.00	1.50	1.00	1.50
TALON	3-3 f	1.00	1.50	1.00	1.50
	3-3 c	1.00	1.50	1.00	1.50

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	33.974	408.627	93.031
	0-0 (-)	25.038	5.897	0.000
	1-1 (+)	19.051	160.453	50.109
	1-1 (-)	14.407	2.486	0.000
PUNTERA	2-2 f (+)	0.000	206.972	---
	2-2 f (-)	0.000	26.946	---
	2-2 c (+)	---	---	60.197
	2-2 c (-)	---	---	7.938
TALON	3-3 f (+)	-1.513	15.778	---
	3-3 f (-)	-55.400	-205.333	---
	3-3 c (+)	---	---	4.280
	3-3 c (-)	---	---	-51.252

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm2/m	Minima cm2/m	Control cálculo	Adoptada cm2/m
ALZADO	Vert. trasdós	0-0 (+)	63.950	9.150	Vale	63.950
		0-0 (-)	0.000	4.575	Vale	
		1-1 (+)	31.722	7.050	Vale	
		1-1 (-)	0.000	3.525	Vale	
	Vert. intradós	0-0 (+)	0.000	4.575	Vale	4.575
		0-0 (-)	0.000	4.575	Vale	
		1-1 (+)	0.000	3.525	Vale	
		1-1 (-)	0.000	3.525	Vale	
	Hor. trasdós (*)	---	12.790	16.267	Vale	16.267
	Hor. intradós (*)	---	0.000	8.133	Vale	8.133
	Cortante	0-0 (+)	0.000	4.500	Vale	4.500 (cm²/m²)
		0-0 (-)	0.000	4.500	Vale	
		1-1 (+)	0.000	4.500	Vale	
PUNTERA	Trans. inferior	2-2 f (+)	33.390	10.853	Vale	33.390
		2-2 f (-)	4.210	10.853	Vale	
	Long. inf. (*)	---	6.678	10.853	Vale	10.853
		---	---	---	---	
	Trans. superior	2-2 f (+)	0.000	10.853	Vale	45.607
		2-2 f (-)	0.000	10.853	Vale	
	Long. sup. (*)	---	0.000	10.853	Vale	10.853
		---	---	---	---	
TALON	Trans. inferior	3-3 f (+)	2.460	10.853	Vale	33.390
		3-3 f (-)	0.000	10.853	Vale	
	Long. inf. (*)	---	0.492	10.853	Vale	10.853
		---	---	---	---	
	Trans. superior	3-3 f (+)	0.341	10.853	Vale	45.607
		3-3 f (-)	45.607	10.853	Vale	
	Long. sup. (*)	---	9.121	10.853	Vale	10.853
		---	---	---	---	
ZAPATA	Perimetral	3-3 c (+)	0.000	0.000	Vale	0.000 (cm²/m²)
		3-3 c (-)	0.000	0.000	Vale	

(*) Calculada como el 20% de la armadura perpendicular a ella

CALCULO DE SECUENCIA DE MUROS . Resultados.

PROYECTO :	L.A.V. MADRID - ZARAGOZA. Subtramo XV
OBRA :	EVN3-2.7. Aletas 2 y 3.

	Sección 1	Sección 2	Sección 3	Sección 4	Sección 5	Sección 6	Sección 7	Sección 8	Sección 9	Sección 10
GEOMETRIA SECCION										
C. Canto del muro en coronación (m) :	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400
ST. Sobreespesor muro en trasdós (m) :	1.059	1.014	0.968	0.922	0.876	0.831	0.785	0.739	0.693	0.671
Sl. Sobreespesor muro en intradós (m) :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
P. Puntera zapata (m) :	3.750	3.750	3.750	3.750	3.750	3.750	3.750	3.750	3.750	3.750
T. Talón zapata (m) :	5.541	5.322	5.103	4.884	4.665	4.446	4.227	4.008	3.789	3.679
H. Altura muro (m) :	10.594	10.137	9.679	9.222	8.764	8.307	7.850	7.392	6.935	6.706
Hz. Canto zapata (m) :	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500
H1-1. Dist. sección 1 a sup. zapata (m) :	3.500	3.500	3.500	3.500	3.500	3.500	3.500	3.500	3.500	3.500
Cota cimentación :	-1.500	-1.500	-1.500	-1.500	-1.500	-1.500	-1.500	-1.500	-1.500	-1.500
TERRENO										
X0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X1										
X2	0.312	1.458	2.604	3.750	4.896	6.043	7.189	8.335	9.481	10.054
X3	1.683	3.929	6.176	8.423	10.669	12.916	15.163	17.409	19.656	20.779
X4	17.482	18.676	19.871	21.065	22.259	23.454	24.648	25.842	27.037	27.634
Y0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Y1										
Y2	10.860	10.615	10.371	10.127	9.883	9.638	9.394	9.150	8.906	8.783
Y3	11.125	11.094	11.063	11.032	11.001	10.970	10.939	10.907	10.876	10.861
Y4	11.125	11.094	11.063	11.032	11.001	10.970	10.939	10.907	10.876	10.861
Vale terreno	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
COMPROBACIONES										
Coeficiente seguridad deslizamiento :	2.226	2.066	1.609	1.663	1.687	1.810	1.841	1.867	1.908	1.907
	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Coeficiente seguridad al vuelco :	6.486	5.856	4.067	4.421	4.632	5.267	5.474	5.680	5.947	6.020
	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Tensión puntera (T/m²) :	11.3	12.4	14.9	14.4	13.5	12.6	11.4	10.4	9.4	9.0
Tensión media (T/m²) :	19.6	18.3	17.1	16.3	15.5	14.7	13.9	13.1	12.3	12.0
Tensión cobaricentrica (T/m²) :	22	20	18	17	16	15	15	14	13	13
		OK	OK	OK	OK	OK	OK	OK	OK	OK
ARMADO										
1. Inferior transversal cimentación (cm²/m) :	18.321	19.607	27.466	23.721	21.052	17.357	15.364	13.549	11.788	11.076
2. Superior transversal cimentación (cm²/m) :	43.117	39.818	42.160	35.085	30.098	23.984	20.591	17.650	14.949	13.879
3. Inferior longitudinal cimentación (cm²/m) :	10.853	10.853	10.853	10.853	10.853	10.853	10.853	10.853	10.853	10.853
4. Superior longitudinal cimentación (cm²/m) :	10.853	10.853	10.853	10.853	10.853	10.853	10.853	10.853	10.853	10.853
5. Perimetral cimentación (cm²/m) :	10.853	10.853	10.853	10.853	10.853	10.853	10.853	10.853	10.853	10.853
6a. Espera 6b (cm²/m) :	19.865	15.951	10.609	8.748	7.072	5.585	5.010	4.735	4.461	4.324
6b. Vertical trasdós con solape (cm²/m) :	19.865	15.951	10.609	8.748	7.072	5.585	5.010	4.735	4.461	4.324
7. Vertical trasdós sin solape (cm²/m) :	27.673	25.156	21.269	19.667	18.068	16.486	14.212	11.702	9.681	8.726
8a. Espera 8b (cm²/m) :	4.378	4.241	4.104	3.967	3.829	3.692	3.555	3.418	3.280	3.212
8b. Vertical intradós (cm²/m) :	4.378	4.241	4.104	3.967	3.829	3.692	3.555	3.418	3.280	3.212
9. Horquilla coronación (cm²/m) :	5.650	5.650	5.650	5.650	5.650	5.650	5.650	5.650	5.650	5.650
10. Horizontal trasdós (cm²/m) :	15.567	15.079	14.591	14.103	13.615	13.127	12.640	12.152	11.664	11.420
11. Horizontal intradós (cm²/m) :	7.783	7.540	7.296	7.052	6.808	6.564	6.320	6.076	5.832	5.710
12. Montaje muro y cortante (cm²/m²) :	4.500	4.500	4.500	4.500	4.500	4.500	4.500	4.500	4.500	4.500
13. Horquillas horizontales bordes (cm²/m) :	15.567	15.079	14.591	14.103	13.615	13.127	12.640	12.152	11.664	11.420

NOMBRE PROYECTO : L.A.V. MADRID - ZARAGOZA. Subtramo XV.NOMBRE PROYECTO : L.A.V. MADRID - ZARAGOZA. Subtramo XV.DESIGNACION ALETA: Aleta para marcos sin cobertura de 5 m.DESIGNACION ALETA: Aleta para marcos sin cobertura de 5 m.

HOJA DE CALCULO DE ALETAS

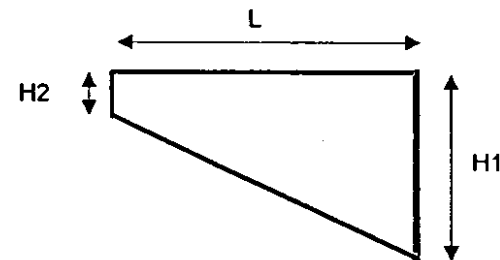
HOJA DE CALCULO DE ALETAS

DATOS REQUERIDOS:

DIMENSIONES(en metros)

H1= 3.83
H2= 0.5
L= 5

Espesor= 0.35
Recubrim.= 0.05



CARACTERISTICAS DE TERRENO

Peso tierras(T/m3) $\gamma = 2$
Angulo rozamiento interno (°) $\phi = 30$
Ang. rozamiento tierras muro (°) $\delta = 0$

COEFICIENTES DE SEGURIDAD

Mayoracion de cargas $\gamma_f = 1.5$
Minoracion acero $g_s = 1.15$
Minoracion hormigon $g_c = 1.5$

CARACTERISTICAS DE LOS MATERIALES

Peso especifico hgon(T/m3) $\gamma_h = 2.5$
Resistencia acero (T/m2) $F_{yk} = 51000$
Resistencia hormigon (T/m2) $F_{ck} = 2500$

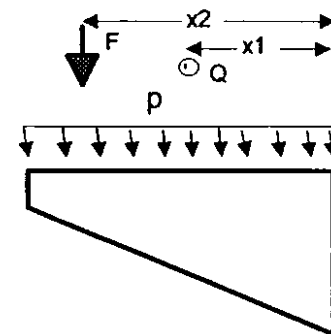
CARGAS (valores sin mayorar)

Cargas verticales

Sobrecarga vertical (t/m) $p = 0.75$
Carga vertical (t.) $F = 0.00$
Situacion x2 (m) $x_2 = 0$

Cargas horizontales

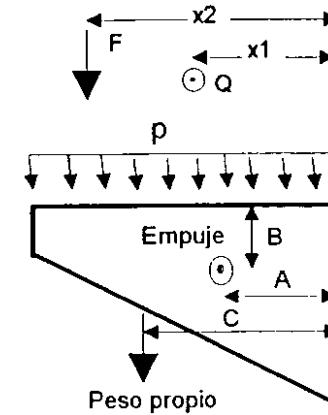
Carga horizontal (t.) $Q = 0$
Posicion x1 (m) $x_1 = 0$
Sobrecarga sobre terreno (ton/m2)

 $q = 3$ 

CUANTIAS MINIMAS

LONGITUDINAL SUPERIOR 0.400 o/oo
LONGITUDINAL INFERIOR 0.400 o/oo
CORTANTE 2.778 CM2/M
HORIZONTAL MUROS ALETA 0.900 o/oo
VERTICAL MUROS ALETA 1.600 o/oo
CORTANTE MUROS 0.000 CM2/M

CARGAS DE PESO PROPIO Y EMPUJES DE TIERRAS SOBRE ESTRIBO(ton/m. sin mayorar)



COEFICIENTES EMPUJE ACTIVO ALETA

Coef. empuje activo $\lambda_h = 0.333$
Coef. empuje activo $\lambda_v = 0.000$

PESO PROPIO

	Peso	Dist.emp.	Dist. vert.
Peso aux. 1	2.188	2.500	0.250
Peso aux. 2	7.284	1.667	1.610
Peso propio	9.472	1.859	1.296

EMPUJE DE TIERRAS

HORIZONTAL

	Empuje.	Dist.emp.	Dist. vert.
Auxiliar	0.139	3.750	-
Auxiliar	1.064	2.500	-
Auxiliar	8.149	1.250	-
Auxiliar	1.250	3.333	-
Auxiliar	9.575	1.667	-
Empuje hor.	20.177	1.660	1.585

VERTICAL

	Empuje.	Dist.emp.
Empuje aux.1	0.000	3.750
Empuje aux.2	0.000	2.500
Empuje aux.3	0.000	1.250
Empuje aux.4	0.000	3.333
Empuje aux.5	0.000	1.667
Empuje vert.	0.000	0.000

NOMBRE PROYECTO : L.A.V. MADRID - ZARAGOZA. Subtramo XV.DESIGNACION ALETA: Aleta para marcos sin cobertura de 5 m.**HOJA DE CALCULO DE ALETAS****CALCULOS****ESFUERZOS DE DISEÑO**

(Para cargas verticales, momentos positivos implica tracciones en cara superior)

Acciones	Verticales	Horizontales
M peso propio	17.609	0.000
M empuje hor.	0.000	33.492
M empuje vert.	0.000	0.000
M sobrec.vert.	9.375	0.000
M carga vert.	0.000	0.000
M carga hor.	0.000	0.000
Md (mt)	40.477	50.238
V peso propio	9.472	0.000
V empuje hor.	0.000	20.177
V empuje vert.	0.000	0.000
V sobrec.vert.	3.750	0.000
V carga vert.	0.000	0.000
V carga hor.	0.000	0.000
Vd (mt)	19.833	30.266

NOMBRE PROYECTO : L.A.V. MADRID - ZARAGOZA. Subtramo XV.DESIGNACION ALETA: Aleta para marcos sin cobertura de 5 m.**HOJA DE CALCULO DE ALETAS****CALCULO DE SECCIONES**

Fcd	1666.67	
0,85*Fcd	1416.67	
Fcv	64.55	
Es	21000000	
Fyd	44347.83	
FYAD	42000.00	
Acciones	Verticales	Horizontales
Md(m.t)	40.477	50.238
Md max/Md med	1.000	1.545
Md a usar calculo	40.477	77.604
Canto seccion	3.830	0.350
Canto util	3.780	0.300
ancho seccion	0.350	3.830
Ancho calculo	0.350	3.787
Def acero	0.010	0.010
Tension acero	44348	44348
X	0.022	0.053
As (cm.2)	2.422	63.968
Prof. fibra neutra	0.268	0.069
Def. hormigon	0.001	0.003
Comentarios	VALE	VALE
Vd	19.833	30.266
Vd compuesto		36.185
Vu1		568.003
Vsu		0.000
Vcu		73.329
Vu2		73.329
Comentarios		
As (cm.2)		0.000

ARMADO

	Calculo	Minima	total
Long. superior	2.422	5.362	5.362
Long inferior	0.000	5.362	5.362
Cortante	0.000	13.889	13.889
Horizontal trasdos	63.968	8.043	63.968
Vertical trasdos	0.000	14.000	14.000
Horizontal intrados	0.000	4.022	4.022
Vertical intrados	0.000	14.000	14.000
Cortante transversal		NO	

TOTAL ENVOLVENTE ARMADURA

Long. superior	5.362 cm²
Long inferior	5.362 cm²
Horizontal trasdos	16.702 cm²/m
Horizontal intrados	1.050 cm²/m
Estribos	8.378 cm²/m

4.4.10 Pasos inferiores ED 2-3.0

PASO INFERIOR ED2-0.3

INDICE

1º DEFINICION GEOMETRICA

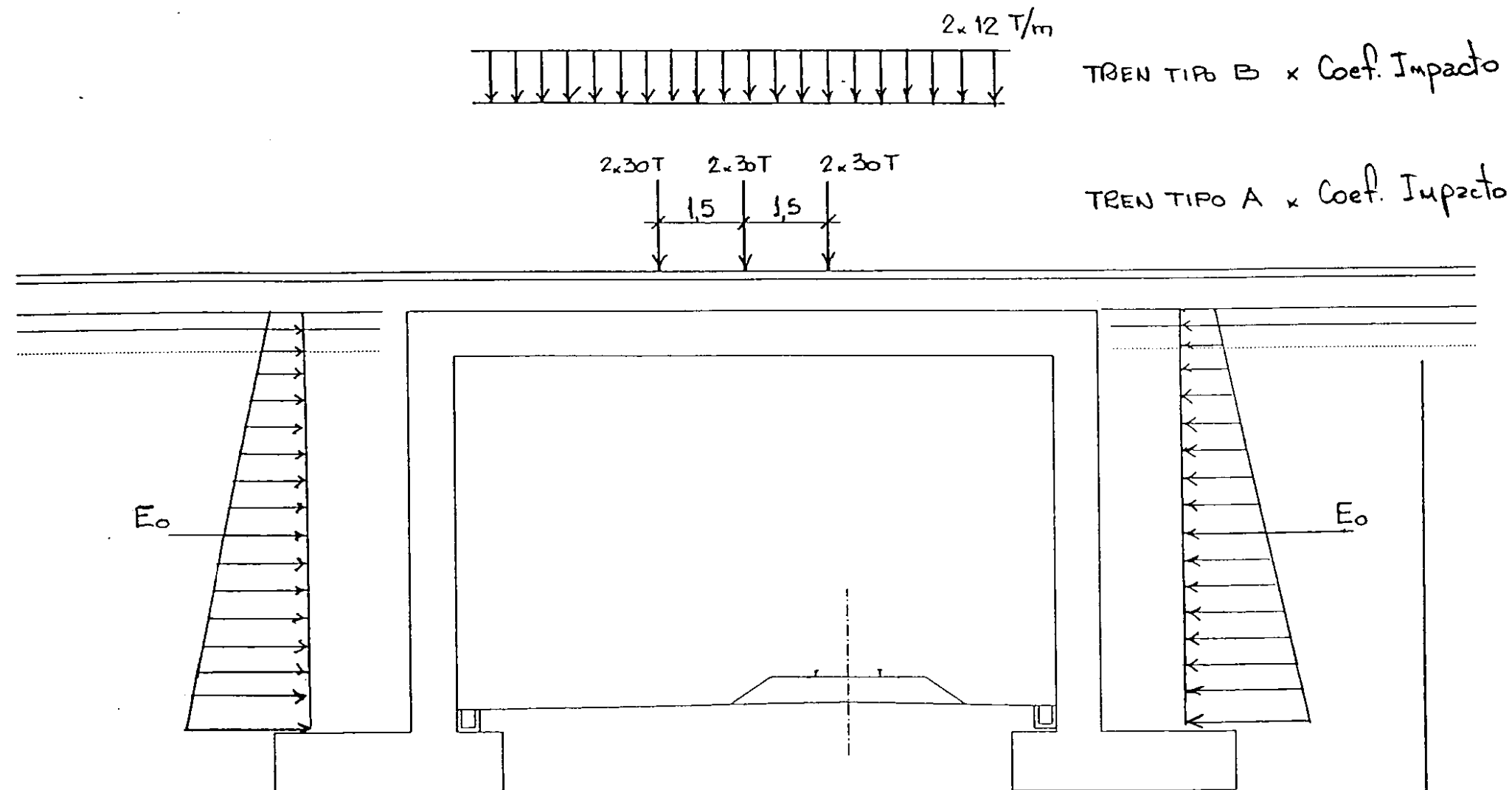
2º CALCULOS

PASO INFERIOR ED2-0.3

1º DEFINICION GEOMETRICA

PASO INFERIOR ED2-0.3

2º CALCULOS



CARGAS PERMANENTES (g)

$$g: \text{Riel + Traviessas: } \frac{0,12 \text{ T/m} + 0,52 \text{ T/m}}{2,4 \text{ m}} = 0,27 \text{ T/m}^2$$

$$\text{Balasto: } 0,60 \text{ m} \times 1,6 \text{ T/m}^3 = 0,96 \text{ T/m}^2$$

$$1,23 \text{ T/m}^2 + \text{Peso Propio Pórtico}$$

SOBRECARGAS (CARGAS VARIABLES)

- Tren: TREN TIPO A (QA)
- TREN TIPO B (QB)
- Empuje Terreno: (Eo)

ESTADO LIMITE ULTIMO

$$S_d = 1,5 [g] + 1,5 \text{ ó } 0,0 [Q_A \text{ ó } Q_B] + 1,5 \text{ ó } 0,0 [E_o]$$

ESTADOS LIMITES DE SERVICIO

$$S_k = 1,0 [g] + 1,0 \text{ ó } 0,0 [Q_A \text{ ó } Q_B] + 1,0 \text{ ó } 0,0 [E_o]$$

Coef. Impacto

$$V = 200 \text{ km/h}$$

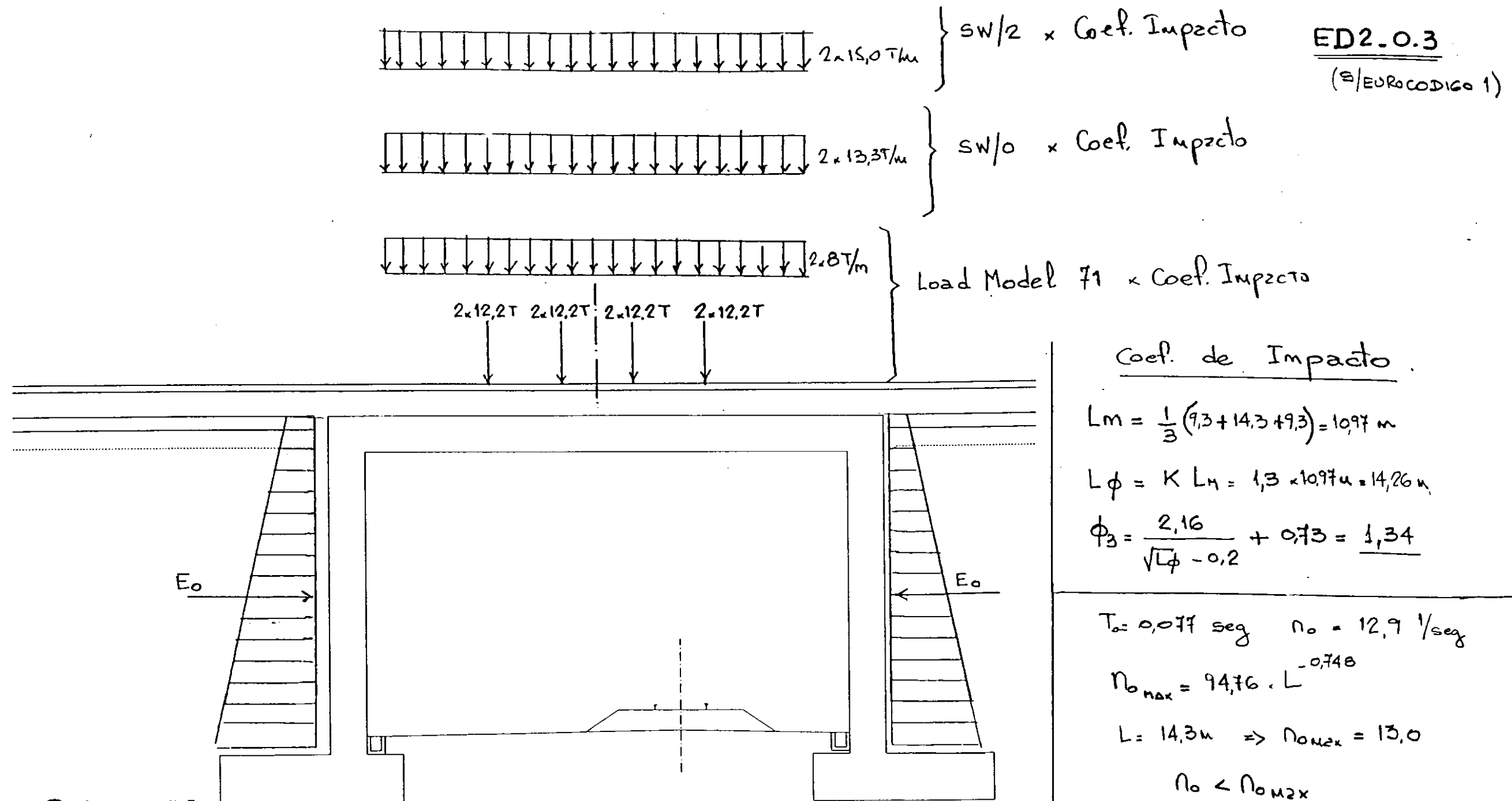
$$T = 0,077 \text{ seg.}$$

$$L = 14,30 \text{ m}$$

$$\mu = \frac{VT}{2L} = \frac{200 \times 0,077}{2 \times 14,3} = 0,54$$

$$I = 65 \frac{\mu}{1 - \mu + \mu^2} = 47$$

$$\phi_o = 1,47$$



CARGAS PERMANENTE (g)

- Peso propio y elementos no estructurales

RIEL Y TRAVIESAS $\frac{0,12 \text{ T/m} + 0,52 \text{ T/m}}{2,4 \text{ m}} = 0,27 \text{ T/m}^2$

BALASTA $0,60 \text{ m} \times 1,6 \text{ T/m}^3 = 0,96 \text{ T/m}^2$

$1,23 \text{ T/m}^2 + \text{Peso propio Pórtico}$

- Empuje del Terreno : (E_o)

SOBRECARGAS (Q)

LOAD Model 71 [Q_{LM71}]

SW/0 [$Q_{SW/0}$]

SW/2 [$Q_{SW/2}$]

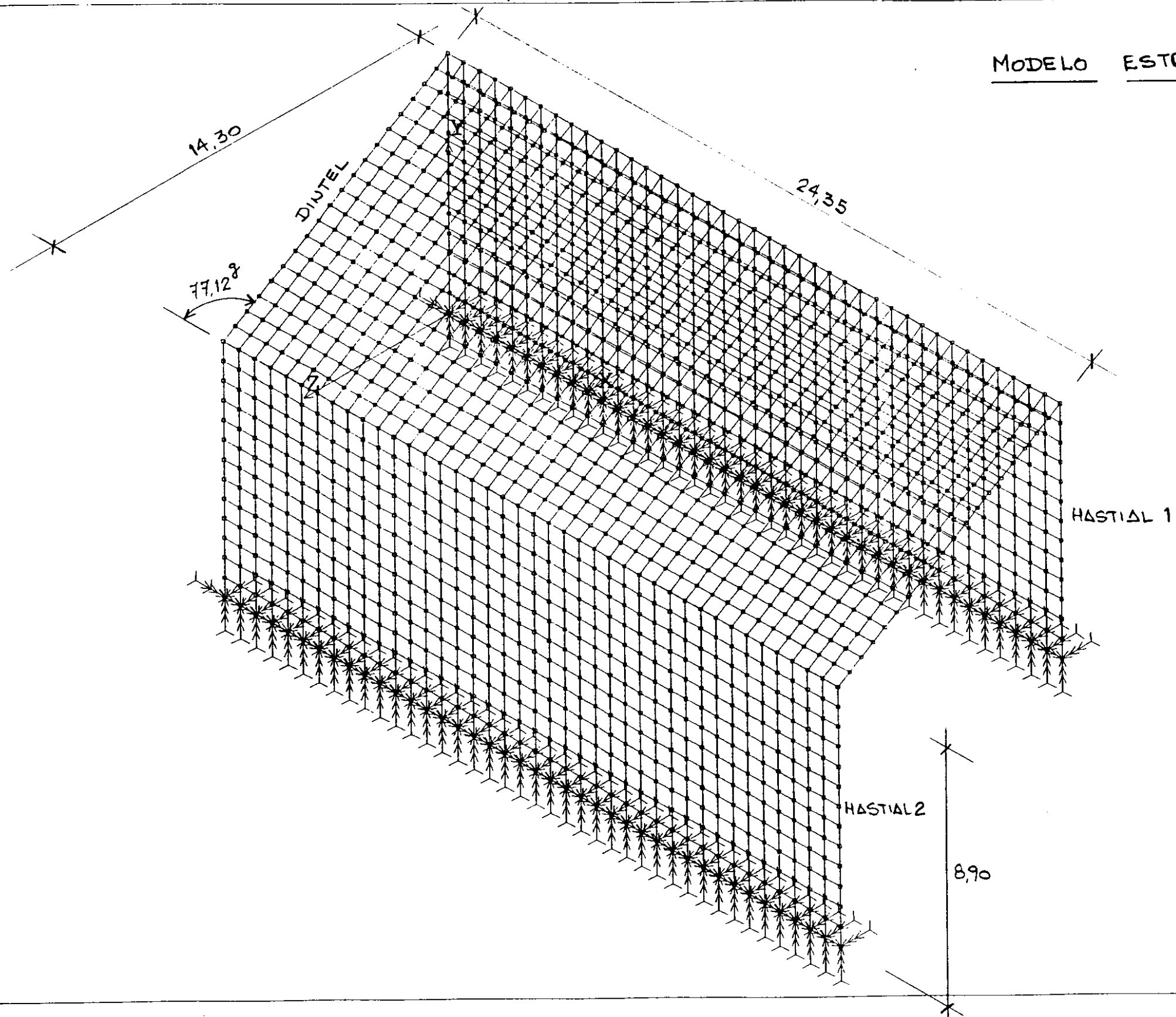
ESTADO LIMITE ÚLTIMO

$$S_d = 1,35 [g] + \frac{1,00 [E_o]}{1,35} + \begin{cases} 1,45 [Q_{LM71}] \\ 1,45 [Q_{SW/0}] \\ 1,20 [Q_{SW/2}] \end{cases}$$

ESTADOS LIMITES DE SERVICIO

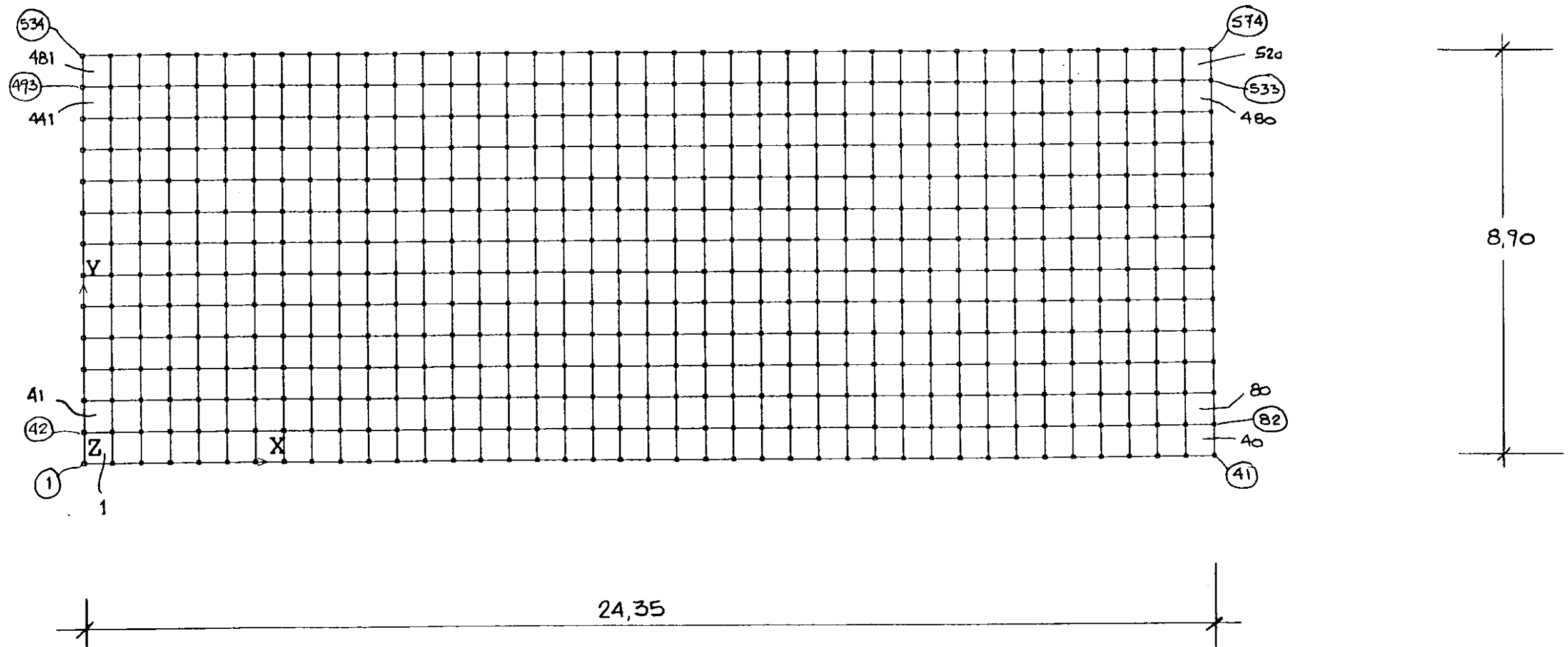
$$S_k = 1,00 [g] + 1,00 [E_o] + 1,00 [Q_{LM71}]$$

MODELO ESTRUCTURAL



HASTIAL 1

NUMERACION DE NODOS
Y ELEMENTOS



CALCULO DE MUROS.

NOMBRE PROYECTO :	L.A.V. MADRID - BARCELONA - FRONTERA FRANCESA.
NOMBRE OBRA :	ED2-3.0 - ALETA 1 -

DATOS

GEOMETRIA DE CALCULO DEL MURO

C. Canto del muro en coronación (m) :	0.500
ST. Sobreespesor muro en trasdós (m) :	0.783
Sl. Sobreespesor muro en intradós (m) :	0.000
P. Puntera zapata (m) :	1.000
T. Talón zapata (m) :	4.217
H. Altura muro (m) :	9.400
H _z Canto zapata (m) :	1.200
Anchura total cimentación (m) :	6.500
Angulo trasdós muro (°) :	85.236

DEFINICION TERRENO

	X	Y
0. Coordenadas base trasdos (m) :	0.000	0.000
1. Coordenadas coronación trasdos (m) :	-0.783	9.400
2. Coordenadas fin tramo 1 terreno (m) :	0.417	10.000
3. Coordenadas fin tramo 2 terreno (m) :	10.000	10.000
4. Coordenadas fin tramo 3 terreno (m) :	20.000	10.000

COEFICIENTES DE SEGURIDAD

Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
γ _o (coeficiente combinación variables) :	1.00

Estado Límite Ultimo	
Favorable	Desfavorable

Acciones permanentes (G)	
Peso propio, cargas muertas :	0.90
Acciones permanentes de valor no constante (G*)	
Terreno (peso propio y empujes) :	0.00
Acciones variables (Q)	
Sobrecargas :	0.00
	1.500

CARACTERISTICAS DEL TERRENO

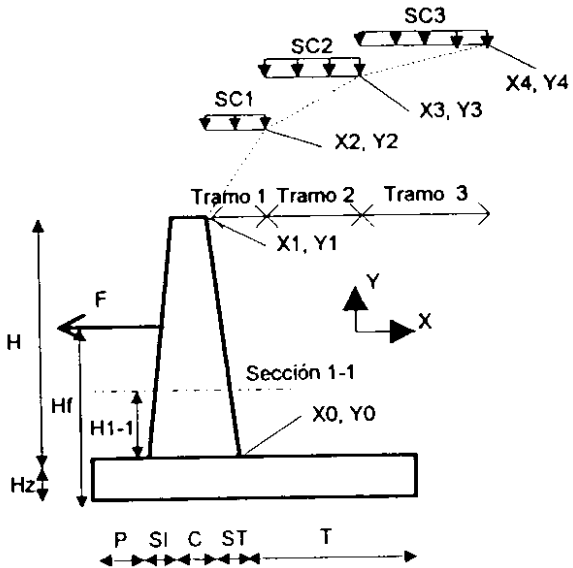
γ. Peso específico (T/m³) :	2.00
φ. Angulo rozamiento interno (°) :	30.000
δ _{mt} . Angulo rozamiento muro-tierras (°) :	0.000
δ _{tt} . Angulo rozamiento tierras-tierras (°) :	0.000
μ. Coeficiente rozamiento zapata-tierras :	0.580
Tensión admisible cimentación (T/m²) :	40.000

ARMADO

H1-1. Dist. sección 1 a sup. zapata (m) :	2.700
Recubrimiento alzado (m) :	0.050
Recubrimiento cimentación (m) :	0.050

Cuantías mínimas

Vertical muros (1/3 min. cara)(o/oo) :	0.900
Horizontal muros (1/3 min. cara)(o/oo) :	1.600
Cortante o montaje alzado (cm²/m²) :	4.500
Transversal zapata (sup+inf)(o/oo) :	1.447
Longitudinal zapata (sup+inf)(o/oo) :	1.447
Cortante zapata (cm²/m²) :	0.000
Perimetral zapata (en canto)(cm²/m) :	8.682

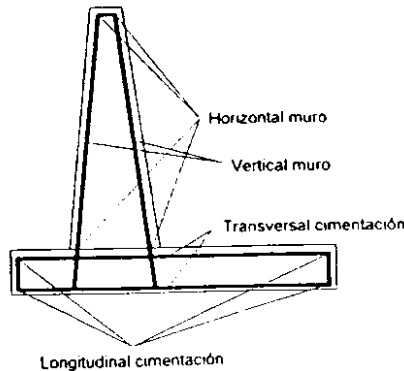


CARGAS (sin mayorar)

Acciones permanentes (G)	
Peso propio barrera coronación (T/m) :	0.000
Acciones permanentes de valor no constante (G*)	
F _g . Carga horizontal sobre muro (T/m) :	0.000
H _{fg} . Posición F _g a inferior zapata (m) :	0.000
Acciones variables (Q)	
SC1. Sobrecarga en tramo 1 (T/m) :	0.000
SC2. Sobrecarga en tramo 2 (T/m) :	3.000
SC3. Sobrecarga en tramo 3 (T/m) :	3.000
F _q . Carga horizontal sobre muro (T/m) :	0.000
H _{fq} . Posición F _q a inferior zapata (m) :	0.000

CARACTERISTICAS MATERIALES

Peso específico hormigón (T/m³) :	2.500
Hormigón alzado (T/m²) :	H - 250
Hormigón cimentación (T/m²) :	H - 250
Acero (T/P) :	AEH - 500



RESUMEN ACCIONES SOBRE EL MURO

		F.vertical (T / m)	X (m)	F. Horizontal (T / m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 (ΣP _i , i=1..3)	13.051	1.406	---	---
	Sobre sección base muro (ΣP _i , i=1..3)	20.954	1.475	---	---
	Total peso propio (ΣP _i , i=1..6)	40.454	2.330	---	---
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E1't)	1.527	1.872	18.330	6.133
	Sobre sección base muro (E1t)	3.007	2.022	36.080	4.333
	Total tierras (E2t + ΣT)	91.916	4.196	40.366	3.733
	Verticales sobre talón (ΣT' ij)	84.246	4.394	---	---
	Verticales sobre talón (cortante) (ΣT'' ij)	61.333	4.967	---	---
Fuerza F _g	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total F _g	---	---	0.000	0.000
Acciones variables (Q)					
Sobrecargas sobre terreno	Sección 1 (E1'sc)	0.516	1.779	6.195	7.250
	Base muro (E1sc)	0.724	1.892	8.692	5.900
	Inf. cimentación (E2sc + ΣS)	28.749	4.600	7.038	5.600
	Verticales sobre talón (ΣS' i, i=1..3)	28.749	4.600	---	---
	Verticales sobre talón (cortante) (ΣS'' i)	9.200	4.967	---	---
Fuerza F _q	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total F _q	---	---	0.000	0.000

COMPROBACIONES

SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	23.463	---
Acciones permanentes de valor no constante (G*)		
Tierras	53.312	40.366
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	---	---
Fuerza Fq	---	0.000
TOTAL	76.775	40.366
Csd=	1.902	Vale

SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	94.272	---
Acciones permanentes de valor no constante (G*)		
Tierras	385.664	150.699
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	---	---
Fuerza Fq	---	0.000
TOTAL	479.936	150.699
Csv=	3.185	Vale

TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	40.454	37.204
Acciones permanentes de valor no constante (G*)		
Tierras	91.916	63.764
Fuerza Fg	0.000	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	28.749	0.596
Fuerza Fq	0.000	0.000
TOTAL	161.120	101.564
D (m) =	6.50	
σ talón (T / m²) =	10.36	
σ puntera (T / m²) =	39.21	
σ med (T / m²) =	24.79	
σ cob (T / m²) =	30.75	
Vale		

ARMADO

Secciones

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	1.28	1.00	1.28
	1-1	1.00	1.06	1.00	1.06
PUNTERA	2-2 f	1.00	1.20	1.00	1.20
	2-2 c	1.00	1.20	1.00	0.69
TALON	3-3 f	1.00	1.20	1.00	1.20
	3-3 c	1.00	1.20	1.00	1.20

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	24.455	232.016	67.157
	0-0 (-)	18.859	3.152	0.000
	1-1 (+)	14.812	93.000	36.787
	1-1 (-)	11.746	1.444	0.000
PUNTERA	2-2 f (+)	0.000	36.739	---
	2-2 f (-)	0.000	5.030	---
	2-2 c (+)	---	---	22.483
	2-2 c (-)	---	---	3.122
TALON	3-3 f (+)	0.000	4.806	---
	3-3 f (-)	-39.668	-198.667	---
	3-3 c (+)	---	---	8.332
	3-3 c (-)	---	---	-47.758

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm2/m	Minima cm2/m	Control cálculo	Adoptada cm2/m
ALZADO	Vert. trasdós	0-0 (+)	42.473	7.700	Vale	42.473
		0-0 (-)	0.000	3.850	Vale	
		1-1 (+)	19.882	6.350	Vale	19.882
		1-1 (-)	0.000	3.175	Vale	
	Vert. intrados	0-0 (+)	0.000	3.850	Vale	3.850
		0-0 (-)	0.000	3.850	Vale	
		1-1 (+)	0.000	3.175	Vale	
		1-1 (-)	0.000	3.175	Vale	
	Hor. trasdós (*)	---	8.495	13.689	Vale	13.689
	Hor. intrados (*)	---	0.000	6.844	Vale	6.844
	Cortante	0-0 (+)	0.000	4.500	Vale	4.600 (cm²/m²)
		0-0 (-)	0.000	4.500	Vale	
PUNTERA	Trans. inferior	2-2 f (+)	7.276	8.682	Vale	8.682
		2-2 f (-)	0.988	8.682	Vale	
	Long. inf. (*)	---	1.455	8.682	Vale	8.682
	Trans. superior	2-2 f (+)	0.000	8.682	Vale	50.218
		2-2 f (-)	0.000	8.682	Vale	
	Long. sup. (*)	---	0.000	8.682	Vale	10.044
	Cortante	2-2 c (+)	0.000	0.000	Vale	0.000 (cm²/m²)
		2-2 c (-)	0.000	0.000	Vale	
TALON	Trans. inferior	3-3 f (+)	0.943	8.682	Vale	8.682
		3-3 f (-)	0.000	8.682	Vale	
	Long. inf. (*)	---	0.189	8.682	Vale	8.682
	Trans. superior	3-3 f (+)	0.000	8.682	Vale	50.218
		3-3 f (-)	50.218	8.682	Vale	
	Long. sup. (*)	---	10.044	8.682	Vale	10.044
	Cortante	3-3 c (+)	0.000	0.000	Vale	0.000 (cm²/m²)
		3-3 c (-)	0.000	0.000	Vale	
ZAPATA	Perimetral	---	0.000	8.682	Vale	8.682

(*) Calculada como el 20% de la armadura perpendicular a ella

CALCULO DE MUROS.

NOMBRE PROYECTO :	L.A.V. MADRID - BARCELONA - FRONTERA FRANCESA.
NOMBRE OBRA :	ED2-3.0 - ALETAS 2 y 3 -

DATOS

GEOMETRIA DE CALCULO DEL MURO	
C. Canto del muro en coronación (m) :	0.500
ST. Sobreespesor muro en trasdós (m) :	0.783
SI. Sobreespesor muro en intradós (m) :	0.000
P. Puntera zapata (m) :	1.000
T. Talón zapata (m) :	4.217
H. Altura muro (m) :	9.400
H _z . Canto zapata (m) :	1.200
Anchura total cimentación (m) :	6.500
Angulo trasdós muro (°) :	85.236

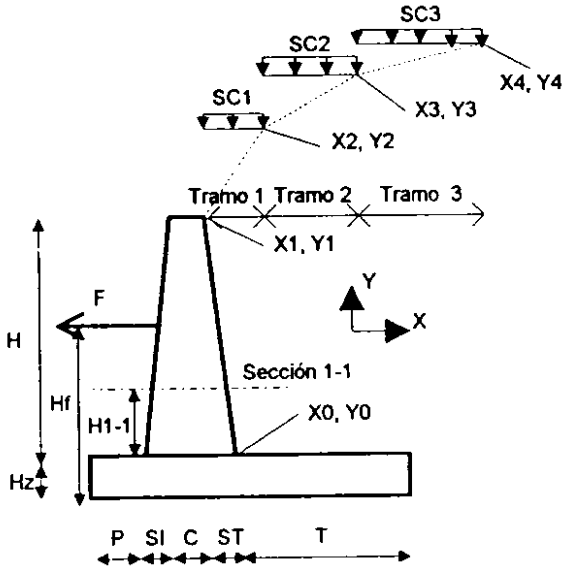
DEFINICION TERRENO		
	X	Y
0. Coordenadas base trasdós (m) :	0.000	0.000
1. Coordenadas coronación trasdós (m) :	-0.783	9.400
2. Coordenadas fin tramo 1 terreno (m) :	0.417	9.400
3. Coordenadas fin tramo 2 terreno (m) :	10.000	9.400
4. Coordenadas fin tramo 3 terreno (m) :	20.000	9.400

COEFICIENTES DE SEGURIDAD	
Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
γ _o (coeficiente combinación variables) :	1.00

Estado Limite Ultimo		
	Favorable	Desfavorable
Acciones permanentes (G)		
Peso propio, cargas muertas :	0.90	1.50
Acciones permanentes de valor no constante (G*)		
Terreno (peso propio y empujes) :	0.00	1.50
Acciones variables (Q)		
Sobrecargas :	0.00	1.500

CARACTERISTICAS DEL TERRENO	
γ. Peso específico (T/m³) :	2.00
φ. Angulo rozamiento interno (°) :	30.000
φ _{mt} . Angulo rozamiento muro-tierras (°) :	0.000
φ _{tt} . Angulo rozamiento tierras-tierras (°) :	0.000
μ. Coeficiente rozamiento zapata-tierras :	0.580
Tensión admisible cimentación (T/m²) :	40.000

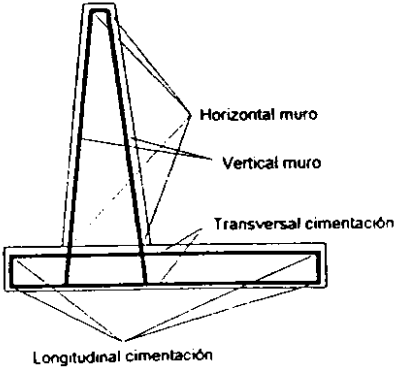
ARMADO	
H1-1. Dist. sección 1 a sup. zapata (m) :	2.700
Recubrimiento alzado (m) :	0.050
Recubrimiento cimentación (m) :	0.050
Cuantías mínimas	
Vertical muros (1/3 min. cara)(o/oo) :	0.900
Horizontal muros (1/3 min. cara)(o/oo) :	1.600
Cortante o montaje alzado (cm²/m²) :	4.500
Transversal zapata (sup+inf)(o/oo) :	1.447
Longitudinal zapata (sup+inf)(o/oo) :	1.447
Cortante zapata (cm²/m²) :	0.000
Perimetral zapata (en canto)(cm²/m) :	8.682



CARGAS (sin mayorar)

Acciones permanentes (G)	
Peso propio barrera coronación (T/m) :	0.000
Acciones permanentes de valor no constante (G*)	
Fg. Carga horizontal sobre muro (T/m) :	0.000
H _g . Posición Fg a inferior zapata (m) :	0.000
Acciones variables (Q)	
SC1. Sobrecarga en tramo 1 (T/m) :	3.000
SC2. Sobrecarga en tramo 2 (T/m) :	3.000
SC3. Sobrecarga en tramo 3 (T/m) :	3.000
Fq. Carga horizontal sobre muro (T/m) :	0.000
H _{fq} . Posición Fq a inferior zapata (m) :	0.000

CARACTERISTICAS MATERIALES	
Peso específico hormigón (T/m³) :	2.500
Hormigón alzado (T/m²) :	H - 250
Hormigón cimentación (T/m²) :	H - 250
Acero (T/m) :	AEH - 500



RESUMEN ACCIONES SOBRE EL MURO

		F. vertical (T / m)	X (m)	F. Horizontal (T / m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 (ΣP _i , i=1..3)	13.051	1.406	---	---
	Sobre sección base muro (ΣP _i , i=1..3)	20.954	1.475	---	---
	Total peso propio (ΣP _i , i=1..6)	40.454	2.330	---	---
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E1't)	1.365	1.872	16.379	6.133
	Sobre sección base muro (E1t)	2.687	2.022	32.240	4.333
	Total tierras (E2t + ΣT)	86.637	4.190	37.395	3.533
	Verticales sobre talón (ΣT ⁺ ij)	79.273	4.392	---	---
	Verticales sobre talón (cortante) (ΣT ⁺ ij)	57.653	4.967	---	---
Fuerza Fg	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fg	---	---	0.000	0.000
Acciones variables (Q)					
Sobrecargas sobre terreno	Sección 1 (E1'sc)	0.611	1.779	7.334	7.250
	Base muro (E1sc)	0.857	1.892	10.289	5.900
	Inf. cimentación (E2sc + ΣS)	32.350	4.322	10.584	5.300
	Verticales sobre talón (ΣS ⁺ i, i=1..3)	30.000	4.512	---	---
	Verticales sobre talón (cortante) (ΣS ⁺ i)	9.200	4.967	---	---
Fuerza Fq	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fq	---	---	0.000	0.000

COMPROBACIONES

SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	23.463	—
Acciones permanentes de valor no constante (G*)		
Tierras	50.249	37.395
Fuerza Fg	—	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	—	—
Fuerza Fq	—	0.000
TOTAL	73.713	37.395
Csd=	1.971	Vale

SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	94.272	—
Acciones permanentes de valor no constante (G*)		
Tierras	363.032	132.129
Fuerza Fg	—	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	—	—
Fuerza Fq	—	0.000
TOTAL	457.304	132.129
Csv=	3.461	Vale

TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	40.454	37.204
Acciones permanentes de valor no constante (G*)		
Tierras	86.637	50.666
Fuerza Fg	0.000	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	32.350	21.417
Fuerza Fq	0.000	0.000
TOTAL	159.441	109.287
D (m) =	6.50	
σ talón (T / m²) =	9.01	
σ puntera (T / m²) =	40.05	
σ med (T / m²) =	24.53	
σ cob (T / m²) =	31.09	
Vale		

ARMADO

Secciones

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	1.28	1.00	1.28
	1-1	1.00	1.06	1.00	1.06
PUNTERA	2-2 f	1.00	1.20	1.00	1.20
	2-2 c	1.00	1.20	1.00	0.69
TALON	3-3 f	1.00	1.20	1.00	1.20
	3-3 c	1.00	1.20	1.00	1.20

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	24.175	225.365	63.794
	0-0 (-)	18.859	3.152	0.000
	1-1 (+)	14.710	92.235	35.569
	1-1 (-)	11.746	1.444	0.000
PUNTERA	2-2 f (+)	0.000	37.490	—
	2-2 f (-)	0.000	5.030	—
	2-2 c (+)	—	—	22.972
	2-2 c (-)	—	—	3.122
TALON	3-3 f (+)	0.000	4.806	—
	3-3 f (-)	-39.266	-194.525	—
	3-3 c (+)	—	—	3.696
	3-3 c (-)	—	—	-41.455

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm2/m	Minima cm2/m	Control cálculo	Adoptada cm2/m
ALZADO	Vert. trasdós	0-0 (+)	41.120	7.700	Vale	41.120
		0-0 (-)	0.000	3.850	Vale	
		1-1 (+)	19.708	6.350	Vale	19.708
		1-1 (-)	0.000	3.175	Vale	
	Vert. intrados	0-0 (+)	0.000	3.850	Vale	3.850
		0-0 (-)	0.000	3.850	Vale	
		1-1 (+)	0.000	3.175	Vale	
		1-1 (-)	0.000	3.175	Vale	
	Hor. trasdós (*)	—	8.224	13.689	Vale	13.689
	Hor. intrados (*)	—	0.000	6.844	Vale	6.844
	Cortante	0-0 (+)	0.000	4.500	Vale	4.500
		0-0 (-)	0.000	4.500	Vale	(cm²/m²)
PUNTERA	Trans. inferior	2-2 f (+)	7.426	8.682	Vale	8.682
		2-2 f (-)	0.988	8.682	Vale	
	Long. inf. (*)	—	1.485	8.682	Vale	8.682
	Trans. superior	2-2 f (+)	0.000	8.682	Vale	49.213
		2-2 f (-)	0.000	8.682	Vale	
	Long. sup. (*)	—	0.000	8.682	Vale	9.843
		2-2 c (+)	0.000	0.000	Vale	0.000
		2-2 c (-)	0.000	0.000	Vale	(cm²/m²)
TALON	Trans. inferior	3-3 f (+)	0.943	8.682	Vale	8.682
		3-3 f (-)	0.000	8.682	Vale	
	Long. inf. (*)	—	0.189	8.682	Vale	8.682
	Trans. superior	3-3 f (+)	0.000	8.682	Vale	49.213
		3-3 f (-)	49.213	8.682	Vale	
	Long. sup. (*)	—	9.843	8.682	Vale	9.843
		3-3 c (+)	0.000	0.000	Vale	0.000
		3-3 c (-)	0.000	0.000	Vale	(cm²/m²)
ZAPATA	Perimetral	—	0.000	8.682	Vale	8.682

(*) Calculada como el 20% de la armadura perpendicular a ella

CALCULO DE MUROS.

NOMBRE PROYECTO :	L.A.V. MADRID - BARCELONA - FRONTERA FRANCESA.
NOMBRE OBRA :	ED2-3.0 - ALETA 4 - MODULO A

DATOS

GEOMETRIA DE CALCULO DEL MURO

C. Canto del muro en coronación (m) :	0.500
ST. Sobreepesor muro en trasdós (m) :	0.797
SI. Sobreepesor muro en intradós (m) :	0.000
P. Puntera zapata (m) :	1.000
T. Talón zapata (m) :	4.203
H. Altura muro (m) :	9.560
Hz. Canto zapata (m) :	1.200
Anchura total cimentación (m) :	6.500
Angulo trasdós muro (°) :	85.236

DEFINICION TERRENO

	X	Y
0. Coordenadas base trasdós (m) :	0.000	0.000
1. Coordenadas coronación trasdós (m) :	-0.797	9.560
2. Coordenadas fin tramo 1 terreno (m) :	0.417	9.560
3. Coordenadas fin tramo 2 terreno (m) :	10.000	9.560
4. Coordenadas fin tramo 3 terreno (m) :	20.000	9.560

COEFICIENTES DE SEGURIDAD

Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
Ψo (coeficiente combinación variables) :	1.00

Estado Límite Ultimo	
Favorable	Desfavorable

Acciones permanentes (G)		
Peso propio, cargas muertas :	0.90	1.50
Acciones permanentes de valor no constante (G*)		
Terreno (peso propio y empujes) :	0.00	1.50
Acciones variables (Q)		
Sobrecargas :	0.00	1.500

CARACTERISTICAS DEL TERRENO

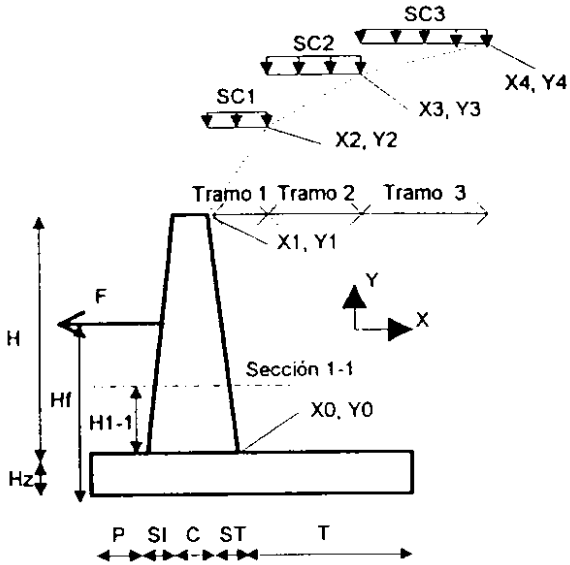
γ. Peso específico (T/m³) :	2.00
φ. Angulo rozamiento interno (°) :	30.000
δm. Angulo rozamiento muro-tierras (°) :	0.000
φt. Angulo rozamiento tierras-tierras (°) :	0.000
μ. Coeficiente rozamiento zapata-tierras :	0.580
Tensión admisible cimentación (T/m²) :	40.000

ARMADO

H1-1. Dist. sección 1 a sup. zapata (m) :	2.700
Recubrimiento alzado (m) :	0.050
Recubrimiento cimentación (m) :	0.050

Cuantías mínimas

Vertical muros (1/3 mín. cara)(o/oo) :	0.900
Horizontal muros (1/3 mín. cara)(o/oo) :	1.600
Cortante o montaje alzado (cm³/m³) :	4.500
Transversal zapata (sup+inf)(o/oo) :	1.447
Longitudinal zapata (sup+inf)(o/oo) :	1.447
Cortante zapata (cm³/m³) :	0.000
Perimetral zapata (en canto)(cm³/m) :	8.682

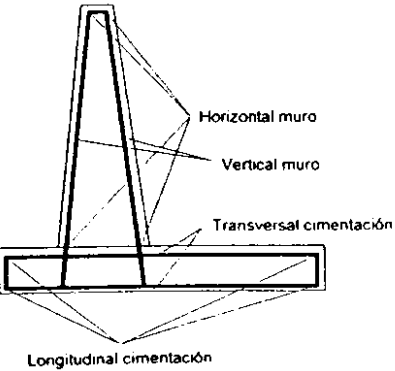


CARGAS (sin mayorar)

Acciones permanentes (G)	
Peso propio barrera coronación (T/m) :	0.000
Acciones permanentes de valor no constante (G*)	
Fg. Carga horizontal sobre muro (T/m) :	0.000
Hfg. Posición Fg a inferior zapata (m) :	0.000
Acciones variables (Q)	
SC1. Sobrecarga en tramo 1 (T/m) :	3.000
SC2. Sobrecarga en tramo 2 (T/m) :	3.000
SC3. Sobrecarga en tramo 3 (T/m) :	3.000
Fq. Carga horizontal sobre muro (T/m) :	0.000
Hfq. Posición Fq a inferior zapata (m) :	0.000

CARACTERISTICAS MATERIALES

Peso específico hormigón (T/m³) :	2.500
Hormigón alzado (T/m²) :	H - 250
Hormigón cimentación (T/m²) :	H - 250
Acero (T/°) :	AEH - 500



RESUMEN ACCIONES SOBRE EL MURO

		F.vertical (T / m)	X (m)	F. Horizontal (T / m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 (ΣP i, i=1..3)	13.477	1.410	---	---
	Sobre sección base muro (ΣP i, i=1..3)	21.470	1.479	---	---
	Total peso propio (ΣP i, i=1..6)	40.970	2.322	---	---
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E1'i)	1.432	1.881	17.182	6.187
	Sobre sección base muro (E1'i)	2.781	2.031	33.368	4.387
	Total tierras (E2'i + ΣT' ij)	87.984	4.193	38.503	3.587
	Verticales sobre talón (ΣT' ij)	80.368	4.398	---	---
Fuerza Fg	Verticales sobre talón (cortante) (ΣT'' ij)	58.380	4.973	---	---
	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
Acciones variables (Q)					
Sobrecargas sobre terreno	Total Fg	---	---	0.000	0.000
	Sección 1 (E1'sc)	0.626	1.786	7.514	7.330
	Base muro (E1'sc)	0.873	1.898	10.471	5.980
	Inf. cimentación (E2'sc + ΣS)	32.390	4.326	10.735	5.380
	Verticales sobre talón (ΣS' i, i=1..3)	30.000	4.519	---	---
Fuerza Fq	Verticales sobre talón (cortante) (ΣS'' i)	9.160	4.973	---	---
	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
Total Fq		---	---	0.000	0.000

COMPROBACIONES

SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	23.763	---
Acciones permanentes de valor no constante (G*)		
Tierras	51.031	38.503
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	---	---
Fuerza Fq	---	0.000
TOTAL	74.793	38.503
Csd=	1.943	Vale

SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	95.121	---
Acciones permanentes de valor no constante (G*)		
Tierras	368.953	138.098
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	---	---
Fuerza Fq	---	0.000
TOTAL	464.074	138.098
Csv=	3.360	Vale

TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	40.970	38.032
Acciones permanentes de valor no constante (G*)		
Tierras	87.984	55.092
Fuerza Fg	0.000	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	32.390	22.909
Fuerza Fq	0.000	0.000
TOTAL	161.344	116.034
D (m) =	6.50	
σ talón (T / m²) =	8.34	
σ puntera (T / m²) =	41.30	
σ med (T / m²) =	24.82	
σ cob (T / m²) =	31.88	
Vale		

ARMADO

Secciones

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	1.30	1.00	1.30
	1-1	1.00	1.07	1.00	1.07
PUNTERA	2-2 f	1.00	1.20	1.00	1.20
	2-2 c	1.00	1.20	1.00	0.69
TALON	3-3 f	1.00	1.20	1.00	1.20
	3-3 c	1.00	1.20	1.00	1.20

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	24.803	235.936	65.759
	0-0 (-)	19.323	3.280	0.000
	1-1 (+)	15.216	98.139	37.043
	1-1 (-)	12.129	1.523	0.000
PUNTERA	2-2 f (+)	0.000	38.826	---
	2-2 f (-)	0.000	5.164	---
	2-2 c (+)	---	---	23.730
	2-2 c (-)	---	---	3.194
TALON	3-3 f (+)	0.000	4.907	---
	3-3 f (-)	-39.595	-202.202	---
	3-3 c (+)	---	---	3.193
	3-3 c (-)	---	---	-43.369

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm2/m	Minima cm2/m	Control cálculo	Adoptada cm2/m
ALZADO	Vert. trasdós	0-0 (+)	42.693	7.780	Vale	42.693
		0-0 (-)	0.000	3.890	Vale	
		1-1 (+)	20.757	6.430	Vale	20.757
		1-1 (-)	0.000	3.215	Vale	
	Vert. intrados	0-0 (+)	0.000	3.890	Vale	3.890
		0-0 (-)	0.000	3.890	Vale	
		1-1 (+)	0.000	3.215	Vale	
		1-1 (-)	0.000	3.215	Vale	
	Hor. trasdós (*)	---	8.539	13.831	Vale	13.831
	Hor. intrados (*)	---	0.000	6.916	Vale	6.916
	Cortante	0-0 (+)	0.000	4.500	Vale	4.500
		0-0 (-)	0.000	4.500	Vale	(cm²/m²)
PUNTERA	Trans. inferior	2-2 f (+)	7.693	8.682	Vale	8.682
		2-2 f (-)	1.014	8.682	Vale	
	Long. inf. (*)	---	1.539	8.682	Vale	8.682
	Trans. superior	2-2 f (+)	0.000	8.682	Vale	50.983
		2-2 f (-)	0.000	8.682	Vale	
	Long. sup. (*)	---	0.000	8.682	Vale	10.197
	Cortante	2-2 c (+)	0.000	0.000	Vale	0.000
		2-2 c (-)	0.000	0.000	Vale	(cm²/m²)
TALON	Trans. inferior	3-3 f (+)	0.963	8.682	Vale	8.682
		3-3 f (-)	0.000	8.682	Vale	
	Long. inf. (*)	---	0.193	8.682	Vale	8.682
	Trans. superior	3-3 f (+)	0.000	8.682	Vale	50.983
		3-3 f (-)	50.983	8.682	Vale	
	Long. sup. (*)	---	10.197	8.682	Vale	10.197
	Cortante	3-3 c (+)	0.000	0.000	Vale	0.000
		3-3 c (-)	0.000	0.000	Vale	(cm²/m²)
ZAPATA	Perimetral	---	0.000	8.682	Vale	8.682

(*) Calculada como el 20% de la armadura perpendicular a ella

CALCULO DE MUROS.

NOMBRE PROYECTO :	L.A.V. MADRID - BARCELONA - FRONTERA FRANCESA.
NOMBRE OBRA :	ED2-3.0 - ALETA 4 - MODULO B

DATOS

GEOMETRIA DE CALCULO DEL MURO

C. Canto del muro en coronación (m) :	0.500
ST. Sobreepesor muro en trasdós (m) :	0.633
SI. Sobreepesor muro en intradós (m) :	0.000
P. Puntera zapata (m) :	1.000
T. Talón zapata (m) :	3.067
H. Altura muro (m) :	7.600
H _z . Canto zapata (m) :	1.000
Anchura total cimentación (m) :	5.200
Angulo trasdós muro (°) :	85.236

DEFINICION TERRENO

	X	Y
0. Coordenadas base trasdós (m) :	0.000	0.000
1. Coordenadas coronación trasdós (m) :	-0.633	7.600
2. Coordenadas fin tramo 1 terreno (m) :	0.417	7.600
3. Coordenadas fin tramo 2 terreno (m) :	10.000	7.600
4. Coordenadas fin tramo 3 terreno (m) :	20.000	7.600

COEFICIENTES DE SEGURIDAD

Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
Ψo (coeficiente combinación variables) :	1.00

Estado Limite Ultimo	
Favorable	Desfavorable

Acciones permanentes (G)		
Peso propio, cargas muertas :	0.90	1.50
Acciones permanentes de valor no constante (G*)		
Terreno (peso propio y empujes) :	0.00	1.50
Acciones variables (Q)		
Sobrecargas :	0.00	1.500

CARACTERISTICAS DEL TERRENO

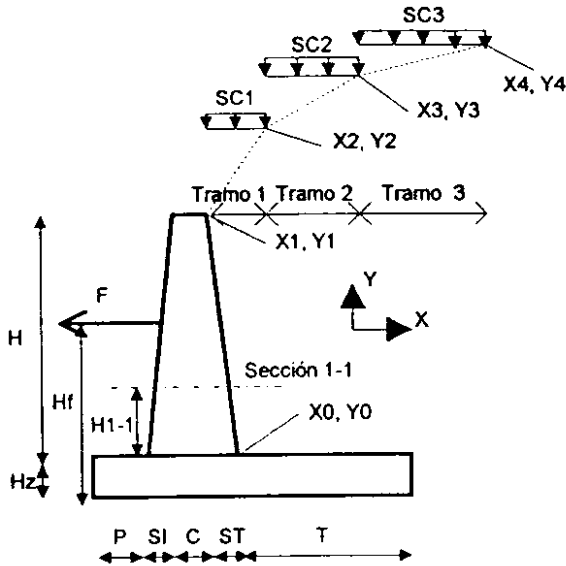
γ. Peso específico (T/m³) :	2.00
φ. Angulo rozamiento interno (°) :	30.000
δmt. Angulo rozamiento muro-barras (°) :	0.000
δtt. Angulo rozamiento tierras-barras (°) :	0.000
μ. Coeficiente rozamiento zapata-barras :	0.580
Tensión admisible cimentación (T/m²) :	40.000

ARMADO

H1-1. Dist. sección 1 a sup. zapata (m) :	2.700
Recubrimiento alzado (m) :	0.050
Recubrimiento cimentación (m) :	0.050

Cuantías mínimas

Vertical muros (1/3 min. cara)(o/oo) :	0.900
Horizontal muros (1/3 min. cara)(o/oo) :	1.600
Cortante o montaje alzado (cm²/m²) :	4.500
Transversal zapata (sup+inf)(o/oo) :	1.447
Longitudinal zapata (sup+inf)(o/oo) :	1.447
Cortante zapata (cm²/m²) :	0.000
Perimetral zapata (en canto)(cm²/m) :	7.235

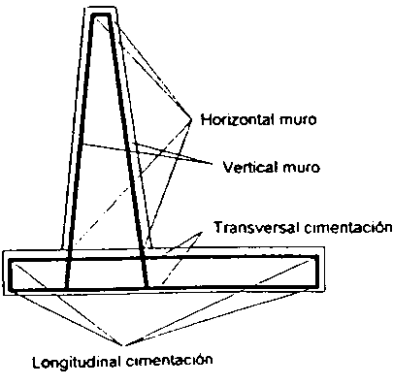


CARGAS (sin mayorar)

Acciones permanentes (G)	
Peso propio barrera coronación (T/m) :	0.000
Acciones permanentes de valor no constante (G*)	
Fg. Carga horizontal sobre muro (T/m) :	0.000
Htg. Posición Fg a inferior zapata (m) :	0.000
Acciones variables (Q)	
SC1. Sobrecarga en tramo 1 (T/m) :	3.000
SC2. Sobrecarga en tramo 2 (T/m) :	3.000
SC3. Sobrecarga en tramo 3 (T/m) :	3.000
Fq. Carga horizontal sobre muro (T/m) :	0.000
Htg. Posición Fq a inferior zapata (m) :	0.000

CARACTERISTICAS MATERIALES

Peso específico hormigón (T/m³) :	2.500
Hormigón alzado (T/m²) :	H - 250
Hormigón cimentación (T/m²) :	H - 250
Acero (T/ℓ) :	AEH - 500



RESUMEN ACCIONES SOBRE EL MURO

		F. vertical (T / m)	X (m)	F. Horizontal (T / m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 (ΣP _i , i=1..3)	8.626	1.362	---	---
	Sobre sección base muro (ΣP _i , i=1..3)	15.517	1.429	---	---
	Total peso propio (ΣP _i , i=1..6)	28.517	1.963	---	---
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E1t)	0.708	1.772	8.494	5.333
	Sobre sección base muro (E1t)	1.703	1.922	20.434	3.533
	Total tierras (E2t + ΣT)	51.427	3.503	24.626	2.867
	Verticales sobre talón (ΣT _{ij})	46.613	3.667	---	---
	Verticales sobre talón (cortante) (ΣT _{ij})	32.173	4.142	---	---
Fuerza Fg	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fg	---	---	0.000	0.000
Acciones variables (Q)					
Sobrecargas sobre terreno	Sección 1 (E1sc)	0.433	1.704	5.201	6.150
	Base muro (E1sc)	0.672	1.817	8.066	4.800
	Inf. cimentación (E2sc + ΣS)	31.900	3.692	8.591	4.300
	Verticales sobre talón (ΣS _{ij} , i=1..3)	30.000	3.811	---	---
	Verticales sobre talón (cortante) (ΣS _{ij})	6.350	4.142	---	---
Fuerza Fq	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fq	---	---	0.000	0.000

COMPROBACIONES

SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	16.540	---
Acciones permanentes de valor no constante (G*)		
Tierras	29.827	24.626
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	---	---
Fuerza Fq	---	0.000
TOTAL	46.367	24.626

Csd= 1.883 Vale

SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	55.970	---
Acciones permanentes de valor no constante (G*)		
Tierras	180.168	70.596
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	---	---
Fuerza Fq	---	0.000
TOTAL	236.138	70.596

Csv= 3.345 Vale

TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	28.517	18.173
Acciones permanentes de valor no constante (G*)		
Tierras	51.427	24.137
Fuerza Fg	0.000	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	31.900	2.091
Fuerza Fq	0.000	0.000
TOTAL	111.843	44.401

D (m) = 6.20
 σ talón (T / m²) = 11.66
 σ puntera (T / m²) = 31.36
 σ med (T / m²) = 21.51
 σ cob (T / m²) = 25.38
 Vale

ARMADO

Secciones

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	1.13	1.00	1.13
	1-1	1.00	0.91	1.00	0.91
PUNTERA	2-2 f	1.00	1.00	1.00	1.00
	2-2 c	1.00	1.00	1.00	0.84
TALON	3-3 f	1.00	1.00	1.00	1.00
	3-3 c	1.00	1.00	1.00	1.00

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	17.528	124.391	42.750
	0-0 (-)	13.965	1.925	0.000
	1-1 (+)	9.475	40.138	20.542
	1-1 (-)	7.763	0.716	0.000
PUNTERA	2-2 f (+)	0.000	28.113	---
	2-2 f (-)	0.000	3.950	---
	2-2 c (+)	---	---	21.944
	2-2 c (-)	---	---	3.123
TALON	3-3 f (+)	0.000	4.909	---
	3-3 f (-)	-26.018	-100.156	---
	3-3 c (+)	---	---	10.961
	3-3 c (-)	---	---	-25.814

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm2/m	Minima cm2/m	Control cálculo	Adoptada cm2/m
ALZADO	Vert. trasdós	0-0 (+)	25.038	6.800	Vale	25.038
		0-0 (-)	0.000	3.400	Vale	
		1-1 (+)	9.668	5.450	Vale	9.668
		1-1 (-)	0.000	2.725	Vale	
	Vert. intrados	0-0 (+)	0.000	3.400	Vale	3.400
		0-0 (-)	0.000	3.400	Vale	
		1-1 (+)	0.000	2.725	Vale	
		1-1 (-)	0.000	2.725	Vale	
	Hor. trasdós (*)	---	5.008	12.089	Vale	12.089
	Hor. intrados (*)	---	0.000	6.044	Vale	6.044
	Cortante	0-0 (+)	0.000	4.500	Vale	4.500
		0-0 (-)	0.000	4.500	Vale	(cm²/m²)
		1-1 (+)	0.000	4.500	Vale	
		1-1 (-)	0.000	4.500	Vale	
PUNTERA	Trans. inferior	2-2 f (+)	6.748	7.235	Vale	7.235
		2-2 f (-)	0.939	7.235	Vale	
	Long. inf. (*)	---	1.350	7.235	Vale	7.235
	Trans. superior	2-2 f (+)	0.000	7.235	Vale	30.652
		2-2 f (-)	0.000	7.235	Vale	
	Long. sup. (*)	---	0.000	7.235	Vale	7.235
	Cortante	2-2 c (+)	0.000	0.000	Vale	0.000
		2-2 c (-)	0.000	0.000	Vale	(cm²/m²)
TALON	Trans. inferior	3-3 f (+)	1.167	7.235	Vale	7.235
		3-3 f (-)	0.000	7.235	Vale	
	Long. inf. (*)	---	0.233	7.235	Vale	7.235
	Trans. superior	3-3 f (+)	0.000	7.235	Vale	30.652
		3-3 f (-)	30.652	7.235	Vale	
	Long. sup. (*)	---	6.130	7.235	Vale	7.235
	Cortante	3-3 c (+)	0.000	0.000	Vale	0.000
		3-3 c (-)	0.000	0.000	Vale	(cm²/m²)
ZAPATA	Perimetral	---	0.000	7.235	Vale	7.235

(*) Calculada como el 20% de la armadura perpendicular a ella

CALCULO DE MUROS.

NOMBRE PROYECTO :	L.A.V. MADRID - BARCELONA - FRONTERA FRANCESA.
NOMBRE OBRA :	ED2-3.0 - ALETA 4 - MODULO C

DATOS

GEOMETRIA DE CALCULO DEL MURO

C. Canto del muro en coronación (m) :	0.500
ST. Sobreespesor muro en trasdós (m) :	0.442
SI. Sobreespesor muro en intradós (m) :	0.000
P. Puntera zapata (m) :	1.000
T. Talón zapata (m) :	1.858
H. Altura muro (m) :	5.300
H _z . Canto zapata (m) :	0.800
Anchura total cimentación (m) :	3.800
Angulo trasdós muro (°) :	85.236

DEFINICION TERRENO

	X	Y
0. Coordenadas base trasdós (m) :	0.000	0.000
1. Coordenadas coronación trasdós (m) :	-0.442	5.300
2. Coordenadas fin tramo 1 terreno (m) :	0.417	5.300
3. Coordenadas fin tramo 2 terreno (m) :	10.000	5.300
4. Coordenadas fin tramo 3 terreno (m) :	20.000	5.300

COEFICIENTES DE SEGURIDAD

Seguridad al deslizamiento :	1.500
Seguridad al vuelco :	1.800
Minoración acero :	1.150
Minoración hormigón :	1.500
Ψ ₀ (coeficiente combinación variables) :	1.00

Estado Límite Ultimo	
Favorable	Desfavorable

Acciones permanentes (G)		
Peso propio, cargas muertas :	0.90	1.50
Acciones permanentes de valor no constante (G*)		
Terreno (peso propio y empujes) :	0.00	1.50
Acciones variables (Q)		
Sobrecargas :	0.00	1.500

CARACTERISTICAS DEL TERRENO

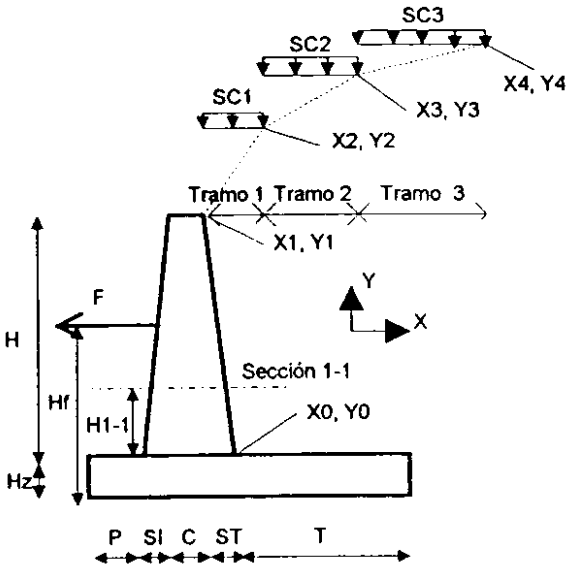
γ. Peso específico (T/m³) :	2.00
δ. Angulo rozamiento interno (°) :	30.000
δ _{mt} . Angulo rozamiento muro-tierras (°) :	0.000
δ _{tt} . Angulo rozamiento tierras-tierras (°) :	0.000
μ. Coeficiente rozamiento zapata-tierras :	0.580
Tensión admisible cimentación (T/m²) :	40.000

ARMADO

H1-1. Dist. sección 1 a sup. zapata (m) :	2.000
Recubrimiento alzado (m) :	0.050
Recubrimiento cimentación (m) :	0.050

Cuantías mínimas

Vertical muros (1/3 min. cara)(o/oo) :	0.900
Horizontal muros (1/3 min. cara)(o/oo) :	1.600
Cortante o montaje alzado (cm²/m³) :	4.500
Transversal zapata (sup+inf)(o/oo) :	1.447
Longitudinal zapata (sup+inf)(o/oo) :	1.447
Cortante zapata (cm²/m³) :	0.000
Perimetral zapata (en canto)(cm²/m) :	5.788

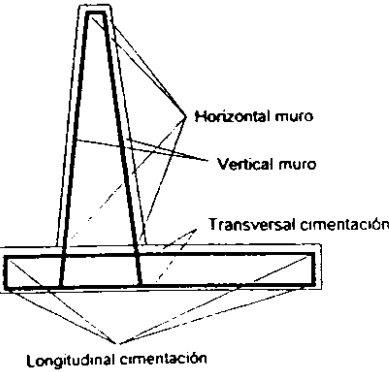


CARGAS (sin mayorar)

Acciones permanentes (G)	
Peso propio barrera coronación (T/m) :	0.000
Acciones permanentes de valor no constante (G*)	
Fg. Carga horizontal sobre muro (T/m) :	0.000
Hfg. Posición Fg a inferior zapata (m) :	0.000
Acciones variables (Q)	
SC1. Sobrecarga en tramo 1 (T/m) :	3.000
SC2. Sobrecarga en tramo 2 (T/m) :	3.000
SC3. Sobrecarga en tramo 3 (T/m) :	3.000
Fq. Carga horizontal sobre muro (T/m) :	0.000
Hfq. Posición Fq a inferior zapata (m) :	0.000

CARACTERISTICAS MATERIALES

Peso específico hormigón (T/m³) :	2.500
Hormigón alzado (T/m³) :	H - 250
Hormigón cimentación (T/m³) :	H - 250
Acero (TP) :	AEH - 500



RESUMEN ACCIONES SOBRE EL MURO

		F.vertical (T / m)	X (m)	F. Horizontal (T / m)	Y (m)
Acciones permanentes (G)					
Peso propio muro + barrera	Sobre sección 1 (ΣP _i , i=1..3)	5.259	1.324	---	---
	Sobre sección base muro (ΣP _i , i=1..3)	9.551	1.372	---	---
	Total peso propio (ΣP _i , i=1..6)	17.151	1.606	---	---
Acciones permanentes de valor no constante (G*)					
Tierras	Sobre sección 1 (E1'i)	0.332	1.683	3.978	3.900
	Sobre sección base muro (E1i)	0.855	1.794	10.261	2.567
	Total tierras (E2i + ΣT _i)	22.039	2.757	12.286	2.033
	Verticales sobre talón (ΣT ⁺ ij)	19.698	2.871	---	---
	Verticales sobre talón (cortante) (ΣT ⁻ ij)	11.748	3.246	---	---
Fuerza Fg	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fg	---	---	0.000	0.000
Acciones variables (Q)					
Sobrecargas sobre terreno	Sección 1 (E1'sc)	0.301	1.638	3.617	4.450
	Base muro (E1sc)	0.484	1.721	5.808	3.450
	Inf. cimentación (E2sc + ΣS)	31.325	2.985	6.042	3.050
	Verticales sobre talón (ΣS ⁺ i, i=1..3)	30.000	3.041	---	---
	Verticales sobre talón (cortante) (ΣS ⁻ i)	3.325	3.246	---	---
Fuerza Fq	Sobre sección 1	---	---	0.000	0.000
	Sobre sección base muro	---	---	0.000	0.000
	Total Fq	---	---	0.000	0.000

COMPROBACIONES

SEGURIDAD AL DESLIZAMIENTO (Planteamiento clásico)

	Fuerzas (T / m)	
	Opuestas	Deslizantes
Acciones permanentes (G)		
Peso propio muro	9.948	---
Acciones permanentes de valor no constante (G*)		
Tierras	12.783	12.286
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	---	---
Fuerza Fq	---	0.000
TOTAL	22.730	12.286

Csd= 1.850 Vale

SEGURIDAD AL VUELCO (Planteamiento clásico)

	Momentos (mT / m)	
	Estabilizadores	Volcadores
Acciones permanentes (G)		
Peso propio muro	27.541	---
Acciones permanentes de valor no constante (G*)		
Tierras	60.751	24.981
Fuerza Fg	---	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	---	---
Fuerza Fq	---	0.000
TOTAL	88.292	24.981

Csv= 3.534 Vale

TENSIONES MAXIMAS EN CIMENTACION

	N (T / m)	M (mT / m)
Acciones permanentes (G)		
Peso propio muro	17.151	5.046
Acciones permanentes de valor no constante (G*)		
Tierras	22.039	6.104
Fuerza Fg	0.000	0.000
Acciones variables (Q)		
Sobrecargas sobre terreno	31.325	-15.552
Fuerza Fq	0.000	0.000
TOTAL	70.515	-4.402

D (m) = 3.80
 σ talón (T / m²) = 20.39
 σ puntera (T / m²) = 16.73
 σ med (T / m²) = 18.56
 σ cob (T / m²) = 19.19
 Vale

ARMADO

Secciones

Elemento	Designación	Datos reales		Datos de cálculo	
		Ancho (m)	Canto (m)	Ancho (m)	Canto (m)
ALZADO	0-0	1.00	0.94	1.00	0.94
	1-1	1.00	0.78	1.00	0.78
PUNTERA	2-2 f	1.00	0.80	1.00	0.80
	2-2 c	1.00	0.80	1.00	0.80
TALON	3-3 f	1.00	0.80	1.00	0.80
	3-3 c	1.00	0.80	1.00	0.80

Esfuerzos mayorados

Elemento	Sección	Nd (T / m)	Md (mT / m)	Vd (T / m)
ALZADO	0-0 (+)	10.605	50.537	24.105
	0-0 (-)	8.596	0.852	0.000
	1-1 (+)	5.683	15.557	11.392
	1-1 (-)	4.733	0.302	0.000
PUNTERA	2-2 f (+)	0.000	14.744	---
	2-2 f (-)	0.000	2.456	---
	2-2 c (+)	---	---	14.089
	2-2 c (-)	---	---	2.399
TALON	3-3 f (+)	0.000	3.455	---
	3-3 f (-)	-15.558	-35.608	---
	3-3 c (+)	---	---	18.036
	3-3 c (-)	---	---	-9.941

Armaduras

Elemento	Armadura	Sección	ARMADURA DE CALCULO			
			Necesaria cm2/m	Minima cm2/m	Control cálculo	Adoptada cm2/m
ALZADO	Vert. trasdós	0-0 (+)	11.875	5.650	Vale	11.875
		0-0 (-)	0.000	2.825	Vale	
		1-1 (+)	4.219	4.650	Vale	
		1-1 (-)	0.000	2.325	Vale	
	Vert. intrados	0-0 (+)	0.000	2.825	Vale	2.825
		0-0 (-)	0.000	2.825	Vale	
		1-1 (+)	0.000	2.325	Vale	
		1-1 (-)	0.000	2.325	Vale	
	Hor. trasdós (*)	---	2.375	10.044	Vale	10.044
	Hor. intrados (*)	---	0.000	5.022	Vale	5.022
	Cortante	0-0 (+)	0.000	4.500	Vale	4.500 (cm²/m²)
		0-0 (-)	0.000	4.500	Vale	
		1-1 (+)	0.000	4.500	Vale	
		1-1 (-)	0.000	4.500	Vale	
PUNTERA	Trans. inferior	2-2 f (+)	4.475	5.788	Vale	5.788
		2-2 f (-)	0.740	5.788	Vale	
	Long. inf. (*)	---	0.895	5.788	Vale	5.788
	Trans. superior	2-2 f (+)	0.000	5.788	Vale	14.464
		2-2 f (-)	0.000	5.788	Vale	
	Long. sup. (*)	---	0.000	5.788	Vale	5.788
	Cortante	2-2 c (+)	0.000	0.000	Vale	0.000 (cm²/m²)
		2-2 c (-)	0.000	0.000	Vale	
TALON	Trans. inferior	3-3 f (+)	1.041	5.788	Vale	5.788
		3-3 f (-)	0.000	5.788	Vale	
	Long. inf. (*)	---	0.208	5.788	Vale	5.788
	Trans. superior	3-3 f (+)	0.000	5.788	Vale	14.464
		3-3 f (-)	14.464	5.788	Vale	
	Long. sup. (*)	---	2.893	5.788	Vale	5.788
	Cortante	3-3 c (+)	0.000	0.000	Vale	0.000 (cm²/m²)
		3-3 c (-)	0.000	0.000	Vale	
ZAPATA	Perimetral	---	0.000	5.788	Vale	5.788

(*) Calculada como el 20% de la armadura perpendicular a ella

MEMORIA

Para el cálculo de este paso inferior (EVN3-4.7-1), se han empleado dos programas de cálculo:

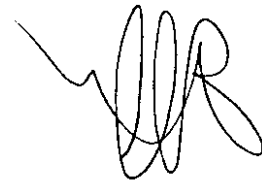
- PROGRAMA ARCO, de J. Díaz del Valle
- PROGRAMA DE CÁLCULO DE MUROS, según teoría de Coulomb.

Mediante el programa ARCO, se obtienen los esfuerzos y armaduras del marco (tanto en losa superior, como en losa inferior y en hastiales).

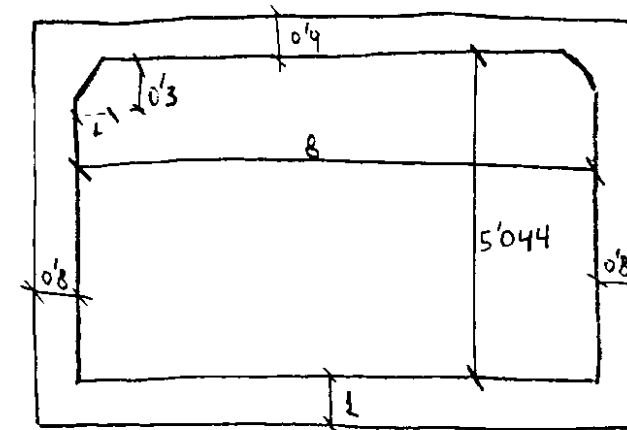
A través del programa de CÁLCULO DE MUROS, se determina la geometría y el armado de las aletas del paso inferior.

Para definir las hipótesis de carga así como el coeficiente de impacto se han seguido las pautas marcadas en el proyecto.

El ingeniero autor del cálculo:



Gonzalo Rodríguez Heredia
OFICINA TÉCNICA



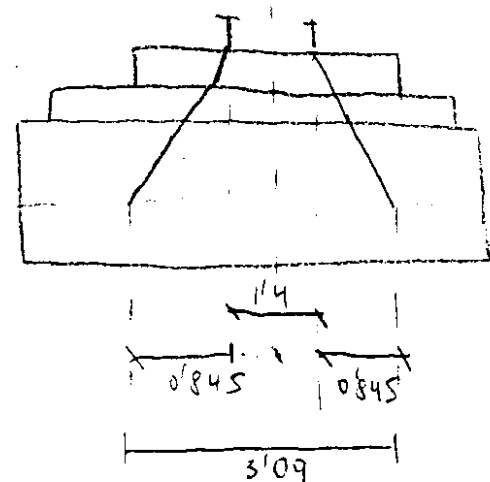
COEFICIENTE IMPACTO

Al estar bajo balasto, según proyecto, se toma un coeficiente de impacto ψ

$$\bar{\psi} = 1'5$$

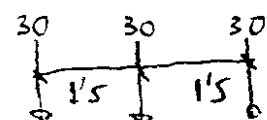
SOBRECARGAS

a) Ancho eficaz



b) Tren tipo A

Son cargas puntuales a 1.5 m. :



b-1 Carga sobre eje simétrico

b-2 Carga a canto útil apoyado

Estas 30T son por 3.09m $\Rightarrow$ 9.71 T/m

$\Rightarrow$ Aplicando el coeficiente de impacto :

$$q_A = 14.57 \text{ T/m}$$

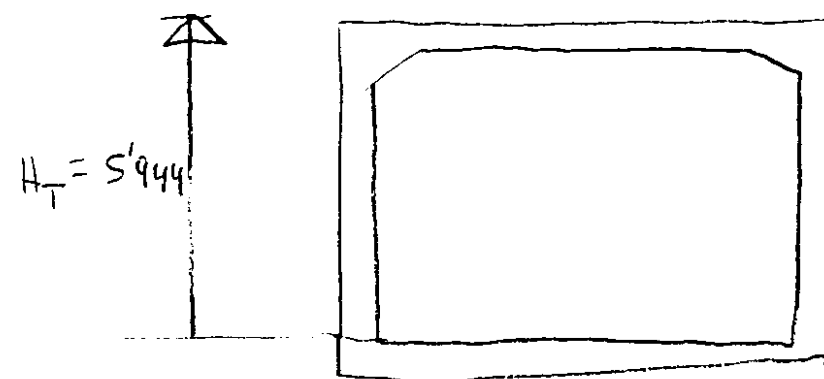
c) Tren tipo B

Carga repartida de 12 T/m

$$q_B = \frac{12}{3.09} = 3.89 \text{ T/m}^2$$

Aplicando el coeficiente de impacto : $q_B = 5.83 \text{ T/m}^2$

d) Tierras



e) PP

$$PP_{\text{riel}} + PP_{\text{tracción}} + PP_{\text{balasto}} = 2.19 \text{ T/m}^2$$

PROGRAMA ARCO

CALCULO DE GALERIAS ENTERRADAS Y PASOS INFERIORES

VERSION Nº 1 FECHA : 15/03/1989

Copyright : J.Díaz del Valle, 1989

E.T.S. de I.C.C. y P. de Santander

DATOS DEL PROYECTO DE LA GALERIA

PROYECTO : L.A.V.

REFERENCIA : P.I. EVN3-4.7-1

FECHA DEL CALCULO : 04-28-2000

HIPOTESIS CARRO CENTRADO

DATOS DE LA ESTRUCTURA

NUMERO DE SEGMENTOS = 50
 SALTO = 1

TIPO DE GEOMETRIA :

TIPO 0 : POLIGONAL ARBITRARIA DADA POR COORDENADAS
 TIPO 1 : ARCO CIRCULAR DEFINIDO POR f,a
 TIPO 2 : PARABOLA CON $y'(0)=0$, DEFINIDA POR f,a
 TIPO 3 : PARABOLA CON $y'(0)=0$, DEFINIDA POR a,c,b
 TIPO 4 : PARABOLA CON $y'(0) \neq 0$ DEFINIDA POR f,a,c,b
 TIPO 5 : CUBICA CON $y'(0)=0$ DEFINIDA POR f,a,c,b
 TIPO 6 : PORTICO CIRCULAR DEFINIDO POR f,a,H,B
 TIPO 7 : CURVA GENERAL DEFINIDA POR PUNTOS DE PASO
 TIPO 8 : GEOMETRIA ANTERIOR ALMACENADA EN FICHERO DE DATOS

2a = CUERDA , f = FLECHA , (c,b) = COORDENADAS DE UN PUNTO

TIPO = 9

CUERDA 2a = 8.800 m
 ALTURA H = 5.494 m

TIPO DE CONDICIONES DE APOYO :

TIPO 0 : TRIARTICULADO (EN APOYOS Y CLAVE)
 TIPO 1 : BIARTICULADO (EN APOYOS)
 TIPO 2 : EMPOTRADO EN EXTREMOS
 TIPO 3 : EMPOTRADO EN EXTREMOS CON ROTULA EN CLAVE
 TIPO 4 : EMPOTRADO ELASTICAMENTE
 TIPO 5 : ATIRANTADO EN EXTREMOS

TIPO = 2

PESO ESPECIFICO DEL HORMIGON = 2.50 t/m³
 RESISTENCIA CARACTERISTICA DEL HORMIGON f_{ck} = 250 Kp/cm²
 COEFICIENTE DE MINORACION DE f_{ck} γ_c = 1.50
 LIMITE ELASTICO CARACTERISTICO DEL ACERO f_{yk} = 5100 Kp/cm²
 COEFICIENTE DE MINORACION DE f_{yk} γ_s = 1.15
 RECUBRIMIENTO DE LAS ARMADURAS c = 5 cm
 SE DISPONEN ARMADURAS MINIMAS DE FLEXOCOMPRESION

ALTURA DE TIERRAS DESDE LA BASE = 5.94 m
 PESO ESPECIFICO DE LAS TIERRAS = 2.00 t/m³

COEFICIENTE EMPUJE TIERRAS = 0.50
 SOBRECARGA q = 2.19 t/m²

CARGAS CONCENTRADAS EN LOS NUDOS :

NUDO = 42 . FX = 0.00 t/m . FY = 14.57 t/m . MZ = 0.00 txm/m
 NUDO = 51 . FX = 0.00 t/m . FY = 14.57 t/m . MZ = 0.00 txm/m

COEFICIENTE DE MAYORACION DE LAS CARGAS %f = 1.50

GALIBO GX = 8.00 m
 GALIBO GY = 4.61 m

EXISTE LOSA DE CIMENTACION :

SOBRECARGA DE LA LOSA DE CIMENTACION Q = 0.40 t/m²
 CANTO DE LA LOSA DE CIMENTACION t = 1.00 m
 COEFICIENTE DE BALASTO DEL TERRENO K = 8000 t/m³

E S F U E R Z O S E N E L A R C O

=====

SEC	X (m)	Y (m)	AXIL (t/m)	CORTANTE (t/m)	FLECTOR (txm/m)	ESPESOR (m)
1	4.400	0.000	85.443	-11.144	-48.010	0.800
2	4.400	0.334	84.942	-9.683	-44.776	0.800
3	4.400	0.668	83.940	-6.872	-42.480	0.800
4	4.400	1.002	82.938	-4.229	-41.068	0.800
5	4.400	1.336	81.936	-1.753	-40.482	0.800
6	4.400	1.670	80.934	0.556	-40.668	0.800
7	4.400	2.004	79.932	2.697	-41.569	0.800
8	4.400	2.338	78.930	4.671	-43.129	0.800
9	4.400	2.672	77.928	6.477	-45.292	0.800
10	4.400	3.006	76.926	8.117	-48.003	0.800
11	4.400	3.340	75.924	9.589	-51.206	0.800
12	4.400	3.674	74.922	10.893	-54.844	0.800
13	4.400	4.008	73.920	12.030	-58.862	0.800
14	4.400	4.342	72.918	13.000	-63.204	0.800
15	4.400	4.676	71.916	13.803	-67.814	0.800
16	4.400	5.010	70.914	14.438	-72.637	0.800
17	4.400	5.344	22.256	-67.802	-77.615	1.200
18	4.313	5.353	22.326	-66.743	-71.742	1.181
19	4.225	5.363	22.245	-65.915	-65.941	1.163
20	4.138	5.372	22.166	-65.095	-60.213	1.144
21	4.050	5.381	22.087	-64.284	-54.556	1.125
22	3.963	5.391	22.009	-63.481	-48.970	1.106
23	3.875	5.400	21.932	-62.687	-43.453	1.087
24	3.788	5.410	21.855	-61.902	-38.006	1.069
25	3.700	5.419	21.780	-61.125	-32.627	1.050
26	3.612	5.428	21.705	-60.357	-27.315	1.031
27	3.525	5.438	21.631	-59.598	-22.070	1.013

28	3.438	5.447	21.558	-58.847	-16.892	0.994
29	3.350	5.457	21.485	-58.104	-11.779	0.975
30	3.263	5.466	21.413	-57.371	-6.730	0.956
31	3.175	5.475	21.342	-56.645	-1.745	0.938
32	3.088	5.485	21.272	-55.929	3.177	0.919
33	3.000	5.494	15.199	-57.166	8.036	0.900
34	2.833	5.494	15.202	-56.145	17.394	0.900
35	2.667	5.494	15.202	-54.810	26.529	0.900
36	2.500	5.494	15.202	-53.475	35.441	0.900
37	2.333	5.494	15.202	-52.140	44.131	0.900
38	2.167	5.494	15.202	-50.805	52.599	0.900
39	2.000	5.494	15.202	-49.470	60.844	0.900
40	1.833	5.494	15.202	-48.135	68.866	0.900
41	1.667	5.494	15.202	-46.800	76.666	0.900
42	1.500	5.494	15.202	-45.465	84.244	0.900
43	1.333	5.494	15.202	-22.275	87.956	0.900
44	1.167	5.494	15.202	-20.940	91.446	0.900
45	1.000	5.494	15.202	-19.605	94.714	0.900
46	0.833	5.494	15.202	-18.270	97.759	0.900
47	0.667	5.494	15.202	-16.935	100.581	0.900
48	0.500	5.494	15.202	-15.600	103.181	0.900
49	0.333	5.494	15.202	-14.265	105.559	0.900
50	0.167	5.494	15.202	-12.930	107.714	0.900
51	0.000	5.494	15.202	-11.595	109.646	0.900

Reacciones : R = 0.85443E+02 M = -.48010E+02 H = -.11144E+02
 Flecha en clave v = 0.40090E-02m, Giro en base θ = -.97591E-03 rad
 Longitud del semiarco = 9.752m, Longitud de transporte = 7.039m

LOSA DE CIMENTACION SOBRE TERRENO ELASTICO

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X (m)	W (mm)	GIRO (1000xrad)	FLECTOR (txm/m)	CORTANTE (t/m)	REACCION (t/m ²)
4.400	4.886	-0.976	48.010	85.443	39.086
3.960	4.442	-1.029	13.664	70.933	35.539
3.520	3.988	-1.027	-14.644	58.009	31.905
3.080	3.545	-0.981	-37.617	46.671	28.359
2.640	3.130	-0.898	-55.937	36.848	25.042
2.200	2.759	-0.787	-70.246	28.411	22.070
1.760	2.441	-0.653	-81.118	21.190	19.531
1.320	2.186	-0.503	-89.042	14.979	17.492
0.880	2.000	-0.342	-94.413	9.545	16.002
0.440	1.887	-0.173	-97.519	4.639	15.096
0.000	1.849	-0.000	-98.535	-0.000	14.792

A R M A D U R A S E N E L A R C O

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SEC	X (m)	Y (m)	Ainterior (cm ² /m)	Aexterior (cm ² /m)	Acortante (cm ² /m)
1	4.400	0.000	6.000	7.135	0.000
2	4.400	0.334	6.000	6.315	0.000
3	4.400	0.668	6.000	6.000	0.000
4	4.400	1.002	6.000	6.000	0.000
5	4.400	1.336	6.000	6.000	0.000
6	4.400	1.670	6.000	6.000	0.000
7	4.400	2.004	6.000	6.000	0.000
8	4.400	2.338	6.000	6.438	0.000
9	4.400	2.672	6.000	7.356	0.000
10	4.400	3.006	6.000	8.393	0.000
11	4.400	3.340	6.000	9.480	0.000
12	4.400	3.674	6.000	10.552	0.000
13	4.400	4.008	6.000	11.275	0.000
14	4.400	4.342	6.000	12.796	0.000
15	4.400	4.676	6.000	14.574	0.000
16	4.400	5.010	6.000	16.440	0.000
17	4.400	5.344	9.000	15.584	0.000
18	4.313	5.353	8.859	14.735	0.000
19	4.225	5.363	8.719	13.848	0.000
20	4.137	5.372	8.578	12.905	0.000
21	4.050	5.381	8.438	11.901	0.000
22	3.963	5.391	8.297	10.830	0.000
23	3.875	5.400	8.156	9.683	0.000
24	3.787	5.410	8.016	8.453	0.000
25	3.700	5.419	7.875	7.875	0.000
26	3.612	5.428	7.734	7.734	0.000
27	3.525	5.438	7.594	7.594	0.000
28	3.438	5.447	7.453	7.453	0.000
29	3.350	5.457	7.313	7.313	0.000
30	3.263	5.466	7.172	7.172	0.000
31	3.175	5.475	7.031	7.031	0.000
32	3.088	5.485	6.891	6.891	0.000
33	3.000	5.494	6.750	6.750	0.715
34	2.833	5.494	6.750	6.750	0.398
35	2.667	5.494	7.459	6.750	0.000
36	2.500	5.494	10.011	6.750	0.000
37	2.333	5.494	12.025	6.750	0.000
38	2.167	5.494	13.522	6.750	0.000
39	2.000	5.494	16.001	6.750	0.000
40	1.833	5.494	18.433	6.750	0.000
41	1.667	5.494	20.816	6.750	0.000
42	1.500	5.494	23.150	6.750	0.000
43	1.333	5.494	24.300	6.750	0.000
44	1.167	5.494	25.386	6.750	0.000
45	1.000	5.494	26.407	6.750	0.000
46	0.833	5.494	27.361	6.750	0.000
47	0.667	5.494	28.249	6.750	0.000
48	0.500	5.494	29.069	6.750	0.000
49	0.333	5.494	29.822	6.750	0.000
50	0.167	5.494	30.506	6.750	0.000

51 0.000 5.494 31.120 6.750 0.000

ARMADURAS EN LA LOSA
=====

SEC	X (m)	Y (m)	Ainferior (cm ² /m)	Asuperior (cm ² /m)	Acortante (cm ² /m)
1	4.400	-0.500	13.514	7.500	6.717
2	3.960	-0.500	7.500	7.500	2.676
3	3.520	-0.500	7.500	7.500	0.000
4	3.080	-0.500	7.500	11.432	0.000
5	2.640	-0.500	7.500	14.534	0.000
6	2.200	-0.500	7.500	18.341	0.000
7	1.760	-0.500	7.500	21.260	0.000
8	1.320	-0.500	7.500	23.403	0.000
9	0.880	-0.500	7.500	24.863	0.000
10	0.440	-0.500	7.500	25.710	0.000
11	0.000	-0.500	7.500	25.988	0.000

PROGRAMA ARCO

CALCULO DE GALERIAS ENTERRADAS Y PASOS INFERIORES

VERSION Nº 1 FECHA : 15/03/1989
 Copyright : J.Díaz del Valle, 1989
 E.T.S. de I.C.C. y P. de Santander

DATOS DEL PROYECTO DE LA GALERIA

PROYECTO : A.V.E.
 REFERENCIA : P.I. EVN3-4.7-L
 FECHA DEL CALCULO : 04-28-2000

HIPOTESIS CARGA A CANTO UTIL

DATOS DE LA ESTRUCTURA

NUMERO DE SEGMENTOS = 50
 SALTO = 1

TIPO DE GEOMETRIA :

TIPO 0 : POLIGONAL ARBITRARIA DADA POR COORDENADAS
 TIPO 1 : ARCO CIRCULAR DEFINIDO POR f,a
 TIPO 2 : PARABOLA CON $y'(0)=0$, DEFINIDA POR f,a
 TIPO 3 : PARABOLA CON $y'(0)=0$, DEFINIDA POR a,c,b
 TIPO 4 : PARABOLA CON $y'(0)<0$ DEFINIDA POR f,a,c,b
 TIPO 5 : CUBICA CON $y'(0)=0$ DEFINIDA POR f,a,c,b
 TIPO 6 : PORTICO CIRCULAR DEFINIDO POR f,a,H,B
 TIPO 7 : CURVA GENERAL DEFINIDA POR PUNTOS DE PASO
 TIPO 8 : GEOMETRIA ANTERIOR ALMACENADA EN FICHERO DE DATOS

2a = CUERDA , f = FLECHA , (c,b) = COORDENADAS DE UN PUNTO

TIPO = 9

CUERDA 2a = 8.800 m
 ALTURA H = 5.494 m

TIPO DE CONDICIONES DE APOYO :

TIPO 0 : TRIARTICULADO (EN APOYOS Y CLAVE)
 TIPO 1 : BIARTICULADO (EN APOYOS)
 TIPO 2 : EMPOTRADO EN EXTREMOS
 TIPO 3 : EMPOTRADO EN EXTREMOS CON ROTULA EN CLAVE
 TIPO 4 : EMPOTRADO ELASTICAMENTE
 TIPO 5 : ATIRANTADO EN EXTREMOS

TIPO = 2

PESO ESPECIFICO DEL HORMIGON = 2.50 t/m³
 RESISTENCIA CARACTERISTICA DEL HORMIGON fck = 250 Kp/cm²
 COEFICIENTE DE MINORACION DE fck γ_c = 1.50
 LIMITE ELASTICO CARACTERISTICO DEL ACERO fyk = 5100 Kp/cm²
 COEFICIENTE DE MINORACION DE fyk γ_s = 1.15
 RECUBRIMIENTO DE LAS ARMADURAS c = 5 cm
 SE DISPONEN ARMADURAS MINIMAS DE FLEXOCOMPRESION

ALTURA DE TIERRAS DESDE LA BASE = 5.94 m
 PESO ESPECIFICO DE LAS TIERRAS = 2.00 t/m³

COEFICIENTE EMPUJE TIERRAS = 0.50
 SOBRECARGA q = 2.19 t/m²

CARGAS CONCENTRADAS EN LOS NUDOS :

NUDO = 27 . FX = 0.00 t/m . FY = 14.57 t/m. MZ = 0.00 txm/m
 NUDO = 39 . FX = 0.00 t/m . FY = 14.57 t/m. MZ = 0.00 txm/m
 NUDO = 48 . FX = 0.00 t/m . FY = 14.57 t/m. MZ = 0.00 txm/m

COEFICIENTE DE MAYORACION DE LAS CARGAS %f = 1.50

GALIBO GX = 8.00 m
 GALIBO GY = 4.61 m

EXISTE LOSA DE CIMENTACION :

SOBRECARGA DE LA LOSA DE CIMENTACION Q = 0.40 t/m²
 CANTO DE LA LOSA DE CIMENTACION t = 1.00 m
 COEFICIENTE DE BALASTO DEL TERRENO K = 8000 t/m³

ESFUERZOS EN EL ARCO
 =====

SEC	X (m)	Y (m)	AXIL (t/m)	CORTANTE (t/m)	FLECTOR (txm/m)	ESPESOR (m)
1	4.400	0.000	118.173	-10.364	-65.036	0.800
2	4.400	0.334	117.672	-8.904	-62.062	0.800
3	4.400	0.668	116.670	-6.095	-60.026	0.800
4	4.400	1.002	115.668	-3.454	-58.872	0.800
5	4.400	1.336	114.666	-0.980	-58.545	0.800
6	4.400	1.670	113.664	1.327	-58.988	0.800
7	4.400	2.004	112.662	3.466	-60.146	0.800
8	4.400	2.338	111.660	5.438	-61.962	0.800
9	4.400	2.672	110.658	7.242	-64.381	0.800
10	4.400	3.006	109.656	8.880	-67.346	0.800
11	4.400	3.340	108.654	10.350	-70.803	0.800
12	4.400	3.674	107.652	11.652	-74.695	0.800
13	4.400	4.008	106.650	12.787	-78.966	0.800
14	4.400	4.342	105.648	13.755	-83.560	0.800
15	4.400	4.676	104.646	14.556	-88.422	0.800
16	4.400	5.010	103.644	15.189	-93.495	0.800
17	4.400	5.344	26.488	-100.265	-98.724	1.200
18	4.313	5.353	26.557	-99.208	-89.994	1.181
19	4.225	5.363	26.476	-98.380	-81.336	1.163
20	4.138	5.372	26.397	-97.562	-72.751	1.144
21	4.050	5.381	26.318	-96.751	-64.236	1.125
22	3.963	5.391	26.240	-95.950	-55.793	1.106
23	3.875	5.400	26.163	-95.157	-47.419	1.087
24	3.788	5.410	26.086	-94.373	-39.114	1.069
25	3.700	5.419	26.011	-93.597	-30.877	1.050
26	3.612	5.428	25.936	-92.830	-22.708	1.031

27	3.525	5.438	25.862	-92.071	-14.606	1.013
28	3.438	5.447	23.460	-69.591	-8.482	0.994
29	3.350	5.457	23.388	-68.849	-2.423	0.975
30	3.263	5.466	23.316	-68.117	3.571	0.956
31	3.175	5.475	23.245	-67.393	9.502	0.938
32	3.088	5.485	23.175	-66.677	15.369	0.919
33	3.000	5.494	15.946	-68.057	21.175	0.900
34	2.833	5.494	15.950	-67.038	32.348	0.900
35	2.667	5.494	15.950	-65.705	43.299	0.900
36	2.500	5.494	15.950	-64.372	54.027	0.900
37	2.333	5.494	15.950	-63.039	64.534	0.900
38	2.167	5.494	15.950	-61.706	74.818	0.900
39	2.000	5.494	15.950	-60.373	84.880	0.900
40	1.833	5.494	15.950	-37.185	91.077	0.900
41	1.667	5.494	15.950	-35.852	97.053	0.900
42	1.500	5.494	15.950	-34.519	102.806	0.900
43	1.333	5.494	15.950	-33.186	108.337	0.900
44	1.167	5.494	15.950	-31.853	113.645	0.900
45	1.000	5.494	15.950	-30.520	118.732	0.900
46	0.833	5.494	15.950	-29.187	123.596	0.900
47	0.667	5.494	15.950	-27.854	128.239	0.900
48	0.500	5.494	15.950	-26.521	132.659	0.900
49	0.333	5.494	15.950	-3.333	133.214	0.900
50	0.167	5.494	15.950	-2.000	133.547	0.900
51	0.000	5.494	15.950	-0.667	133.658	0.900

Reacciones : R = 0.11817E+03 M = -.65036E+02 H = -.10364E+02
 Flecha en clave v = 0.52175E-02m, Giro en base θ = -.13691E-02 rad
 Longitud del semiarco = 9.752m, Longitud de transporte = 7.039m

LOSA DE CIMENTACION SOBRE TERRENO ELASTICO

X (m)	W (mm)	GIRO (1000xrad)	FLECTOR (txm/m)	CORTANTE (t/m)	REACCION (t/m ²)
4.400	6.575	-1.369	65.036	118.173	52.604
3.960	5.954	-1.440	17.552	98.025	47.634
3.520	5.319	-1.436	-21.553	80.099	42.552
3.080	4.700	-1.369	-53.260	64.388	37.600
2.640	4.122	-1.252	-78.525	50.791	32.973
2.200	3.604	-1.096	-98.240	39.128	28.830
1.760	3.161	-0.910	-113.206	29.160	25.292
1.320	2.807	-0.701	-124.107	20.597	22.452
0.880	2.547	-0.476	-131.491	13.117	20.378
0.440	2.390	-0.240	-135.758	6.373	19.116
0.000	2.337	-0.000	-137.154	-0.000	18.693

ARMADURAS EN EL ARCO
 =====

SEC	X (m)	Y (m)	Ainterior (cm ² /m)	Aexterior (cm ² /m)	Acortante (cm ² /m)
1	4.400	0.000	6.000	9.361	0.000
2	4.400	0.334	6.000	8.850	0.000
3	4.400	0.668	6.000	8.269	0.000
4	4.400	1.002	6.000	7.973	0.000
5	4.400	1.336	6.000	7.963	0.000
6	4.400	1.670	6.000	8.222	0.000
7	4.400	2.004	6.000	8.712	0.000
8	4.400	2.338	6.000	9.382	0.000
9	4.400	2.672	6.000	10.170	0.000
10	4.400	3.006	6.000	11.010	0.000
11	4.400	3.340	6.000	11.646	0.000
12	4.400	3.674	6.000	13.206	0.000
13	4.400	4.008	6.000	14.917	0.000
14	4.400	4.342	6.000	16.760	0.000
15	4.400	4.676	6.000	18.717	0.000
16	4.400	5.010	6.000	20.771	0.000
17	4.400	5.344	9.000	18.189	5.989
18	4.313	5.353	8.859	17.006	6.124
19	4.225	5.363	8.719	16.038	6.318
20	4.137	5.372	8.578	14.809	6.521
21	4.050	5.381	8.438	13.429	6.733
22	3.963	5.391	8.297	11.881	6.955
23	3.875	5.400	8.156	10.143	7.187
24	3.787	5.410	8.016	8.195	7.430
25	3.700	5.419	7.875	7.875	7.684
26	3.612	5.428	7.734	7.734	7.951
27	3.525	5.438	7.594	7.594	8.230
28	3.438	5.447	7.453	7.453	2.431
29	3.350	5.457	7.313	7.313	2.614
30	3.263	5.466	7.172	7.172	2.808
31	3.175	5.475	7.031	7.031	3.012
32	3.088	5.485	6.891	6.891	3.228
33	3.000	5.494	6.750	6.750	4.105
34	2.833	5.494	9.096	6.750	3.788
35	2.667	5.494	11.789	6.750	3.373
36	2.500	5.494	13.862	6.750	2.958
37	2.333	5.494	17.030	6.750	2.543
38	2.167	5.494	20.163	6.750	2.128
39	2.000	5.494	23.261	6.750	1.713
40	1.833	5.494	25.187	6.750	0.000
41	1.667	5.494	27.056	6.750	0.000
42	1.500	5.494	28.867	6.750	0.000
43	1.333	5.494	30.621	6.750	0.000
44	1.167	5.494	32.315	6.750	0.000
45	1.000	5.494	33.948	6.750	0.000
46	0.833	5.494	35.520	6.750	0.000
47	0.667	5.494	37.029	6.750	0.000
48	0.500	5.494	38.474	6.750	0.000
49	0.333	5.494	38.657	6.750	0.000

50	0.167	5.494	38.766	6.750	0.000
51	0.000	5.494	38.802	6.750	0.000

A R M A D U R A S E N L A L O S A
=====

SEC	X (m)	Y (m)	Ainferior (cm ² /m)	Asuperior (cm ² /m)	Acortante (cm ² /m)
1	4.400	-0.500	16.950	7.500	15.831
2	3.960	-0.500	7.500	7.500	10.221
3	3.520	-0.500	7.500	7.500	5.229
4	3.080	-0.500	7.500	14.281	0.854
5	2.640	-0.500	7.500	20.561	0.000
6	2.200	-0.500	7.500	25.907	0.000
7	1.760	-0.500	7.500	30.024	0.000
8	1.320	-0.500	7.500	33.056	0.000
9	0.880	-0.500	7.500	35.127	0.000
10	0.440	-0.500	7.500	36.330	0.000
11	0.000	-0.500	7.500	36.725	0.000

PROGRAMA ARCO

CALCULO DE GALERIAS ENTERRADAS Y PASOS INFERIORES

VERSION Nº 1 FECHA : 15/03/1989

Copyright : J.Díaz del Valle, 1989

E.T.S. de I.C.C. y P. de Santander

DATOS DEL PROYECTO DE LA GALERIA

PROYECTO : A.V.E.

REFERENCIA : PASOS INFERIOR EVN3-4.7-1

FECHA DEL CALCULO : 04-28-2000

HIPOTESIS CARGA REPARTIDA

DATOS DE LA ESTRUCTURA

NUMERO DE SEGMENTOS = 50
 SALTO = 1

TIPO DE GEOMETRIA :

TIPO 0 : POLIGONAL ARBITRARIA DADA POR COORDENADAS
 TIPO 1 : ARCO CIRCULAR DEFINIDO POR: f,a
 TIPO 2 : PARABOLA CON $y'(0)=0$, DEFINIDA POR: f,a
 TIPO 3 : PARABOLA CON $y'(0)=0$, DEFINIDA POR: a,c,b
 TIPO 4 : PARABOLA CON $y'(0)<>0$ DEFINIDA POR: f,a,c,b
 TIPO 5 : CUBICA CON $y'(0)=0$ DEFINIDA POR: f,a,c,b
 TIPO 6 : PORTICO CIRCULAR DEFINIDO POR: f,a,H,B
 TIPO 7 : CURVA GENERAL DEFINIDA POR PUNTOS DE PASO
 TIPO 8 : GEOMETRIA ANTERIOR ALMACENADA EN FICHERO DE DATOS

2a = CUERDA , f = FLECHA , (c,b) = COORDENADAS DE UN PUNTO

TIPO = 9

CUERDA 2a = 8.800 m
 ALTURA H = 5.494 m

TIPO DE CONDICIONES DE APOYO :

TIPO 0 : TRIARTICULADO (EN APOYOS Y CLAVE)
 TIPO 1 : BIARTICULADO (EN APOYOS)
 TIPO 2 : EMPOTRADO EN EXTREMOS
 TIPO 3 : EMPOTRADO EN EXTREMOS CON ROTULA EN CLAVE
 TIPO 4 : EMPOTRADO ELASTICAMENTE
 TIPO 5 : ATIRANTADO EN EXTREMOS

TIPO = 2

PESO ESPECIFICO DEL HORMIGON = 2.50 t/m³
 RESISTENCIA CARACTERISTICA DEL HORMIGON fck = 250 Kp/cm²
 COEFICIENTE DE MINORACION DE fck γ_c = 1.50
 LIMITE ELASTICO CARACTERISTICO DEL ACERO fyk = 5100 Kp/cm²
 COEFICIENTE DE MINORACION DE fyk γ_s = 1.15
 RECUBRIMIENTO DE LAS ARMADURAS c = 5 cm
 SE DISPONEN ARMADURAS MINIMAS DE FLEXOCOMPRESION

ALTURA DE TIERRAS DESDE LA BASE = 5.94 m
 PESO ESPECIFICO DE LAS TIERRAS = 2.00 t/m³

COEFICIENTE EMPUJE TIERRAS = 0.50
 SOBRECARGA q = 8.02 t/m²

CARGAS CONCENTRADAS EN LOS NUDOS : NINGUNA

COEFICIENTE DE MAYORACION DE LAS CARGAS γ_f = 1.50

GALIBO GX = 8.00 m
 GALIBO GY = 4.61 m

EXISTE LOSA DE CIMENTACION :

SOBRECARGA DE LA LOSA DE CIMENTACION Q = 0.40 t/m²
 CANTO DE LA LOSA DE CIMENTACION t = 1.00 m
 COEFICIENTE DE BALASTO DEL TERRENO K = 8000 t/m³

ESFUERZOS EN EL ARCO =====

SEC	X (m)	Y (m)	AXIL (t/m)	CORTANTE (t/m)	FLECTOR (txm/m)	ESPESOR (m)
1	4.400	0.000	91.086	-13.807	-54.006	0.800
2	4.400	0.334	90.585	-12.347	-49.882	0.800
3	4.400	0.668	89.583	-9.538	-46.696	0.800
4	4.400	1.002	88.581	-6.897	-44.393	0.800
5	4.400	1.336	87.579	-4.423	-42.915	0.800
6	4.400	1.670	86.577	-2.116	-42.208	0.800
7	4.400	2.004	85.575	0.023	-42.216	0.800
8	4.400	2.338	84.573	1.995	-42.882	0.800
9	4.400	2.672	83.571	3.799	-44.151	0.800
10	4.400	3.006	82.569	5.437	-45.967	0.800
11	4.400	3.340	81.567	6.907	-48.274	0.800
12	4.400	3.674	80.565	8.209	-51.016	0.800
13	4.400	4.008	79.563	9.345	-54.137	0.800
14	4.400	4.342	78.561	10.312	-57.581	0.800
15	4.400	4.676	77.559	11.113	-61.293	0.800
16	4.400	5.010	76.557	11.746	-65.216	0.800
17	4.400	5.344	75.555	12.207	-69.295	1.200
18	4.313	5.353	74.553	12.207	-72.261	1.181
19	4.225	5.363	73.551	12.207	-75.227	1.163
20	4.138	5.372	72.549	12.207	-78.193	1.144
21	4.050	5.381	71.547	12.207	-81.159	1.125
22	3.963	5.391	70.545	12.207	-84.125	1.106
23	3.875	5.400	69.543	12.207	-87.091	1.087
24	3.788	5.410	68.541	12.207	-90.057	1.069
25	3.700	5.419	67.539	12.207	-93.023	1.050
26	3.612	5.428	66.537	12.207	-95.989	1.031
27	3.525	5.438	65.535	12.207	-98.955	1.013
28	3.438	5.447	64.533	12.207	-101.921	0.994
29	3.350	5.457	63.531	12.207	-104.887	0.975

30	3.263	5.466	18.316	-53.771	2.687	0.956
31	3.175	5.475	18.164	-52.286	7.289	0.938
32	3.088	5.485	18.013	-50.810	11.760	0.919
33	3.000	5.494	12.504	-50.964	16.102	0.900
34	2.833	5.494	12.507	-48.834	24.241	0.900
35	2.667	5.494	12.507	-46.043	31.915	0.900
36	2.500	5.494	12.507	-43.253	39.124	0.900
37	2.333	5.494	12.507	-40.462	45.867	0.900
38	2.167	5.494	12.507	-37.672	52.146	0.900
39	2.000	5.494	12.507	-34.881	57.959	0.900
40	1.833	5.494	12.507	-32.091	63.308	0.900
41	1.667	5.494	12.507	-29.300	68.191	0.900
42	1.500	5.494	12.507	-26.510	72.610	0.900
43	1.333	5.494	12.507	-23.719	76.563	0.900
44	1.167	5.494	12.507	-20.929	80.051	0.900
45	1.000	5.494	12.507	-18.138	83.074	0.900
46	0.833	5.494	12.507	-15.348	85.632	0.900
47	0.667	5.494	12.507	-12.557	87.725	0.900
48	0.500	5.494	12.507	-9.767	89.353	0.900
49	0.333	5.494	12.507	-6.976	90.515	0.900
50	0.167	5.494	12.507	-4.186	91.213	0.900
51	0.000	5.494	12.507	-1.395	91.445	0.900

Reacciones : R = 0.91086E+02 M = -.54006E+02 H = -.13807E+02
 Flecha en clave v = 0.36310E-02m, Giro en base θ = -.10003E-02 rad
 Longitud del semiarco = 9.752m, Longitud de transporte = 7.039m

LOSA DE CIMENTACION SOBRE TERRENO ELASTICO =====

X (m)	W (mm)	GIRO (1000xrad)	FLECTOR (txm/m)	CORTANTE (t/m)	REACCION (t/m ²)
4.400	5.118	-1.000	54.006	91.086	40.942
3.960	4.662	-1.062	17.354	75.780	37.293
3.520	4.192	-1.065	-12.921	62.112	33.534
3.080	3.731	-1.020	-37.546	50.087	29.852
2.640	3.300	-0.936	-57.229	39.637	26.399
2.200	2.912	-0.821	-72.638	30.632	23.299
1.760	2.581	-0.683	-84.371	22.896	20.646
1.320	2.314	-0.527	-92.941	16.215	18.513
0.880	2.119	-0.358	-98.760	10.348	16.954
0.440	2.001	-0.181	-102.129	5.034	16.004
0.000	1.961	0.000	-103.232	-0.000	15.686

ARMADURAS EN EL ARCO =====

SEC	X (m)	Y (m)	Ainterior (cm ² /m)	Aexterior (cm ² /m)	Acortante (cm ² /m)
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1	4.400	0.000	6.000	8.514	0.000
2	4.400	0.334	6.000	7.536	0.000
3	4.400	0.668	6.000	6.477	0.000
4	4.400	1.002	6.000	6.000	0.000
5	4.400	1.336	6.000	6.000	0.000
6	4.400	1.670	6.000	6.000	0.000
7	4.400	2.004	6.000	6.000	0.000
8	4.400	2.338	6.000	6.000	0.000
9	4.400	2.672	6.000	6.247	0.000
10	4.400	3.006	6.000	7.054	0.000
11	4.400	3.340	6.000	7.982	0.000
12	4.400	3.674	6.000	8.977	0.000
13	4.400	4.008	6.000	9.979	0.000
14	4.400	4.342	6.000	10.937	0.000
15	4.400	4.676	6.000	11.588	0.000
16	4.400	5.010	6.000	13.116	0.000
17	4.400	5.344	9.000	14.375	0.000
18	4.313	5.353	8.859	13.341	0.000
19	4.225	5.363	8.719	12.268	0.000
20	4.137	5.372	8.578	11.134	0.000
21	4.050	5.381	8.438	9.935	0.000
22	3.963	5.391	8.297	8.664	0.000
23	3.875	5.400	8.156	8.156	0.000
24	3.787	5.410	8.016	8.016	0.000
25	3.700	5.419	7.875	7.875	0.000
26	3.612	5.428	7.734	7.734	0.000
27	3.525	5.438	7.594	7.594	0.000
28	3.438	5.447	7.453	7.453	0.000
29	3.350	5.457	7.313	7.313	0.000
30	3.263	5.466	7.172	7.172	0.000
31	3.175	5.475	7.031	7.031	0.000
32	3.088	5.485	6.891	6.891	0.000
33	3.000	5.494	6.750	6.750	0.000
34	2.833	5.494	7.087	6.750	0.000
35	2.667	5.494	9.366	6.750	0.000
36	2.500	5.494	11.176	6.750	0.000
37	2.333	5.494	12.575	6.750	0.000
38	2.167	5.494	13.705	6.750	0.000
39	2.000	5.494	15.449	6.750	0.000
40	1.833	5.494	17.062	6.750	0.000
41	1.667	5.494	18.542	6.750	0.000
42	1.500	5.494	19.887	6.750	0.000
43	1.333	5.494	21.095	6.750	0.000
44	1.167	5.494	22.166	6.750	0.000
45	1.000	5.494	23.097	6.750	0.000
46	0.833	5.494	23.888	6.750	0.000
47	0.667	5.494	24.536	6.750	0.000
48	0.500	5.494	25.041	6.750	0.000
49	0.333	5.494	25.403	6.750	0.000
50	0.167	5.494	25.620	6.750	0.000
51	0.000	5.494	25.692	6.750	0.000

ARMADURAS EN LA LOSA
=====

SEC	X (m)	Y (m)	Ainferior (cm ² /m)	Asuperior (cm ² /m)	Acorante (cm ² /m)
1	4.400	-0.500	14.281	7.500	8.288
2	3.960	-0.500	7.500	7.500	4.026
3	3.520	-0.500	7.500	7.500	0.220
4	3.080	-0.500	7.500	11.416	0.000
5	2.640	-0.500	7.500	14.876	0.000
6	2.200	-0.500	7.500	18.981	0.000
7	1.760	-0.500	7.500	22.138	0.000
8	1.320	-0.500	7.500	24.462	0.000
9	0.880	-0.500	7.500	26.049	0.000
10	0.440	-0.500	7.500	26.972	0.000
11	0.000	-0.500	7.500	27.274	0.000

PROGRAMA DE CALCULOS DE MUROS

SEGUN TEORIA DE COULOMB

Num.de capas de terreno detras = 1
Num.de capas de terreno delante = 0

TERRENO TRASERO

CAPA	PROFUND.	ANG.ROZ.INT.	ROZ.TIER.-MURO	DENSIDAD	ANG.TALUD	COHESION
Num.	(mts)	(sexag.)	(sexag.)	(t/m3)	(sexag.)	(t/m2)
1	0.00	30.0	0.0	2.00	0.0	0.00

SOBRECARGAS UNIF.SOBRE EL TERRENO

Sobrecarga unif. DETRAS = 3.5 (t/m2)
Distancia al Muro = 1.5 (mts)
Sobrecarga unif. DELANTE= 0 (t/m2)
Distancia al Muro = 0 (mts)

ALTURA DEL MURO = 5.944 (mts)
Peso Especif.del MURO = 2.5 (t/m3)

ESCALONES TRASEROS

Escalon	Profund.	Anchura	Tipo
Num.	(mts)	(mts)	
1	0.55	0.30	1
2	3.25	0.30	1

ESCALONES DELANTEROS

Escalon	Profund.	Anchura	Tipo	Carg.Vert.	Distanc.	Carg.Horiz.
Num.	(mts)	(mts)		(t/ml)	(mts)	(t/ml)
Canto	0.00	0.30	1	0.00	0.00	0.00

PESO DE TIERRAS + SOBR.(sin P.agua)

NUDO	PROFUND.	CARG. TRAS.	CARG. DELAN.
1	0.00	0.00	0.00
2	0.55	1.10	0.00
3	0.87	1.73	0.00
4	2.60	8.70	0.00
5	3.25	10.00	0.00
6	5.94	15.39	0.00

PRESIONES SOBRE EL MURO

HORIZONTALES VERTICALES

BARRA	SUP.T.	INF.T.	SUP.D.	INF.D.	SUP.T.	INF.T.	SUP.D.	INF.D.
1	0.000	0.367	0.000	0.000	0.000	0.000	0.000	0.000
2	0.367	0.577	0.000	0.000	0.000	0.000	0.000	0.000
3	0.577	2.899	0.000	0.000	0.000	0.000	0.000	0.000
4	2.899	3.333	0.000	0.000	0.000	0.000	0.000	0.000
5	3.333	5.129	0.000	0.000	0.000	0.000	0.000	0.000

ESFUERZOS EN BARRAS

BARRA	NUDO	PROFUND.	AXIL	CORTANTE	FLECTOR
1	1	0.00	-0.00	-0.00	-0.00
1	2		0.41	0.10	0.02
2	2	0.55	0.41	0.10	0.02
2	3		1.22	0.25	0.08
3	3	0.87	1.22	0.25	0.08
3	4		3.81	3.26	2.54
4	4	2.60	3.81	3.26	2.54
4	5		4.79	5.29	5.32
5	5	3.25	4.79	5.29	5.32
5	6		13.85	16.69	33.66

REACCIONES SOBRE LOS APOYOS

NUDO	PROFUND.	HORIZONT.	VERTICAL	MOMENTO
6	5.94	16.69	13.85	33.66

SOL. * LONGITUD * COEF.SEGUR. * TENS.EXTREMAS *
NUM.: * TACON ZARPA * VUELCO DESLIZ. * MAXIMA MINIMA *
1 5.80 0.00 7.55 3.79 24.98 10.80

2	5.30	0.10	6.68	3.51	24.94	10.35
3	4.80	0.20	5.85	3.24	25.00	9.74
4	4.40	0.30	5.26	3.02	24.87	9.26
5	4.00	0.40	4.70	2.80	24.83	8.62
6	3.60	0.50	4.17	2.58	24.92	7.78
7	3.30	0.60	3.83	2.42	24.73	7.20
8	3.00	0.70	3.49	2.26	24.63	6.47
9	2.70	0.80	3.17	2.10	24.66	5.52
10	2.40	0.90	2.85	1.94	24.86	4.33
11	2.20	1.00	2.69	1.83	24.55	3.72
12	2.00	1.10	2.52	1.73	24.34	2.98
13	1.80	1.20	2.35	1.62	24.24	2.07
14	1.60	1.30	2.19	1.52	24.27	0.98
15	1.50	1.90	2.59	1.51	16.91	5.27
16	1.40	2.60	3.06	1.51	11.48	7.97
17	1.30	3.30	3.51	1.50	9.22	8.09
18	1.20	4.00	3.95	1.50	9.67	5.93

DIMENSIONES DE LA ZAPATA ELEGIDA

	LONGITUD	CANTO
TACON	1.60	1.00
ZARPA	1.30	1.00

ESFUERZOS EN ZAPATA

SECCION	TIPO	AXIL	MOMENTO	CORTANTE	PUNZONAM.	CORT.ADHEREN.
Inf.MURO		13.85	33.66	16.69		
Zarpa	I		19.39	15.87		24.93
Tacon	I		-19.97	-15.14		-18.03
Base Zapata		47.97	28.02	22.15		

CONDICIONES DE SEGURIDAD

TENSIONES EFECTIVAS

Maxima = 24.27(t/m2)
Minima = 0.98(t/m2)
Cobaricentrica = 18.23 (t/m2)
Excent.Result.(M/N)= 0.58 (m)
Dist.Result.Borde= 1.32 (m)

VUELCO

Momento Estabil. = 116.33 (mt/m)
Momento Volcador = 53.20 (mt/m)
Coef.Seguridad = 2.19

DESLIZAMIENTO

Roz.Base muro-Tierras (g)= 35
Comp.Rozamiento = 33.59 (t/m)
Fuerza Deslizante = 22.15 (t/m)
Coef.Seguridad = 1.52

CALCULO DE ARMADURAS EN SECCIONES
=====

CARACTERISTICAS DE LOS MATERIALES

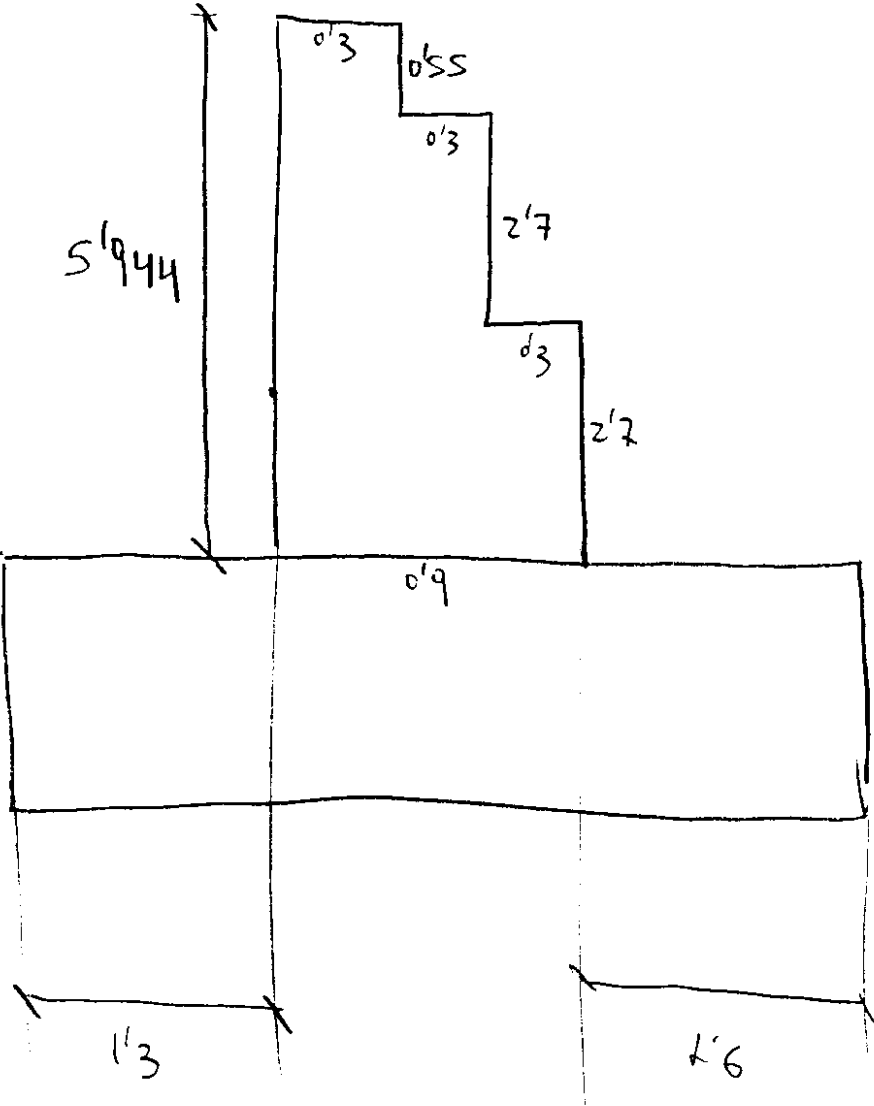
Resist.Caract.HORMIGON en Zapata = 250 (kg/cm2)
Resist.Caract.HORMIGON en Alzado = 250 (kg/cm2)
Resistenc.Caract.ACERO = 5100 (kg/cm2)
Coef.Minorac.HORMIGON = 1.5
Coef.Minorac.ACERO = 1.15
Coef.Mayoracion CARGAS = 1.6
Recubr.Armad.Zapata = 4 (cms)
Recubr.Armad.Alzado = 3 (cms)

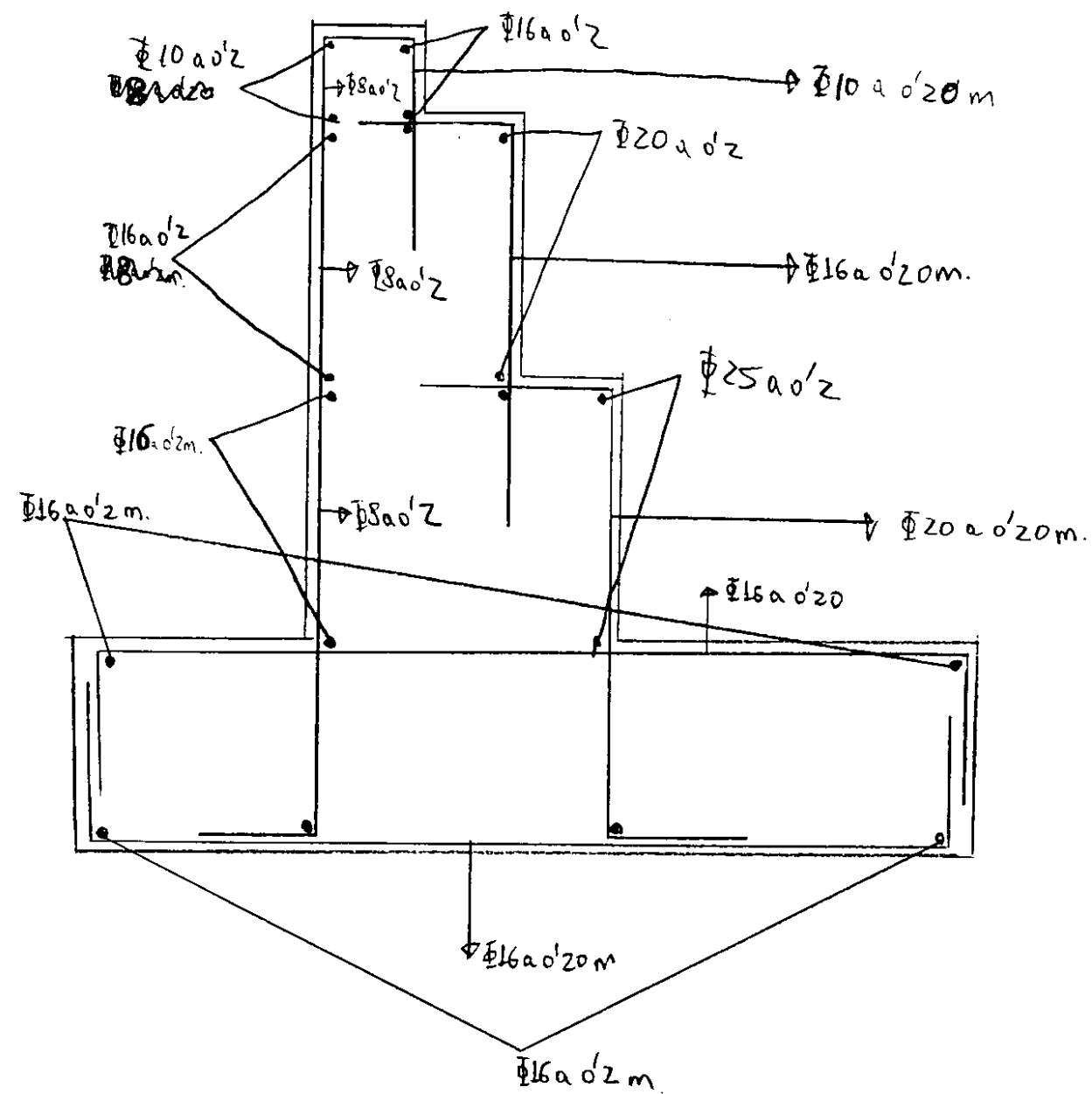
ALZADO

Prof. (m)	Espe (m)	Axil C. (t/m)	Flect.C. (mt/m)	AR.TRA (cm2/m)	AR.DEL. (cm2/m)	Corr.C. (t/m)	CORT.H. (t/m)
0.55	0.30	0.86	0.63	0.01	0.01	0.16	17.43
0.87	0.60	1.95	0.14	0.02	0.02	0.40	36.79
2.60	0.60	6.10	4.07	8.57	0.08	5.22	36.79
3.25	0.60	7.67	8.51	8.57	0.10	8.47	36.79
5.94	0.90	22.17	53.86	13.68	0.28	26.71	56.16

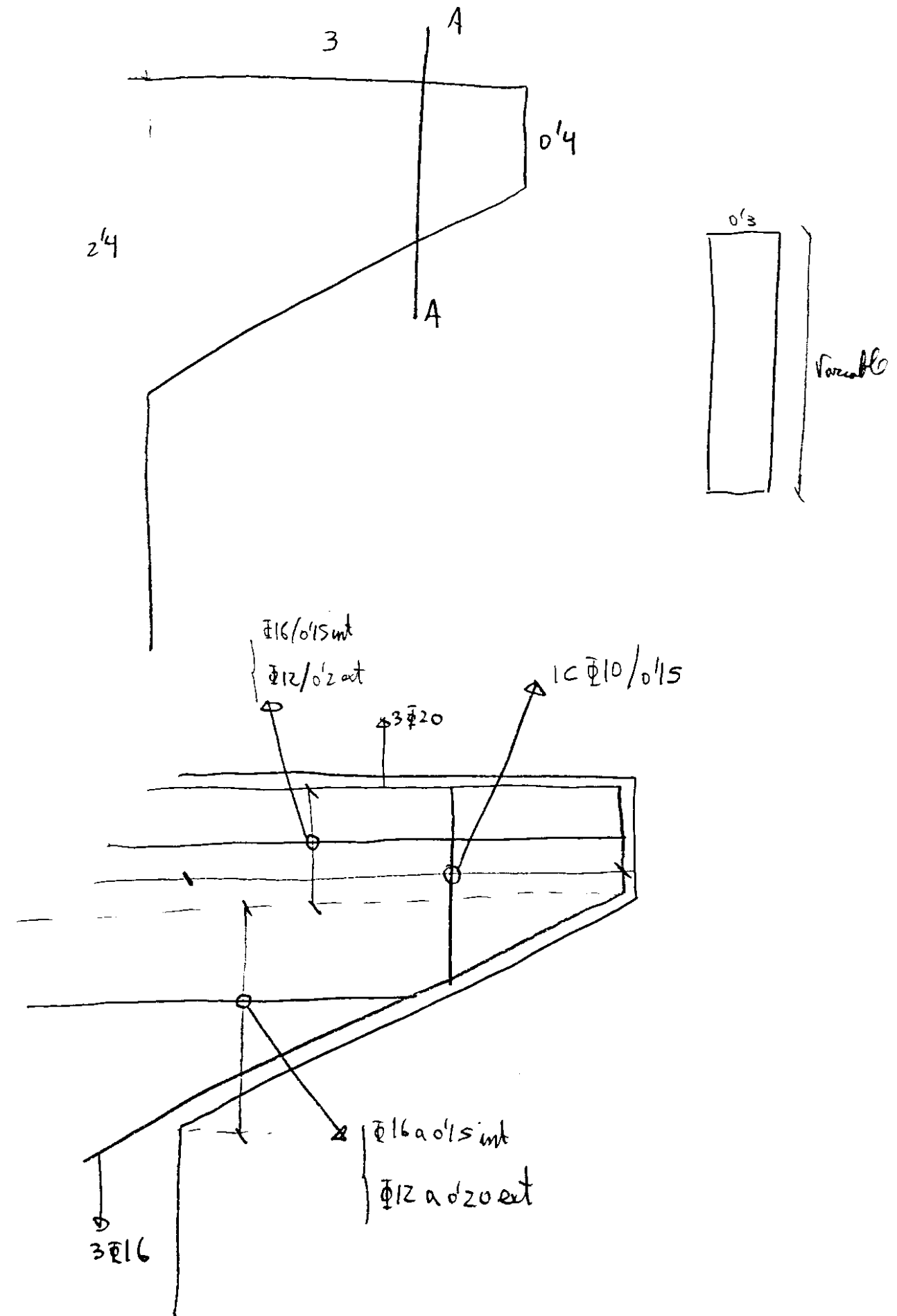
ZAPATA

Secc	Fle.C. (mt/m)	Canto (m)	AR.SLP. (cm2/m)	AR.IAF. (cm2/m)	Corr.C. (t/m)	Canto (m)	COR.H. (t/m)	Pun.C. (t/m)	Canto (m)	PLN.H. (t/m)
Zarpa	31.03	1.00	0.60	9.24	25.40	1.00	123.94			
Tacot	31.95	1.00	9.46	0.00	24.23	1.00	123.94			





$$\begin{aligned}
 & \left. \begin{aligned}
 & 0'3(100) \cdot 100 \cdot 0'9 \cdot 10^{-3} = 2'7 \frac{\text{cm}^2}{\text{m}} \Rightarrow \\
 & 0'6(100) \cdot 100 \cdot 0'9 \cdot 10^{-3} = 5'4 \frac{\text{cm}^2}{\text{m}} \Rightarrow 1'62 \frac{\text{cm}^2}{\text{m}} \\
 & 0'9(100) \cdot 100 \cdot 0'9 \cdot 10^{-3} = 8'1 \frac{\text{cm}^2}{\text{m}} \Rightarrow 2'43 \frac{\text{cm}^2}{\text{m}}
 \end{aligned} \right\} \\
 & \left. \begin{aligned}
 & 0'3 \cdot 100 \cdot 0'55 \cdot 100 \cdot 3'2 \cdot 10^{-3} = 5'28 \frac{\text{cm}^2}{\text{m}} \Rightarrow 1'6 \frac{\text{cm}^2}{\text{m}} \mid \theta = 3'2 \\
 & 0'6 \cdot 100 \cdot 100 \cdot 3'2 \cdot 10^{-3} = 19'2 \frac{\text{cm}^2}{\text{m}} \mid 1'28 \frac{\text{cm}^2}{\text{m}} \\
 & 0'9 \cdot 100 \cdot 100 \cdot 3'2 \cdot 10^{-3} = 28'8 \frac{\text{cm}^2}{\text{m}} \mid 1'92 \frac{\text{cm}^2}{\text{m}}
 \end{aligned} \right\} 0'6 \cdot 1'4 \frac{\text{cm}^2}{\text{m}}
 \end{aligned}$$



MEMORIA

Para el cálculo de este paso inferior (EVN3-4.7-2), se han empleado dos programas de cálculo:

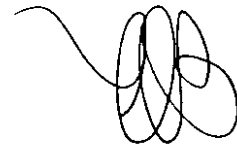
- PROGRAMA ARCO, de J. Díaz del Valle
- PROGRAMA DE CÁLCULO DE MUROS, según teoría de Coulomb.

Mediante el programa ARCO, se obtienen los esfuerzos y armaduras del marco (tanto en losa superior, como en losa inferior y en hastiales).

A través del programa de CÁLCULO DE MUROS, se determina la geometría y el armado de las aletas del paso inferior.

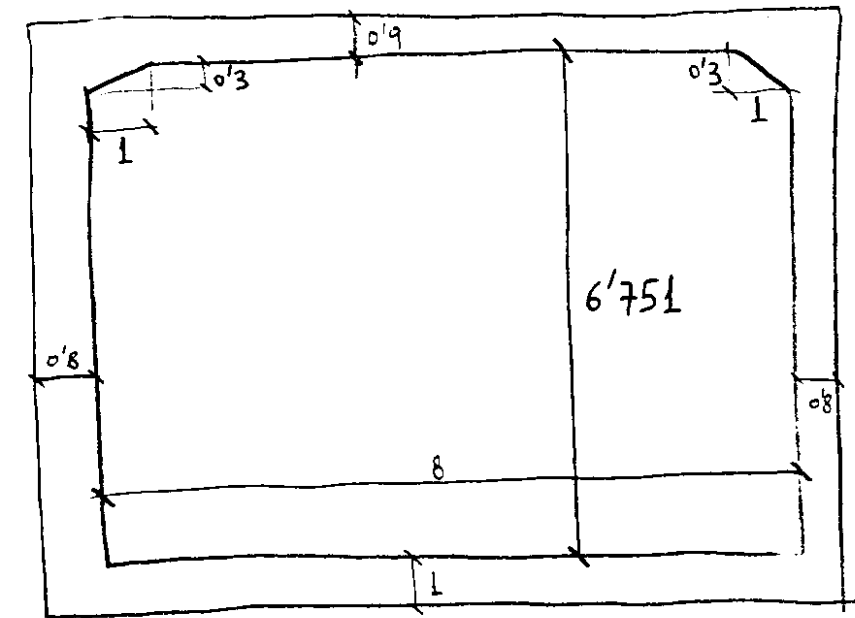
Para definir las hipótesis de carga así como el coeficiente de impacto se han seguido las pautas marcadas en el proyecto.

El ingeniero autor del cálculo:



Gonzalo Rodríguez Heredia
OFICINA TÉCNICA

GEOMETRIA PASO INFERIOR EVN3-4.7-2

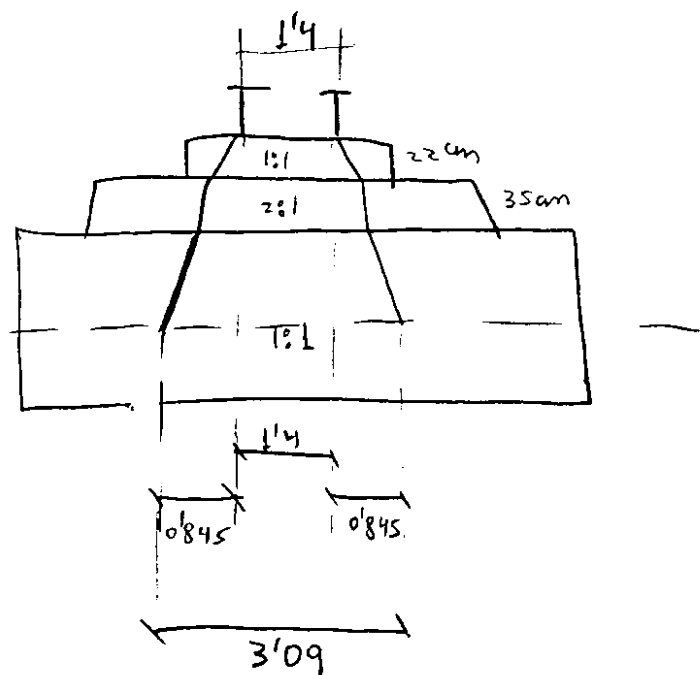


COEFICIENTE IMPACTO

Se toma un coeficiente de impacto $\phi = 1'5$

SOBRECARGAS

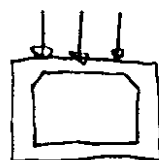
a) **Ancho eficaz**



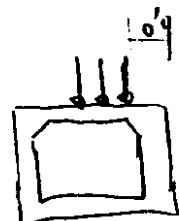
b) **Tren tipo A**

• Cargas puntuales a 1.5m. : $30T \quad 30T \quad 30T$

b-1 : Carga sobre eje simétrico



b-2 : Carga a canto útil apoyo

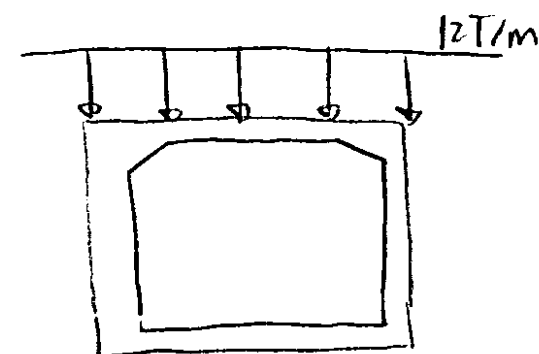


Estos 30T son por 3.09 m. $\Rightarrow 9.71 T/m$

$\Rightarrow$ Con coeficiente de impacto : $q_A = 14.57 T/m$

c) **Tren tipo B**

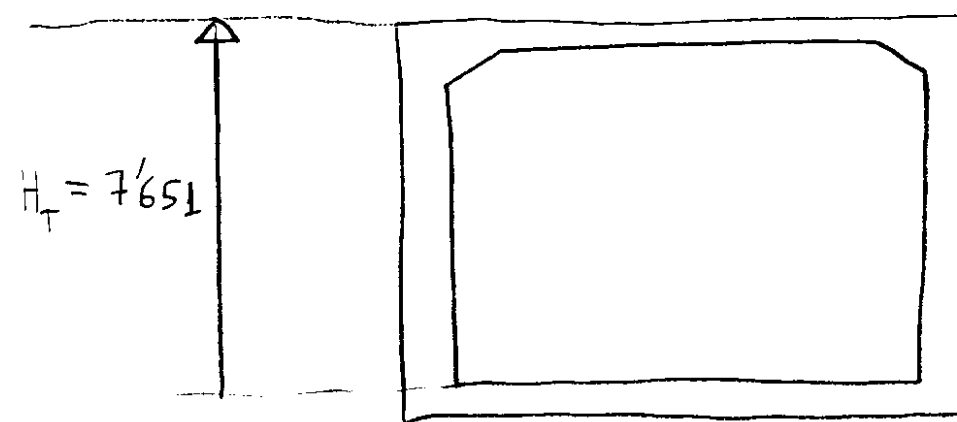
Carga repartida de $12 T/m$



$$q_B = \frac{12}{3.09} = 3.89 T/m^2$$

Con coeficiente de impacto : $q_B = 5.83 T/m^2$

d) **Tierras**



e) **PP**

$$PP_{\text{ruel}} + PP_{\text{traviesa}} + PP_{\text{bolasto}} = 2.19 T/m^2$$

PROGRAMA ARCO

CALCULO DE GALERIAS ENTERRADAS Y PASOS INFERIORES

VERSION Nº 1 FECHA : 15/03/1989

Copyright : J.Díaz del Valle, 1989

E.T.S. de I.C.C. y P. de Santander

DATOS DEL PROYECTO DE LA GALERIA

PROYECTO : A.V.E.

REFERENCIA : PASO INFERIOR EVN3-4.7-1

FECHA DEL CALCULO : 04-27-2000

HIPOTESIS CARRO CENTRADO

DATOS DE LA ESTRUCTURA

NUMERO DE SEGMENTOS = 50
 SALTO = 1

TIPO DE GEOMETRIA :

TIPO 0 : POLIGONAL ARBITRARIA DADA POR COORDENADAS
 TIPO 1 : ARCO CIRCULAR DEFINIDO POR: f,a
 TIPO 2 : PARABOLA CON $y'(0)=0$, DEFINIDA POR: f,a
 TIPO 3 : PARABOLA CON $y'(0)=0$, DEFINIDA POR: a,c,b
 TIPO 4 : PARABOLA CON $y'(0) \neq 0$ DEFINIDA POR: f,a,c,b
 TIPO 5 : CUBICA CON $y'(0)=0$ DEFINIDA POR: f,a,c,b
 TIPO 6 : PORTICO CIRCULAR DEFINIDO POR: f,a,H,B
 TIPO 7 : CURVA GENERAL DEFINIDA POR PUNTOS DE PASO
 TIPO 8 : GEOMETRIA ANTERIOR ALMACENADA EN FICHERO DE DATOS

2a = CUERDA , f = FLECHA , (c,b) = COORDENADAS DE UN PUNTO

TIPO = 9

CUERDA 2a = 8.800 m
 ALTURA H = 7.201 m

TIPO DE CONDICIONES DE APOYO :

TIPO 0 : TRIARTICULADO (EN APOYOS Y CLAVE)
 TIPO 1 : BIARTICULADO (EN APOYOS)
 TIPO 2 : EMPOTRADO EN EXTREMOS
 TIPO 3 : EMPOTRADO EN EXTREMOS CON ROTULA EN CLAVE
 TIPO 4 : EMPOTRADO ELASTICAMENTE
 TIPO 5 : ATIRANTADO EN EXTREMOS

TIPO = 2

PESO ESPECIFICO DEL HORMIGON = 2.50 t/m³
 RESISTENCIA CARACTERISTICA DEL HORMIGON f_{ck} = 250 Kp/cm²
 COEFICIENTE DE MINORACION DE f_{ck} γ_c = 1.50
 LIMITE ELASTICO CARACTERISTICO DEL ACERO f_{yk} = 5100 Kp/cm²
 COEFICIENTE DE MINORACION DE f_{yk} γ_s = 1.15
 RECUBRIMIENTO DE LAS ARMADURAS c = 5 cm
 SE DISPONEN ARMADURAS MINIMAS DE FLEXOCOMPRESION

ALTURA DE TIERRAS DESDE LA BASE = 7.65 m
 PESO ESPECIFICO DE LAS TIERRAS = 2.00 t/m³

COEFICIENTE EMPUJE TIERRAS = 0.50
 SOBRECARGA q = 2.19 t/m²

CARGAS CONCENTRADAS EN LOS NUDOS :

NUDO = 42 . FX = 0.00 t/m . FY = 14.57 t/m . MZ = 0.00 t·m/m
 NUDO = 51 . FX = 0.00 t/m . FY = 14.57 t/m . MZ = 0.00 t·m/m

COEFICIENTE DE MAYORACION DE LAS CARGAS γ_f = 1.50

GALIBO GX = 8.00 m
 GALIBO GY = 6.18 m

EXISTE LOSA DE CIMENTACION :

SOBRECARGA DE LA LOSA DE CIMENTACION Q = 0.40 t/m²
 CANTO DE LA LOSA DE CIMENTACION t = 1.00 m
 COEFICIENTE DE BALASTO DEL TERRENO K = 8000 t/m³

ESFUERZOS EN EL ARCO
 =====

SEC	X (m)	Y (m)	AXIL (t/m)	CORTANTE (t/m)	FLECTOR (t·m/m)	ESPESOR (m)
1	4.400	0.000	90.631	-25.081	-54.966	0.800
2	4.400	0.441	89.970	-22.601	-45.006	0.800
3	4.400	0.881	88.648	-17.835	-37.147	0.800
4	4.400	1.322	87.326	-13.361	-31.259	0.800
5	4.400	1.763	86.004	-9.178	-27.214	0.800
6	4.400	2.203	84.682	-5.286	-24.885	0.800
7	4.400	2.644	83.360	-1.686	-24.142	0.800
8	4.400	3.085	82.037	1.623	-24.857	0.800
9	4.400	3.526	80.715	4.641	-26.902	0.800
10	4.400	3.966	79.393	7.367	-30.149	0.800
11	4.400	4.407	78.071	9.803	-34.469	0.800
12	4.400	4.848	76.749	11.946	-39.733	0.800
13	4.400	5.288	75.427	13.799	-45.814	0.800
14	4.400	5.729	74.105	15.360	-52.583	0.800
15	4.400	6.170	72.783	16.630	-59.912	0.800
16	4.400	6.610	71.461	17.608	-67.672	0.800
17	4.400	7.051	25.646	-67.626	-75.734	1.200
18	4.313	7.060	25.763	-66.362	-69.895	1.181
19	4.225	7.070	25.682	-65.534	-64.127	1.163
20	4.138	7.079	25.603	-64.714	-58.433	1.144
21	4.050	7.089	25.524	-63.903	-52.809	1.125
22	3.963	7.098	25.446	-63.101	-47.256	1.106
23	3.875	7.107	25.369	-62.307	-41.773	1.087
24	3.788	7.117	25.292	-61.522	-36.359	1.069
25	3.700	7.126	25.216	-60.746	-31.013	1.050
26	3.612	7.135	25.142	-59.978	-25.735	1.031
27	3.525	7.145	25.068	-59.219	-20.524	1.013

28	3.438	7.154	24.994	-58.468	-15.379	0.994
29	3.350	7.164	24.922	-57.726	-10.299	0.975
30	3.263	7.173	24.850	-56.993	-5.283	0.956
31	3.175	7.182	24.779	-56.268	-0.332	0.938
32	3.088	7.192	24.709	-55.551	4.557	0.919
33	3.000	7.201	18.657	-57.157	9.383	0.900
34	2.833	7.201	18.660	-56.136	18.739	0.900
35	2.667	7.201	18.660	-54.802	27.873	0.900
36	2.500	7.201	18.660	-53.467	36.784	0.900
37	2.333	7.201	18.660	-52.133	45.473	0.900
38	2.167	7.201	18.660	-50.798	53.939	0.900
39	2.000	7.201	18.660	-49.464	62.183	0.900
40	1.833	7.201	18.660	-48.129	70.205	0.900
41	1.667	7.201	18.660	-46.795	78.004	0.900
42	1.500	7.201	18.660	-45.460	85.580	0.900
43	1.333	7.201	18.660	-22.271	89.292	0.900
44	1.167	7.201	18.660	-20.936	92.782	0.900
45	1.000	7.201	18.660	-19.602	96.049	0.900
46	0.833	7.201	18.660	-18.267	99.093	0.900
47	0.667	7.201	18.660	-16.933	101.915	0.900
48	0.500	7.201	18.660	-15.598	104.515	0.900
49	0.333	7.201	18.660	-14.264	106.892	0.900
50	0.167	7.201	18.660	-12.929	109.047	0.900
51	0.000	7.201	18.660	-11.595	110.980	0.900

Reacciones : R = 0.90631E+02 M = -.54966E+02 H = -.25081E+02
 Flecha en clave v = 0.41426E-02m, Giro en base θ = -.97785E-03 rad
 Longitud del semiarco = 11.459m, Longitud de transporte = 8.439m

LOSA DE CIMENTACION SOBRE TERRENO ELASTICO
 =====

X (m)	W (mm)	GIRO (1000xrad)	FLECTOR (t·m/m)	CORTANTE (t/m)	REACCION (t/m ²)
4.400	5.071	-0.978	54.966	90.631	40.568
3.960	4.624	-1.041	18.481	75.473	36.995
3.520	4.163	-1.047	-11.686	61.920	33.305
3.080	3.711	-1.004	-36.246	49.982	29.684
2.640	3.286	-0.922	-55.898	39.593	26.285
2.200	2.904	-0.810	-71.297	30.629	23.229
1.760	2.577	-0.674	-83.034	22.915	20.613
1.320	2.314	-0.520	-91.615	16.242	18.509
0.880	2.121	-0.353	-97.445	10.372	16.970
0.440	2.004	-0.178	-100.822	5.048	16.033
0.000	1.965	0.000	-101.928	0.000	15.718

ARMADURAS EN EL ARCO
 =====

SEC	X (m)	Y (m)	Ainterior (cm ² /m)	Aexterior (cm ² /m)	Acortante (cm ² /m)
1	4.400	0.000	6.000	8.850	0.000
2	4.400	0.441	6.000	6.000	0.000
3	4.400	0.881	6.000	6.000	0.000
4	4.400	1.322	6.000	6.000	0.000
5	4.400	1.763	6.000	6.000	0.000
6	4.400	2.203	6.000	6.000	0.000
7	4.400	2.644	6.000	6.000	0.000
8	4.400	3.085	6.000	6.000	0.000
9	4.400	3.526	6.000	6.000	0.000
10	4.400	3.966	6.000	6.000	0.000
11	4.400	4.407	6.000	6.000	0.000
12	4.400	4.848	6.000	6.000	0.000
13	4.400	5.288	6.000	7.825	0.000
14	4.400	5.729	6.000	10.031	0.000
15	4.400	6.170	6.000	11.629	0.000
16	4.400	6.610	6.000	14.573	0.000
17	4.400	7.051	9.000	14.980	0.000
18	4.313	7.060	8.859	14.089	0.000
19	4.225	7.070	8.719	13.164	0.000
20	4.137	7.079	8.578	12.181	0.000
21	4.050	7.089	8.438	11.134	0.000
22	3.963	7.098	8.297	10.017	0.000
23	3.875	7.107	8.156	8.822	0.000
24	3.787	7.117	8.016	8.016	0.000
25	3.700	7.126	7.875	7.875	0.000
26	3.612	7.135	7.734	7.734	0.000
27	3.525	7.145	7.594	7.594	0.000
28	3.438	7.154	7.453	7.453	0.000
29	3.350	7.163	7.313	7.313	0.000
30	3.263	7.173	7.172	7.172	0.000
31	3.175	7.182	7.031	7.031	0.000
32	3.088	7.192	6.891	6.891	0.000
33	3.000	7.201	6.750	6.750	0.713
34	2.833	7.201	6.750	6.750	0.395
35	2.667	7.201	7.433	6.750	0.000
36	2.500	7.201	9.996	6.750	0.000
37	2.333	7.201	12.016	6.750	0.000
38	2.167	7.201	13.515	6.750	0.000
39	2.000	7.201	16.001	6.750	0.000
40	1.833	7.201	18.439	6.750	0.000
41	1.667	7.201	20.828	6.750	0.000
42	1.500	7.201	23.169	6.750	0.000
43	1.333	7.201	24.323	6.750	0.000
44	1.167	7.201	25.412	6.750	0.000
45	1.000	7.201	26.435	6.750	0.000
46	0.833	7.201	27.393	6.750	0.000
47	0.667	7.201	28.283	6.750	0.000
48	0.500	7.201	29.106	6.750	0.000
49	0.333	7.201	29.861	6.750	0.000
50	0.167	7.201	30.547	6.750	0.000

51 0.000 7.201 31.164 6.750 0.000

ARMADURAS EN LA LOSA
=====

SEC	X (m)	Y (m)	Ainferior (cm ² /m)	Asuperior (cm ² /m)	Acortante (cm ² /m)
1	4.400	-0.500	14.281	7.500	8.162
2	3.960	-0.500	7.500	7.500	3.941
3	3.520	-0.500	7.500	7.500	0.166
4	3.080	-0.500	7.500	11.122	0.000
5	2.640	-0.500	7.500	14.524	0.000
6	2.200	-0.500	7.500	18.622	0.000
7	1.760	-0.500	7.500	21.777	0.000
8	1.320	-0.500	7.500	24.101	0.000
9	0.880	-0.500	7.500	25.690	0.000
10	0.440	-0.500	7.500	26.614	0.000
11	0.000	-0.500	7.500	26.917	0.000

PROGRAMA ARCO

CALCULO DE GALERIAS ENTERRADAS Y PASOS INFERIORES

VERSION Nº 1 FECHA : 15/03/1989

Copyright : J.Diaz del Valle, 1989

E.T.S. de I.C.C. y P. de Santander

DATOS DEL PROYECTO DE LA GALERIA

PROYECTO : A.V.E.

REFERENCIA : PASO INFERIOR EVN3-4.7-2

FECHA DEL CALCULO : 04-27-2000

HIPOTESIS CARRO A CANTO UTIL

DATOS DE LA ESTRUCTURA

NUMERO DE SEGMENTOS = 50
 SALTO = 1

TIPO DE GEOMETRIA :

TIPO 0 : POLIGONAL ARBITRARIA DADA POR COORDENADAS
 TIPO 1 : ARCO CIRCULAR DEFINIDO POR: f,a
 TIPO 2 : PARABOLA CON $y'(0)=0$, DEFINIDA POR: f,a
 TIPO 3 : PARABOLA CON $y'(0)=0$, DEFINIDA POR: a,c,b
 TIPO 4 : PARABOLA CON $y'(0)<>0$ DEFINIDA POR: f,a,c,b
 TIPO 5 : CUBICA CON $y'(0)=0$ DEFINIDA POR: f,a,c,b
 TIPO 6 : PORTICO CIRCULAR DEFINIDO POR: f,a,H,B
 TIPO 7 : CURVA GENERAL DEFINIDA POR PUNTOS DE PASO
 TIPO 8 : GEOMETRIA ANTERIOR ALMACENADA EN FICHERO DE DATOS

2a = CUERDA , f = FLECHA , (c,b) = COORDENADAS DE UN PUNTO

TIPO = 9

CUERDA 2a = 8.800 m
 ALTURA H = 7.201 m

TIPO DE CONDICIONES DE APOYO :

TIPO 0 : TRIARTICULADO (EN APOYOS Y CLAVE)
 TIPO 1 : BIARTICULADO (EN APOYOS)
 TIPO 2 : EMPOTRADO EN EXTREMOS
 TIPO 3 : EMPOTRADO EN EXTREMOS CON ROTULA EN CLAVE
 TIPO 4 : EMPOTRADO ELASTICAMENTE
 TIPO 5 : ATIRANTADO EN EXTREMOS

TIPO = 2

PESO ESPECIFICO DEL HORMIGON = 2.50 t/m³
 RESISTENCIA CARACTERISTICA DEL HORMIGON f_{ck} = 250 Kp/cm²
 COEFICIENTE DE MINORACION DE f_{ck} γ_c = 1.50
 LIMITE ELASTICO CARACTERISTICO DEL ACERO f_{yk} = 5100 Kp/cm²
 COEFICIENTE DE MINORACION DE f_{yk} γ_s = 1.15
 RECUBRIMIENTO DE LAS ARMADURAS c = 5 cm
 SE DISPONEN ARMADURAS MINIMAS DE FLEXOCOMPRESION

ALTURA DE TIERRAS DESDE LA BASE = 7.65 m
 PESO ESPECIFICO DE LAS TIERRAS = 2.00 t/m³

COEFICIENTE EMPUJE TIERRAS = 0.50
 SOBRECARGA q = 2.19 t/m²

CARGAS CONCENTRADAS EN LOS NUDOS :

NUDO = 27 . FX = 0.00 t/m . FY = 14.57 t/m. MZ = 0.00 t×m/m
 NUDO = 39 . FX = 0.00 t/m . FY = 14.57 t/m. MZ = 0.00 t×m/m
 NUDO = 48 . FX = 0.00 t/m . FY = 14.57 t/m. MZ = 0.00 t×m/m

COEFICIENTE DE MAYORACION DE LAS CARGAS %f = 1.50

GALIBO GX = 8.00 m
 GALIBO GY = 6.18 m

EXISTE LOSA DE CIMENTACION :

SOBRECARGA DE LA LOSA DE CIMENTACION Q = 0.40 t/m²
 CANTO DE LA LOSA DE CIMENTACION t = 1.00 m
 COEFICIENTE DE BALASTO DEL TERRENO K = 8000 t/m³

ESFUERZOS EN EL ARCO
 =====

SEC	X (m)	Y (m)	AXIL (t/m)	CORTANTE (t/m)	FLECTOR (t×m/m)	ESPESOR (m)
1	4.400	0.000	123.413	-24.432	-69.016	0.800
2	4.400	0.441	122.752	-21.952	-59.342	0.800
3	4.400	0.881	121.430	-17.187	-51.768	0.800
4	4.400	1.322	120.108	-12.712	-46.166	0.800
5	4.400	1.763	118.786	-8.529	-42.407	0.800
6	4.400	2.203	117.464	-4.638	-40.363	0.800
7	4.400	2.644	116.142	-1.037	-39.906	0.800
8	4.400	3.085	114.820	2.272	-40.907	0.800
9	4.400	3.526	113.498	5.290	-43.238	0.800
10	4.400	3.966	112.176	8.016	-46.771	0.800
11	4.400	4.407	110.854	10.451	-51.376	0.800
12	4.400	4.848	109.532	12.595	-56.927	0.800
13	4.400	5.288	108.210	14.447	-63.294	0.800
14	4.400	5.729	106.888	16.009	-70.348	0.800
15	4.400	6.170	105.566	17.278	-77.963	0.800
16	4.400	6.610	104.244	18.257	-86.008	0.800
17	4.400	7.051	29.783	-100.153	-94.357	1.200
18	4.313	7.060	29.900	-98.889	-85.655	1.181
19	4.225	7.070	29.819	-98.061	-77.025	1.163
20	4.138	7.079	29.740	-97.241	-68.468	1.144
21	4.050	7.089	29.661	-96.430	-59.982	1.125
22	3.963	7.098	29.583	-95.628	-51.567	1.106
23	3.875	7.107	29.506	-94.834	-43.221	1.087
24	3.788	7.117	29.430	-94.049	-34.945	1.069
25	3.700	7.126	29.354	-93.273	-26.737	1.050
26	3.612	7.135	29.279	-92.505	-18.596	1.031

27	3.525	7.145	29.205	-91.745	-10.523	1.013
28	3.438	7.154	26.803	-69.264	-4.427	0.994
29	3.350	7.164	26.731	-68.522	1.603	0.975
30	3.263	7.173	26.659	-67.789	7.568	0.956
31	3.175	7.182	26.588	-67.064	13.470	0.938
32	3.088	7.192	26.518	-66.348	19.308	0.919
33	3.000	7.201	19.306	-68.084	25.085	0.900
34	2.833	7.201	19.309	-67.064	36.262	0.900
35	2.667	7.201	19.309	-65.729	47.217	0.900
36	2.500	7.201	19.309	-64.395	57.949	0.900
37	2.333	7.201	19.309	-63.060	68.460	0.900
38	2.167	7.201	19.309	-61.726	78.747	0.900
39	2.000	7.201	19.309	-60.391	88.812	0.900
40	1.833	7.201	19.309	-37.202	95.013	0.900
41	1.667	7.201	19.309	-35.867	100.991	0.900
42	1.500	7.201	19.309	-34.533	106.746	0.900
43	1.333	7.201	19.309	-33.198	112.279	0.900
44	1.167	7.201	19.309	-31.864	117.590	0.900
45	1.000	7.201	19.309	-30.529	122.678	0.900
46	0.833	7.201	19.309	-29.195	127.544	0.900
47	0.667	7.201	19.309	-27.860	132.187	0.900
48	0.500	7.201	19.309	-26.526	136.608	0.900
49	0.333	7.201	19.309	-3.336	137.164	0.900
50	0.167	7.201	19.309	-2.002	137.498	0.900
51	0.000	7.201	19.309	-0.667	137.609	0.900

Reacciones : R = 0.12341E+03 M = -.69016E+02 H = -.24432E+02
 Flecha en clave v = 0.55087E-02m, Giro en base θ = -.14143E-02 rad
 Longitud del semiarco = 11.459m , Longitud de transporte = 8.439m

LOSA DE CIMENTACION SOBRE TERRENO ELASTICO
 =====

X (m)	W (mm)	GIRO (1000×rad)	FLECTOR (t×m/m)	CORTANTE (t/m)	REACCION (t/m ²)
4.400	6.822	-1.414	69.016	123.413	54.573
3.960	6.179	-1.491	19.412	102.436	49.435
3.520	5.522	-1.488	-21.465	83.756	44.172
3.080	4.880	-1.420	-54.631	67.373	39.038
2.640	4.280	-1.300	-81.075	53.181	34.239
2.200	3.742	-1.138	-101.725	40.997	29.938
1.760	3.283	-0.945	-117.411	30.572	26.264
1.320	2.914	-0.728	-128.842	21.606	23.314
0.880	2.645	-0.494	-136.590	13.766	21.160
0.440	2.481	-0.250	-141.069	6.690	19.848
0.000	2.426	0.000	-142.534	-0.000	19.408

ARMADURAS EN EL ARCO
 =====

SEC	X (m)	Y (m)	Ainterior (cm ² /m)	Aexterior (cm ² /m)	Acortante (cm ² /m)
1	4.400	0.000	6.000	10.053	0.000
2	4.400	0.441	6.000	7.377	0.000
3	4.400	0.881	6.000	6.000	0.000
4	4.400	1.322	6.000	6.000	0.000
5	4.400	1.763	6.000	6.000	0.000
6	4.400	2.203	6.000	6.000	0.000
7	4.400	2.644	6.000	6.000	0.000
8	4.400	3.085	6.000	6.000	0.000
9	4.400	3.526	6.000	6.000	0.000
10	4.400	3.966	6.000	6.000	0.000
11	4.400	4.407	6.000	6.000	0.000
12	4.400	4.848	6.000	7.941	0.000
13	4.400	5.288	6.000	10.071	0.000
14	4.400	5.729	6.000	11.668	0.000
15	4.400	6.170	6.000	14.654	0.000
16	4.400	6.610	6.000	17.838	0.000
17	4.400	7.051	9.000	17.288	5.963
18	4.313	7.060	8.859	16.306	6.049
19	4.225	7.070	8.719	15.099	6.242
20	4.137	7.079	8.578	13.749	6.444
21	4.050	7.089	8.438	12.239	6.654
22	3.963	7.098	8.297	10.552	6.874
23	3.875	7.107	8.156	8.665	7.105
24	3.787	7.117	8.016	8.016	7.346
25	3.700	7.126	7.875	7.875	7.599
26	3.612	7.135	7.734	7.734	7.863
27	3.525	7.145	7.594	7.594	8.140
28	3.438	7.154	7.453	7.453	2.339
29	3.350	7.163	7.313	7.313	2.521
30	3.263	7.173	7.172	7.172	2.712
31	3.175	7.182	7.031	7.031	2.914
32	3.088	7.192	6.891	6.891	3.127
33	3.000	7.201	6.750	6.750	4.114
34	2.833	7.201	9.790	6.750	3.796
35	2.667	7.201	12.314	6.750	3.381
36	2.500	7.201	14.646	6.750	2.965
37	2.333	7.201	17.831	6.750	2.550
38	2.167	7.201	20.983	6.750	2.135
39	2.000	7.201	24.100	6.750	1.719
40	1.833	7.201	26.037	6.750	0.000
41	1.667	7.201	27.919	6.750	0.000
42	1.500	7.201	29.742	6.750	0.000
43	1.333	7.201	31.508	6.750	0.000
44	1.167	7.201	33.213	6.750	0.000
45	1.000	7.201	34.858	6.750	0.000
46	0.833	7.201	36.441	6.750	0.000
47	0.667	7.201	37.961	6.750	0.000
48	0.500	7.201	39.416	6.750	0.000
49	0.333	7.201	39.600	6.750	0.000

50	0.167	7.201	39.710	6.750	0.000
51	0.000	7.201	39.747	6.750	0.000

ARMADURAS EN LA LOSA
=====

SEC	X (m)	Y (m)	Ainferior (cm ² /m)	Asuperior (cm ² /m)	Acortante (cm ² /m)
1	4.400	-0.500	18.012	7.500	17.291
2	3.960	-0.500	7.500	7.500	11.449
3	3.520	-0.500	7.500	7.500	6.247
4	3.080	-0.500	7.500	14.281	1.685
5	2.640	-0.500	7.500	21.248	0.000
6	2.200	-0.500	7.500	26.861	0.000
7	1.760	-0.500	7.500	31.190	0.000
8	1.320	-0.500	7.500	34.382	0.000
9	0.880	-0.500	7.500	36.565	0.000
10	0.440	-0.500	7.500	37.834	0.000
11	0.000	-0.500	7.500	38.251	0.000

PROGRAMA ARCO

CALCULO DE GALERIAS ENTERRADAS Y PASOS INFERIORES

VERSION Nº 1 FECHA : 15/03/1989

Copyright : J.Díaz del Valle, 1989

E.T.S. de I.C.C. y P. de Santander

DATOS DEL PROYECTO DE LA GALERIA

PROYECTO : A.V.E

REFERENCIA : PASO INFERIOR EVN3-4.7-2

FECHA DEL CALCULO : 04-27-2000

HIPOTESIS CARGA REPARTIDA

DATOS DE LA ESTRUCTURA

NUMERO DE SEGMENTOS = 50
 SALTO = 1

TIPO DE GEOMETRIA :

TIPO 0 : POLIGONAL ARBITRARIA DADA POR COORDENADAS
 TIPO 1 : ARCO CIRCULAR DEFINIDO POR : f,a
 TIPO 2 : PARABOLA CON $y'(0)=0$, DEFINIDA POR : f,a
 TIPO 3 : PARABOLA CON $y'(0)=0$, DEFINIDA POR : a,c,b
 TIPO 4 : PARABOLA CON $y'(0)<0$ DEFINIDA POR : f,a,c,b
 TIPO 5 : CUBICA CON $y'(0)=0$ DEFINIDA POR : f,a,c,b
 TIPO 6 : PORTICO CIRCULAR DEFINIDO POR : f,a,H,B
 TIPO 7 : CURVA GENERAL DEFINIDA POR PUNTOS DE PASO
 TIPO 8 : GEOMETRIA ANTERIOR ALMACENADA EN FICHERO DE DATOS

2a = CUERDA , f = FLECHA , (c,b) = COORDENADAS DE UN PUNTO

TIPO = 9

CUERDA 2a = 8.800 m
 ALTURA H = 7.201 m

TIPO DE CONDICIONES DE APOYO :

TIPO 0 : TRIARTICULADO (EN APOYOS Y CLAVE)
 TIPO 1 : BIARTICULADO (EN APOYOS)
 TIPO 2 : EMPOTRADO EN EXTREMOS
 TIPO 3 : EMPOTRADO EN EXTREMOS CON ROTULA EN CLAVE
 TIPO 4 : EMPOTRADO ELASTICAMENTE
 TIPO 5 : ATIRANTADO EN EXTREMOS

TIPO = 2

PESO ESPECIFICO DEL HORMIGON = 2.50 t/m³
 RESISTENCIA CARACTERISTICA DEL HORMIGON fck = 250 Kp/cm²
 COEFICIENTE DE MINORACION DE fck γ_c = 1.50
 LIMITE ELASTICO CARACTERISTICO DEL ACERO fyk = 5100 Kp/cm²
 COEFICIENTE DE MINORACION DE fyk γ_s = 1.15
 RECUBRIMIENTO DE LAS ARMADURAS c = 5 cm
 SE DISPONEN ARMADURAS MINIMAS DE FLEXOCOMPRESION

ALTURA DE TIERRAS DESDE LA BASE = 7.65 m
 PESO ESPECIFICO DE LAS TIERRAS = 2.00 t/m³

COEFICIENTE EMPUJE TIERRAS = 0.50
 SOBRECARGA q = 8.02 t/m²

CARGAS CONCENTRADAS EN LOS NUDOS : NINGUNA

COEFICIENTE DE MAYORACION DE LAS CARGAS γ_f = 1.50

GALIBO GX = 8.00 m

GALIBO GY = 6.18 m

EXISTE LOSA DE CIMENTACION :

SOBRECARGA DE LA LOSA DE CIMENTACION Q = 0.40 t/m²

CANTO DE LA LOSA DE CIMENTACION t = 1.00 m

COEFICIENTE DE BALASTO DEL TERRENO K = 8000 t/m³

ESFUERZOS EN EL ARCO

SEC	X (m)	Y (m)	AXIL (t/m)	CORTANTE (t/m)	FLECTOR (txm/m)	ESPESOR (m)
1	4.400	0.000	96.326	-26.969	-60.579	0.800
2	4.400	0.441	95.665	-24.489	-49.787	0.800
3	4.400	0.881	94.343	-19.723	-41.095	0.800
4	4.400	1.322	93.021	-15.249	-34.375	0.800
5	4.400	1.763	91.699	-11.066	-29.498	0.800
6	4.400	2.203	90.377	-7.174	-26.337	0.800
7	4.400	2.644	89.055	-3.574	-24.762	0.800
8	4.400	3.085	87.733	-0.265	-24.645	0.800
9	4.400	3.526	86.411	2.753	-25.858	0.800
10	4.400	3.966	85.089	5.479	-28.272	0.800
11	4.400	4.407	83.767	7.914	-31.760	0.800
12	4.400	4.848	82.445	10.058	-36.192	0.800
13	4.400	5.288	81.123	11.910	-41.441	0.800
14	4.400	5.729	79.801	13.472	-47.378	0.800
15	4.400	6.170	78.479	14.742	-53.875	0.800
16	4.400	6.610	77.156	15.720	-60.802	0.800
17	4.400	7.051	74.375	-73.491	-68.033	1.200
18	4.313	7.060	74.451	-71.846	-61.710	1.181
19	4.225	7.070	74.289	-70.257	-55.528	1.163
20	4.138	7.079	74.128	-68.676	-49.484	1.144
21	4.050	7.089	73.968	-67.105	-43.579	1.125
22	3.963	7.098	73.808	-65.542	-37.811	1.106
23	3.875	7.107	73.650	-63.987	-32.180	1.087
24	3.788	7.117	73.492	-62.441	-26.685	1.069
25	3.700	7.126	73.334	-60.904	-21.326	1.050
26	3.612	7.135	73.178	-59.375	-16.101	1.031
27	3.525	7.145	73.023	-57.855	-11.009	1.013
28	3.438	7.154	72.868	-56.343	-6.051	0.994
29	3.350	7.164	72.714	-54.840	-1.225	0.975

30	3.263	7.173	22.560	-53.346	3.469	0.956
31	3.175	7.182	22.408	-51.861	8.033	0.938
32	3.088	7.192	22.256	-50.384	12.467	0.919
33	3.000	7.201	16.769	-50.992	16.772	0.900
34	2.833	7.201	16.772	-48.860	24.915	0.900
35	2.667	7.201	16.772	-46.068	32.593	0.900
36	2.500	7.201	16.772	-43.276	39.806	0.900
37	2.333	7.201	16.772	-40.484	46.553	0.900
38	2.167	7.201	16.772	-37.692	52.835	0.900
39	2.000	7.201	16.772	-34.900	58.652	0.900
40	1.833	7.201	16.772	-32.108	64.003	0.900
41	1.667	7.201	16.772	-29.316	68.889	0.900
42	1.500	7.201	16.772	-26.524	73.310	0.900
43	1.333	7.201	16.772	-23.732	77.265	0.900
44	1.167	7.201	16.772	-20.940	80.755	0.900
45	1.000	7.201	16.772	-18.148	83.780	0.900
46	0.833	7.201	16.772	-15.356	86.339	0.900
47	0.667	7.201	16.772	-12.564	88.433	0.900
48	0.500	7.201	16.772	-9.772	90.062	0.900
49	0.333	7.201	16.772	-6.980	91.225	0.900
50	0.167	7.201	16.772	-4.188	91.923	0.900
51	0.000	7.201	16.772	-1.396	92.156	0.900

Reacciones : R = 0.96326E+02 M = -.60579E+02 H = -.26969E+02
 Flecha en clave v = 0.37358E-02m, Giro en base θ = -.10087E-02 rad
 Longitud del semiarco = 11.459m, Longitud de transporte = 8.439m

LOSA DE CIMENTACION SOBRE TERRENO ELASTICO

X (m)	W (mm)	GIRO (1000xrad)	FLECTOR (txm/m)	CORTANTE (t/m)	REACCION (t/m ²)
4.400	5.314	-1.009	60.579	96.326	42.509
3.960	4.852	-1.080	21.772	80.340	38.813
3.520	4.372	-1.089	-10.365	66.019	34.979
3.080	3.901	-1.047	-36.571	53.378	31.206
2.640	3.457	-0.964	-57.575	42.353	27.656
2.200	3.058	-0.847	-74.061	32.816	24.460
1.760	2.715	-0.706	-86.645	24.589	21.721
1.320	2.439	-0.545	-95.859	17.452	19.516
0.880	2.238	-0.370	-102.126	11.156	17.902
0.440	2.115	-0.187	-105.760	5.433	16.919
0.000	2.074	0.000	-106.950	0.000	16.588

ARMADURAS EN EL ARCO

SEC	X (m)	Y (m)	Ainterior (cm ² /m)	Aexterior (cm ² /m)	Acortante (cm ² /m)
-----	----------	----------	-----------------------------------	-----------------------------------	-----------------------------------

1	4.400	0.000	6.000	9.940	0.000
2	4.400	0.441	6.000	6.912	0.000
3	4.400	0.881	6.000	6.000	0.000
4	4.400	1.322	6.000	6.000	0.000
5	4.400	1.763	6.000	6.000	0.000
6	4.400	2.203	6.000	6.000	0.000
7	4.400	2.644	6.000	6.000	0.000
8	4.400	3.085	6.000	6.000	0.000
9	4.400	3.526	6.000	6.000	0.000
10	4.400	3.966	6.000	6.000	0.000
11	4.400	4.407	6.000	6.000	0.000
12	4.400	4.848	6.000	6.000	0.000
13	4.400	5.288	6.000	6.000	0.000
14	4.400	5.729	6.000	7.872	0.000
15	4.400	6.170	6.000	10.002	0.000
16	4.400	6.610	6.000	11.457	0.000
17	4.400	7.051	9.000	13.734	0.000
18	4.313	7.060	8.859	12.655	0.000
19	4.225	7.070	8.719	11.542	0.000
20	4.137	7.079	8.578	10.367	0.000
21	4.050	7.089	8.438	9.124	0.000
22	3.963	7.098	8.297	8.297	0.000
23	3.875	7.107	8.156	8.156	0.000
24	3.787	7.117	8.016	8.016	0.000
25	3.700	7.126	7.875	7.875	0.000
26	3.612	7.135	7.734	7.734	0.000
27	3.525	7.145	7.594	7.594	0.000
28	3.438	7.154	7.453	7.453	0.000
29	3.350	7.163	7.313	7.313	0.000
30	3.263	7.173	7.172	7.172	0.000
31	3.175	7.182	7.031	7.031	0.000
32	3.088	7.192	6.891	6.891	0.000
33	3.000	7.201	6.750	6.750	0.000
34	2.833	7.201	6.750	6.750	0.000
35	2.667	7.201	9.070	6.750	0.000
36	2.500	7.201	10.934	6.750	0.000
37	2.333	7.201	12.381	6.750	0.000
38	2.167	7.201	13.407	6.750	0.000
39	2.000	7.201	15.156	6.750	0.000
40	1.833	7.201	16.773	6.750	0.000
41	1.667	7.201	18.257	6.750	0.000
42	1.500	7.201	19.606	6.750	0.000
43	1.333	7.201	20.819	6.750	0.000
44	1.167	7.201	21.893	6.750	0.000
45	1.000	7.201	22.827	6.750	0.000
46	0.833	7.201	23.620	6.750	0.000
47	0.667	7.201	24.270	6.750	0.000
48	0.500	7.201	24.777	6.750	0.000
49	0.333	7.201	25.139	6.750	0.000
50	0.167	7.201	25.357	6.750	0.000
51	0.000	7.201	25.430	6.750	0.000

ARMADURAS EN LA LOSA
=====

SEC	X (m)	Y (m)	Ainferior (cm ² /m)	Asuperior (cm ² /m)	Acortante (cm ² /m)
1	4.400	-0.500	15.765	7.500	9.748
2	3.960	-0.500	7.500	7.500	5.296
3	3.520	-0.500	7.500	7.500	1.308
4	3.080	-0.500	7.500	11.196	0.000
5	2.640	-0.500	7.500	14.968	0.000
6	2.200	-0.500	7.500	19.362	0.000
7	1.760	-0.500	7.500	22.753	0.000
8	1.320	-0.500	7.500	25.257	0.000
9	0.880	-0.500	7.500	26.971	0.000
10	0.440	-0.500	7.500	27.969	0.000
11	0.000	-0.500	7.500	28.297	0.000

PROGRAMA DE CALCULOS DE MUROS

SEGUN TEORIA DE COULOMB

Num.de capas de terreno detras = 1
Num.de capas de terreno delante = 0

TERRENO TRASERO

CAPA	PROFUND.	ANG.ROZ.INT.	ROZ.TIER.-MURO	DENSIDAD	ANG.TALUD	COHESION
Num.	(mts)	(sexag.)	(sexag.)	(t/m3)	(sexag.)	(t/m2)
1	0.00	30.0	0.0	2.00	0.0	0.00

SOBRECARGAS UNIF.SOBRE EL TERRENO

Sobrecarga unif. DETRAS = 3.5 (t/m2)
Distancia al Muro = 1.5 (mts)
Sobrecarga unif. DELANTE = 0 (t/m2)
Distancia al Muro = 0 (mts)

ALTURA DEL MURO = 7.651 (mts)
Peso Especific.del MURO = 2.5 (t/m3)

ESCALONES TRASEROS

Escalon	Profund.	Anchura	Tipo
Num.	(mts)	(mts)	
1	2.25	0.35	1
2	4.95	0.35	1

ESCALONES DELANTEROS

Escalon	Profund.	Anchura	Tipo	Carg.Vert.	Distanc.	Carg.Horiz.
Num.	(mts)	(mts)		(t/ml)	(mts)	(t/ml)
Canto	0.00	0.30	1	0.00	0.00	0.00

PESO DE TIERRAS + SOBR.(sin P.agua)

NUDO	PROFUND.	CARG.TRAS.	CARG.DELAN.
1	0.00	0.00	0.00
2	0.87	1.73	0.00
3	2.25	7.30	0.00
4	2.60	8.70	0.00
5	4.95	13.40	0.00
6	7.65	18.80	0.00

PRESIONES SOBRE EL MURO

HORIZONTALES

VERTICALES

BARRA	SUP.T.	INF.T.	SUP.D.	INF.D.	SUP.T.	INF.T.	SUP.D.	INF.D.
1	0.000	0.577	0.000	0.000	0.000	0.000	0.000	0.000
2	0.577	2.432	0.000	0.000	0.000	0.000	0.000	0.000
3	2.432	2.899	0.000	0.000	0.000	0.000	0.000	0.000
4	2.899	4.467	0.000	0.000	0.000	0.000	0.000	0.000
5	4.467	6.257	0.000	0.000	0.000	0.000	0.000	0.000

ESFUERZOS EN BARRAS

BARRA	NUDO	PROFUND.	AXIL	CORTANTE	FLECTOR
1	1	0.00	-0.00	0.00	0.00
1	2		0.65	0.25	0.07
2	2	0.87	0.65	0.25	0.07
2	3		1.69	2.33	1.56
3	3	2.25	1.69	2.33	1.56
3	4		4.81	3.26	2.44
4	4	2.60	4.81	3.26	2.44
4	5		8.63	11.92	19.57
5	5	4.95	8.63	11.92	19.57
5	6		20.07	26.42	70.24

REACCIONES SOBRE LOS APOYOS

NUDO	PROFUND.	HORIZONT.	VERTICAL	MOMENTO
------	----------	-----------	----------	---------

6 7.65 26.42 20.07 70.24

SOL.	* LONGITUD	* COEF.SEGUR.	* TENS.EXTREMAS *			
NUM.:	* TACON	* ZARPA	* VUELCO			
			DESGLIZ.			
			* MAXIMA			
			MINIMA *			
1	5.80	0.80	6.11	3.14	24.89	14.09
2	5.30	0.90	5.46	2.92	24.85	13.41
3	4.80	1.00	4.85	2.70	24.93	12.52
4	4.40	1.10	4.41	2.52	24.87	11.76
5	4.00	1.20	3.98	2.35	24.93	10.80
6	3.70	1.30	3.70	2.22	24.77	10.11
7	3.40	1.40	3.42	2.09	24.70	9.27
8	3.10	1.50	3.15	1.96	24.74	8.25
9	2.80	1.60	2.89	1.83	24.92	7.01
10	2.60	1.70	2.75	1.74	24.68	6.34
11	2.40	1.80	2.61	1.66	24.52	5.55
12	2.20	1.90	2.46	1.57	24.45	4.64
13	2.10	2.00	2.43	1.53	23.79	4.56
14	2.00	2.30	2.53	1.50	20.83	5.94
15	1.90	3.10	2.98	1.50	14.24	9.36
16	1.80	4.00	3.48	1.50	11.31	9.55

DIMENSIONES DE LA ZAPATA ELEGIDA

	LONGITUD	CANTO
TACON	3.10	1.00
ZARPA	1.50	1.00

ESFUERZOS EN ZAPATA

SECCION	TIPO	AXIL	MOMENTO	CORTANTE	PUNZONAM.	CORT.ADHEREN.
Inf.MURO		20.07	70.24	26.42		
Zarpa	I		28.07	21.25		32.69
Tacon	III		-51.89	-21.26	-24.13	-24.06
Base Zapata		92.36	43.11	33.02		

CONDICIONES DE SEGURIDAD

TENSIONES EFECTIVAS

Maxima = 24.74 (t/m2)
Minima = 8.25 (t/m2)
Cobaricentrica = 19.79 (t/m2)
Excent.Result.(M/N) = 0.47 (m)
Dist.Result.Borde = 2.33 (m)

VUELCO

Momento Estabil. = 315.50 (mt/m)
Momento Volcador = 100.01 (mt/m)
Coef.Seguridad = 3.15

DESGLIZAMIENTO

Roz.Base muro-Tierras (°) = 35
Comp.Rozamiento = 64.67 (t/m)
Fuerza Deslizante = 33.02 (t/m)
Coef.Seguridad = 1.96

CALCULO DE ARMADURAS EN SECCIONES =====

CARACTERISTICAS DE LOS MATERIALES -----

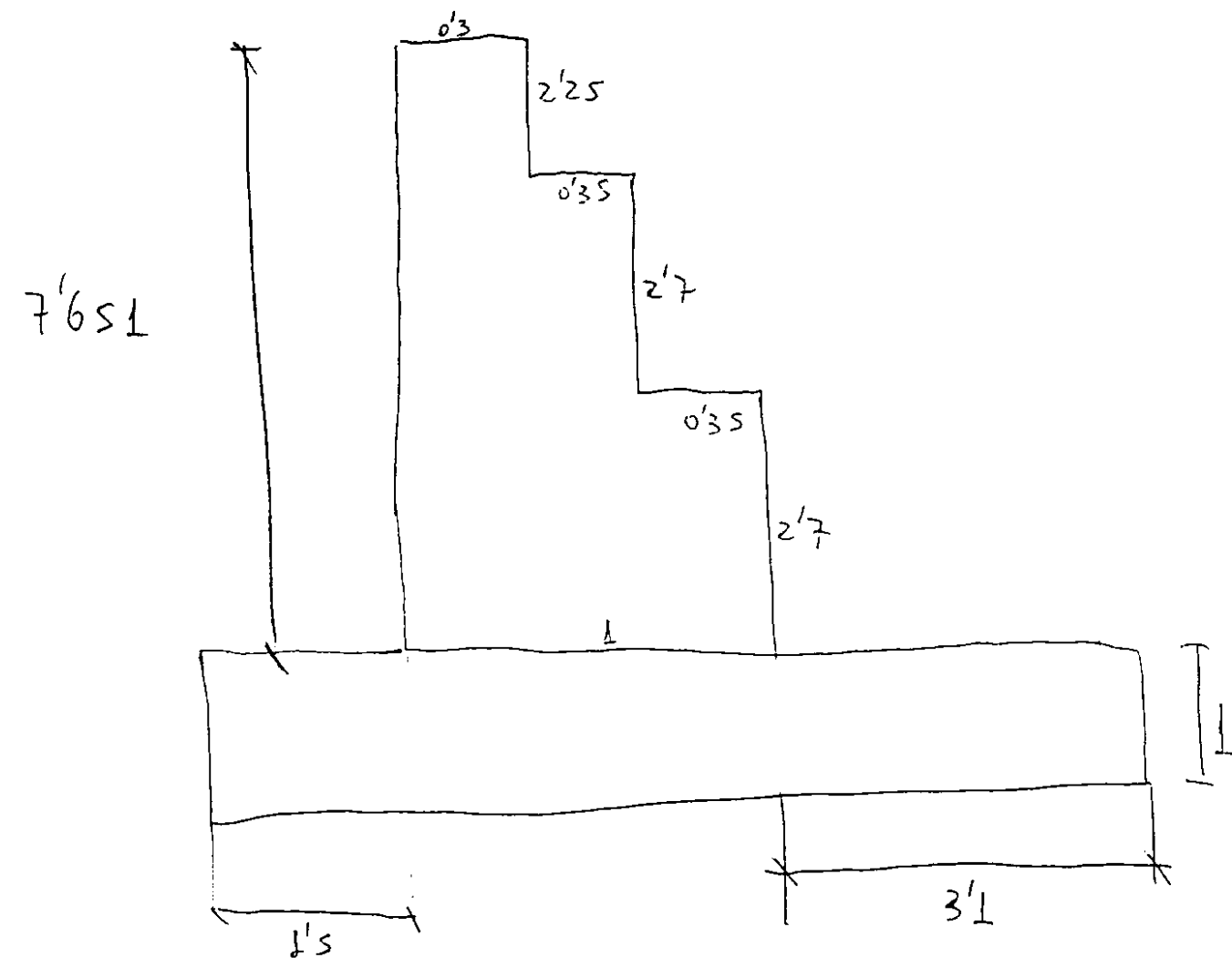
Resist.Caract.HORMIGON en Zapata = 250 (kg/cm²)
 Resist.Caract.HORMIGON en Alzado = 250 (kg/cm²)
 Resistenc.Caract.ACERO = 5100 (kg/cm²)
 Coef.Minorac.HORMIGON = 1.5
 Coef.Minorac.ACERO = 1.15
 Coef.Mayoracion CARGAS = 1.6
 Recubr.Armad.Zapata = 4 (cms)
 Recubr.Armad.Alzado = 3 (cms)

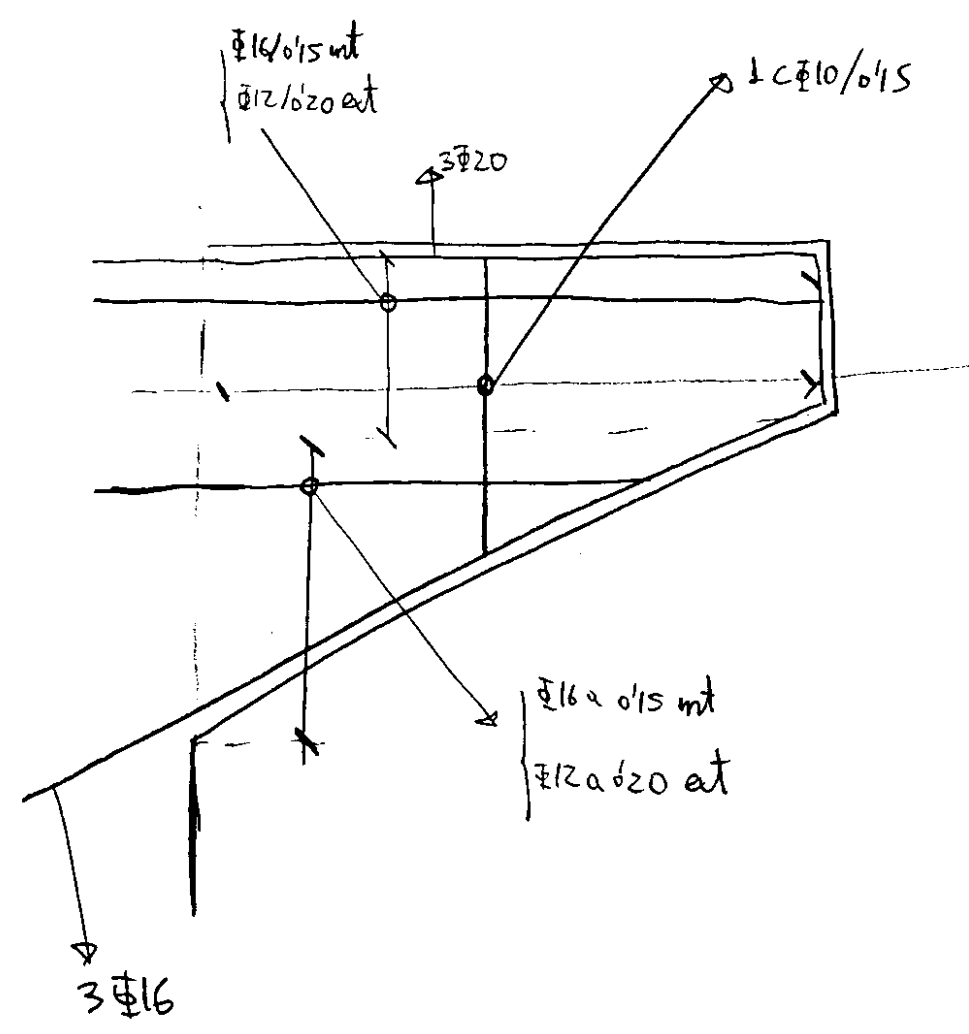
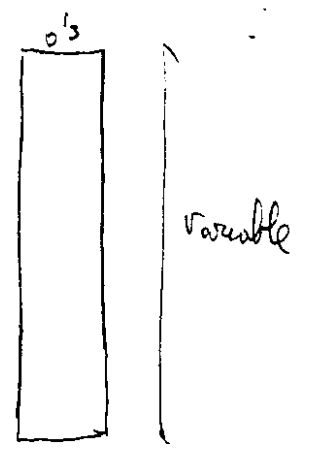
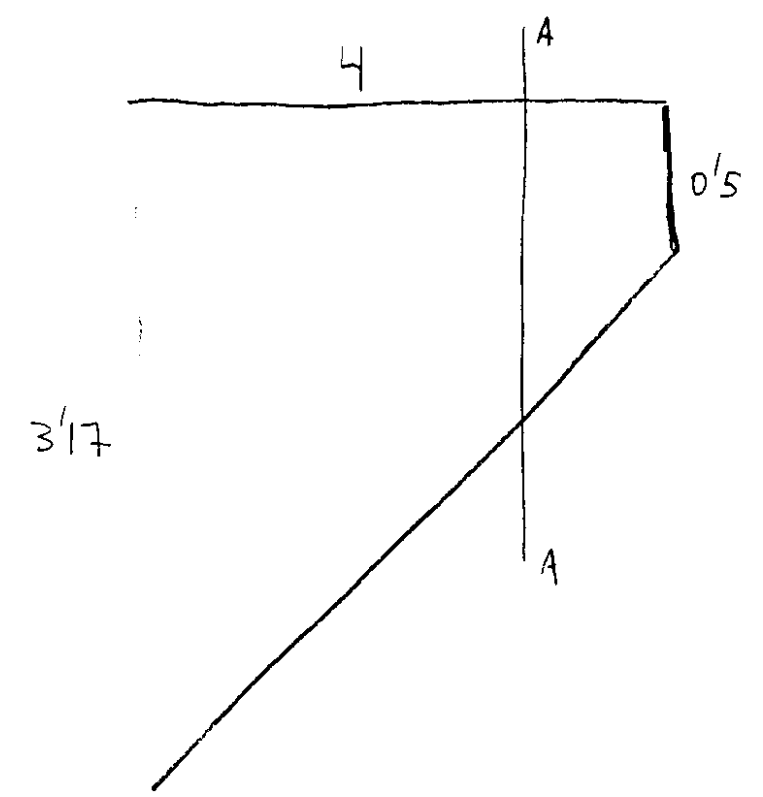
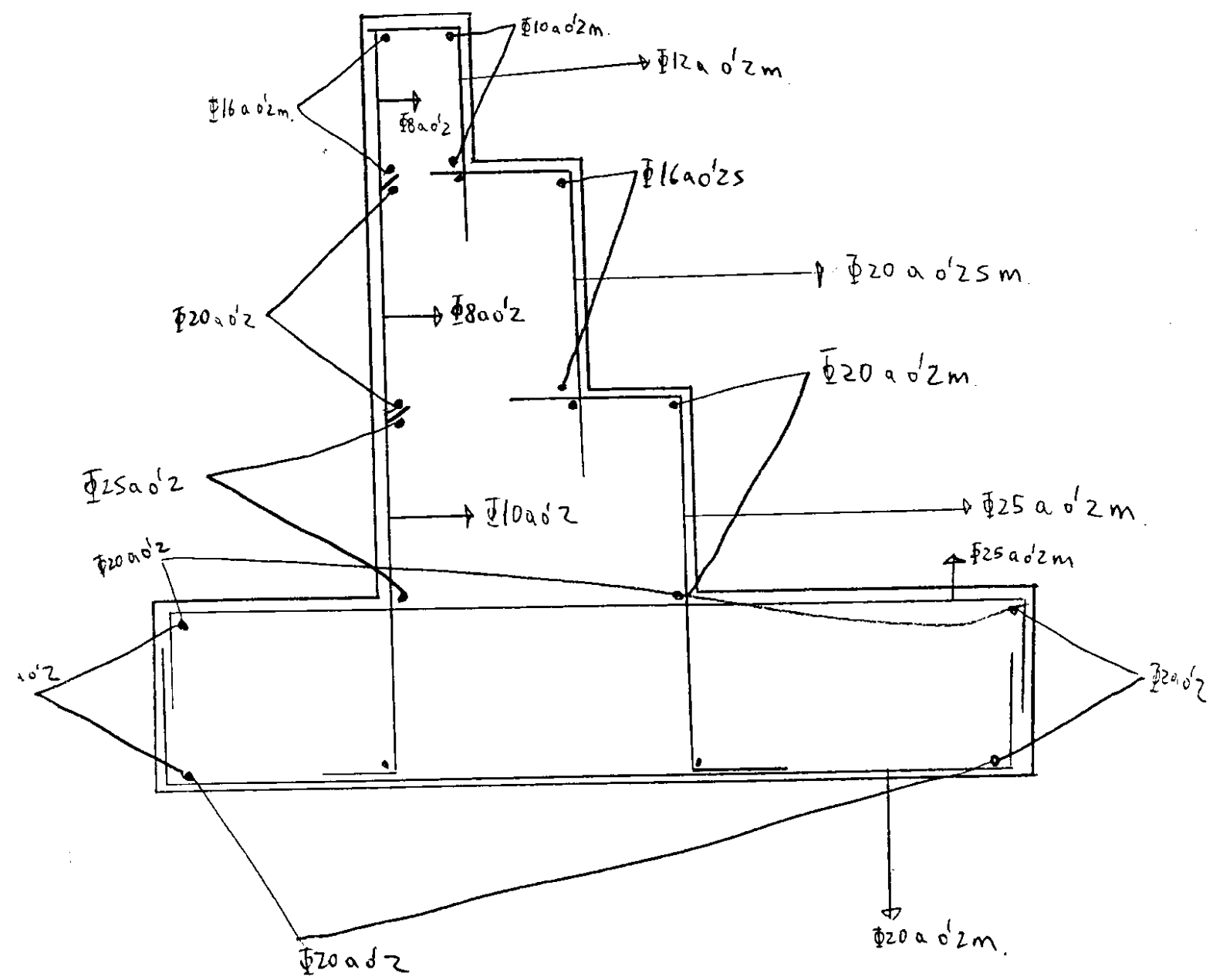
ALZADO -----

Prof.	Espe	Axil C.	Flect.C.	AR.TRA	AR.DEL.	Cort.C.	CORT.H.
(m)	(m)	(t/m)	(mt/m)	(cm ² /m)	(cm ² /m)	(t/m)	(t/m)
0.87	0.30	1.04	0.12	0.01	0.01	0.40	17.43
2.25	0.30	2.70	2.50	4.06	0.03	3.73	17.43
2.60	0.65	7.69	3.91	9.32	0.10	5.22	40.02
4.95	0.65	13.81	31.32	10.13	0.17	19.07	40.02
7.65	1.00	32.11	112.39	23.69	0.40	42.27	62.61

ZAPATA -----

Secc.	Fla.C.	Canto	AR.SUP.	AR.INF.	Cen.C.	Canto	COR.H.	Pun.C.	Canto	PUN.H.
(m/m)	(m)	(cm ² /m)	(cm ² /m)	(t/m)	(m)	(t/m)	(t/m)	(m)	(t/m)	(t/m)
Zarpa	44.91	1.00	0.00	12.25	34.60	1.00	123.94			
Taco	83.03	1.00	20.06	0.00	-34.02	1.00	61.97	-38.60	1.00	123.94





MINIMOS EHE MURD

$$\begin{aligned}
 &0'3 \cdot (100) \cdot 2'25 \cdot 100 \cdot 3'2 \cdot 10^{-3} = 21'6 \text{ cm}^2 \quad \left\{ \begin{array}{l} \text{mita} = \frac{2}{3} \cdot 21'6 = 14'4 \text{ cm}^2 \\ \text{outro} = \frac{1}{3} \cdot 21'6 = 7'2 \text{ cm}^2 \end{array} \right. \\
 &0'65(100) \cdot 2'7(100) \cdot 3'2 \cdot 10^{-3} = 56'16 \text{ cm}^2 \quad \left\{ \begin{array}{l} \text{mita} = 37'44 \text{ cm}^2 \\ \text{outro} = 18'72 \text{ cm}^2 \end{array} \right. \\
 &1 \cdot (100) \cdot 2'7 \cdot (100) \cdot 3'2 \cdot 10^{-3} = 86'4 \text{ cm}^2 \quad \left\{ \begin{array}{l} \text{mita} = 57'6 \text{ cm}^2 \\ \text{outro} = 28'8 \text{ cm}^2 \end{array} \right. \\
 &0'3 \cdot 100 \cdot 100 \cdot 0'9 \cdot 10^{-3} = 2'7 \frac{\text{cm}^2}{m} \approx 0'81 \text{ cm}^2 \\
 &0'65 \cdot 100 \cdot 100 \cdot 0'9 \cdot 10^{-3} = 5'85 \frac{\text{cm}^2}{m} \approx 1'8 \text{ cm}^2/m \\
 &100 \cdot 100 \cdot 0'9 \cdot 10^{-3} = 9 \frac{\text{cm}^2}{m} \approx 2'7 \text{ cm}^2
 \end{aligned}$$

4.5 Aletas de pasos inferiores

4.5.1 E 1502.0

<i>ALHOSA</i> PREFABRICADOS DE HORMIGÓN	ALETA 1050 x (786/305) E-1512.0
Oferta: 99/643 Obra: SUBTRAMO XV Empresa: NECSO Fecha: Junio de 2.000	

ÍNDICE

- 1.- Generalidades
- 2.- Descripción
- 3.- Instrucciones aplicadas
- 4.- Características de los materiales
- 5.- Control de calidad
- 6.- Coeficientes de seguridad
- 7.- Parámetros del terreno
- 8.- Acciones consideradas
- 9.- Hipótesis de cálculo
- 10.- Cálculos
- 11.- Cimentación
- 12.- Planos

1. Generalidades

En la presente memoria se muestran los cálculos realizados para justificar las Aletas Prefabricadas de hormigón que sostienen el terraplén.

2. Descripción

El sostenimiento de las tierras que forman el terraplén en las entradas de las obras de fábrica se realiza con aletas prefabricadas de hormigón armado.

El espesor de los muros que forman las aletas es de 20 cm. hasta los 300 cm. de profundidad y luego aumenta progresivamente, tal y como se muestra en los planos adjuntos.

La cimentación se realiza con hormigón vertido in situ

3. Instrucciones aplicadas

Para el cálculo de las Aletas, se han utilizado las siguientes Instrucciones y Normas:

* Instrucción para el Proyecto y Ejecución de Obras de Hormigón en Masa o Armado EH-91.

4. Características de los materiales*** Hormigones:**

Hormigón en elemento prefabricado	H-300
Hormigón en obra in situ	H-250

*** Acero:**

Acero para armar corrugado	B-500 S
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5. Control de calidad

El control de calidad se atenderá a lo especificado en la EH-91, habiéndose seleccionado los siguientes niveles:

Elementos prefabricados:**a) Materiales:**

- Hormigón	Control Intenso
- Armadura pasiva	Control Intenso

b) Ejecución:

- En toda la obra	Control Intenso
-------------------	-----------------

Obra in situ:**a) Materiales:**

- Hormigón	Control Normal
- Armadura pasiva	Control Normal

b) Ejecución:

- En toda la obra	Control Normal
-------------------	----------------

6. Coeficientes de seguridad

De acuerdo con los niveles de control de calidad definidos, se adoptan los siguientes coeficientes de seguridad:

Elementos prefabricados:

- Coeficientes de minoración de resistencias:

Acero pasivo

$\gamma_s = 1,10$

Hormigón

$\gamma_c = 1,40$

- Coeficientes de ponderación de acciones:

$\gamma_f = 1,50$

Obra in situ:

- Coeficientes de minoración de resistencias:

Acero pasivo

$\gamma_s = 1,15$

Hormigón

$\gamma_c = 1,50$

- Coeficientes de ponderación de acciones:

$\gamma_f = 1,60$

7. Parámetros del terreno

Pese a existir un relleno de calidad adecuadamente compactado (al que correspondería un ángulo de rozamiento interno de 35°), con un talud 2H:1V. En los cálculos se ha considerado, conservadoramente, un talud de terraplén 3H:2V con ángulo de rozamiento interno de 30°. La Aleta forma un ángulo mínimo de 60° con el pie del terraplén

Peso específico

$2,0 \text{ ton/m}^3$

Ángulo de rozamiento interno

30°

Ángulo Talud coronación

$18,4^\circ$

Coeficiente de empuje activo

$0,427$

8. Acciones consideradas**8.1 Empuje por efecto de las tierras**

Se considera el empuje de las tierras que se encuentran en el trasdós de la Aleta con un coeficiente de empuje de 0,427.

8.2 Sobrecargas de uso

Se considera una sobrecarga de 400 Kg/m² sobre el terraplén, que es la establecida para paseos de servicio.

9. Hipótesis de cálculo.**HIPÓTESIS I:**

- Empuje de las tierras

- Sobrecarga de uso

Combinación: 1,5 * [Caso (1) + Caso (2)]

En Alcañiz, Junio de 2.000



Alcañiz Javier Tello Sánchez

Dpto. Técnico ALHOSA

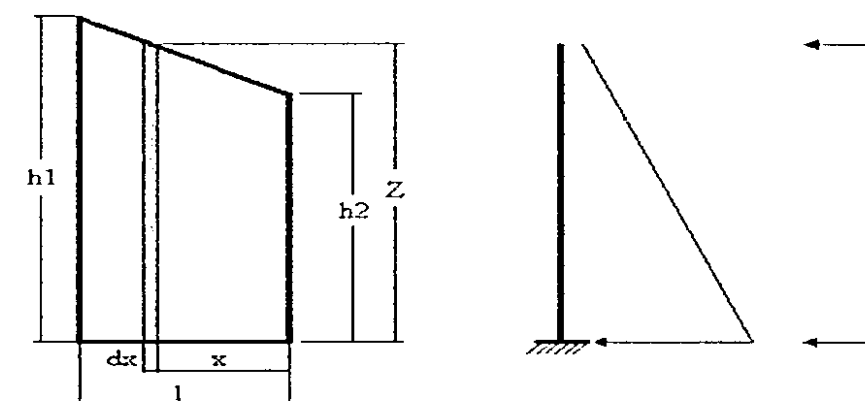
- El presente informe se ha realizado con los datos aportados por el cliente para esta pieza prefabricada concreta.

- Salvo comunicación escrita de lo contrario, las consideraciones en él realizadas, así como los resultados aportados, se ajustan a lo solicitado por el cliente.

10. Cálculos.

Dada la geometría de la estructura en la que se reduce la altura en función de la longitud y los esfuerzos se comportan de igual manera, cada tramo de la aleta se ha armado para la altura existente a una distancia, del lado mayor, de 1/3 de su longitud, siendo en todo momento superiores las sollicitaciones en este punto que la resultante sobre cada tramo.

Pza.	H.máx	H.mín	H.cál
1	786,0	689,8	754
2	689,8	593,6	658
3	593,6	497,4	562
4	497,4	401,2	465
5	401,2	305,0	369



$$M = \int_{x=0}^{x=l} dM = \int_{x=0}^{x=l} \left(\frac{1}{6} \cdot \lambda_h \cdot \gamma_t \cdot z^3 + \frac{1}{2} \cdot \lambda_h \cdot SC \cdot z^2 \right) \cdot dx =$$

$$= \frac{1}{6} \cdot \lambda_h \cdot \gamma_t \cdot \left(\frac{1}{4} \cdot \frac{h_1^4 - h_2^4}{h_1 - h_2} \right) \cdot l + \frac{1}{2} \cdot \lambda_h \cdot SC \cdot \left(\frac{1}{3} \cdot \frac{h_1^3 - h_2^3}{h_1 - h_2} \right) \cdot l \leq M \left(z = h_2 + \frac{2 \cdot (h_1 - h_2)}{3} \right)$$

$$V = \int_{x=0}^{x=l} dV = \int_{x=0}^{x=l} \left(\frac{1}{2} \cdot \lambda_h \cdot \gamma_t \cdot z^2 + \lambda_h \cdot SC \cdot z \right) \cdot dx =$$

$$= \frac{1}{2} \cdot \lambda_h \cdot \gamma_t \cdot \left(\frac{1}{3} \cdot \frac{h_1^3 - h_2^3}{h_1 - h_2} \right) \cdot l + \lambda_h \cdot SC \cdot \left(\frac{1}{2} \cdot \frac{h_1^2 - h_2^2}{h_1 - h_2} \right) \cdot l \leq V \left(z = h_2 + \frac{2 \cdot (h_1 - h_2)}{3} \right)$$

$$z = h_2 + \frac{h_1 - h_2}{l} \cdot x$$

DATOS GENERALES:

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1050x(786x305)

TERRENO:

Densidad terreno: 0,0020 Kg/cm³
 Densidad Agua: 0,0010 Kg/cm³
 Indice Huecos: 30,0 %
 Densidad Aparente: 0,0013 Kg/cm³
 Angulo Roz.Int: 30,0 °
 Angulo Roz. Trno/Mro: 0,0 °
 Angulo de Talud: 18,4 °
 Coef. Empuje Activo Hztal: 0,427
 Coef. Empuje Activo Vtcal: 0,000

MURO:

Altura máxima: 786 cm Quiebro 300 cm
 Resguardo Tierras: 0 cm Canto C. 20 cm
 Longitud Muro: 100 cm Canto Z. 53,6 cm
 Peso del Muro 5.971 Kg/ml Xcdg (m) 17,2 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm²
 Prof. Aplic. (S.C.p) 0 cm

MATERIALES ALZADO:

Fc,k 300 Kg/cm² Gc (1,40)
 Fy,k 5100 Kg/cm² Gs (1,10)
 Fc,d 214,3 Kg/cm² Gf (1,50)
 Fy,d 4.636,4 Kg/cm² Recubrimiento: 4,0 cm.
 Fyv,d 4.200,0 Kg/cm²

ESFUERZOS:

	H_Calc	Canto	Md	As1	As2	Vd	Vcu	Ast
	cm	cm	Kg x cm	cm ²	cm ²	Kg	Kg	cm ² /ml
1	754	53,6	9.874.632	47,96	0,00	38.327	36.303	1,08
2	658	46,9	6.627.184	36,67	0,00	29.385	31.436	0,00
3	562	40,3	4.182.941	27,03	0,00	21.628	26.568	0,00
4	465	33,6	2.427.893	18,98	0,00	15.057	21.700	0,00
5	369	27,0	1.248.030	12,43	0,00	9.670	16.832	0,00

Aleta 1050x(786x305)

Tierras: 2.000 Kg/m³ SC_c: 400 Kg/m² Gc: 1,40
 Talud: 18,40° SC_p: 0 Kg/m² Gs: 1,10
 C.E.h: 0,427 Z_SCp: 0 cm Gf: 1,50

Z	Eh (Kg)				Vd	M (Kg)				Md
(cm)	(Tierras)	(Agua)	(SC.c)	(SC.p)	(Kg)	(Tierras)	(Agua)	(SC.c)	(SC.p)	(Kg x cm)
0	0	0	0	0	0	0	0	0	0	0
10	4	0	17	0	32	14	0	85	0	149
20	17	0	34	0	77	114	0	341	0	683
30	38	0	51	0	134	384	0	768	0	1.729
40	68	0	68	0	205	911	0	1.366	0	3.415
50	107	0	85	0	288	1.779	0	2.134	0	5.869
60	154	0	102	0	384	3.073	0	3.073	0	9.220
70	209	0	120	0	493	4.881	0	4.183	0	13.596
80	273	0	137	0	615	7.285	0	5.464	0	19.124
90	346	0	154	0	749	10.373	0	6.915	0	25.932
100	427	0	171	0	896	14.229	0	8.537	0	34.150
110	517	0	188	0	1.057	18.939	0	10.330	0	43.904
120	615	0	205	0	1.229	24.588	0	12.294	0	55.322
130	721	0	222	0	1.415	31.261	0	14.428	0	68.534
140	837	0	239	0	1.614	39.044	0	16.733	0	83.667
150	960	0	256	0	1.825	48.023	0	19.209	0	100.848
160	1.093	0	273	0	2.049	58.282	0	21.856	0	120.207
170	1.234	0	290	0	2.286	69.907	0	24.673	0	141.870
180	1.383	0	307	0	2.536	82.984	0	27.661	0	165.967
190	1.541	0	324	0	2.798	97.597	0	30.820	0	192.625
200	1.707	0	341	0	3.073	113.832	0	34.150	0	221.973
210	1.882	0	359	0	3.362	131.775	0	37.650	0	254.137
220	2.066	0	376	0	3.663	151.511	0	41.321	0	289.247
230	2.258	0	393	0	3.976	173.124	0	45.163	0	327.431
240	2.459	0	410	0	4.303	196.702	0	49.175	0	368.816
250	2.668	0	427	0	4.642	222.328	0	53.359	0	413.531
260	2.886	0	444	0	4.994	250.089	0	57.713	0	461.703
270	3.112	0	461	0	5.359	280.070	0	62.238	0	513.461
280	3.347	0	478	0	5.737	312.355	0	66.933	0	568.933
290	3.590	0	495	0	6.128	347.032	0	71.800	0	628.247
300	3.842	0	512	0	6.531	384.183	0	76.837	0	691.530
310	4.102	0	529	0	6.947	423.897	0	82.045	0	758.912
320	4.371	0	546	0	7.376	466.256	0	87.423	0	830.519
330	4.649	0	563	0	7.818	511.348	0	92.972	0	906.481
340	4.935	0	581	0	8.273	559.257	0	98.692	0	986.925
350	5.229	0	598	0	8.740	610.069	0	104.583	0	1.071.979
360	5.532	0	615	0	9.220	663.869	0	110.645	0	1.161.771
370	5.844	0	632	0	9.713	720.742	0	116.877	0	1.256.429
380	6.164	0	649	0	10.219	780.775	0	123.280	0	1.356.082
390	6.493	0	666	0	10.738	844.051	0	129.854	0	1.460.858
400	6.830	0	683	0	11.269	910.657	0	136.599	0	1.570.884
410	7.176	0	700	0	11.814	980.678	0	143.514	0	1.686.288
420	7.530	0	717	0	12.371	1.054.199	0	150.600	0	1.807.199
430	7.893	0	734	0	12.941	1.131.307	0	157.857	0	1.933.745
440	8.264	0	751	0	13.523	1.212.085	0	165.284	0	2.066.053
450	8.644	0	768	0	14.119	1.296.619	0	172.883	0	2.204.253
460	9.033	0	785	0	14.727	1.384.996	0	180.652	0	2.348.471
470	9.430	0	803	0	15.348	1.477.299	0	188.591	0	2.498.836
480	9.835	0	820	0	15.982	1.573.616	0	196.702	0	2.655.476

Aleta 1050x(786x305)

Tierras: 2.000 Kg/m³ SC_c: 400 Kg/m² Gc: 1,40
 Talud: 18,40° SC_p: 0 Kg/m² Gs: 1,10
 C.E.h: 0,427 Z_SCp: 0 cm Gf: 1,50

Z (cm)	Eh (Kg)				Vd (Kg)	M (Kg)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
490	10.249	0	837	0	16.629	1.674.030	0	204.983	0	2.818.519
500	10.672	0	854	0	17.288	1.778.627	0	213.435	0	2.988.094
510	11.103	0	871	0	17.961	1.887.493	0	222.058	0	3.164.327
520	11.543	0	888	0	18.646	2.000.714	0	230.852	0	3.347.348
530	11.991	0	905	0	19.344	2.118.373	0	239.816	0	3.537.284
540	12.448	0	922	0	20.054	2.240.558	0	248.951	0	3.734.263
550	12.913	0	939	0	20.778	2.367.353	0	258.257	0	3.938.414
560	13.387	0	956	0	21.514	2.498.843	0	267.733	0	4.149.865
570	13.869	0	973	0	22.263	2.635.115	0	277.380	0	4.368.742
580	14.360	0	990	0	23.025	2.776.252	0	287.198	0	4.595.176
590	14.859	0	1.007	0	23.800	2.922.341	0	297.187	0	4.829.293
600	15.367	0	1.024	0	24.588	3.073.468	0	307.347	0	5.071.222
610	15.884	0	1.042	0	25.388	3.229.717	0	317.677	0	5.321.091
620	16.409	0	1.059	0	26.201	3.391.173	0	328.178	0	5.579.027
630	16.942	0	1.076	0	27.027	3.557.923	0	338.850	0	5.845.160
640	17.485	0	1.093	0	27.866	3.730.052	0	349.692	0	6.119.616
650	18.035	0	1.110	0	28.718	3.907.644	0	360.706	0	6.402.524
660	18.594	0	1.127	0	29.582	4.090.786	0	371.890	0	6.694.013
670	19.162	0	1.144	0	30.459	4.279.562	0	383.244	0	6.994.210
680	19.738	0	1.161	0	31.349	4.474.059	0	394.770	0	7.303.243
690	20.323	0	1.178	0	32.252	4.674.360	0	406.466	0	7.621.240
700	20.917	0	1.195	0	33.168	4.880.553	0	418.333	0	7.948.329
710	21.519	0	1.212	0	34.096	5.092.722	0	430.371	0	8.284.639
720	22.129	0	1.229	0	35.038	5.310.952	0	442.579	0	8.630.298
730	22.748	0	1.246	0	35.992	5.535.330	0	454.959	0	8.985.433
740	23.375	0	1.264	0	36.958	5.765.940	0	467.509	0	9.350.172
750	24.011	0	1.281	0	37.938	6.002.867	0	480.229	0	9.724.644
760	24.656	0	1.298	0	38.931	6.246.197	0	493.121	0	10.108.977
770	25.309	0	1.315	0	39.936	6.496.016	0	506.183	0	10.503.299
780	25.971	0	1.332	0	40.954	6.752.409	0	519.416	0	10.907.737

11. CIMENTACIONES

En las páginas siguientes se muestran los cálculos de la cimentación de la aleta.

Armado a cortante: No necesario.

Obra: SUBTRAMO XV
 Cliente: NECSO
 Nº Oferta: 99/643
 Pieza: Aleta 1050x(786/305)

Densidad terreno:	0,00200 Kg/cm ³
Angulo rozamiento interno:	30,0 °
Angulo rozamiento terreno muro:	0,0 °
Angulo de Talud:	18,4 °
Coefficiente de rozamiento:	0,58
Tensión Admisible:	2,0 Kg/cm ²
Densidad del hormigón:	0,0025 Kg/cm ³

Nº Pza:	2		
Altura del Muro:	657,7 cm	Quiebro	267,9 cm
Altura tierras:	657,7 cm	Canto.C	20,0 cm
		Canto.Z	46,9 cm
Longitud Muro:	100,0 cm	Xcdg (m)	15,4 cm
Peso del Muro:	4 602 Kg/ml	Xcdg (t)	178,2 cm

Sobrecarga (coron.):	0,0400 Kg/cm2		
Sobrecarga (prof.):	0,0000 Kg/cm2	Prof. (S.C.p)	0 cm

Hormigon:	250 Kg/cm ²	(1,50)
Acero:	5.100 Kg/cm ²	(1,15)
Acciones:		(1,60)

Vuelo Puntera:	113 cm
Vuelo del Talon:	365 cm
Canto de la Zapata:	90 cm

Coeficiente Empuje Activo (H _{ztal}):	0,427
Base de la Zapata:	524.9 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-139	0	0
Muro:		-4602	-134		-629558
Tierras:	-23867	-55567	76	5948605	-19038126
Sobrecarga (coron.):	-1277	-1566	67	477331	-536695
Sobrecarga (prof.):	0	0	67	0	0
Zapata:		-11811	0		-3100180
	-25143	-73547		6425936	-23304559

$$C_{sd} = 1,69 \qquad C_{sv} = 3,63 \qquad e = -36,9 \quad \text{cm.}$$

TENSION DEL TERRENO:	1,70	<	2,00	(Servicio)	
	2,05	<	4,00	(Empuje mayorado)	(1,50)

Distribucion Trapezoidal

SP= 1,99	ST= 0,81	Le= 524,9
(Kg/cm2)	(Kg/cm2)	(cm)

Fcd =	166,7 Kg/cm2	Mayoración Cargas:	1,60
Fyd =	4.434,8 Kg/cm2	Recubrimiento:	6,0 cm.

Flexión:					
S1= 318,66	SPf= 275,32	STf= 263,49	S2= 129,67		
qvP= -36,00		qvT= -286,20			
Puntera:	VPf= 120,4	MP= 1.943.263	Us= 23.363	5,27	
Talón:	VTf= 371,7 (cm)	MT= -7.732.545 (Kgxcmm)	Us= 95.920 (Kg)	21,63 (cm2)	
As,min=	13,50 cm2 1,5 ‰				

S1= 318,66		SPc= 292,98		STc= 230,71		S2= 129,67	
qvP= -36,00				qvT= -286,20			
Puntera:	VPc= 71,3	VP=	19.247	Vcu=	54.222	0,00	
Talón:	VTc= 280,7	VT=	-29.755		(Kg)	(cm2/ml)	
	(cm)		(Kg)				

Perpendicular Muro: Ø25 /20cm
Paralelo Muro: Ø16 /25cm

Perpendicular Muro: Ø16 /25cm
Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1050x(786/305)

Densidad terreno:	0,00200 Kg/cm ³
Angulo rozamiento interno:	30,0 °
Angulo rozamiento terreno muro:	0,0 °
Angulo de Talud:	18,4 °
Coefficiente de rozamiento:	0,58
Tensión Admisible:	2,0 Kg/cm ²
Densidad del hormigón:	0,0025 Kg/cm ³

Nº Pza:	3		
Altura del Muro:	561,5 cm	Quiebro	267,9 cm
Altura tierras:	561,5 cm	Canto.C	20,0 cm
		Canto.Z	40,3 cm
Longitud Muro:	100,0 cm	Xcdg (m)	13,5 cm
Peso del Muro:	3.553 Kg/ml	Xcdg (t)	163,0 cm

Sobrecarga (coron.):	0,0400 Kg/cm2		
Sobrecarga (prof.):	0,0000 Kg/cm2	Prof.(S.C.p)	0 cm

Hormigon:	250 Kg/cm2	(1,50)
Acero:	5.100 Kg/cm2	(1,15)
Acciones:		(1,60)

Vuelo Puntera:	93 cm
Vuelo del Talon:	331 cm
Canto de la Zapata:	90 cm

Coeficiente Empuje Activo (H _{ztal}):	0,427
Base de la Zapata:	464,3 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-129	0	0
Muro:		-3553	-125		-403159
Tierras:	-18120	-42917	65	3935363	-12830761
Sobrecarga (coron.):	-1112	-1404	57	362409	-419705
Sobrecarga (prof.):	0	0	57	0	0
Zapata:		-10447	0		-2425195
	-19233	-58320		4297773	-16078821

$C_{sd} = 1,75$ $C_{sv} = 3,74$ $e = -32,5$ cm.

TENSION DEL TERRENO:	1,52	<	2,00	(Servicio)	
	1,82	<	4,00	(Empuje mayorado)	(1,50)

SP= 1,78 ST= 0,73 Le= 464,3
(Kg/cm2) (Kg/cm2) (cm)

Fcd =	166,7 Kg/cm2	Mayoración Cargas:	1,60
Fyd =	4.434,8 Kg/cm2	Recubrimiento:	6,0 cm.

Flexión:					
S1= 285,37	SPf= 249,24	STf= 238,99	S2= 116,58		
qvP= -36,00		qvT= -250,06			
Puntera:	VPf= 99,4	MP= 1.171.938	Us= 14.034	3,16	
Talón:	VTf= 336,7	MT= -5.253.903	Us= 64.283	14,50	
	(cm)	(Kgxcn)	(Kg)	(cm2)	
As,min= 13,50 cm2					
1,5 ‰					

S1= 285,37	SPc= 266,71	STc= 206,25	S2= 116,58
qvP= -36,00		qvT= -250,06	
Puntera:	VPc= 51,3	VP= 12.322	Vcu= 54.222 0,00
Talón:	VTc= 246,7 (cm)	VT= -21.867 (Kg)	(Kg) (cm2/ml)

Perpendicular Muro: Ø20 /20cm
Paralelo Muro: Ø16 /25cm

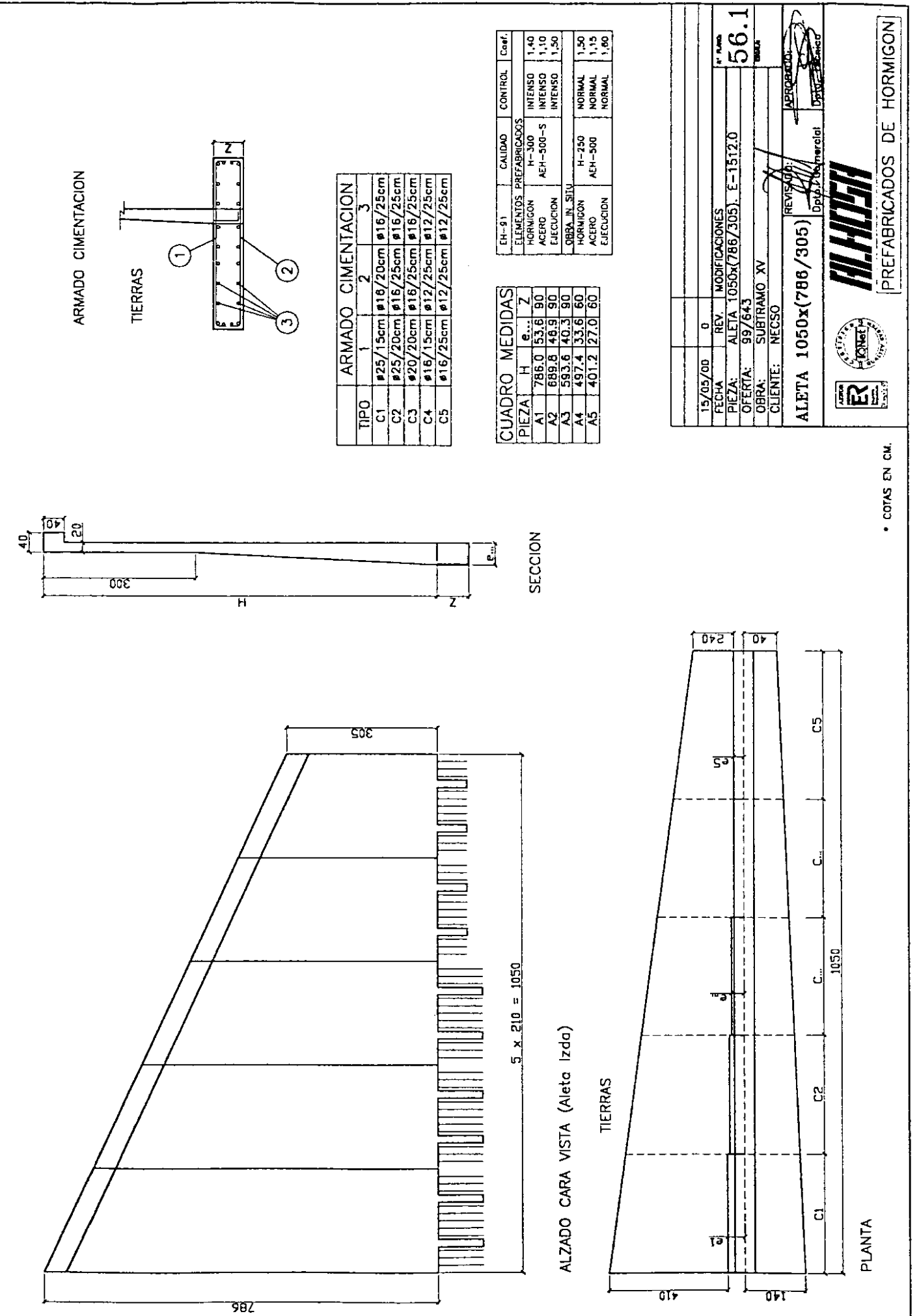
Perpendicular Muro: Ø16 /25cm
Paralelo Muro: Ø16 /25cm

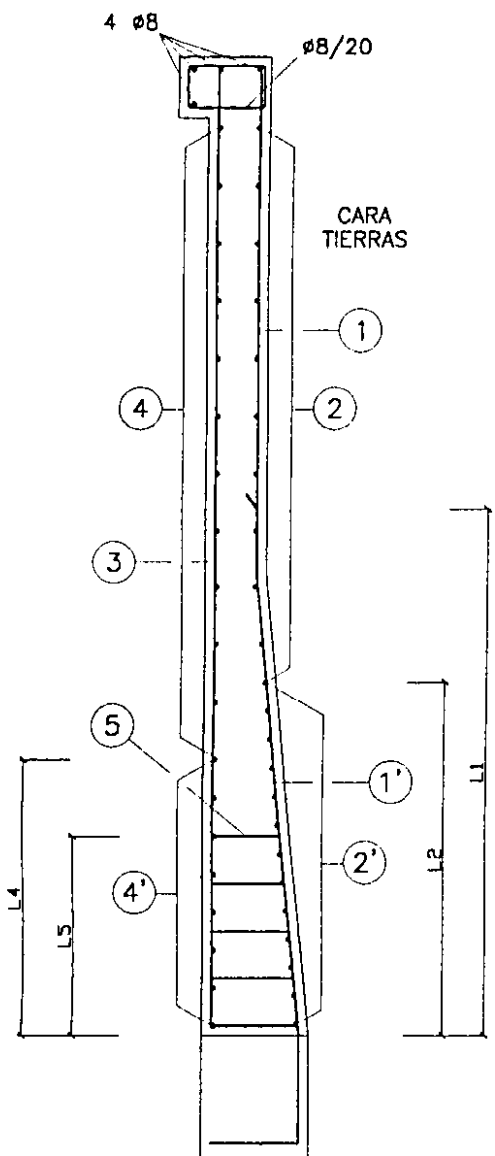
Armado a cortante: No necesario.

Armado a cortante: No necesario.

Armado a cortante: No necesario.

12. PLANOS





DEFINICIÓN DE ARMADO

	A 1	A 2	A 3	A 4	A 4
1	Ø25/20	Ø20/16	Ø20/22	Ø16/30	Ø16/30
1'	Ø25/10	Ø20/8	Ø20/11	Ø16/10	Ø16/15
L1	430	350	325	320	220
2	Ø10/24	Ø10/30	Ø10/30	Ø8/30	Ø8/30
2'	Ø10/8	Ø10/10	Ø10/12.5	Ø8/12.5	Ø8/20
L2	392	340	250	200	120
3	Ø20/30	Ø16/25	Ø12/24	Ø10/24	Ø8/30
4	Ø10/30	Ø8/20	Ø8/25	Ø8/25	Ø8/25
4'	Ø10/15	Ø8/10	Ø8/12.5	Ø8/15	8/15
L4	390	310	300	195	90
5	5Ø8/25	--	--	--	--
L5	100	--	--	--	--

Distancias en centímetros

EH-91	CALIDAD	CONTROL	Coef.
ELEMENTOS PREFABRICADOS			
HORMIGON	H-300	INTENSO	1,40
ACERO	AEH-500-S	INTENSO	1,10
EJECUCION		INTENSO	1,50
OBRA IN SITU			
HORMIGON	H-250	NORMAL	1,50
ACERO	AEH-500	NORMAL	1,15
EJECUCION		NORMAL	1,60

15/05/00	0	MODIFICACIONES	Nº PLANO
FECHA	REV.		
PIEZA:	ALETA 1050x(786/305)	E-1512.0	56.2
OFERTA:	99/643		
OBRA:	ZARAGOZA		
CLIENTE:	NECSO		
ALETA 1050x(786/305)		REVISADO:	APROBADO:
		Fecha Comercial	Dpto. Técnico
PREFABRICADOS DE HORMIGON			

4.5.2 E-1516.3

<i>ALHOSA</i> PREFABRICADOS DE HORMIGÓN	ALETA 1150 x (545/50) E-1516.3
Oferta: 99/643 Obra: SUBTRAMO XV Empresa: NECSO Fecha: Junio de 2.000	

ÍNDICE

- 1.- Generalidades
- 2.- Descripción
- 3.- Instrucciones aplicadas
- 4.- Características de los materiales
- 5.- Control de calidad
- 6.- Coeficientes de seguridad
- 7.- Parámetros del terreno
- 8.- Acciones consideradas
- 9.- Hipótesis de cálculo
- 10.- Cálculos
- 11.- Cimentación
- 12.- Planos

1. Generalidades

En la presente memoria se muestran los cálculos realizados para justificar las Aletas Prefabricadas de hormigón que sostienen el terraplén.

2. Descripción

El sostenimiento de las tierras que forman el terraplén en las entradas de las obras de fábrica se realiza con aletas prefabricadas de hormigón armado.

El espesor de los muros que forman las aletas es de 20 cm. hasta los 300 cm. de profundidad y luego aumenta progresivamente, tal y como se muestra en los planos adjuntos.

La cimentación se realiza con hormigón vertido in situ

3. Instrucciones aplicadas

Para el cálculo de las Aletas, se han utilizado las siguientes Instrucciones y Normas:

* Instrucción para el Proyecto y Ejecución de Obras de Hormigón en Masa o Armado EH-91.

4. Características de los materiales

* Hormigones:

Hormigón en elemento prefabricado	H-300
Hormigón en obra in situ	H-250

* Acero:

Acero para armar corrugado	B-500 S
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5. Control de calidad

El control de calidad se atenderá a lo especificado en la EH-91, habiéndose seleccionado los siguientes niveles:

Elementos prefabricados:

a) Materiales:

- Hormigón	Control Intenso
- Armadura pasiva	Control Intenso

b) Ejecución:

- En toda la obra	Control Intenso
-------------------	-----------------

Obra in situ:

a) Materiales:

- Hormigón	Control Normal
- Armadura pasiva	Control Normal

b) Ejecución:

- En toda la obra	Control Normal
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6. Coeficientes de seguridad

De acuerdo con los niveles de control de calidad definidos, se adoptan los siguientes coeficientes de seguridad:

Elementos prefabricados:

- Coeficientes de minoración de resistencias:	
Acero pasivo	$\gamma_s = 1,10$
Hormigón	$\gamma_c = 1,40$
- Coeficientes de ponderación de acciones:	$\gamma_f = 1,50$

Obra in situ:

- Coeficientes de minoración de resistencias:	
Acero pasivo	$\gamma_s = 1,15$
Hormigón	$\gamma_c = 1,50$
- Coeficientes de ponderación de acciones:	$\gamma_f = 1,60$

7. Parámetros del terreno

Pese a existir un relleno de calidad adecuadamente compactado (al que correspondería un ángulo de rozamiento interno de 35°), con un talud 2H:1V. En los cálculos se ha considerado, conservadoramente, un talud de terraplén 3H:2V con ángulo de rozamiento interno de 30°. La Aleta forma un ángulo de 60° con el pie del terraplén

Peso específico	2,0ton/m3
Ángulo de rozamiento interno	30°
Ángulo Talud coronación	18,4°
Coefficiente de empuje activo	0,427

8. Acciones consideradas

8.1 Empuje por efecto de las tierras

Se considera el empuje de las tierras que se encuentran en el trasdós de la Aleta con un coeficiente de empuje de 0,427.

8.2 Sobrecargas de uso

Se considera una sobrecarga de 400 Kg/m2 sobre el terraplén, que es la establecida para paseos de servicio.

8.3 Sobrecargas de tráfico

En la primera pieza de la aleta, dada su proximidad a la plataforma, se considera una sobrecarga de 3.500Kg/m2 en todo su alzado.

En la segunda pieza de la aleta, dada su proximidad a la plataforma, se considera una sobrecarga de 3.500Kg/m2 a partir de 2,80m de profundidad.

9. Hipótesis de cálculo.

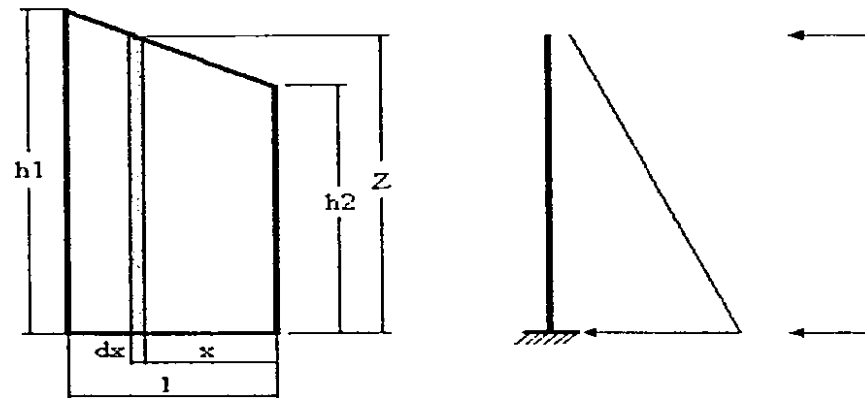
HIPÓTESIS I:

- Empuje de las tierras
- Sobrecarga de uso
- Sobrecarga de tráfico (En las dos primeras piezas)
- Combinación: 1,5 * [Caso (1) + Caso (2) + Caso (3)]

10. Cálculos.

Dada la geometría de la estructura en la que se reduce la altura en función de la longitud y los esfuerzos se comportan de igual manera, cada tramo de la aleta se ha armado para la altura existente a una distancia, del lado mayor, de 1/3 de su longitud, siendo en todo momento superiores las solicitaciones en este punto que la resultante sobre cada tramo.

Pza.	H.máx	H.mín	H.cál
1	545,0	446,0	512
2	446,0	347,0	413
3	347,0	248,0	314
4	248,0	149,0	215
5	149,0	50,0	116



$$M = \int_{x=0}^{x=l} dM = \int_{x=0}^{x=l} \left(\frac{1}{6} \cdot \lambda_h \cdot \gamma_t \cdot z^3 + \frac{1}{2} \cdot \lambda_h \cdot SC \cdot z^2 \right) \cdot dx =$$

$$= \frac{1}{6} \cdot \lambda_h \cdot \gamma_t \cdot \left(\frac{1}{4} \cdot \frac{h_1^4 - h_2^4}{h_1 - h_2} \right) \cdot l + \frac{1}{2} \cdot \lambda_h \cdot SC \cdot \left(\frac{1}{3} \cdot \frac{h_1^3 - h_2^3}{h_1 - h_2} \right) \cdot l = M \left(z = h_2 + \frac{2 \cdot (h_1 - h_2)}{3} \right)$$

$$V = \int_{x=0}^{x=l} dV = \int_{x=0}^{x=l} \left(\frac{1}{2} \cdot \lambda_h \cdot \gamma_t \cdot z^2 + \lambda_h \cdot SC \cdot z \right) \cdot dx =$$

$$= \frac{1}{2} \cdot \lambda_h \cdot \gamma_t \cdot \left(\frac{1}{3} \cdot \frac{h_1^3 - h_2^3}{h_1 - h_2} \right) \cdot l + \lambda_h \cdot SC \cdot \left(\frac{1}{2} \cdot \frac{h_1^2 - h_2^2}{h_1 - h_2} \right) \cdot l = V \left(z = h_2 + \frac{2 \cdot (h_1 - h_2)}{3} \right)$$

$$z = h_2 + \frac{h_1 - h_2}{l} \cdot x$$

DATOS GENERALES:

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1150x(545x50)

TERRENO:

Densidad terreno: 0,0020 Kg/cm³
 Densidad Agua: 0,0010 Kg/cm³
 Índice Huecos: 30,0 %
 Densidad Aparente: 0,0013 Kg/cm³
 Angulo Roz.Int: 30,0 °
 Angulo Roz. Trmo/Mro: 0,0 °
 Angulo de Talud: 0,0 °
 Coef. Empuje Activo Hztal: 0,333
 Coef. Empuje Activo Vtcal: 0,000

MURO:

Altura máxima: 545 cm Quiebro: 300 cm
 Resguardo Tierras: 0 cm Canto C: 20 cm
 Longitud Muro: 100 cm Canto Z: 32,3 cm
 Peso del Muro: 3.100 Kg/ml Xcdg (m): 11,7 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,3500 Kg/cm²
 Prof. Aplic. (S.C.p.): 0 cm

MATERIALES ALZADO:

Fc,k: 300 Kg/cm² Gc: (1,40)
 Fy,k: 5100 Kg/cm² Gs: (1,10)
 Fc,d: 214,3 Kg/cm² Gf: (1,50)
 Fy,d: 4.636,4 Kg/cm² Recubrimiento: 4,0 cm.
 Fyv,d: 4.200,0 Kg/cm²

ESFUERZOS:

	H_Calc cm	Canto cm	Md Kg x cm	As1 cm ²	As2 cm ²	Vd Kg	Vcu Kg	Ast cm ² /ml
1	512	32,3	4.792.866	44,01	0,00	23.091	20.677	2,26

ESFUERZOS

Aleta 1150x(545x50)

Tierras: 2.000 Kg/m3 SC_c: 400 Kg/m2 Gc: 1,40
 Talud: 0,00° SC_p: 3.500 Kg/m2 Gs: 1,10
 C.E.h: 0,333 Z_SCp: 0 cm Gf: 1,50

Z (cm)	Eh (Kg)				Vd (Kg)	M (Kg)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
0	0	0	0	0	0	0	0	0	0	0
10	3	0	13	117	200	11	0	67	583	992
20	13	0	27	233	410	89	0	267	2.333	4.033
30	30	0	40	350	630	300	0	600	5.250	9.225
40	53	0	53	467	860	711	0	1.067	9.333	16.667
50	83	0	67	583	1.100	1.389	0	1.667	14.583	26.458
60	120	0	80	700	1.350	2.400	0	2.400	21.000	38.700
70	163	0	93	817	1.610	3.811	0	3.267	28.583	53.492
80	213	0	107	933	1.880	5.689	0	4.267	37.333	70.933
90	270	0	120	1.050	2.160	8.100	0	5.400	47.250	91.125
100	333	0	133	1.167	2.450	11.111	0	6.667	58.333	114.167
110	403	0	147	1.283	2.750	14.789	0	8.067	70.583	140.158
120	480	0	160	1.400	3.060	19.200	0	9.600	84.000	169.200
130	563	0	173	1.517	3.380	24.411	0	11.267	98.583	201.392
140	653	0	187	1.633	3.710	30.489	0	13.067	114.333	236.833
150	750	0	200	1.750	4.050	37.500	0	15.000	131.250	275.625
160	853	0	213	1.867	4.400	45.511	0	17.067	149.333	317.867
170	963	0	227	1.983	4.760	54.589	0	19.267	168.583	363.658
180	1.080	0	240	2.100	5.130	64.800	0	21.600	189.000	413.100
190	1.203	0	253	2.217	5.510	76.211	0	24.067	210.583	466.292
200	1.333	0	267	2.333	5.900	88.889	0	26.667	233.333	523.333
210	1.470	0	280	2.450	6.300	102.900	0	29.400	257.250	584.325
220	1.613	0	293	2.567	6.710	118.311	0	32.267	282.333	649.367
230	1.763	0	307	2.683	7.130	135.189	0	35.267	308.583	718.558
240	1.920	0	320	2.800	7.560	153.600	0	38.400	336.000	792.000
250	2.083	0	333	2.917	8.000	173.611	0	41.667	364.583	869.792
260	2.253	0	347	3.033	8.450	195.289	0	45.067	394.333	952.033
270	2.430	0	360	3.150	8.910	218.700	0	48.600	425.250	1.038.825
280	2.613	0	373	3.267	9.380	243.911	0	52.267	457.333	1.130.267
290	2.803	0	387	3.383	9.860	270.989	0	56.067	490.583	1.226.458
300	3.000	0	400	3.500	10.350	300.000	0	60.000	525.000	1.327.500
310	3.203	0	413	3.617	10.850	331.011	0	64.067	560.583	1.433.492
320	3.413	0	427	3.733	11.360	364.089	0	68.267	597.333	1.544.533
330	3.630	0	440	3.850	11.880	399.300	0	72.600	635.250	1.660.725
340	3.853	0	453	3.967	12.410	436.711	0	77.067	674.333	1.782.167
350	4.083	0	467	4.083	12.950	476.389	0	81.667	714.583	1.908.958
360	4.320	0	480	4.200	13.500	518.400	0	86.400	756.000	2.041.200
370	4.563	0	493	4.317	14.060	562.811	0	91.267	798.583	2.178.992
380	4.813	0	507	4.433	14.630	609.689	0	96.267	842.333	2.322.433
390	5.070	0	520	4.550	15.210	659.100	0	101.400	887.250	2.471.625
400	5.333	0	533	4.667	15.800	711.111	0	106.667	933.333	2.626.667
410	5.603	0	547	4.783	16.400	765.789	0	112.067	980.583	2.787.658
420	5.880	0	560	4.900	17.010	823.200	0	117.600	1.029.000	2.954.700
430	6.163	0	573	5.017	17.630	883.411	0	123.267	1.078.583	3.127.892
440	6.453	0	587	5.133	18.260	946.489	0	129.067	1.129.333	3.307.333
450	6.750	0	600	5.250	18.900	1.012.500	0	135.000	1.181.250	3.493.125
460	7.053	0	613	5.367	19.550	1.081.511	0	141.067	1.234.333	3.685.367
470	7.363	0	627	5.483	20.210	1.153.589	0	147.267	1.288.583	3.884.158
480	7.680	0	640	5.600	20.880	1.228.800	0	153.600	1.344.000	4.089.600

ESFUERZOS

Aleta 1150x(545x50)

Tierras: 2.000 Kg/m3 SC_c: 400 Kg/m2 Gc: 1,40
 Talud: 0,00° SC_p: 3.500 Kg/m2 Gs: 1,10
 C.E.h: 0,333 Z_SCp: 0 cm Gf: 1,50

Z (cm)	Eh (Kg)				Vd (Kg)	M (Kg)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
490	8.003	0	653	5.717	21.560	1.307.211	0	160.067	1.400.583	4.301.792
500	8.333	0	667	5.833	22.250	1.388.889	0	166.667	1.458.333	4.520.833
510	8.670	0	680	5.950	22.950	1.473.900	0	173.400	1.517.250	4.746.825
520	9.013	0	693	6.067	23.660	1.562.311	0	180.267	1.577.333	4.979.867
530	9.363	0	707	6.183	24.380	1.654.189	0	187.267	1.638.583	5.220.058
540	9.720	0	720	6.300	25.110	1.749.600	0	194.400	1.701.000	5.467.500

DATOS GENERALES:

Obra:
 Cliente:
 N° Oferta:
 Pieza: Aleta 1150x(545x50)

TERRENO:

Densidad terreno: 0,0020 Kg/cm³
 Densidad Agua: 0,0010 Kg/cm³
 Indice Huecos: 30,0 %
 Densidad Aparente: 0,0013 Kg/cm³
 Angulo Roz.Int: 30,0 °
 Angulo Roz. Trmo/Mro: 0,0 °
 Angulo de Talud: 18,4 °
 Coef. Empuje Activo Hztal: 0,427
 Coef. Empuje Activo Vtal: 0,000

MURO:

Altura máxima: 545 cm Quiebro 300 cm
 Resguardo Tierras: 0 cm Canto C. 20 cm
 Longitud Muro: 100 cm Canto Z. 32,3 cm
 Peso del Muro 3.100 Kg/ml Xcdg (m) 11,7 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,3500 Kg/cm²
 Prof. Aplic. (S.C.p.) 280 cm

MATERIALES ALZADO:

Fc,k 300 Kg/cm² Gc (1,40)
 Fy,k 5100 Kg/cm² Gs (1,10)
 Fc,d 214,3 Kg/cm² Gf (1,50)
 Fy,d 4.636,4 Kg/cm²
 Fyv,d 4.200,0 Kg/cm²
 Recubrimiento: 4,0 cm.

ESFUERZOS:

H_Calc	Canto	Md	As1	As2	Vd	Vcu	Ast
cm	cm	Kg x cm	cm ²	cm ²	Kg	Kg	cm ² /ml
2	413	27,3	1.920.189	19,55	0,00	14.960	17.054 0,00

Aleta 1150x(545x50)

Tierras: 2.000 Kg/m³ SC_c: 400 Kg./m² Gc: 1,40
 Talud: 18,40° SC_p: 3.500 Kg./m² Gs: 1,10
 C.E.h: 0,427 Z_SCp: 280 cm Gf: 1,50

Z (cm)	Eh (Kg)				Vd (Kg)	M (Kg x cm)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
0	0	0	0	0	0	0	0	0	0	0
10	4	0	17	0	32	14	0	85	0	149
20	17	0	34	0	77	114	0	341	0	683
30	38	0	51	0	134	384	0	768	0	1.729
40	68	0	68	0	205	911	0	1.366	0	3.415
50	107	0	85	0	288	1.779	0	2.134	0	5.869
60	154	0	102	0	384	3.073	0	3.073	0	9.220
70	209	0	120	0	493	4.881	0	4.183	0	13.596
80	273	0	137	0	615	7.285	0	5.464	0	19.124
90	346	0	154	0	749	10.373	0	6.915	0	25.932
100	427	0	171	0	896	14.229	0	8.537	0	34.150
110	517	0	188	0	1.057	18.939	0	10.330	0	43.904
120	615	0	205	0	1.229	24.588	0	12.294	0	55.322
130	721	0	222	0	1.415	31.261	0	14.428	0	68.534
140	837	0	239	0	1.614	39.044	0	16.733	0	83.667
150	960	0	256	0	1.825	48.023	0	19.209	0	100.848
160	1.093	0	273	0	2.049	58.282	0	21.856	0	120.207
170	1.234	0	290	0	2.286	69.907	0	24.673	0	141.870
180	1.383	0	307	0	2.536	82.984	0	27.661	0	165.967
190	1.541	0	324	0	2.798	97.597	0	30.820	0	192.625
200	1.707	0	341	0	3.073	113.832	0	34.150	0	221.973
210	1.882	0	359	0	3.362	131.775	0	37.650	0	254.137
220	2.066	0	376	0	3.663	151.511	0	41.321	0	289.247
230	2.258	0	393	0	3.976	173.124	0	45.163	0	327.431
240	2.459	0	410	0	4.303	196.702	0	49.175	0	368.816
250	2.668	0	427	0	4.642	222.328	0	53.359	0	413.531
260	2.886	0	444	0	4.994	250.089	0	57.713	0	461.703
270	3.112	0	461	0	5.359	280.070	0	62.238	0	513.461
280	3.347	0	478	0	5.737	312.355	0	66.933	0	568.933
290	3.590	0	495	149	6.352	347.032	0	71.800	747	629.367
300	3.842	0	512	299	6.979	384.183	0	76.837	2.988	696.012
310	4.102	0	529	448	7.620	423.897	0	82.045	6.723	768.997
320	4.371	0	546	598	8.273	466.256	0	87.423	11.952	848.448
330	4.649	0	563	747	8.939	511.348	0	92.972	18.676	934.494
340	4.935	0	581	896	9.617	559.257	0	98.692	26.893	1.027.264
350	5.229	0	598	1.046	10.309	610.069	0	104.583	36.604	1.126.885
360	5.532	0	615	1.195	11.013	663.869	0	110.645	47.809	1.233.485
370	5.844	0	632	1.345	11.730	720.742	0	116.877	60.509	1.347.193
380	6.164	0	649	1.494	12.460	780.775	0	123.280	74.702	1.468.136
390	6.493	0	666	1.643	13.203	844.051	0	129.854	90.390	1.596.442
400	6.830	0	683	1.793	13.959	910.657	0	136.599	107.571	1.732.241
410	7.176	0	700	1.942	14.727	980.678	0	143.514	126.247	1.875.658
420	7.530	0	717	2.092	15.508	1.054.199	0	150.600	146.417	2.026.824
430	7.893	0	734	2.241	16.302	1.131.307	0	157.857	168.080	2.185.865
440	8.264	0	751	2.390	17.109	1.212.085	0	165.284	191.238	2.352.910

DATOS GENERALES:

Obra:
 Cliente:
 N° Oferta:
 Pieza: Aleta 1150x(545x50)

TERRENO:

Densidad terreno: 0,0020 Kg/cm³
 Densidad Agua: 0,0010 Kg/cm³
 Indice Huecos: 30,0 %
 Densidad Aparente: 0,0013 Kg/cm³
 Angulo Roz.Int: 30,0 °
 Angulo Roz. Tmo/Mro: 0,0 °
 Angulo de Talud: 18,4 °
 Coef. Empuje Activo Hztal: 0,427
 Coef. Empuje Activo Vtal: 0,000

MURO:

Altura máxima: 545 cm Quiebro 300 cm
 Resguardo Tierras: 0 cm Canto C. 20 cm
 Longitud Muro: 100 cm Canto Z. 32,3 cm
 Peso del Muro 3.100 Kg/ml Xcdg (m) 11,7 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm²
 Prof. Aplic. (S.C.p.) 0 cm

MATERIALES ALZADO:

Fc,k 300 Kg/cm² Gc (1,40)
 Fy,k 5100 Kg/cm² Gs (1,10)
 Fc,d 214,3 Kg/cm² Gf (1,50)
 Fy,d 4.636,4 Kg/cm²
 Fyv,d 4.200,0 Kg/cm²
 Recubrimiento: 4,0 cm.

ESFUERZOS:

	H_Calc cm	Canto cm	Md Kg x cm	As1 cm ²	As2 cm ²	Vd Kg	Vcu Kg	Ast cm ² /ml
3	314	22,4	787.040	9,82	0,00	7.117	13.431	0,00
4	215	20,0	271.316	3,75	0,00	3.510	11.711	0,00
5	116	20,0	50.547	0,96	0,00	1.159	11.711	0,00

Aleta 1150x(545x50)

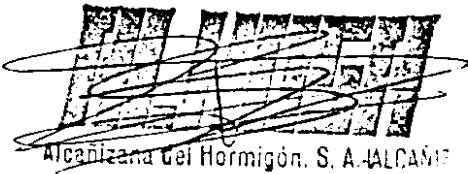
Tierras: 2.000 Kg/m³ SC_c: 400 Kg/m² Gc: 1,40
 Talud: 18,40° SC_p: 0 Kg/m² Gs: 1,10
 C.E.h: 0,427 Z_SCp: 0 cm Gf: 1,50

Z (cm)	Eh (Kg)				Vd (Kg)	M (Kg x cm)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
0	0	0	0	0	0	0	0	0	0	0
10	4	0	17	0	32	14	0	85	0	149
20	17	0	34	0	77	114	0	341	0	683
30	38	0	51	0	134	384	0	768	0	1.729
40	68	0	68	0	205	911	0	1.366	0	3.415
50	107	0	85	0	288	1.779	0	2.134	0	5.869
60	154	0	102	0	384	3.073	0	3.073	0	9.220
70	209	0	120	0	493	4.881	0	4.183	0	13.596
80	273	0	137	0	615	7.285	0	5.464	0	19.124
90	346	0	154	0	749	10.373	0	6.915	0	25.932
100	427	0	171	0	896	14.229	0	8.537	0	34.150
110	517	0	188	0	1.057	18.939	0	10.330	0	43.904
120	615	0	205	0	1.229	24.588	0	12.294	0	55.322
130	721	0	222	0	1.415	31.261	0	14.428	0	68.534
140	837	0	239	0	1.614	39.044	0	16.733	0	83.667
150	960	0	256	0	1.825	48.023	0	19.209	0	100.848
160	1.093	0	273	0	2.049	58.282	0	21.856	0	120.207
170	1.234	0	290	0	2.286	69.907	0	24.673	0	141.870
180	1.383	0	307	0	2.536	82.984	0	27.661	0	165.967
190	1.541	0	324	0	2.798	97.597	0	30.820	0	192.625
200	1.707	0	341	0	3.073	113.832	0	34.150	0	221.973
210	1.882	0	359	0	3.362	131.775	0	37.650	0	254.137
220	2.066	0	376	0	3.663	151.511	0	41.321	0	289.247
230	2.258	0	393	0	3.976	173.124	0	45.163	0	327.431
240	2.459	0	410	0	4.303	196.702	0	49.175	0	368.816
250	2.668	0	427	0	4.642	222.328	0	53.359	0	413.531
260	2.886	0	444	0	4.994	250.089	0	57.713	0	461.703
270	3.112	0	461	0	5.359	280.070	0	62.238	0	513.461
280	3.347	0	478	0	5.737	312.355	0	66.933	0	568.933
290	3.590	0	495	0	6.128	347.032	0	71.800	0	628.247
300	3.842	0	512	0	6.531	384.183	0	76.837	0	691.530
310	4.102	0	529	0	6.947	423.897	0	82.045	0	758.912
320	4.371	0	546	0	7.376	466.256	0	87.423	0	830.519
330	4.649	0	563	0	7.818	511.348	0	92.972	0	906.481
340	4.935	0	581	0	8.273	559.257	0	98.692	0	986.925

11. CIMENTACIONES

En las páginas siguientes se muestran los cálculos de la cimentación de la aleta.

En Alcañiz, Junio de 2.000



Javier Tello Sánchez
Dpto. Técnico ALHOSA

DATOS GENERALES:

Obra: SUBTRAMO XV
Cliente: NECSO
Nº Oferta: 99/643
Pieza: Aleta 1150x(545/50)

TERRENO:

Densidad terreno: 0,00200 Kg/cm3
Angulo rozamiento interno: 30,0 °
Angulo rozamiento terreno muro: 0,0 °
Angulo de Talud: 0,0 °
Coeficiente de rozamiento: 0,58
Tensión Admisible: 2,0 Kg/cm2
Densidad del hormigón: 0,0025 Kg/cm3

DATOS DEL MURO:

Nº Pza:	1		
Altura del Muro:	512,0 cm	Quiebro	267,0 cm
Altura tierras:	512,0 cm	Canto.C	20,0 cm
		Canto.Z	32,3 cm
Longitud Muro:	100,0 cm	Xcdg (m)	11,8 cm
Peso del Muro:	2.935 Kg/ml	Xcdg (t)	155,9 cm

ACCIONES:

Sobrecarga (coron.):	0,0400 Kg/cm2		
Sobrecarga (prof.):	0,3500 Kg/cm2	Prof.(S.C.p)	0 cm

RESISTENCIAS:

Hormigon:	250 Kg/cm2	(1,50)
Acero:	5.100 Kg/cm2	(1,15)
Acciones:		(1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera:	96 cm
Vuelo del Talon:	321 cm
Canto de la Zapata:	80 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (Hztal):	0,333
Base de la Zapata:	449,6 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-119	0	0
Muro:		-2935	-117		-329104
Tierras:	-11682	-33859	59	2305274	-9782374
Sobrecarga (coron.):	-789	-1334	58	233643	-385511
Sobrecarga (prof.):	-6907	-11675	58	2044373	-3373222
Zapata:		-8992	0		-2021252
	-19378	-58795		4583290	-15891464

Csd = 1,75 Csv = 3,47 e = -48,3 cm.

- El presente informe se ha realizado con los datos aportados por el cliente para esta pieza prefabricada concreta.
Salvo comunicación escrita de lo contrario, las consideraciones en él realizadas, así como los resultados aportados, se ajustan a lo solicitado por el cliente.

Aleta 1150x(545/50) Pza. 1

TENSION DEL TERRENO: 1,73 < 2,00 (Servicio)
2,14 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
SP= 2,15 ST= 0,47 Le= 449,6
(Kg/cm2) (Kg/cm2) (cm)

CIMENTACIÓN:

Fcd = 166,7 Kg/cm2 Mayoración Cargas: 1,60
Fyd = 4.434,8 Kg/cm2 Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:

Flexión:
S1= 344,03 SPf= 283,57 STf= 270,03 S2= 74,46
qvP= -32,00 qvT= -262,99

Puntera: VPf= 100,8 MP= 1.483.924 Us= 20.249 4,57
Talón: VTf= 326,2 MT= -6.561.030 Us= 92.767 20,92
(cm) (Kgxcn) (Kg) (cm2)
As,min= 12,00 cm2
1,5 ‰

Cortante:
S1= 344,03 SPc= 308,65 STc= 222,76 S2= 74,46
qvP= -32,00 qvT= -262,99

Puntera: VPc= 59,0 VP= 17.366 Vcu= 47.767 0,00
Talón: VTc= 247,3 VT= -28.291 (Kg) (cm2/ml)
(cm) (Kg)

Armado Superior (Talón):

Perpendicular Muro: Ø25 /20cm
Paralelo Muro: Ø16 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø16 /25cm
Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

DATOS GENERALES:

Obra: SUBTRAMO XV
Cliente: NECSO
Nº Oferta: 99/643
Pieza: Aleta 1150x(545/50)

TERRENO:

Densidad terreno: 0,00200 Kg/cm3
Angulo rozamiento interno: 30,0 °
Angulo rozamiento terreno muro: 0,0 °
Angulo de Talud: 18,4 °
Coeficiente de rozamiento: 0,58
Tensión Admisible: 2,0 Kg/cm2
Densidad del hormigón: 0,0025 Kg/cm3

DATOS DEL MURO:

Nº Pza: 2
Altura del Muro: 413,0 cm Quiebro 267,0 cm
Altura tierras: 413,0 cm Canto.C 20,0 cm
Canto.Z 27,3 cm
Longitud Muro: 100,0 cm Xcdg (m) 10,8 cm
Peso del Muro: 2.198 Kg/ml Xcdg (t) 134,1 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm2
Sobrecarga (prof.): 0,3500 Kg/cm2 Prof.(S.C.p) 280 cm

RESISTENCIAS:

Hormigon: 250 Kg/cm2 (1,50)
Acero: 5.100 Kg/cm2 (1,15)
Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 84 cm
Vuelo del Talon: 265 cm
Canto de la Zapata: 80 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (Hztal): 0,427
Base de la Zapata: 376,6 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-94	0	0
Muro:		-2198	-94		-214657
Tierras:	-10375	-24886	57	1704966	-6071239
Sobrecarga (coron.):	-842	-1091	52	207501	-266054
Sobrecarga (prof.):	-3182	-9542	52	338917	-2327971
Zapata:		-7533	0		-1418527
	-14399	-45249		2251384	-10298447

Csd = 1,81 Csv = 4,57 e = -21,7 cm.

Aleta 1150x(545/50) Pza. 2

TENSION DEL TERRENO: 1,41 < 2,00 (Servicio)
1,65 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
SP= 1,62 ST= 0,79 Le= 376,6
(Kg/cm2) (Kg/cm2) (cm)

CIMENTACIÓN:

Fcd = 166,7 Kg/cm2 Mayoración Cargas: 1,60
Fyd = 4.434,8 Kg/cm2 Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S1= 258,54 SPf= 227,52 STf= 220,79 S2= 125,91
qvP= -32,00 qvT= -244,46

Puntera: VPf= 88,1 MP= 838.945 Us= 11.399 2,57
Talón: VTf= 269,4 MT= -3.155.139 Us= 43.541 9,82
(cm) (Kgxcn) (Kg) (cm2)
As,min= 12,00 cm2
1,5 ‰

Cortante:

S1= 258,54 SPc= 241,99 STc= 193,29 S2= 125,91
qvP= -32,00 qvT= -244,46

Puntera: VPc= 47,0 VP= 10.259 Vcu= 47.767 0,00
Talón: VTc= 191,3 VT= -16.238 (Kg) (cm2/ml)
(cm) (Kg)

Armado Superior (Talón):

Perpendicular Muro: Ø16 /15cm
Paralelo Muro: Ø16 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø16 /25cm
Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

DATOS GENERALES:

Obra: SUBTRAMO XV
Cliente: NECSO
Nº Oferta: 99/643
Pieza: Aleta 1150x(545/50)

TERRENO:

Densidad terreno: 0,00200 Kg/cm3
Angulo rozamiento interno: 30,0 °
Angulo rozamiento terreno muro: 0,0 °
Angulo de Talud: 18,4 °
Coeficiente de rozamiento: 0,58
Tensión Admisible: 2,0 Kg/cm2
Densidad del hormigón: 0,0025 Kg/cm3

DATOS DEL MURO:

Nº Pza: 3
Altura del Muro: 314,0 cm Quiebro 267,0 cm
Altura tierras: 314,0 cm Canto.C 20,0 cm
Canto.Z 22,4 cm
Longitud Muro: 100,0 cm Xcdg (m) 10,1 cm
Peso del Muro: 1.584 Kg/ml Xcdg (t) 107,1 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm2
Sobrecarga (prof.): 0,0000 Kg/cm2 Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigon: 250 Kg/cm2 (1,50)
Acero: 5.100 Kg/cm2 (1,15)
Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 72 cm
Vuelo del Talon: 209 cm
Canto de la Zapata: 60 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (Hztal): 0,427
Base de la Zapata: 303,7 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-70	0	0
Muro:		-1584	-70		-131733
Tierras:	-5971	-14773	50	744371	-2940132
Sobrecarga (coron.):	-639	-847	46	119418	-168514
Sobrecarga (prof.):	0	0	46	0	0
Zapata:		-4555	0		-691677
	-6609	-21759		863789	-3932055

Csd = 1,90 Csv = 4,55 e = -9,3 cm.

Aleta 1150x(545/50) Pza. 3

TENSION DEL TERRENO: 0,78 < 2,00 (Servicio)
0,92 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
SP= 0,85 ST= 0,59 Le= 303,7
(Kg/cm2) (Kg/cm2) (cm)

CIMENTACIÓN:

Fcd = 166,7 Kg/cm2 Mayoración Cargas: 1,60
Fyd = 4.434,8 Kg/cm2 Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:Flexión:

S1= 135,67 SPf= 125,23 STf= 123,07 S2= 93,61
qvP= -24,00 qvT= -143,32

Puntera: VPf= 75,4 MP= 307.149 Us= 5.709 1,29
Talón: VTf= 212,7 MT= -902.107 Us= 16.892 3,81
(cm) (Kgxcn) (Kg) (cm2)
As,min= 9,00 cm2
1,5 ‰

Cortante:

S1= 135,67 SPc= 129,44 STc= 115,12 S2= 93,61
qvP= -24,00 qvT= -143,32

Puntera: VPc= 45,0 VP= 4.885 Vcu= 34.857 0,00
Talón: VTc= 155,3 VT= -6.050 (Kg) (cm2/ml)
(cm) (Kg)

Armado Superior (Talón):

Perpendicular Muro: Ø12 /25cm
Paralelo Muro: Ø12 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø12 /25cm
Paralelo Muro: Ø12 /25cm

Armado a cortante: No necesario.

DATOS GENERALES:

Obra: SUBTRAMO XV
Cliente: NECSO
Nº Oferta: 99/643
Pieza: Aleta 1150x(545/50)

TERRENO:

Densidad terreno: 0,00200 Kg/cm3
Angulo rozamiento interno: 30,0 °
Angulo rozamiento terreno muro: 0,0 °
Angulo de Talud: 18,4 °
Coeficiente de rozamiento: 0,58
Tensión Admisible: 2,0 Kg/cm2
Densidad del hormigón: 0,0025 Kg/cm3

DATOS DEL MURO:

Nº Pza: 4
Altura del Muro: 215,0 cm Quiebro 267,0 cm
Altura tierras: 215,0 cm Canto.C 20,0 cm
Canto.Z 20,0 cm
Longitud Muro: 100,0 cm Xcdg (m) 10,0 cm
Peso del Muro: 1.075 Kg/ml Xcdg (t) 79,4 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm2
Sobrecarga (prof.): 0,0000 Kg/cm2 Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigon: 250 Kg/cm2 (1,50)
Acero: 5.100 Kg/cm2 (1,15)
Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 60 cm
Vuelo del Talon: 153 cm
Canto de la Zapata: 60 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (Hztal): 0,427
Base de la Zapata: 233,3 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-47	0	0
Muro:		-1075	-47		-75250
Tierras:	-3228	-7375	43	295919	-1155486
Sobrecarga (coron.):	-470	-613	40	64564	-96089
Sobrecarga (prof.):	0	0	40	0	0
Zapata:		-3500	0		-408333
	-3698	-12564		360483	-1735158

Csd = 1,96 Csv = 4,81 e = -5,7 cm.

Aleta 1150x(545/50) Pza. 4

TENSION DEL TERRENO: 0,58 < 2,00 (Servicio)
0,68 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
SP= 0,62 ST= 0,46 Le= 233,3
(Kg/cm2) (Kg/cm2) (cm)

CIMENTACIÓN:

Fcd = 166,7 Kg/cm2 Mayoración Cargas: 1,60
Fyd = 4.434,8 Kg/cm2 Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:Flexión:

S1= 98,69 SPf= 91,92 STf= 90,41 S2= 73,61
qvP= -24,00 qvT= -107,36

Puntera: VPf= 63,0 MP= 143.744 Us= 2.667 0,60
Talón: VTf= 156,3 MT= -343.967 Us= 6.396 1,44
(cm) (Kgxcn) (Kg) (cm2)
As,min= 9,00 cm2
1,5 ‰

Cortante:

S1= 98,69 SPc= 95,14 STc= 84,29 S2= 73,61
qvP= -24,00 qvT= -107,36

Puntera: VPc= 33,0 VP= 2.406 Vcu= 34.857 0,00
Talón: VTc= 99,3 VT= -2.822 (Kg) (cm2/ml)
(cm) (Kg)

Armado Superior (Talón):

Perpendicular Muro: Ø12 /25cm
Paralelo Muro: Ø12 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø12 /25cm
Paralelo Muro: Ø12 /25cm

Armado a cortante: No necesario.

DATOS GENERALES:

Obra: SUBTRAMO XV
Cliente: NECSO
Nº Oferta: 99/643
Pieza: Aleta 1150x(545/50)

TERRENO:

Densidad terreno: 0,00200 Kg/cm3
Angulo rozamiento interno: 30,0 °
Angulo rozamiento terreno muro: 0,0 °
Angulo de Talud: 18,4 °
Coeficiente de rozamiento: 0,58
Tensión Admisible: 2,0 Kg/cm2
Densidad del hormigón: 0,0025 Kg/cm3

DATOS DEL MURO:

Nº Pza: 5
Altura del Muro: 116,0 cm Quiebro 267,0 cm
Altura tierras: 116,0 cm Canto.C 20,0 cm
Canto.Z 20,0 cm
Longitud Muro: 100,0 cm Xcdg (m) 10,0 cm
Peso del Muro: 580 Kg/ml Xcdg (t) 50,7 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm2
Sobrecarga (prof.): 0,0000 Kg/cm2 Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigon: 250 Kg/cm2 (1,50)
Acero: 5.100 Kg/cm2 (1,15)
Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 48 cm
Vuelo del Talon: 97 cm
Canto de la Zapata: 40 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (Hztal): 0,427
Base de la Zapata: 165,3 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-25	0	0
Muro:		-580	-25		-33640
Tierras:	-1039	-2573	36	54019	-300216
Sobrecarga (coron.):	-266	-389	34	20777	-45422
Sobrecarga (prof.):	0	0	34	0	0
Zapata:		-1653	0		-136676
	-1305	-5196		74796	-515954

Csd = 2,30 Csv = 6,90 e = 3,2 cm.

Aleta 1150x(545/50) Pza. 5

12. PLANOS

TENSION DEL TERRENO: 0,30 < 2,00 (Servicio)
 0,34 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal

SP= 0,28 ST= 0,35 Le= 165,3
 (Kg/cm2) (Kg/cm2) (cm)

CIMENTACIÓN:

Fcd = 166,7 Kg/cm2 Mayoración Cargas: 1,60
 Fyd = 4.434,8 Kg/cm2 Recubrimiento: 6,0 cm.

CÁCULO ZAPATA:Flexión:

S1= 44,40 SPf= 48,03 STf= 49,03 S2= 56,16
 qvP= -16,00 qvT= -64,70

Puntera: VPf= 51,0 MP= 38.513 Us= 1.134 0,26
 Talón: VTf= 100,3 MT= -54.949 Us= 1.619 0,37
 (cm) (Kgxcn) (Kg) (cm2)
 As,min= 6,00 cm2
 1,5 ‰

Cortante:

S1= 44,40 SPc= 46,61 STc= 51,66 S2= 56,16
 qvP= -16,00 qvT= -64,70

Puntera: VPc= 31,0 VP= 915 Vcu= 21.947 0,00
 Talón: VTc= 63,3 VT= -683 (Kg) (cm2/ml)
 (cm) (Kg)

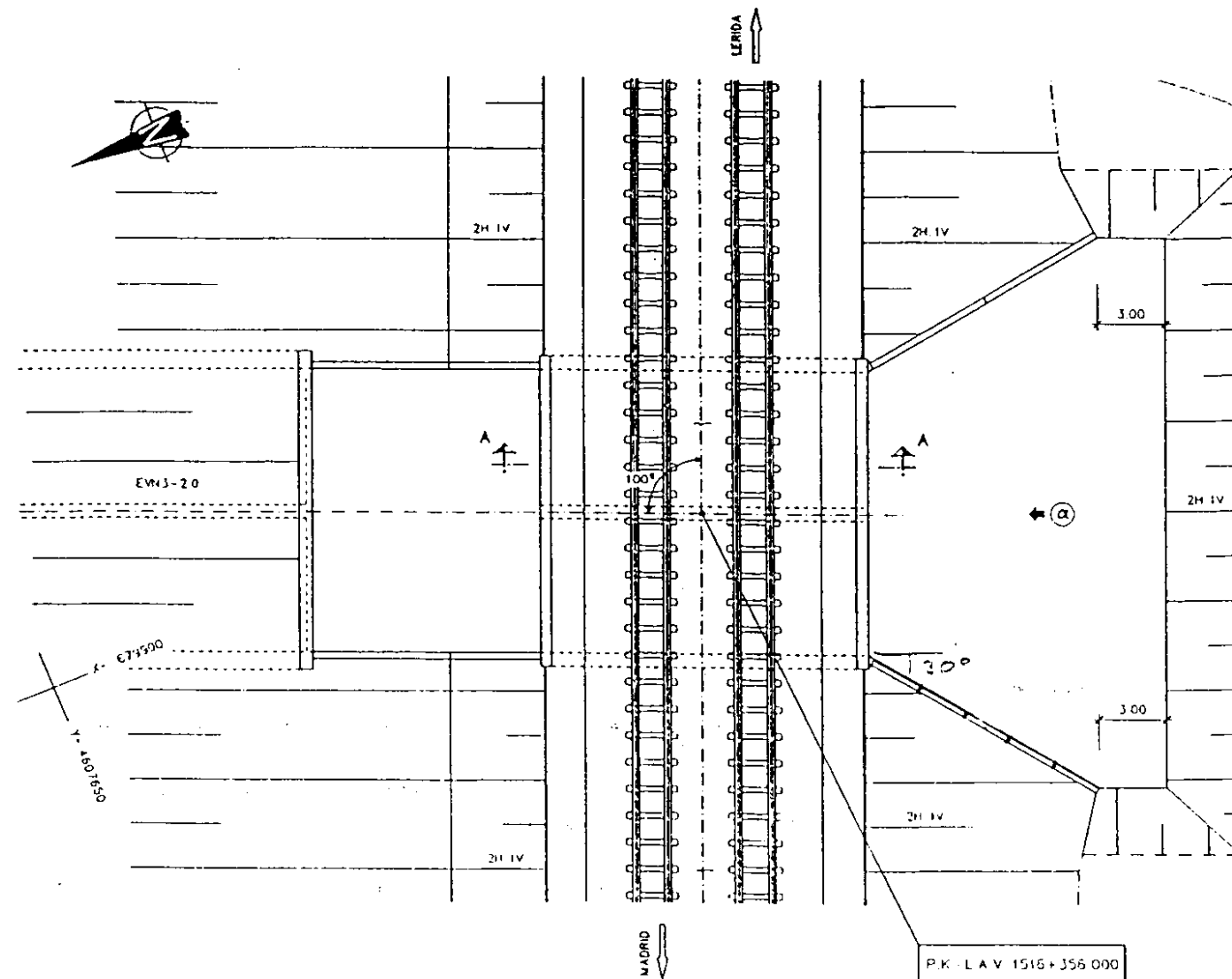
Armado Superior (Talón):

Perpendicular Muro: Ø12 /25cm
 Paralelo Muro: Ø12 /25cm

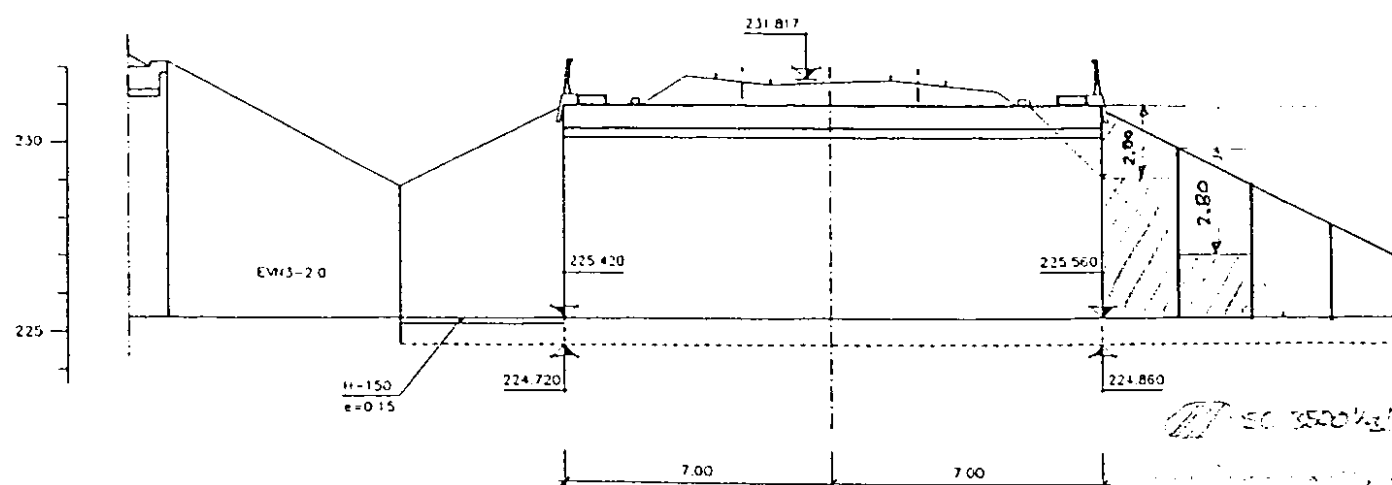
Armado Inferior (Puntera):

Perpendicular Muro: Ø12 /25cm
 Paralelo Muro: Ø12 /25cm

Armado a cortante: No necesario.



PLANTA
ESCALA 1:150



SECCION A-A
ESCALA 1:100

E 1516.3



GIF
Grupo de Infraestructuras Ferroviarias

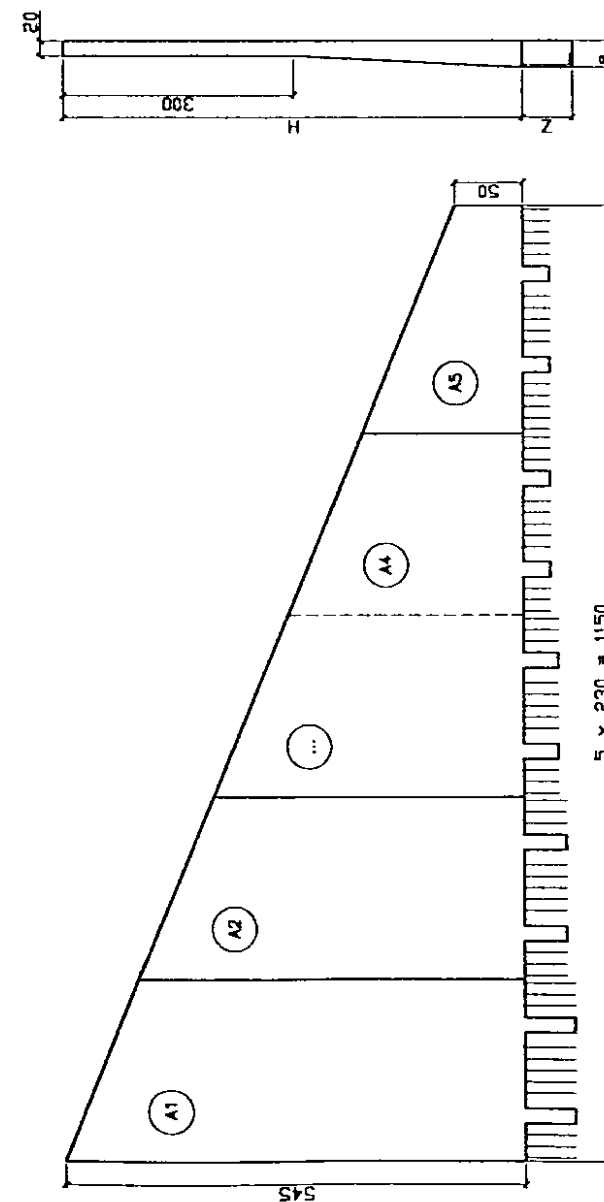
TÍTULO
PROYECTO DE CONSTRUCCIÓN. LÍNEA DE ALTA VELOCIDAD
MADRID - BARCELONA - FRONTERA FRANCESA
TRAMO: MADRID - ZARAGOZA. SUBTRAMO XV. PLATAFORMA

AUTOR

SGS
PROYECTO DE CONSTRUCCIÓN. LÍNEA DE ALTA VELOCIDAD. MADRID - BARCELONA - FRONTERA FRANCESA. TRAMO: MADRID - ZARAGOZA. SUBTRAMO XV. PLATAFORMA.

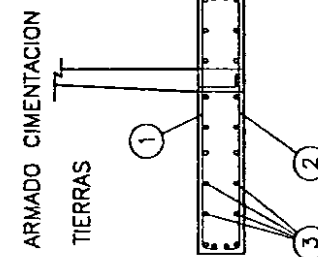


SGS
PROYECTO DE CONSTRUCCIÓN. LÍNEA DE ALTA VELOCIDAD. MADRID - BARCELONA - FRONTERA FRANCESA. TRAMO: MADRID - ZARAGOZA. SUBTRAMO XV. PLATAFORMA.



ALZADO CARA VISTA (Aleta Izda)

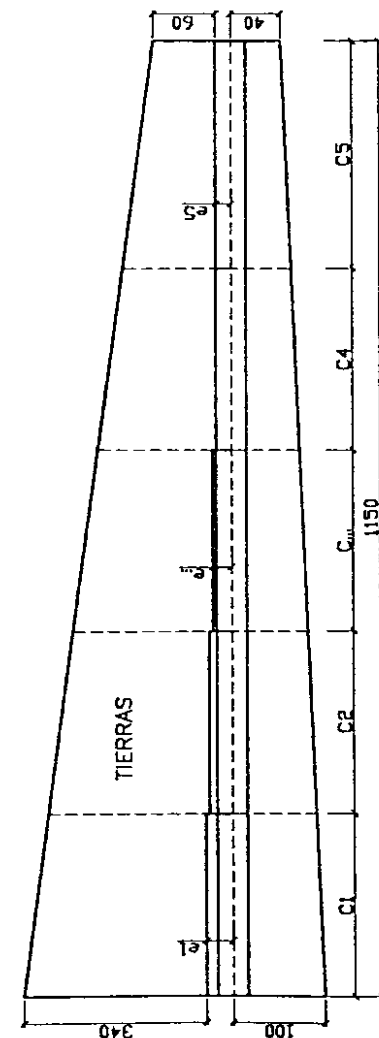
SECCION



TIPO	1	2	3
C1	Ø25/20cm	Ø16/25cm	Ø10/25cm
C2	Ø16/15cm	Ø16/25cm	Ø16/25cm
C3	Ø12/25cm	Ø12/25cm	Ø12/25cm
C4	Ø12/25cm	Ø12/25cm	Ø12/25cm
C5	Ø12/25cm	Ø12/25cm	Ø12/25cm

PIEZA	H	e	Z
A1	545.0	32.3	80
A2	445.8	27.3	80
A3	346.8	22.4	60
A4	247.8	20.0	60
A5	148.8	20.0	40

EN-81	CAUDAL	CONTROL	Cost.
ELEVANTES PREFABRICADOS	H-300	INTENSO	1.40
ACERO	AEN-500-S	INTENSO	1.10
OBRA IN SITU	H-250	NORMAL	1.50
ACERO	AEN-500	NORMAL	1.15
EJECUCION		NORMAL	1.40



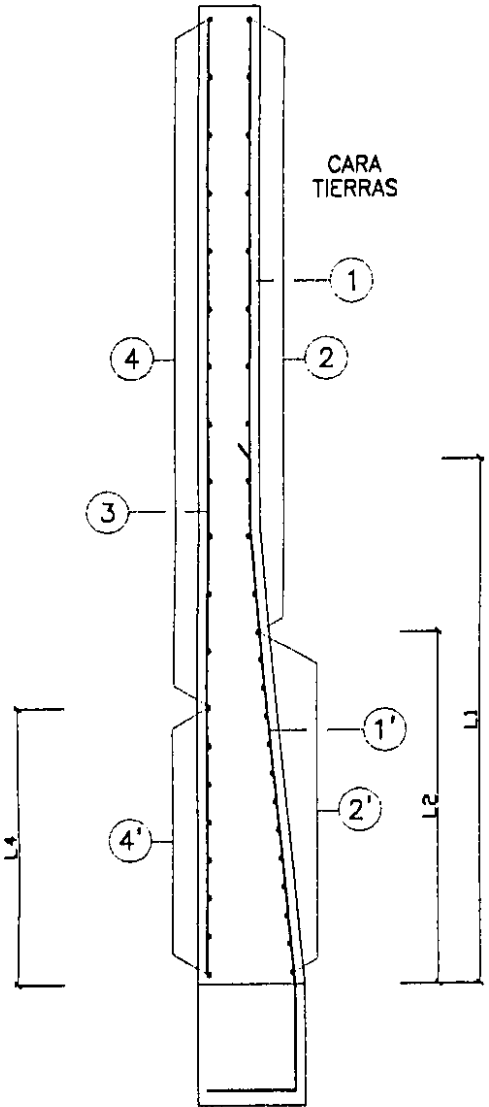
PLANTA

20/09/00	0	REV.	MODIFICACIONES	Nº PLAN
FECHA				62.1
PIEZA			ALETA 1150x(545/50) E-1516.3	
OFERTA			99/843	
OBRA			SUBTRAMO XV	
CLIENTE			NECSO	
REVISADO:				
ALETA 1150x(545/50)				
Dpto. Comercial				
Dpto. Técnico				

ALHADA

PREFABRICADOS DE HORMIGÓN

• COTAS EN CM.



DEFINICIÓN DE ARMADO

	A 1	A 2	A 3	A 4	A 5
1	ø25/22	ø16/30	ø12/30	ø8/25	ø8/25
1'	ø25/11	ø16/10	ø12/10	ø8/12.5	---
L1	375	265	200	150	---
2	ø10/24	ø8/30	ø8/30	ø6/20	ø8/25
2'	ø10/8	ø8/12.5	ø8/25	---	---
L2	248	150	50	---	---
3	ø10/20	ø10/25	ø8/25	ø6/25	ø6/30
4	ø8/25	ø8/25	ø8/20	ø8/25	ø8/25
4'	ø8/15	ø8/15	---	---	---
L4	240	135	---	---	---
5	10ø8/25	---	---	---	---
L5	175	---	---	---	---

Distancias en centímetros

EH-91	CALIDAD	CONTROL	Coef.
ELEMENTOS PREFABRICADOS			
HORMIGON	H-300	INTENSO	1,40
ACERO	AEH-500-S	INTENSO	1,10
EJECUCION		INTENSO	1,50
OBRA IN SITU			
HORMIGON	H-250	NORMAL	1,50
ACERO	AEH-500	NORMAL	1,15
EJECUCION		NORMAL	1,60

20/06/00	0		
FECHA	REV.	MODIFICACIONES	
PIEZA:	ALETA 1150x(545/50). E-1516.3		59.2
OFERTA:	99/843		
OBRA:	SUBTRAMO XV		
CLIENTE:	NECSO		
ALETA 1150x(545/50)		REVISADO:	APROBADO:
		Opto. Comercial	Opto. Técnico
PREFABRICADOS DE HORMIGON			

4.5.3 E-1516.9.1

E-1516.9.1

<i>ALHOSA</i> PREFABRICADOS DE HORMIGÓN	ALETA 1510 x (690/40) y 1370 x (690/100) E-1516.9.1
Oferta: 99/643 Obra: SUBTRAMO XV Empresa: NECSO Fecha: Junio de 2.000	

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9.-	Hipótesis de cálculo
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1. Generalidades

En la presente memoria se muestran los cálculos realizados para justificar las Aletas Prefabricadas de hormigón que sostienen el terraplén.

2. Descripción

El sostenimiento de las tierras que forman el terraplén en las entradas de las obras de fábrica se realiza con aletas prefabricadas de hormigón armado.

El espesor de los muros que forman las aletas es de 20 cm. hasta los 300 cm. de profundidad y luego aumenta progresivamente, tal y como se muestra en los planos adjuntos.

La cimentación se realiza con hormigón vertido in situ

3. Instrucciones aplicadas

Para el cálculo de las Aletas, se han utilizado las siguientes Instrucciones y Normas:

* Instrucción para el Proyecto y Ejecución de Obras de Hormigón en Masa o Armado EH-91.

4. Características de los materiales

* Hormigones:

Hormigón en elemento prefabricado	H-300
Hormigón en obra in situ	H-250

* Acero:

Acero para armar corrugado	B-500 S
----------------------------	---------

5. Control de calidad

El control de calidad se atenderá a lo especificado en la EH-91, habiéndose seleccionado los siguientes niveles:

Elementos prefabricados:

a) Materiales:	
- Hormigón	Control Intenso
- Armadura pasiva	Control Intenso
b) Ejecución:	
- En toda la obra	Control Intenso

Obra in situ:

a) Materiales:	
- Hormigón	Control Normal
- Armadura pasiva	Control Normal
b) Ejecución:	
- En toda la obra	Control Normal

6. Coeficientes de seguridad

De acuerdo con los niveles de control de calidad definidos, se adoptan los siguientes coeficientes de seguridad:

Elementos prefabricados:

- Coeficientes de minoración de resistencias:

Acero pasivo

$\gamma_s = 1,10$

Hormigón

$\gamma_c = 1,40$

- Coeficientes de ponderación de acciones:

$\gamma_f = 1,50$

Obra in situ:

- Coeficientes de minoración de resistencias:

Acero pasivo

$\gamma_s = 1,15$

Hormigón

$\gamma_c = 1,50$

- Coeficientes de ponderación de acciones:

$\gamma_f = 1,60$

7. Parámetros del terreno

Pese a existir un relleno de calidad adecuadamente compactado (al que correspondería un ángulo de rozamiento interno de 35°), con un talud 2H:1V. En los cálculos se ha considerado, conservadoramente, un talud de terraplén 3H:2V con ángulo de rozamiento interno de 30°. La Aleta forma un ángulo mínimo de 60° con el pie del terraplén

Peso específico

2,0ton/m³

Ángulo de rozamiento interno

30°

Ángulo Talud coronación

18,4°

Coeficiente de empuje activo

0,427

8. Acciones consideradas**8.1 Empuje por efecto de las tierras**

Se considera el empuje de las tierras que se encuentran en el trasdós de la Aleta con un coeficiente de empuje de 0,427.

8.2 Sobrecargas de uso

Se considera una sobrecarga de 400 Kg/m² sobre el terraplén, que es la establecida para paseos de servicio.

9. Hipótesis de cálculo.**HIPÓTESIS I:**

- Empuje de las tierras

- Sobrecarga de uso

Combinación: 1,5 * [Caso (1) + Caso (2)]

En Alcañiz, Junio de 2.000



Alcañizana del Hormigón, S.A. -ALCAÑIZ
Javier Tello Sanchez
Dpto. Técnico ALHOSA

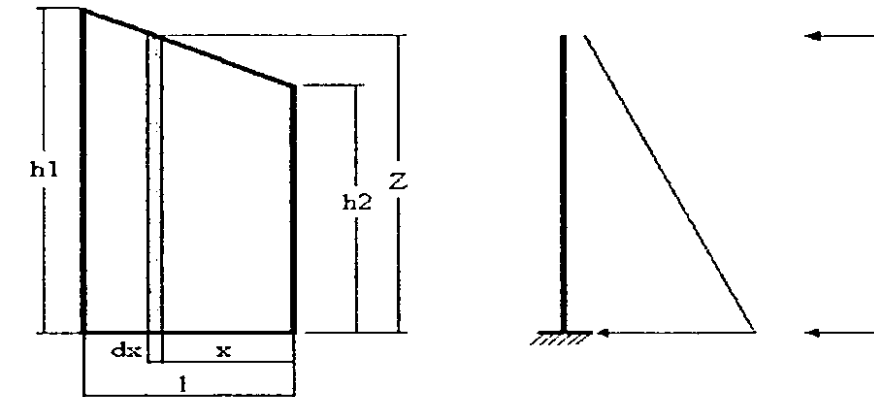
- El presente informe se ha realizado con los datos aportados por el cliente para esta pieza prefabricada concreta.

- Salvo comunicación escrita de lo contrario, las consideraciones en él realizadas, así como los resultados aportados, se ajustan a lo solicitado por el cliente.

10. Cálculos.

Dada la geometría de la estructura en la que se reduce la altura en función de la longitud y los esfuerzos se comportan de igual manera, cada tramo de la aleta se ha armado para la altura existente a una distancia, del lado mayor, de 1/3 de su longitud, siendo en todo momento superiores las sollicitaciones en este punto que la resultante sobre cada tramo.

Pza.	H.máx	H.mín	H.cálculo
1	690,0	593,1	658
2	593,1	493,3	561
3	493,3	399,4	464
4	399,4	302,6	367
5	302,6	205,7	270
6	205,7	40,0	151



$$M = \int_{x=0}^{x=l} dM = \int_{x=0}^{x=l} \left(\frac{1}{6} \cdot \lambda_h \cdot \gamma_t \cdot z^3 + \frac{1}{2} \cdot \lambda_h \cdot SC \cdot z^2 \right) \cdot dx =$$

$$= \frac{1}{6} \cdot \lambda_h \cdot \gamma_t \cdot \left(\frac{1}{4} \cdot \frac{h_1^4 - h_2^4}{h_1 - h_2} \right) \cdot l + \frac{1}{2} \cdot \lambda_h \cdot SC \cdot \left(\frac{1}{3} \cdot \frac{h_1^3 - h_2^3}{h_1 - h_2} \right) \cdot l \leq M \left(z = h_2 + \frac{2 \cdot (h_1 - h_2)}{3} \right)$$

$$V = \int_{x=0}^{x=l} dV = \int_{x=0}^{x=l} \left(\frac{1}{2} \cdot \lambda_h \cdot \gamma_t \cdot z^2 + \lambda_h \cdot SC \cdot z \right) \cdot dx =$$

$$= \frac{1}{2} \cdot \lambda_h \cdot \gamma_t \cdot \left(\frac{1}{3} \cdot \frac{h_1^3 - h_2^3}{h_1 - h_2} \right) \cdot l + \lambda_h \cdot SC \cdot \left(\frac{1}{2} \cdot \frac{h_1^2 - h_2^2}{h_1 - h_2} \right) \cdot l \leq V \left(z = h_2 + \frac{2 \cdot (h_1 - h_2)}{3} \right)$$

$$z = h_2 + \frac{h_1 - h_2}{l} \cdot x$$

DATOS GENERALES:

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1510x(690x40)

TERRENO:

Densidad terreno: 0,0020 Kg/cm³
 Densidad Agua: 0,0010 Kg/cm³
 Indice Huecos: 30,0 %
 Densidad Aparente: 0,0013 Kg/cm³
 Angulo Roz.Int: 30,0 °
 Angulo Roz. Trno/Mro: 0,0 °
 Angulo de Talud: 18,4 °
 Coef. Empuje Activo Hztal: 0,427
 Coef. Empuje Activo Vtcal: 0,000

MURO:

Altura máxima: 690 cm Quiebro 300 cm
 Resguardo Tierras: 0 cm Canto C. 20 cm
 Longitud Muro: 100 cm Canto Z. 44,0 cm
 Peso del Muro 4.620 Kg/ml Xcdg (m) 14,6 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm²
 Prof. Aplic. (S.C.p.) 0 cm

MATERIALES ALZADO:

Fc,k 300 Kg/cm² Gc (1,40)
 Fy,k 5100 Kg/cm² Gs (1,10)
 Fc,d 214,3 Kg/cm² Gf (1,50)
 Fy,d 4.636,4 Kg/cm² Recubrimiento: 4,0 cm
 Fyv,d 4.200,0 Kg/cm²

ESFUERZOS:

	H_Calc	Canto	Md	As1	As2	Vd	Vcu	Ast
	cm	cm	Kg x cm	cm ²	cm ²	Kg	Kg	cm ² /ml
1	658	44,0	6.626.652	40,08	0,00	29.384	29.277	0,07
2	561	38,0	4.168.414	29,10	0,00	21.578	24.915	0,00
3	464	32,1	2.407.971	20,04	0,00	14.974	20.552	0,00
4	367	26,1	1.228.971	12,78	0,00	9.572	16.190	0,00
5	270	20,2	515.060	7,22	0,00	5.370	11.827	0,00
6	150	20,0	101.737	1,82	0,00	1.835	11.711	0,00

Aleta 1510x(690x40)

Tierras: 2.000 Kg/m³ SC_c: 400 Kg/m² Gc: 1,40
 Talud: 18,40° SC_p: 0 Kg/m² Gs: 1,10
 C.E.h: 0,427 Z SCp: 0 cm Gf: 1,50

Z	Eh (Kg)				Vd	M (Kg)				Md
(cm)	(Tierras)	(Agua)	(SC.c)	(SC.p)	(Kg)	(Tierras)	(Agua)	(SC.c)	(SC.p)	(Kg x cm)
0	0	0	0	0	0	0	0	0	0	0
10	4	0	17	0	32	14	0	85	0	149
20	17	0	34	0	77	114	0	341	0	683
30	38	0	51	0	134	384	0	768	0	1.729
40	68	0	68	0	205	911	0	1.366	0	3.415
50	107	0	85	0	288	1.779	0	2.134	0	5.869
60	154	0	102	0	384	3.073	0	3.073	0	9.220
70	209	0	120	0	493	4.881	0	4.183	0	13.596
80	273	0	137	0	615	7.285	0	5.464	0	19.124
90	346	0	154	0	749	10.373	0	6.915	0	25.932
100	427	0	171	0	896	14.229	0	8.537	0	34.150
110	517	0	188	0	1.057	18.939	0	10.330	0	43.904
120	615	0	205	0	1.229	24.588	0	12.294	0	55.322
130	721	0	222	0	1.415	31.261	0	14.428	0	68.534
140	837	0	239	0	1.614	39.044	0	16.733	0	83.667
150	960	0	256	0	1.825	48.023	0	19.209	0	100.848
160	1.093	0	273	0	2.049	58.282	0	21.856	0	120.207
170	1.234	0	290	0	2.286	69.907	0	24.673	0	141.870
180	1.383	0	307	0	2.536	82.984	0	27.661	0	165.967
190	1.541	0	324	0	2.798	97.597	0	30.820	0	192.625
200	1.707	0	341	0	3.073	113.832	0	34.150	0	221.973
210	1.882	0	359	0	3.362	131.775	0	37.650	0	254.137
220	2.066	0	376	0	3.663	151.511	0	41.321	0	289.247
230	2.258	0	393	0	3.976	173.124	0	45.163	0	327.431
240	2.459	0	410	0	4.303	196.702	0	49.175	0	368.816
250	2.668	0	427	0	4.642	222.328	0	53.359	0	413.531
260	2.886	0	444	0	4.994	250.089	0	57.713	0	461.703
270	3.112	0	461	0	5.359	280.070	0	62.238	0	513.461
280	3.347	0	478	0	5.737	312.355	0	66.933	0	568.933
290	3.590	0	495	0	6.128	347.032	0	71.800	0	628.247
300	3.842	0	512	0	6.531	384.183	0	76.837	0	691.530
310	4.102	0	529	0	6.947	423.897	0	82.045	0	758.912
320	4.371	0	546	0	7.376	466.256	0	87.423	0	830.519
330	4.649	0	563	0	7.818	511.348	0	92.972	0	906.481
340	4.935	0	581	0	8.273	559.257	0	98.692	0	986.925
350	5.229	0	598	0	8.740	610.069	0	104.583	0	1.071.979
360	5.532	0	615	0	9.220	663.869	0	110.645	0	1.161.771
370	5.844	0	632	0	9.713	720.742	0	116.877	0	1.256.429
380	6.164	0	649	0	10.219	780.775	0	123.280	0	1.356.082
390	6.493	0	666	0	10.738	844.051	0	129.854	0	1.460.858
400	6.830	0	683	0	11.269	910.657	0	136.599	0	1.570.884
410	7.176	0	700	0	11.814	980.678	0	143.514	0	1.686.288
420	7.530	0	717	0	12.371	1.054.199	0	150.600	0	1.807.199
430	7.893	0	734	0	12.941	1.131.307	0	157.857	0	1.933.745
440	8.264	0	751	0	13.523	1.212.085	0	165.284	0	2.066.053
450	8.644	0	768	0	14.119	1.296.619	0	172.883	0	2.204.253
460	9.033	0	785	0	14.727	1.384.996	0	180.652	0	2.348.471
470	9.430	0	803	0	15.348	1.477.299	0	188.591	0	2.498.836
480	9.835	0	820	0	15.982	1.573.616	0	196.702	0	2.655.476

Aleta 1510x(690x40)

Tierras: 2.000 Kg/m³ SC_c: 400 Kg/m² Gc: 1,40
 Talud: 18,40° SC_p: 0 Kg/m² Gs: 1,10
 C.E.h: 0,427 Z_SCp: 0 cm Gf: 1,50

Z (cm)	Eh (Kg)				Vd (Kg)	M (Kg)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
490	10.249	0	837	0	16.629	1.674.030	0	204.983	0	2.818.519
500	10.672	0	854	0	17.288	1.778.627	0	213.435	0	2.988.094
510	11.103	0	871	0	17.961	1.887.493	0	222.058	0	3.164.327
520	11.543	0	888	0	18.646	2.000.714	0	230.852	0	3.347.348
530	11.991	0	905	0	19.344	2.118.373	0	239.816	0	3.537.284
540	12.448	0	922	0	20.054	2.240.558	0	248.951	0	3.734.263
550	12.913	0	939	0	20.778	2.367.353	0	258.257	0	3.938.414
560	13.387	0	956	0	21.514	2.498.843	0	267.733	0	4.149.865
570	13.869	0	973	0	22.263	2.635.115	0	277.380	0	4.368.742
580	14.360	0	990	0	23.025	2.776.252	0	287.198	0	4.595.176
590	14.859	0	1.007	0	23.800	2.922.341	0	297.187	0	4.829.293
600	15.367	0	1.024	0	24.588	3.073.468	0	307.347	0	5.071.222
610	15.884	0	1.042	0	25.388	3.229.717	0	317.677	0	5.321.091
620	16.409	0	1.059	0	26.201	3.391.173	0	328.178	0	5.579.027
630	16.942	0	1.076	0	27.027	3.557.923	0	338.850	0	5.845.160
640	17.485	0	1.093	0	27.866	3.730.052	0	349.692	0	6.119.616
650	18.035	0	1.110	0	28.718	3.907.644	0	360.706	0	6.402.524
660	18.594	0	1.127	0	29.582	4.090.786	0	371.890	0	6.694.013
670	19.162	0	1.144	0	30.459	4.279.562	0	383.244	0	6.994.210
680	19.738	0	1.161	0	31.349	4.474.059	0	394.770	0	7.303.243
690	20.323	0	1.178	0	32.252	4.674.360	0	406.466	0	7.621.240

11. CIMENTACIONES

En las páginas siguientes se muestran los cálculos de la cimentación de la aleta.

DATOS GENERALES:

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1510x(690/40)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 18,4 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza:	1		
Altura del Muro:	657,7 cm	Quiebro	267,7 cm
Altura tierras:	657,7 cm	Canto.C	20,0 cm
		Canto.Z	44,0 cm
Longitud Muro:	100,0 cm	Xcdg (m)	14,7 cm
Peso del Muro:	4.459 Kg/ml	Xcdg (t)	169,3 cm

ACCIONES:

Sobrecarga (coron.):	0,0400 Kg/cm ²		
Sobrecarga (prof.):	0,0000 Kg/cm ²	Prof.(S.C.p)	0 cm

RESISTENCIAS:

Hormigón:	250 Kg/cm ²	(1,50)
Acero:	5.100 Kg/cm ²	(1,15)
Acciones:		(1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera:	106 cm
Vuelo del Talón:	346 cm
Canto de la Zapata:	80 cm

COMPROBACION DE ESTABILIDAD:

Coefficiente Empuje Activo (Hztal):	0,427
Base de la Zapata:	496,1 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-132	0	0
Muro:		-4459	-127		-571923
Tierras:	-23231	-52265	72	5712697	-16891789
Sobrecarga (coron.):	-1260	-1479	63	464626	-478130
Sobrecarga (prof.):	0	0	63	0	0
Zapata:		-9922	0		-2461343
	-24491	-68125		6177323	-20403186

Csd = 1,61 Csv = 3,30 e = -42,7 cm.

Aleta 1510x(690/40) Pza. 1

TENSION DEL TERRENO: 1,73 < 2,00 (Servicio)
 2,13 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
 SP= 2,08 ST= 0,66 Le= 496,1
 (Kg/cm²) (Kg/cm²) (cm)

CIMENTACIÓN:

Fcd =	166,7 Kg/cm ²	Mayoración Cargas:	1,60
Fyd =	4.434,8 Kg/cm ²	Recubrimiento:	6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S1= 333,28	SPf= 281,60	STf= 267,50	S2= 106,13
qvP= -32,00		qvT= -280,20	

Puntera:	VPf= 112,9	MP= 1.809.532	Us= 24.745	5,58
Talón:	VTf= 352,4	MT= -7.470.179	Us= 106.342	23,98
	(cm)	(Kgxcn)	(Kg)	(cm2)
As,min=	12,00 cm ²			
	1,5 ‰			

Cortante:

S1= 333,28	SPc= 301,56	STc= 230,60	S2= 106,13
qvP= -32,00		qvT= -280,20	

Puntera:	VPc= 69,3	VP= 19.773	Vcu= 47.767	0,00
Talón:	VTc= 271,8	VT= -30.401	(Kg)	(cm2/ml)
	(cm)	(Kg)		

Armado Superior (Talón):

Perpendicular Muro: Ø25 /20cm
 Paralelo Muro: Ø16 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø16 /20cm
 Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1510x(690/40)

Densidad terreno:	0,00200 Kg/cm3
Angulo rozamiento interno:	30,0 °
Angulo rozamiento terreno muro:	0,0 °
Angulo de Talud:	18,4 °
Coefficiente de rozamiento:	0,58
Tensión Admisible:	2,0 Kg/cm2
Densidad del hormigón:	0,0025 Kg/cm3

Nº Pza:	2		
Altura del Muro:	560,9 cm	Quiebro	267,7 cm
Altura tierras:	560,9 cm	Canto.C	20,0 cm
		Canto.Z	38,0 cm
Longitud Muro:	100,0 cm	Xcdg (m)	13,1 cm
Peso del Muro:	3.465 Kg/ml	Xcdg (t)	149,4 cm

Sobrecarga (coron.):	0,0400 Kg/cm2		
Sobrecarga (prof.):	0,0000 Kg/cm2	Prof.(S.C.p)	0 cm

Hormigon:	250 Kg/cm2	(1,50)
Acero:	5.100 Kg/cm2	(1,15)
Acciones:		(1,60)

Vuelo Puntera:	95 cm
Vuelo del Talon:	303 cm
Canto de la Zapata:	80 cm

Coeficiente Empuje Activo (H _{ztal}):	0,427
Base de la Zapata:	436,5 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-113	0	0
Muro:		-3465	-110		-395462
Tierras:	-17532	-38962	64	3745125	-11097427
Sobrecarga (coron.):	-1094	-1286	58	350634	-366194
Sobrecarga (prof.):	0	0	58	0	0
Zapata:		-8730	0		-1905467
	-18626	-52443		4095759	-13764550

$$C_{sd} = 1,62 \quad C_{sv} = 3,36 \quad e = -36,2 \quad \text{cm.}$$

TENSION DEL TERRENO:	1,50	<	2,00	(Servicio)	
	1,83	<	4,00	(Empuje mayorado)	(1,50)

Distribucion Trapezoidal

SP= 1,80	ST= 0,60	Le= 436,5
(Kg/cm2)	(Kg/cm2)	(cm)

Fcd =	166,7 Kg/cm2	Mayoración Cargas:	1,60
Fyd =	4.434,8 Kg/cm2	Recubrimiento:	6,0 cm.

Flexión:					
S1= 287,87	SPf= 243,69	STf= 232,02	S2= 96,58		
qvP= -32,00		qvT= -243,88			
Puntera:	VPf= 100,8	MP= 1.225.204	Us= 16.690	3,76	
Talón:	VTf= 309,1	MT= -4.879.477	Us= 68.154	15,37	
	(cm)	(Kgxcn)	(Kg)	(cm2)	
As,min= 12,00 cm2					
1,5 ‰					

S1= 287,87	SPc= 262,41	STc= 197,10	S2= 96,58
qvP= -32,00		qvT= -243,88	
Puntera:	VPc= 58,1	VP= 14.126	Vcu= 47.767 0,00
Talón:	VTc= 229,4	VT= -22.260	(Kg) (cm2/ml)
	(cm)	(Kg)	

Perpendicular Muro: Ø25 /25cm
Paralelo Muro: Ø16 /25cm

Perpendicular Muro: Ø16 /25cm
Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

DATOS GENERALES:

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1510x(690/40)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 18,4 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 3
 Altura del Muro: 464,0 cm Quiebro 267,7 cm
 Altura tierras: 464,0 cm Canto.C 20,0 cm
 Canto.Z 32,1 cm
 Longitud Muro: 100,0 cm Xcdg (m) 11,6 cm
 Peso del Muro: 2.616 Kg/ml Xcdg (t) 129,6 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigon: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 84 cm
 Vuelo del Talon: 261 cm
 Canto de la Zapata: 60 cm

COMPROBACION DE ESTABILIDAD:

Coefficiente Empuje Activo (Hztal): 0,427
 Base de la Zapata: 376,9 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-95	0	0
Muro:		-2616	-93		-261547
Tierras:	-11721	-27576	57	2047318	-6796293
Sobrecarga (coron.):	-895	-1092	52	234423	-269123
Sobrecarga (prof.):	0	0	52	0	0
Zapata:		-5654	0		-1065481
	-12616	-36938		2281740	-8392444

Csd = 1,69 Csv = 3,68 e = -24,1 cm.

Aleta 1510x(690/40) Pza. 3

TENSION DEL TERRENO: 1,17 < 2,00 (Servicio)
 1,41 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal

SP= 1,36 (Kg/cm²) ST= 0,60 (Kg/cm²) Le= 376,9 (cm)

CIMENTACIÓN:

Fcd = 166,7 Kg/cm² Mayoración Cargas: 1,60
 Fyd = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S1= 217,08 SPf= 188,70 STf= 181,52 S2= 96,52
 qvP= -24,00 qvT= -199,50

Puntera: VPf= 88,7 MP= 722.916 Us= 13.507 3,05
 Talón: VTf= 265,7 (cm) MT= -2.635.534 (Kgxcn) Us= 50.471 11,38
 As,min= 9,00 cm² 1,5 ‰ (Kg) (cm²)

Cortante:

S1= 217,08 SPc= 198,87 STc= 162,70 S2= 96,52
 qvP= -24,00 qvT= -199,50

Puntera: VPc= 56,9 VP= 10.473 Vcu= 34.857 0,00
 Talón: VTc= 206,9 (cm) VT= -14.461 (Kg) (cm²/ml)

Armado Superior (Talon):

Perpendicular Muro: Ø20 /25cm
 Paralelo Muro: Ø12 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø12 /25cm
 Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

Obra: SUBTRAMO XV
Cliente: NECSO
N° Oferta: 99/643
Pieza: Aleta 1510x(690/40)

TERRENO:

Densidad terreno:	0,00200 Kg/cm3
Angulo rozamiento interno:	30,0 °
Angulo rozamiento terreno muro:	0,0 °
Angulo de Talud:	18,4 °
Coefficiente de rozamiento:	0,58
Tensión Admisible:	2,0 Kg/cm2
Densidad del hormigón:	0,0025 Kg/cm3

DATOS DEL MURO:

Nº Pza:	2		
Altura del Muro:	560,9 cm	Quiebro	267,7 cm
Altura tierras:	560,9 cm	Canto.C	20,0 cm
		Canto.Z	38,0 cm
Longitud Muro:	100,0 cm	Xcdg (m)	13,1 cm
Peso del Muro:	3.465 Kg/ml	Xcdg (t)	149,4 cm

ACCIONES:

Sobrecarga (coron.):	0,0400 Kg/cm2		
Sobrecarga (prof.):	0,0000 Kg/cm2	Prof.(S.C.p)	0 cm

RESISTENCIAS:

Hormigon:	250 Kg/cm2	(1,50)
Acero:	5.100 Kg/cm2	(1,15)
Acciones:		(1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera:	95 cm
Vuelo del Talon:	303 cm
Canto de la Zapata:	80 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (H _{ztal}):	0,427
Base de la Zapata:	436,5 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-113	0	0
Muro:		-3465	-110		-395462
Tierras:	-17532	-38962	64	3745125	-11097427
Sobrecarga (coron.):	-1094	-1286	58	350634	-366194
Sobrecarga (prof.):	0	0	58	0	0
Zapata:		-8730	0		-1905467
	-18626	-52443		4095759	-13764550

Csd = 1,62 **Csv** = 3,36 **e** = -36,2 cm.

Aleta 1510x(690/40) Pza. 2

TENSION DEL TERRENO:	1,50	<	2,00	(Servicio)	
	1,83	<	4,00	(Empuje mayorado)	(1,50)

Distribucion Trapezoidal

SP= 1,80	ST= 0,60	Le= 436,5
(Kg/cm2)	(Kg/cm2)	(cm)

CIMENTACIÓN:

Fcd =	166,7 Kg/cm2	Mayoración Cargas:	1,60
Fyd =	4.434,8 Kg/cm2	Recubrimiento:	6,0 cm.

CÁLCULO ZAPATA:

Flexión:

SI= 287,87	SPf= 243,69	STf= 232,02	S2= 96,58
qvP= -32,00		qvT= -243,88	

Puntera:	VPf= 100,8	MP= 1.225.204	Us= 16.690	3,76
Talón:	VTf= 309,1	MT= -4.879.477	Us= 68.154	15,37
	(cm)	(Kgxcmm)	(Kg)	(cm2)
As,min=	12,00 cm2			
	1,5 ‰			

Cortante:

SI= 287,87	SPc= 262,41	STc= 197,10	S2= 96,58
qvP= -32,00		qvT= -243,88	

Puntera:	VPc= 58,1	VP= 14.126	Vcu= 47.767	0,00
Talón:	VTc= 229,4 (cm)	VT= -22.260 (Kg)	(Kg)	(cm2/ml)

<u>Armado Superior (Talón):</u>	<u>Armado Inferior (Puntera):</u>
Perpendicular Muro: Ø25 /25cm	Perpendicular Muro: Ø16 /25cm
Paralelo Muro: Ø16 /25cm	Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1510x(690/40)

TERRENO:

Densidad terreno:	0,00200 Kg/cm3
Angulo rozamiento interno:	30,0 °
Angulo rozamiento terreno muro:	0,0 °
Angulo de Talud:	18,4 °
Coefficiente de rozamiento:	0,58
Tensión Admisible:	2,0 Kg/cm2
Densidad del hormigón:	0,0025 Kg/cm3

DATOS DEL MURO:

Nº Pza:	3		
Altura del Muro:	464,0 cm	Quiebro	267,7 cm
Altura tierras:	464,0 cm	Canto.C	20,0 cm
		Canto.Z	32,1 cm
Longitud Muro:	100,0 cm	Xcdg (m)	11,6 cm
Peso del Muro:	2.616 Kg/ml	Xcdg (t)	129,6 cm

ACCIONES:

Sobrecarga (coron.):	0,0400 Kg/cm2		
Sobrecarga (prof.):	0,0000 Kg/cm2	Prof.(S.C.p)	0 cm

RESISTENCIAS:

Hormigon:	250 Kg/cm ²	(1,50)
Acero:	5.100 Kg/cm ²	(1,15)
Acciones:		(1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera:	84 cm
Vuelo del Talon:	261 cm
Canto de la Zapata:	60 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (H _{ztal}):	0,427
Base de la Zapata:	376,9 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-95	0	0
Muro:		-2616	-93		-261547
Tierras:	-11721	-27576	57	2047318	-6796293
Sobrecarga (coron.):	-895	-1092	52	234423	-269123
Sobrecarga (prof.):	0	0	52	0	0
Zapata:		-5654	0		-1065481
	-12616	-36938		2281740	-8392444

Csd = 1,69 **Csv** = 3,68 **e** = -24,1 cm.

Aleta 1510x(690/40) Pza. 3

TENSION DEL TERRENO:

1,17	<	2,00	(Servicio)	
1,41	<	4,00	(Empuje mayorado)	(1,50)

Distribucion Trapezoidal

SP= 1,36 ST= 0,60 Le= 376,9
(Kg/cm2) (Kg/cm2) (cm)

CIMENTACIÓN:

Fcd =	166,7 Kg/cm2	Mayoración Cargas:	1,60
Fyd =	4.434,8 Kg/cm2	Recubrimiento:	6,0 cm.

CÁLCULO ZAPATA:

Flexión:

S1= 217,08 SPf= 188,70 STf= 181,52 S2= 96,52
qvP= -24,00 qvT= -199,50

Puntera:	VPf= 88,7	MP= 722.916	Us= 13.507	3,05
Talón:	VTf= 265,7	MT= -2.635.534	Us= 50.471	11,38
	(cm)	(Kgxcn)	(Kg)	(cm2)
As,min=	9,00 cm2			
	1,5 ‰			

Cortante:

S1= 217,08	SPc= 198,87	STc= 162,70	S2= 96,52
qvP= -24,00		qvT= -199,50	

Puntera:	VPc= 56,9	VP= 10.473	Vcu= 34.857	0,00
Talón:	VTc= 206,9 (cm)	VT= -14.461 (Kg)	(Kg)	(cm2/ml)

Armado Superior (Talón):

Perpendicular Muro: Ø20 /25cm
Paralelo Muro: Ø12 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø12 /25cm
Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

No necesario.

DATOS GENERALES:

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1510x(690/40)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 18,4 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 4
 Altura del Muro: 367,2 cm Quiebro 267,7 cm
 Altura tierras: 367,2 cm Canto.C 20,0 cm
 Canto.Z 26,1 cm
 Longitud Muro: 100,0 cm Xcdg (m) 10,5 cm
 Peso del Muro: 1.912 Kg/ml Xcdg (t) 110,0 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigón: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 73 cm
 Vuelo del Talón: 218 cm
 Canto de la Zapata: 60 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (Hztal): 0,427
 Base de la Zapata: 317,3 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-76	0	0
Muro:		-1912	-75		-164049
Tierras:	-7789	-18106	50	1108979	-3767759
Sobrecarga (coron.):	-729	-898	46	155773	-186917
Sobrecarga (prof.):	0	0	46	0	0
Zapata:		-4760	0		-755148
	-8518	-25676		1264752	-4873874

Csd = 1,74 Csv = 3,85 e = -17,8 cm.

Aleta 1510x(690/40) Pza. 4

TENSION DEL TERRENO: 0,95 < 2,00 (Servicio)
 1,13 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
 SP= 1,08 ST= 0,54 Le= 317,3
 (Kg/cm²) (Kg/cm²) (cm)

CIMENTACIÓN:

Fcd = 166,7 Kg/cm² Mayoración Cargas: 1,60
 Fyd = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S1= 173,16 SPf= 152,05 STf= 147,01 S2= 85,78
 qvP= -24,00 qvT= -163,02

Puntera: VPf= 76,7 MP= 417.682 Us= 7.774 1,75
 Talón: VTf= 222,4 MT= -1.405.051 Us= 26.478 5,97
 (cm) (Kgxcn) (Kg) (cm²)
 As,min= 9,00 cm²
 1,5 %

Cortante:

S1= 173,16 SPc= 160,56 STc= 131,06 S2= 85,78
 qvP= -24,00 qvT= -163,02

Puntera: VPc= 45,7 VP= 6.536 Vcu= 34.857 0,00
 Talón: VTc= 164,4 VT= -8.979 (Kg) (cm²/ml)
 (cm) (Kg)

Armado Superior (Talón):

Perpendicular Muro: Ø16 /25cm
 Paralelo Muro: Ø12 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø12 /25cm
 Paralelo Muro: Ø12 /25cm

Armado a cortante: No necesario.

Obra: SUBTRAMO XV
 Cliente: NECSO
 Nº Oferta: 99/643
 Pieza: Aleta 1510x(690/40)

Densidad terreno:	0,00200 Kg/cm3
Angulo rozamiento interno:	30,0 °
Angulo rozamiento terreno muro:	0,0 °
Angulo de Talud:	18,4 °
Coefficiente de rozamiento:	0,58
Tensión Admisible:	2,0 Kg/cm2
Densidad del hormigón:	0,0025 Kg/cm3

Nº Pza:	5		
Altura del Muro:	270,3 cm	Quiebro	267,7 cm
Altura tierras:	270,3 cm	Canto.C	20,0 cm
		Canto.Z	20,2 cm
Longitud Muro:	100,0 cm	Xcdg (m)	10,0 cm
Peso del Muro:	1.352 Kg/ml	Xcdg (t)	90,8 cm

Sobrecarga (coron.):	0,0400 Kg/cm2		
Sobrecarga (prof.):	0,0000 Kg/cm2	Prof.(S.C.p)	0 cm

Hormigon:	250 Kg/cm2	(1,50)
Acero:	5.100 Kg/cm2	(1,15)
Acciones:		(1,60)

Vuelo Puntera:	62 cm
Vuelo del Talon:	176 cm
Canto de la Zapata:	40 cm

Coeficiente Empuje Activo (H _{ztal}):	0,427
Base de la Zapata:	257,7 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-57	0	0
Muro:		-1352	-57		-96841
Tierras:	-4110	-10554	44	425120	-1791195
Sobrecarga (coron.):	-530	-705	41	82202	-119575
Sobrecarga (prof.):	0	0	41	0	0
Zapata:		-2577	0		-332069
	-4640	-15187		507323	-2339680

$C_{sd} = 1,89$ $C_{sv} = 4,61$ $e = -6,3$ cm.

TENSION DEL TERRENO:	0,63	<	2,00	(Servicio)	
	0,75	<	4,00	(Empuje mayorado)	(1,50)

Fcd =	166.7 Kg/cm2	Mayoración Cargas:	1,60
Fyd =	4.434.8 Kg/cm2	Recubrimiento:	6,0 cm.

Flexión:					
S1= 108,06		SPf= 101,16		STf= 99,65	S2= 80,52
qvP= -16,00				qvT= -118,36	
Puntera:	VPf= 64,6	MP=	187.266	Us=	5.540 1,25
Talón:	VTf= 179,0 (cm)	MT=	-504.009 (Kgxcmm)	Us=	15.059 3,40 (Kg) (cm2)
As,min=	6,00 cm2 1,5 %				

S1= 108,06	SPc= 103,30	STc= 95,69	S2= 80,52
qvP= -16,00		qvT= -118,36	
Puntera:	VPc= 44,6	VP= 3.997	Vcu= 21.947 0,00
Talón:	VTc= 142,0 (cm)	VT= -4.295 (Kg)	(Kg) (cm2/ml)

Perpendicular Muro: Ø12 /25cm
Paralelo Muro: Ø12 /25cm

Perpendicular Muro: Ø12 /25cm
Paralelo Muro: Ø12 /25cm

Armado a cortante: No necesario.

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1510x(690/40)

Densidad terreno:	0,00200 Kg/cm3
Angulo rozamiento interno:	30,0 °
Angulo rozamiento terreno muro:	0,0 °
Angulo de Talud:	18,4 °
Coefficiente de rozamiento:	0,58
Tensión Admisible:	2,0 Kg/cm2
Densidad del hormigón:	0,0025 Kg/cm3

Nº Pza:	6		
Altura del Muro:	150,5 cm	Quiebro	244,8 cm
Altura tierras:	150,5 cm	Canto.C	20,0 cm
		Canto.Z	20,0 cm
Longitud Muro:	100,0 cm	Xcdg (m)	10,0 cm
Peso del Muro:	752 Kg/ml	Xcdg (t)	64,2 cm

Sobrecarga (coron.):	0,0400 Kg/cm2		
Sobrecarga (prof.):	0,0000 Kg/cm2	Prof (S.C.p)	0 cm

Hormigon:	250 Kg/cm2	(1,50)
Acero:	5.100 Kg/cm2	(1,15)
Acciones:		(1,60)

Vuelo Puntera:	48 cm
Vuelo del Talon:	123 cm
Canto de la Zapata:	40 cm

Coeficiente Empuje Activo (H _{ztal}):	0,427
Base de la Zapata:	191,2 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-38	0	0
Muro:		-752	-38		-43451
Tierras:	-1549	-4222	36	98347	-546651
Sobrecarga (coron.):	-325	-494	34	30978	-63929
Sobrecarga (prof.):	0	0	34	0	0
Zapata:		-1912	0		-182772
	-1874	-7380		129325	-836803

$$C_{sd} = 2,27 \quad C_{sv} = 6,47 \quad e = 1,7 \quad \text{cm.}$$

TENSION DEL TERRENO:	0,38	<	2,00	(Servicio)	
	0,43	<	4,00	(Empuje mayorado)	(1,50)

Distribucion Trapezoidal

SP= 0,37	ST= 0,41	Le= 191,2
(Kg/cm2)	(Kg/cm2)	(cm)

Fcd =	166,7 Kg/cm2	Mayoración Cargas:	1,60
Fyd =	4.434,8 Kg/cm2	Recubrimiento:	6,0 cm.

<u>Flexión:</u>					
S1= 58,51		SPf= 60,24		STf= 60,71	
qvP= -16,00				qvT= -77,13	
				S2= 65,01	
Puntera:	VPf= 50,7	MP=	55.484	Us=	1.635 0,37
Talón:	VTf= 126,4	MT=	-108.284	Us=	3.195 0,72
	(cm)		(Kgxcn)		(Kg) (cm2)
As,min=	6,00 cm2				
	1,5 ‰				

S1= 58,51		SPc= 59,56		STc= 61,97		S2= 65,01	
qvP= -16,00				qvT= -77,13			
Puntera:	VPc= 30,7	VP=	1.323	Vcu=	21.947	0,00	
Talón:	VTc= 89,4	VT=	-1.219		(Kg)	(cm2/ml)	
	(cm)		(Kg)				

Perpendicular Muro: Ø12 /25cm
Paralelo Muro: Ø12 /25cm

Perpendicular Muro: Ø12 /25cm
Paralelo Muro: Ø12 /25cm

Armado a cortante: No necesario.

DATOS GENERALES:

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1510x(690/40)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 18,4 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 6
 Altura del Muro: 150,5 cm Quiebro 244,8 cm
 Altura tierras: 150,5 cm Canto.C 20,0 cm
 Canto.Z 20,0 cm
 Longitud Muro: 100,0 cm Xcdg (m) 10,0 cm
 Peso del Muro: 752 Kg/ml Xcdg (t) 64,2 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigon: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 48 cm
 Vuelo del Talon: 123 cm
 Canto de la Zapata: 40 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (Hztal): 0,427
 Base de la Zapata: 191,2 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-38	0	0
Muro:		-752	-38		-43451
Tierras:	-1549	-4222	36	98347	-546651
Sobrecarga (coron.):	-325	-494	34	30978	-63929
Sobrecarga (prof.):	0	0	34	0	0
Zapata:		-1912	0		-182772
	-1874	-7380		129325	-836803

Csd = 2,27 Csv = 6,47 e = 1,7 cm.

Aleta 1510x(690/40) Pza. 6

TENSION DEL TERRENO: 0,38 < 2,00 (Servicio)
 0,43 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal

SP= 0,37 (Kg/cm²) ST= 0,41 (Kg/cm²) Le= 191,2 (cm)

CIMENTACIÓN:

Fcd = 166,7 Kg/cm² Mayoración Cargas: 1,60
 Fyd = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S1= 58,51 SPf= 60,24 STf= 60,71 S2= 65,01
 qvP= -16,00 qvT= -77,13

Puntera: VPf= 50,7 MP= 55.484 Us= 1.635 0,37
 Talón: VTf= 126,4 (cm) MT= -108.284 (Kgxcn) Us= 3.195 0,72
 As,min= 6,00 cm² 1,5 ‰ (Kg) (cm²)

Cortante:

S1= 58,51 SPc= 59,56 STc= 61,97 S2= 65,01
 qvP= -16,00 qvT= -77,13

Puntera: VPc= 30,7 VP= 1.323 Vcu= 21.947 0,00
 Talón: VTc= 89,4 (cm) VT= -1.219 (Kg) (cm²/ml)

Armado Superior (Talón):

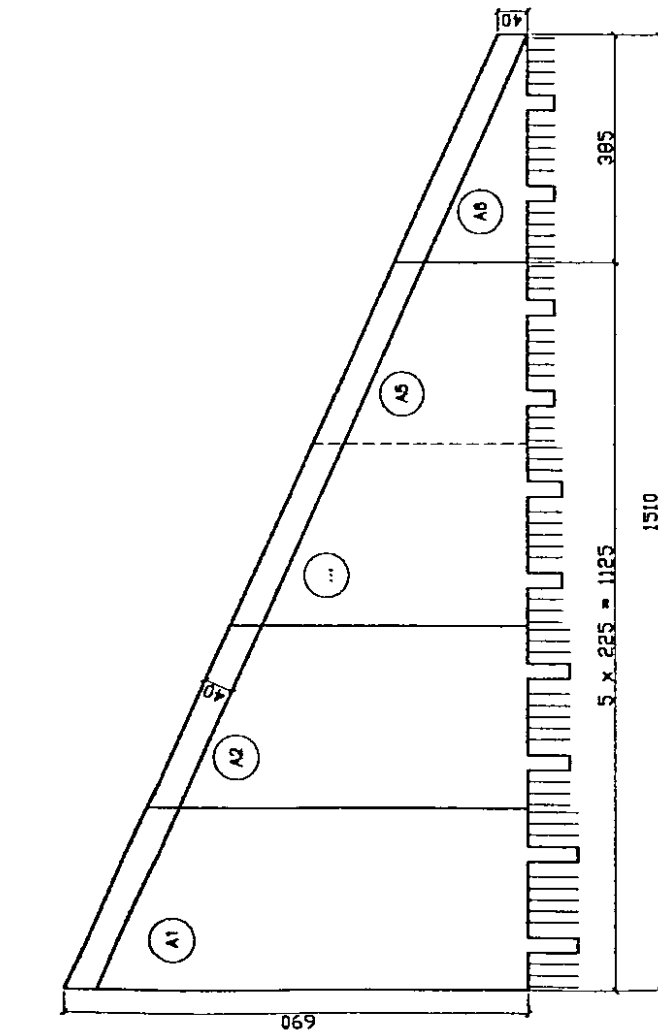
Perpendicular Muro: Ø12 /25cm
 Paralelo Muro: Ø12 /25cm

Armado Inferior (Puntera):

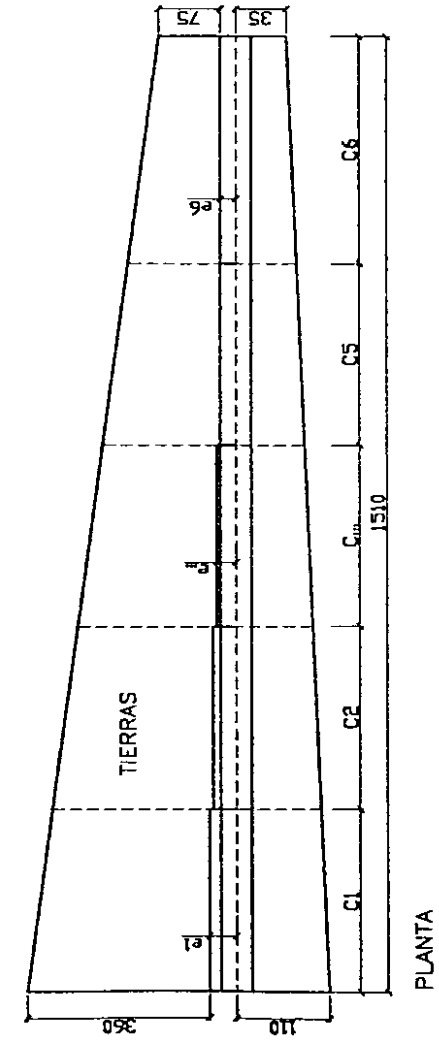
Perpendicular Muro: Ø12 /25cm
 Paralelo Muro: Ø12 /25cm

Armado a cortante: No necesario.

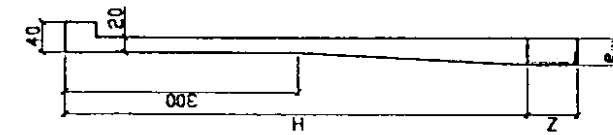
12. PLANOS



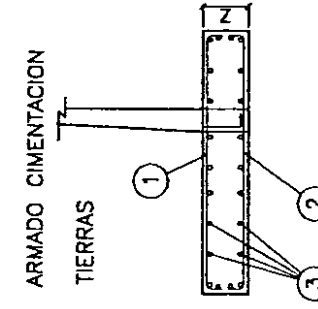
ALZADO CARA VISTA (Aléa Izda)



PLANTA



SECCION

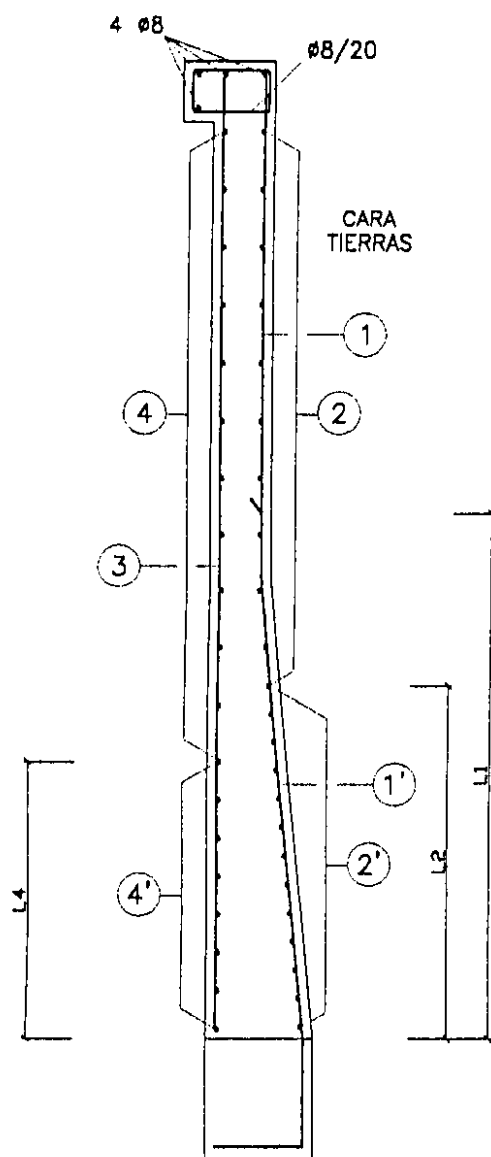


ARMADO CIMENTACION			
TIPO			
	1	2	3
C1	ø25/20cm	ø16/25cm	ø16/25cm
C2	ø25/25cm	ø16/25cm	ø16/25cm
C3	ø20/25cm	ø12/25cm	ø12/25cm
C4	ø16/25cm	ø12/25cm	ø12/25cm
C5	ø12/25cm	ø12/25cm	ø12/25cm
O6	ø15/25cm	ø15/25cm	ø15/25cm

PIEZA	H	e...	Z
A1	690.0	44.0	80
A2	593.1	38.0	80
A3	496.3	32.1	60
A4	389.4	26.1	60
A5	302.6	20.2	40
A6	205.7	10.0	40

EH-81	CALIDAD	CONTROL	Coef.
ELEMENTOS PREFABRICADOS			
HORMIGÓN	H-300	INTENSO	1,40
ACERO	AEN-900-S	INTENSO	1,10
EJECUCIÓN		INTENSO	1,50
OBRA IN SITU			
HORMIGÓN	H-250	NORMAL	1,50
ACERO	AEN-900	NORMAL	1,10
EJECUCIÓN		NORMAL	1,50

25/05/00	0	MODIFICACIONES	1º PLANO	 
FECHA	REV.	PIEZA: ALETA 1510x(890/40). E-1510.9.1	58.1	
OFERTA:	99/843		8645	
OBRA:	SUBIRAMO XV			
CLIENTE:	NECSO			
ALETA 1510x(890/40)			REVISADO:  DISEÑO: Comercial DIBUJO: Técnico	



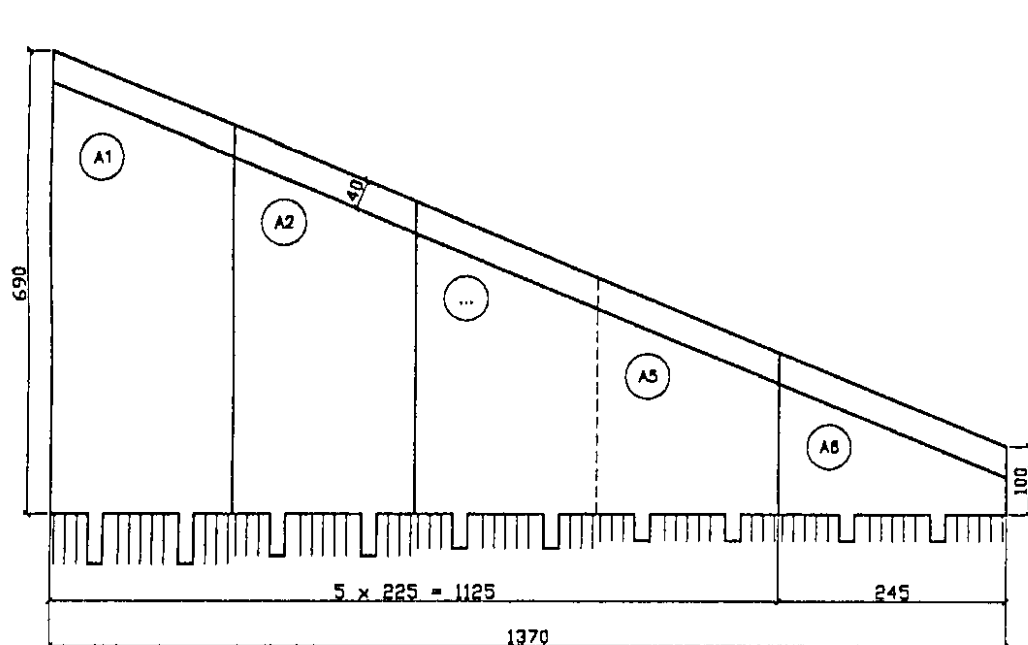
DEFINICIÓN DE ARMADO

	A1	A2	A3	A4	A5	A6
1	Ø25/22	Ø20/30	Ø16/30	Ø16/30	Ø10/30	Ø8/20
1'	Ø25/11	Ø20/10	Ø16/10	Ø16/15	Ø10/10	--
L1	380	390	315	220	190	--
2	Ø10/24	Ø10/30	Ø8/30	Ø8/30	Ø8/25	Ø8/20
2'	Ø10/8	Ø10/12.5	Ø8/12.5	Ø8/15	--	--
L2	304	275	200	105	--	--
3	Ø16/25	Ø12/25	Ø10/25	Ø10/30	Ø6/30	Ø6/30
4	Ø8/20	Ø8/25	Ø8/25	Ø8/20	Ø8/25	Ø8/25
4'	Ø8/10	Ø8/12.5	Ø8/15	--	--	--
L4	290	300	195	--	--	--
5	--	--	--	--	--	--
L5	--	--	--	--	--	--

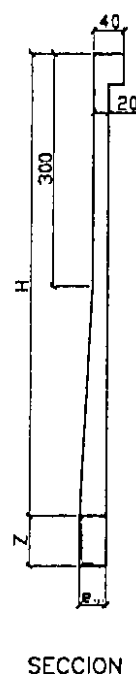
Distancias en centímetros

EH-91	CALIDAD	CONTROL	Coef.
ELEMENTOS PREFABRICADOS			
HORMIGON	H-300	INTENSO	1,40
ACERO	AEH-500-S	INTENSO	1,10
EJECUCION		INTENSO	1,50
OBRA IN SITU			
HORMIGON	H-250	NORMAL	1,50
ACERO	AEH-500	NORMAL	1,15
EJECUCION		NORMAL	1,60

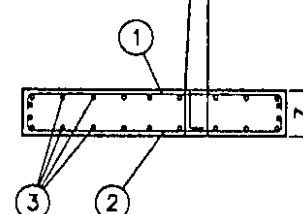
25/05/00	0		
FECHA	REV.	MODIFICACIONES	Nº PLANO
			58.2
PIEZA:	ALETA 1510x(690/40). E-1516.9.1		
OFERTA:	99/643		
OBRA:	SUBTRAMO XV		
CLIENTE:	NECSO		
ALETA 1510x(690/40)		REVISADO	APROBADO
		Dir. Comercial	Dir. Técnica
 PREFABRICADOS DE HORMIGON			



ALZADO CARA VISTA (Aleta Izda)



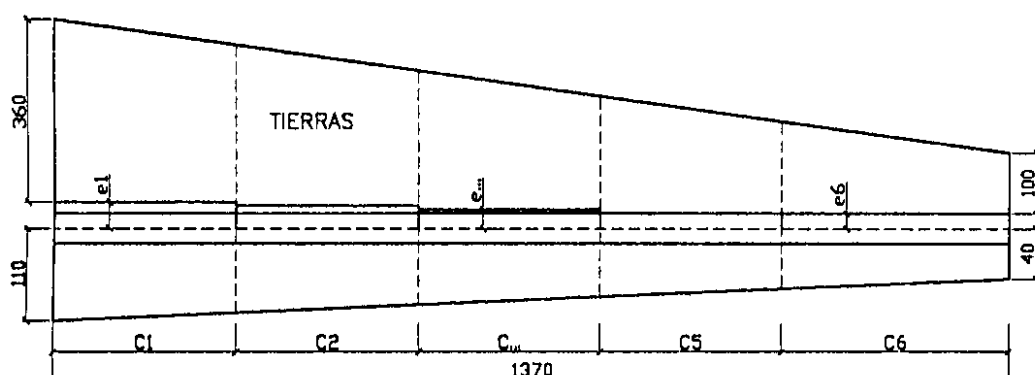
ARMADO CIMENTACION
TIERRAS



TIPO	1	2	3
C1	Ø25/20cm	Ø16/25cm	Ø16/25cm
C2	Ø25/25cm	Ø16/25cm	Ø16/25cm
C3	Ø20/25cm	Ø12/25cm	Ø12/25cm
C4	Ø16/25cm	Ø12/25cm	Ø12/25cm
C5	Ø12/25cm	Ø12/25cm	Ø12/25cm
C6	Ø12/25cm	Ø12/25cm	Ø12/25cm

PIEZA	H	e...	Z
A1	690.0	44.0	80
A2	593.1	38.0	80
A3	496.3	32.1	60
A4	399.4	26.1	60
A5	302.6	20.2	40
A6	205.7	20.0	40

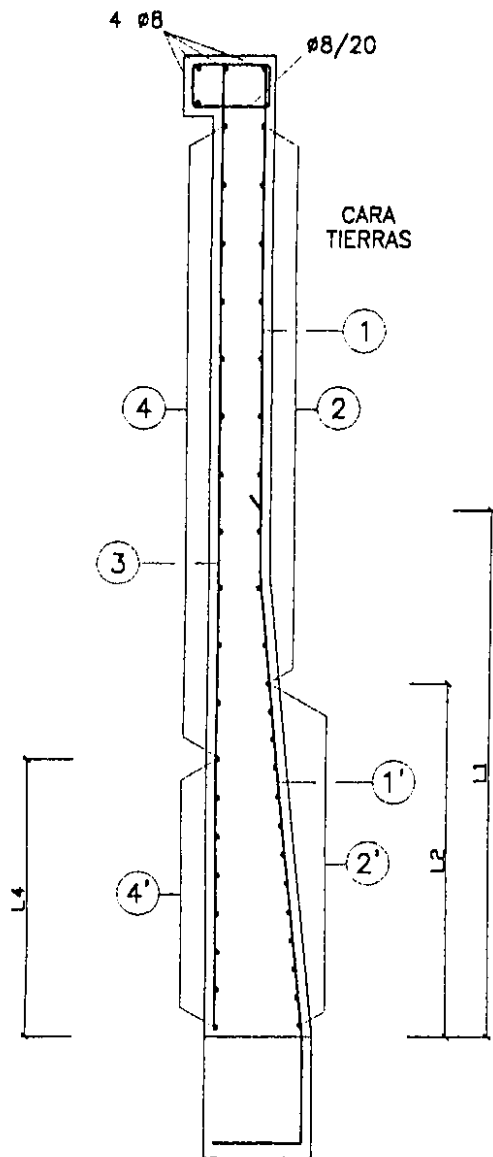
EH-91	CALIDAD	CONTROL	Coef.
ELEMENTOS PREFABRICADOS			
HORMIGON	H-300	INTENSO	1,40
ACERO	AEH-500-S	INTENSO	1,10
EJECUCION		INTENSO	1,50
OBRA IN SITU			
HORMIGON	H-250	NORMAL	1,50
ACERO	AEH-500	NORMAL	1,15
EJECUCION		NORMAL	1,60



PLANTA

25/05/00	0		
FECHA	REV.	MODIFICACIONES	Nº PLANO
			59.1
PIEZA:	ALETA 1370x(690/100). E-1516.9.1		
OFERTA:	99/643		
OBRA:	SUBTRAMO XV		
CLIENTE:	NECSO		
ALETA 1370x(690/100)		REVISADO	APROBADO
		Dir. Comercial	Dir. Técnica
 PREFABRICADOS DE HORMIGON			

* COTAS EN CM.



DEFINICIÓN DE ARMADO

	A 1	A 2	A 3	A 4	A 5	A 6
1	Ø25/22	Ø20/30	Ø16/30	Ø16/30	Ø10/30	Ø8/20
1'	Ø25/11	Ø20/10	Ø16/10	Ø16/15	Ø10/10	--
L1	380	390	315	220	190	--
2	Ø10/24	Ø10/30	Ø8/30	Ø8/30	Ø8/25	Ø8/20
2'	Ø10/8	Ø10/12.5	Ø8/12.5	Ø8/15	--	--
L2	304	275	200	105	--	--
3	Ø16/25	Ø12/25	Ø10/25	Ø10/30	Ø6/30	Ø6/30
4	Ø8/20	Ø8/25	Ø8/25	Ø8/20	Ø8/25	Ø8/25
4'	Ø8/10	Ø8/12.5	Ø8/15	--	--	--
L4	290	300	195	--	--	--
5	--	--	--	--	--	--
L5	--	--	--	--	--	--

Distancias en centímetros

EH-91	CALIDAD	CONTROL	Coef.
ELEMENTOS PREFABRICADOS			
HORMIGÓN	H-300	INTENSO	1,40
ACERO	AEH-500-S	INTENSO	1,10
EJECUCIÓN		INTENSO	1,50
OBRA IN SITU			
HORMIGÓN	H-250	NORMAL	1,50
ACERO	AEH-500	NORMAL	1,15
EJECUCIÓN		NORMAL	1,60

25/05/00	0	
FECHA	REV.	MODIFICACIONES
PIEZA:	ALETA 1370x(690/100).	E-1516.9.1
OFERTA:	99/643	
OBRA:	SUBTRAMO XV	
CLIENTE:	NECSO	
ALETA 1370x(690/100)		59.2
REVISADO:		APROBADO:
DISEÑO: Comercial		DISEÑO: Técnico
PREFABRICADOS DE HORMIGÓN		

<i>ALHOSA</i> PREFABRICADOS DE HORMIGÓN	ALETA 1420 x (690/40) y 1289 x (690/100) E-1516.9.1
Oferta: 99/643 Obra: SUBTRAMO XV Empresa: NECSO Fecha: Junio de 2.000	

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1.-	Generalidades
2.-	Descripción
3.-	Instrucciones aplicadas
4.-	Características de los materiales
5.-	Control de calidad
6.-	Coeficientes de seguridad
7.-	Parámetros del terreno
8.-	Acciones consideradas
9.-	Hipótesis de cálculo
10.-	Cálculos
11.-	Cimentación
12.-	Planos

1. Generalidades

En la presente memoria se muestran los cálculos realizados para justificar las Aletas Prefabricadas de hormigón que sostienen el terraplén.

2. Descripción

El sostenimiento de las tierras que forman el terraplén en las entradas de las obras de fábrica se realiza con aletas prefabricadas de hormigón armado.

El espesor de los muros que forman las aletas es de 20 cm. hasta los 300 cm. de profundidad y luego aumenta progresivamente, tal y como se muestra en los planos adjuntos.

La cimentación se realiza con hormigón vertido in situ

3. Instrucciones aplicadas

Para el cálculo de las Aletas, se han utilizado las siguientes Instrucciones y Normas:

* Instrucción para el Proyecto y Ejecución de Obras de Hormigón en Masa o Armado EH-91.

4. Características de los materiales

* Hormigones:

Hormigón en elemento prefabricado	H-300
Hormigón en obra in situ	H-250

* Acero:

Acero para armar corrugado	B-500 S
----------------------------	---------

5. Control de calidad

El control de calidad se atenderá a lo especificado en la EH-91, habiéndose seleccionado los siguientes niveles:

Elementos prefabricados:

a) Materiales:

- Hormigón	Control Intenso
- Armadura pasiva	Control Intenso

b) Ejecución:

- En toda la obra	Control Intenso
-------------------	-----------------

Obra in situ:

a) Materiales:

- Hormigón	Control Normal
- Armadura pasiva	Control Normal

b) Ejecución:

- En toda la obra	Control Normal
-------------------	----------------

6. Coeficientes de seguridad

De acuerdo con los niveles de control de calidad definidos, se adoptan los siguientes coeficientes de seguridad:

Elementos prefabricados:

- Coeficientes de minoración de resistencias:

Acero pasivo

$\gamma_s = 1,10$

Hormigón

$\gamma_c = 1,40$

- Coeficientes de ponderación de acciones:

$\gamma_f = 1,50$

Obra in situ:

- Coeficientes de minoración de resistencias:

Acero pasivo

$\gamma_s = 1,15$

Hormigón

$\gamma_c = 1,50$

- Coeficientes de ponderación de acciones:

$\gamma_f = 1,60$

7. Parámetros del terreno

Pese a existir un relleno de calidad adecuadamente compactado (al que correspondería un ángulo de rozamiento interno de 35°), con un talud 2H:1V. En los cálculos se ha considerado, conservadoramente, un talud de terraplén 3H:2V con ángulo de rozamiento interno de 30°. La Aleta forma un ángulo mínimo de 60° con el pie del terraplén

Peso específico

2,0ton/m3

Ángulo de rozamiento interno

30°

Ángulo Talud coronación

18,4°

Coeficiente de empuje activo

0,427

8. Acciones consideradas**8.1 Empuje por efecto de las tierras**

Se considera el empuje de las tierras que se encuentran en el trasdós de la Aleta con un coeficiente de empuje de 0,427.

8.2 Sobrecargas de uso

Se considera una sobrecarga de 400 Kg/m2 sobre el terraplén, que es la establecida para paseos de servicio.

9. Hipótesis de cálculo.**HIPÓTESIS I:**

- Empuje de las tierras

- Sobrecarga de uso

Combinación: 1,5 * [Caso (1) + Caso (2)]

En Alcañiz, Junio de 2.000



Alcañizana de Hormigón, S.A. ALCAÑIZ

Javier Tello Sánchez

Dpto. Técnico ALHOSA

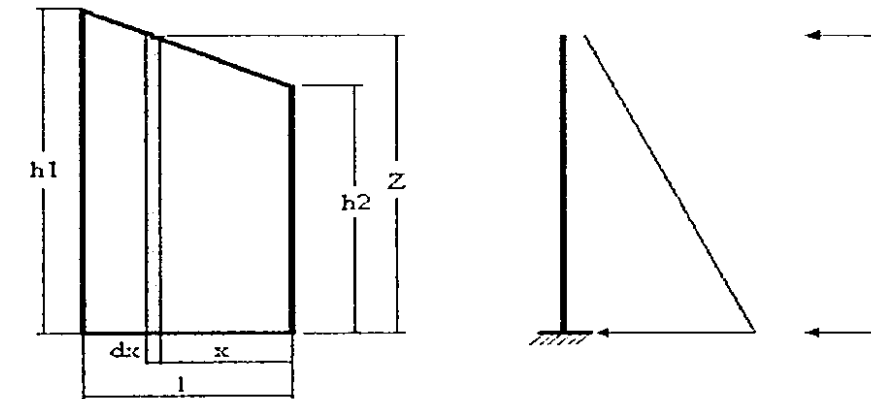
- El presente informe se ha realizado con los datos aportados por el cliente para esta pieza prefabricada concreta.

- Salvo comunicación escrita de lo contrario, las consideraciones en él realizadas, así como los resultados aportados, se ajustan a lo solicitado por el cliente.

10. Cálculos.

Dada la geometría de la estructura en la que se reduce la altura en función de la longitud y los esfuerzos se comportan de igual manera, cada tramo de la aleta se ha armado para la altura existente a una distancia, del lado mayor, de 1/3 de su longitud, siendo en todo momento superiores las sollicitaciones en este punto que la resultante sobre cada tramo.

Pza.	H.máx	H.mín	H.cálculo
1	690,0	587,0	656
2	587,0	484,0	553
3	484,0	381,0	450
4	381,0	278,0	347
5	278,0	175,0	244
6	175,0	40,0	130



$$M = \int_{x=0}^{x=l} dM = \int_{x=0}^{x=l} \left(\frac{1}{6} \cdot \lambda_h \cdot \gamma_t \cdot z^3 + \frac{1}{2} \cdot \lambda_h \cdot SC \cdot z^2 \right) \cdot dx =$$

$$= \frac{1}{6} \cdot \lambda_h \cdot \gamma_t \cdot \left(\frac{1}{4} \cdot \frac{h_1^4 - h_2^4}{h_1 - h_2} \right) \cdot l + \frac{1}{2} \cdot \lambda_h \cdot SC \cdot \left(\frac{1}{3} \cdot \frac{h_1^3 - h_2^3}{h_1 - h_2} \right) \cdot l \leq M \left(z = h_2 + \frac{2 \cdot (h_1 - h_2)}{3} \right)$$

$$V = \int_{x=0}^{x=l} dV = \int_{x=0}^{x=l} \left(\frac{1}{2} \cdot \lambda_h \cdot \gamma_t \cdot z^2 + \lambda_h \cdot SC \cdot z \right) \cdot dx =$$

$$= \frac{1}{2} \cdot \lambda_h \cdot \gamma_t \cdot \left(\frac{1}{3} \cdot \frac{h_1^3 - h_2^3}{h_1 - h_2} \right) \cdot l + \lambda_h \cdot SC \cdot \left(\frac{1}{2} \cdot \frac{h_1^2 - h_2^2}{h_1 - h_2} \right) \cdot l \leq V \left(z = h_2 + \frac{2 \cdot (h_1 - h_2)}{3} \right)$$

$$z = h_2 + \frac{h_1 - h_2}{l} \cdot x$$

DATOS GENERALES:

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1420x(690x40)

TERRENO:

Densidad terreno: 0,0020 Kg/cm³
 Densidad Agua: 0,0010 Kg/cm³
 Indice Huecos: 30,0 %
 Densidad Aparente: 0,0013 Kg/cm³
 Angulo Roz.Int: 30,0 °
 Angulo Roz. Trno/Mro: 0,0 °
 Angulo de Talud: 18,4 °
 Coef. Empuje Activo Hztal: 0,427
 Coef. Empuje Activo Vtal: 0,000

MURO:

Altura máxima: 690 cm Quiebro 300 cm
 Resguardo Tierras: 0 cm Canto C. 20 cm
 Longitud Muro: 100 cm Canto Z. 44,0 cm
 Peso del Muro 4.620 Kg/ml Xcdg (m) 14,6 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm²
 Prof. Aplic. (S.C.p.) 0 cm

MATERIALES ALZADO:

Fc,k 300 Kg/cm² Gc (1,40)
 Fy,k 5100 Kg/cm² Gs (1,10)
 Fc,d 214,3 Kg/cm² Gf (1,50)
 Fy,d 4.636,4 Kg/cm² Recubrimiento: 4,0 cm.
 Fyv,d 4.200,0 Kg/cm²

ESFUERZOS:

	H_Calc	Canto	Md	As1	As2	Vd	Vcu	Ast
	cm	cm	Kg x cm	cm ²	cm ²	Kg	Kg	cm ² /ml
1	656	44,0	6.566.708	39,66	0,00	29.206	29.277	0,00
2	553	37,7	3.994.279	28,14	0,00	20.974	24.638	0,00
3	450	31,3	2.199.781	18,76	0,00	14.100	19.999	0,00
4	347	25,0	1.043.309	11,39	0,00	8.584	15.360	0,00
5	244	20,0	384.953	5,39	0,00	4.427	11.711	0,00
6	130	20,0	68.567	1,28	0,00	1.416	11.711	0,00

Aleta 1420x(690x40)

Tierras: 2.000 Kg/m³ SC_c: 400 Kg/m² Gc: 1,40
 Talud: 18,40° SC_p: 0 Kg/m² Gs: 1,10
 C.E.h: 0,427 Z_SCp: 0 cm Gf: 1,50

Z (cm)	Eh (Kg)				Vd (Kg)	M (Kg)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
0	0	0	0	0	0	0	0	0	0	0
10	4	0	17	0	32	14	0	85	0	149
20	17	0	34	0	77	114	0	341	0	683
30	38	0	51	0	134	384	0	768	0	1.729
40	68	0	68	0	205	911	0	1.366	0	3.415
50	107	0	85	0	288	1.779	0	2.134	0	5.869
60	154	0	102	0	384	3.073	0	3.073	0	9.220
70	209	0	120	0	493	4.881	0	4.183	0	13.596
80	273	0	137	0	615	7.285	0	5.464	0	19.124
90	346	0	154	0	749	10.373	0	6.915	0	25.932
100	427	0	171	0	896	14.229	0	8.537	0	34.150
110	517	0	188	0	1.057	18.939	0	10.330	0	43.904
120	615	0	205	0	1.229	24.588	0	12.294	0	55.322
130	721	0	222	0	1.415	31.261	0	14.428	0	68.534
140	837	0	239	0	1.614	39.044	0	16.733	0	83.667
150	960	0	256	0	1.825	48.023	0	19.209	0	100.848
160	1.093	0	273	0	2.049	58.282	0	21.856	0	120.207
170	1.234	0	290	0	2.286	69.907	0	24.673	0	141.870
180	1.383	0	307	0	2.536	82.984	0	27.661	0	165.967
190	1.541	0	324	0	2.798	97.597	0	30.820	0	192.625
200	1.707	0	341	0	3.073	113.832	0	34.150	0	221.973
210	1.882	0	359	0	3.362	131.775	0	37.650	0	254.137
220	2.066	0	376	0	3.663	151.511	0	41.321	0	289.247
230	2.258	0	393	0	3.976	173.124	0	45.163	0	327.431
240	2.459	0	410	0	4.303	196.702	0	49.175	0	368.816
250	2.668	0	427	0	4.642	222.328	0	53.359	0	413.531
260	2.886	0	444	0	4.994	250.089	0	57.713	0	461.703
270	3.112	0	461	0	5.359	280.070	0	62.238	0	513.461
280	3.347	0	478	0	5.737	312.355	0	66.933	0	568.933
290	3.590	0	495	0	6.128	347.032	0	71.800	0	628.247
300	3.842	0	512	0	6.531	384.183	0	76.837	0	691.530
310	4.102	0	529	0	6.947	423.897	0	82.045	0	758.912
320	4.371	0	546	0	7.376	466.256	0	87.423	0	830.519
330	4.649	0	563	0	7.818	511.348	0	92.972	0	906.481
340	4.935	0	581	0	8.273	559.257	0	98.692	0	986.925
350	5.229	0	598	0	8.740	610.069	0	104.583	0	1.071.979
360	5.532	0	615	0	9.220	663.869	0	110.645	0	1.161.771
370	5.844	0	632	0	9.713	720.742	0	116.877	0	1.256.429
380	6.164	0	649	0	10.219	780.775	0	123.280	0	1.356.082
390	6.493	0	666	0	10.738	844.051	0	129.854	0	1.460.858
400	6.830	0	683	0	11.269	910.657	0	136.599	0	1.570.884
410	7.176	0	700	0	11.814	980.678	0	143.514	0	1.686.288
420	7.530	0	717	0	12.371	1.054.199	0	150.600	0	1.807.199
430	7.893	0	734	0	12.941	1.131.307	0	157.857	0	1.933.745
440	8.264	0	751	0	13.523	1.212.085	0	165.284	0	2.066.053
450	8.644	0	768	0	14.119	1.296.619	0	172.883	0	2.204.253
460	9.033	0	785	0	14.727	1.384.996	0	180.652	0	2.348.471
470	9.430	0	803	0	15.348	1.477.299	0	188.591	0	2.498.836
480	9.835	0	820	0	15.982	1.573.616	0	196.702	0	2.655.476

Aleta 1420x(690x40)

Tierras: 2.000 Kg/m³ SC_c: 400 Kg./m² Gc: 1,40
 Talud: 18,40° SC_p: 0 Kg./m² Gs: 1,10
 C.E.h: 0,427 Z_SCp: 0 cm Gf: 1,50

Z (cm)	Eh (Kg)				Vd (Kg)	M (Kg)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
490	10.249	0	837	0	16.629	1.674.030	0	204.983	0	2.818.519
500	10.672	0	854	0	17.288	1.778.627	0	213.435	0	2.988.094
510	11.103	0	871	0	17.961	1.887.493	0	222.058	0	3.164.327
520	11.543	0	888	0	18.646	2.000.714	0	230.852	0	3.347.348
530	11.991	0	905	0	19.344	2.118.373	0	239.816	0	3.537.284
540	12.448	0	922	0	20.054	2.240.558	0	248.951	0	3.734.263
550	12.913	0	939	0	20.778	2.367.353	0	258.257	0	3.938.414
560	13.387	0	956	0	21.514	2.498.843	0	267.733	0	4.149.865
570	13.869	0	973	0	22.263	2.635.115	0	277.380	0	4.368.742
580	14.360	0	990	0	23.025	2.776.252	0	287.198	0	4.595.176
590	14.859	0	1.007	0	23.800	2.922.341	0	297.187	0	4.829.293
600	15.367	0	1.024	0	24.588	3.073.468	0	307.347	0	5.071.222
610	15.884	0	1.042	0	25.388	3.229.717	0	317.677	0	5.321.091
620	16.409	0	1.059	0	26.201	3.391.173	0	328.178	0	5.579.027
630	16.942	0	1.076	0	27.027	3.557.923	0	338.850	0	5.845.160
640	17.485	0	1.093	0	27.866	3.730.052	0	349.692	0	6.119.616
650	18.035	0	1.110	0	28.718	3.907.644	0	360.706	0	6.402.524
660	18.594	0	1.127	0	29.582	4.090.786	0	371.890	0	6.694.013
670	19.162	0	1.144	0	30.459	4.279.562	0	383.244	0	6.994.210
680	19.738	0	1.161	0	31.349	4.474.059	0	394.770	0	7.303.243
690	20.323	0	1.178	0	32.252	4.674.360	0	406.466	0	7.621.240

11. CIMENTACIONES

En las páginas siguientes se muestran los cálculos de la cimentación de la aleta.

DATOS GENERALES:

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1420x(690/40)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 18,4 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 1
 Altura del Muro: 655,7 cm Quiebro 265,7 cm
 Altura tierras: 655,7 cm Canto.C 20,0 cm
 Canto.Z 44,0 cm
 Longitud Muro: 100,0 cm Xcdg (m) 14,7 cm
 Peso del Muro: 4.448 Kg/ml Xcdg (t) 168,9 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigon: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 106 cm
 Vuelo del Talón: 345 cm
 Canto de la Zapata: 80 cm

COMPROBACION DE ESTABILIDAD:

Coefficiente Empuje Activo (Hztal): 0,427
 Base de la Zapata: 495,0 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-131	0	0
Muro:		-4448	-127		-569560
Tierras:	-23103	-51974	71	5665292	-16762134
Sobrecarga (coron.):	-1256	-1476	63	462052	-475960
Sobrecarga (prof.):	0	0	63	0	0
Zapata:		-9900	0		-2450111
	-24359	-67797		6127344	-20257765

Csd = 1,61 Csv = 3,31 e = -42,6 cm.

Aleta 1420x(690/40) Pza. I

TENSION DEL TERRENO: 1,72 < 2,00 (Servicio)
 2,12 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
 SP= 2,08 ST= 0,66 Le= 495,0
 (Kg/cm²) (Kg/cm²) (cm)

CIMENTACIÓN:

Fcd = 166,7 Kg/cm² Mayoración Cargas: 1,60
 Fyd = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S1= 332,25 SPf= 280,78 STf= 266,70 S2= 106,05
 qvP= -32,00 qvT= -279,47

Puntera: VPf= 112,6 MP= 1.795.864 Us= 24.556 5,54
 Talón: VTF= 351,5 MT= -7.407.369 Us= 105.398 23,77
 (cm) (Kgxcn) (Kg) (cm²)
 As,min= 12,00 cm²
 1,5 ‰

Cortante:

S1= 332,25 SPc= 300,70 STc= 229,87 S2= 106,05
 qvP= -32,00 qvT= -279,47

Puntera: VPc= 69,0 VP= 19.640 Vcu= 47.767 0,00
 Talón: VTc= 270,9 VT= -30.215 (Kg) (cm²/ml)
 (cm) (Kg)

Armado Superior (Talón):

Perpendicular Muro: Ø25 /20cm
 Paralelo Muro: Ø16 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø16 /20cm
 Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1420x(690/40)

TERRENO:

Densidad terreno:	0,00200 Kg/cm3
Angulo rozamiento interno:	30,0 °
Angulo rozamiento terreno muro:	0,0 °
Angulo de Talud:	18,4 °
Coefficiente de rozamiento:	0,58
Tensión Admisible:	2,0 Kg/cm2
Densidad del hormigón:	0,0025 Kg/cm3

DATOS DEL MURO:

Nº Pza:	2		
Altura del Muro:	552,7 cm	Quiebro	265,7 cm
Altura tierras:	552,7 cm	Canto.C	20,0 cm
		Canto.Z	37,7 cm
Longitud Muro:	100,0 cm	Xcdg (m)	13,0 cm
Peso del Muro:	3.397 Kg/ml	Xcdg (t)	147,7 cm

ACCIONES:

Sobrecarga (coron.):	0,0400 Kg/cm2		
Sobrecarga (prof.):	0,0000 Kg/cm2	Prof.(S.C.p)	0 cm

RESISTENCIAS:

Hormigon:	250 Kg/cm ²	(1,50)
Acero:	5.100 Kg/cm ²	(1,15)
Acciones:		(1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera:	94 cm
Vuelo del Talon:	300 cm
Canto de la Zapata:	80 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (H _{ztal}):	0,427
Base de la Zapata:	431,6 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-112	0	0
Muro:		-3397	-109		-383815
Tierras:	-17087	-37935	64	3603455	-10686690
Sobrecarga (coron.):	-1080	-1270	57	341735	-357718
Sobrecarga (prof.):	0	0	57	0	0
Zapata:		-8632	0		-1862834
	-18167	-51234		3945190	-13291058

Csd = 1,63 **Csv** = 3,37 **e** = -35,6 cm.

Aleta 1420x(690/40) Pza. 2

TENSION DEL TERRENO:

1,48	<	2,00	(Servicio)	
1,81	<	4,00	(Empuje mayorado)	(1,50)

Distribucion Trapezoidal

SP= 1,77 ST= 0,60 Le= 431,6
(Kg/cm2) (Kg/cm2) (cm)

CIMENTACIÓN:

Fcd =	166,7 Kg/cm2	Mayoración Cargas:	1,60
Fyd =	4.434,8 Kg/cm2	Recubrimiento:	6,0 cm.

CÁLCULO ZAPATA:

Flexión:

S1= 283,97	SPf= 240,48	STf= 228,99	S2= 95,89
qvP= -32,00		qvT= -240,86	

Puntera:	VPf= 99,8	MP= 1.182.717	Us= 16.106	3,63
Talón:	VTf= 305,4	MT= -4.692.970	Us= 65.462	14,76
	(cm)	(Kgxcmm)	(Kg)	(cm2)
As,min=	12,00 cm2			
	1,5 ‰			

Cortante:

S1= 283,97	SPc= 259,06	STc= 194,28	S2= 95,89
qvP= -32,00		qvT= -240,86	

Puntera:	VPc= 57,2	VP= 13.690	Vcu= 47.767	0,00
Talón:	VTc= 225,8	VT= -21.626	(Kg)	(cm2/ml)
	(cm)	(Kg)		

Armado Superior (Talón):

Perpendicular Muro: Ø25 /25cm
Paralelo Muro: Ø16 /25cm

Armado Inferior (Puntera):

Perpendicular Muro:	Ø16 /25cm
Paralelo Muro:	Ø16 /25cm

Armado a cortante: No necesario.

DATOS GENERALES:

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1420x(690/40)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 18,4 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 3
 Altura del Muro: 449,7 cm Quiebro 265,7 cm
 Altura tierras: 449,7 cm Canto.C 20,0 cm
 Canto.Z 31,3 cm
 Longitud Muro: 100,0 cm Xcdg (m) 11,4 cm
 Peso del Muro: 2.509 Kg/ml Xcdg (t) 126,7 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigon: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 82 cm
 Vuelo del Talon: 255 cm
 Canto de la Zapata: 60 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (Hztal): 0,427
 Base de la Zapata: 368,2 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-92	0	0
Muro:		-2509	-90		-245703
Tierras:	-11089	-26064	56	1883977	-6278982
Sobrecarga (coron.):	-870	-1064	51	221782	-256284
Sobrecarga (prof.):	0	0	51	0	0
Zapata:		-5523	0		-1016924
	-11959	-35160		2105759	-7797893

Csd = 1,70 Csv = 3,70 e = -23,2 cm.

Aleta 1420x(690/40) Pza. 3

TENSION DEL TERRENO: 1,14 < 2,00 (Servicio)
 1,37 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal

SP= 1,32 ST= 0,59 Le= 368,2
 (Kg/cm²) (Kg/cm²) (cm)

CIMENTACIÓN:

Fcd = 166,7 Kg/cm² Mayoración Cargas: 1,60
 Fyd = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S1= 210,48 SPf= 183,22 STf= 176,35 S2= 95,07
 qvP= -24,00 qvT= -194,17

Puntera: VPf= 87,0 MP= 670.870 Us= 12.526 2,82
 Talón: VTf= 259,3 MT= -2.421.374 Us= 46.238 10,43
 (cm) (Kgxcn) (Kg) (cm²)
 As,min= 9,00 cm²
 1,5 ‰

Cortante:

S1= 210,48 SPc= 193,15 STc= 157,95 S2= 95,07
 qvP= -24,00 qvT= -194,17

Puntera: VPc= 55,3 VP= 9.828 Vcu= 34.857 0,00
 Talón: VTc= 200,6 VT= -13.575 (Kg) (cm²/ml)
 (cm) (Kg)

Armado Superior (Talon):

Perpendicular Muro: Ø20 /25cm
 Paralelo Muro: Ø12 /25cm

Armado Inferior (Puntera):

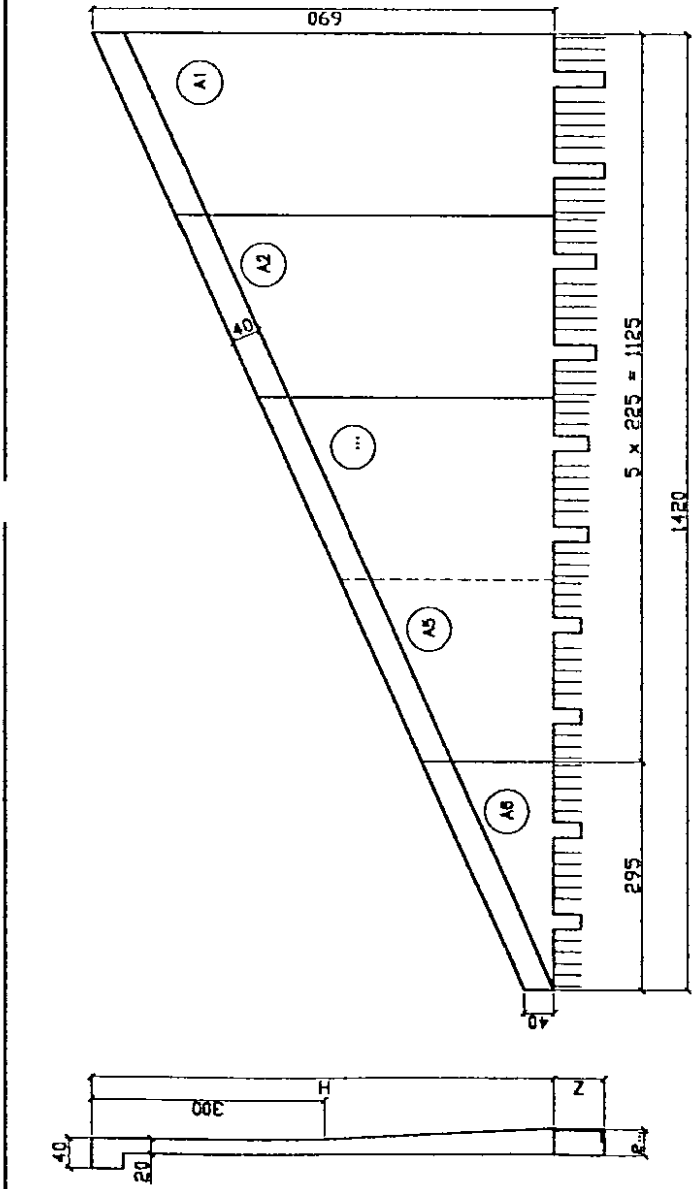
Perpendicular Muro: Ø12 /25cm
 Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

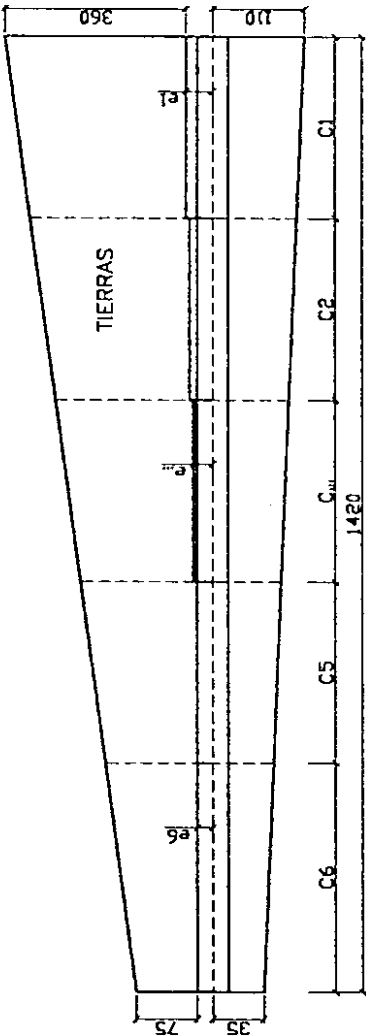
Armado a cortante: No necesario.

Armado a cortante: No necesario.

12. PLANOS

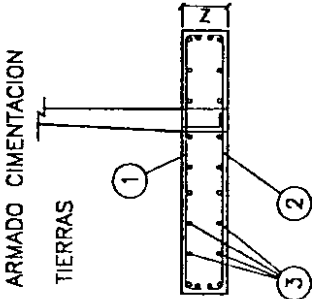


ALZADO CARA VISTA (Aleta Deho)



PLANTA

• COTAS EN CM.



TIPO	1	2	3
C1	25/20cm	16/25cm	10/25cm
C2	25/25cm	16/25cm	10/25cm
C3	20/25cm	12/25cm	12/25cm
C4	16/25cm	12/25cm	12/25cm
C5	12/25cm	12/25cm	12/25cm
C6	12/25cm	12/25cm	12/25cm

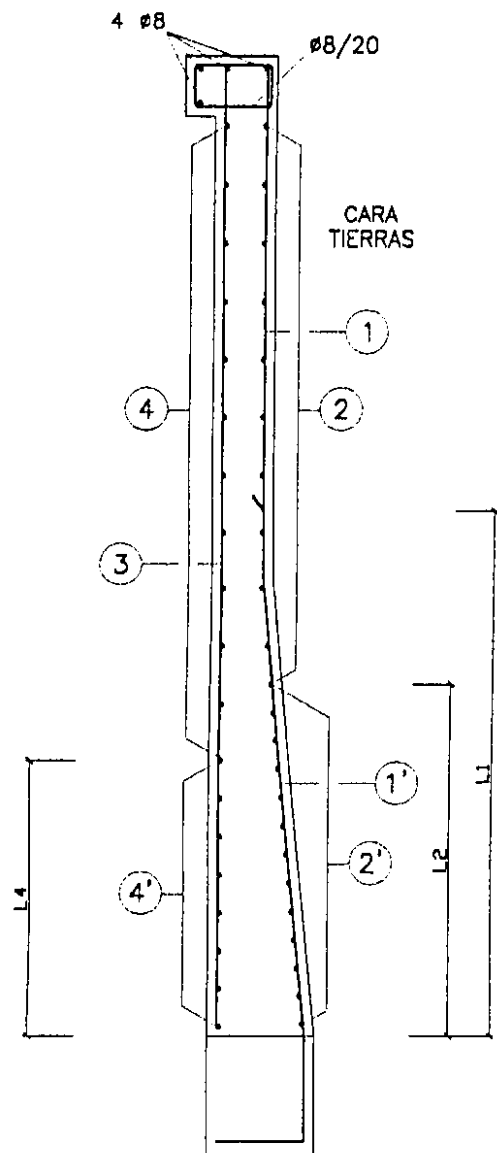
PIEZA	H	e...	Z
A1	690.0	44.0	80
A2	587.0	37.7	80
A3	484.0	31.3	60
A4	381.0	25.0	60
A5	278.0	20.0	40
A6	175.0	20.0	40

EH-91	QUALIDAD	CONTROL	Conf.
ELEMENTOS PREFABRICADOS	H-300	INTENSO	1.40
HORMIGON	AEH-500-S	INTENSO	1.10
ACERO	AEH-500-S	INTENSO	1.50
EJECUCION			
OBRA IN SITU	H-250	NORMAL	1.50
HORMIGON	AEH-500	NORMAL	1.10
ACERO	AEH-500	NORMAL	1.50
EJECUCION			

25/05/00	0	REV	MODIFICACIONES	60.1
PIEZA:	AELETA 1420x(690/40)	E-1518.9.1		
OFERTA:	99/643			
OBRA:	SUBTRAMO XV			
CLIENTE:	NECSO			
REVISADO:				
APROBADO:				
AELETA 1420x(690/40)				
DISEÑO:	Central			
CONF. TECNICO				



PREFABRICADOS DE HORMIGON



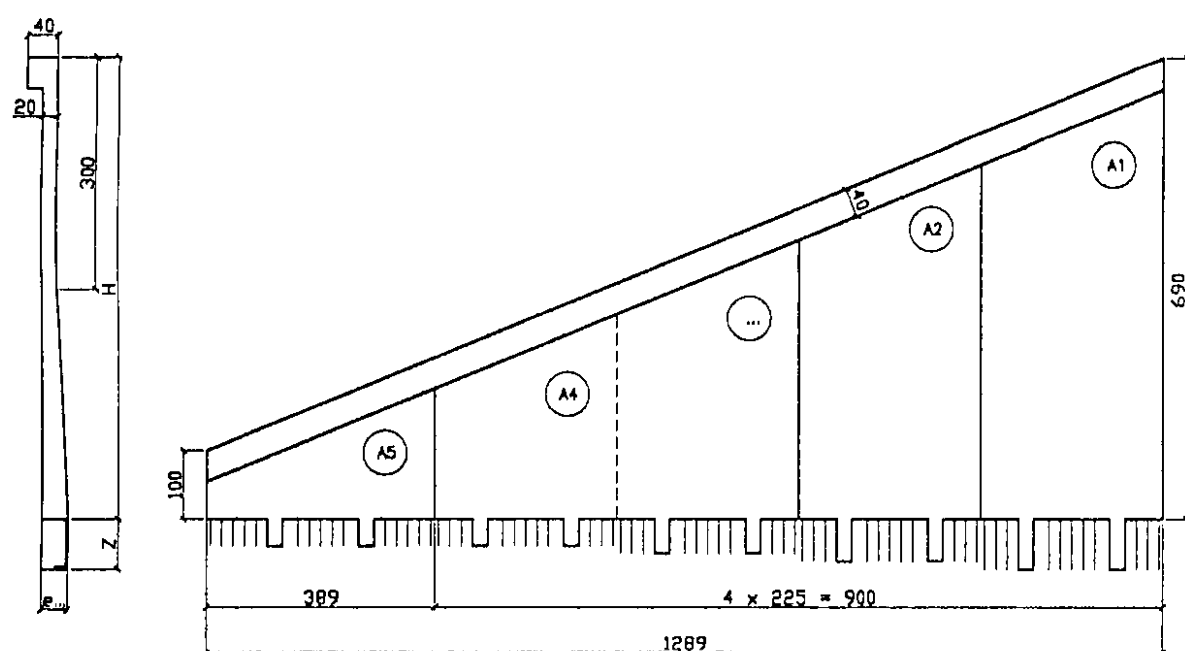
DEFINICIÓN DE ARMADO

	A1	A2	A3	A4	A5	A6
1	Ø25/22	Ø20/22	Ø16/30	Ø16/30	Ø10/25	Ø8/25
1'	Ø25/11	Ø20/11	Ø16/10	Ø16/15	Ø10/12.5	--
L1	380	330	305	200	145	--
2	Ø10/24	Ø10/30	Ø8/30	Ø8/30	Ø6/20	Ø8/20
2'	Ø10/8	Ø10/12.5	Ø8/12.5	Ø8/20	--	--
L2	304	250	200	100	--	--
3	Ø12/15	Ø12/25	Ø10/25	Ø8/15	Ø6/30	Ø6/30
4	Ø8/20	Ø8/25	Ø8/25	Ø8/20	Ø8/25	Ø8/25
4'	Ø8/10	Ø8/12.5	Ø8/15	--	--	--
L4	290	275	180	--	--	--
5	--	--	--	--	--	--
L5	--	--	--	--	--	--

Distancias en centímetros

EH-91	CALIDAD	CONTROL	Coef.
ELEMENTOS PREFABRICADOS			
HORMIGON	H-300	INTENSO	1,40
ACERO	AEH-500-S	INTENSO	1,10
EJECUCION		INTENSO	1,50
OBRA IN SITU			
HORMIGON	H-250	NORMAL	1,50
ACERO	AEH-500	NORMAL	1,15
EJECUCION		NORMAL	1,60

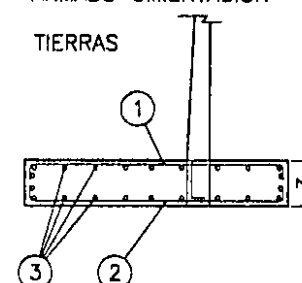
25/05/00	0	MODIFICACIONES	Nº PLANO
FECHA	REV.		60.2
PIEZA:	ALETA 1420x(690/40). E-1516.9.1		OBRA:
OFERTA:	99/643		CLIENTE:
OBRA:	SUBTRAMO XV		
CLIENTE:	NECSO		
ALETA 1420x(690/40)			
REVISADO:			APROBADO:
Dpto. Comercial			Dpto. Técnico
PREFABRICADOS DE HORMIGON			



SECCION

ALZADO CARA VISTA (Aleta Dcha)

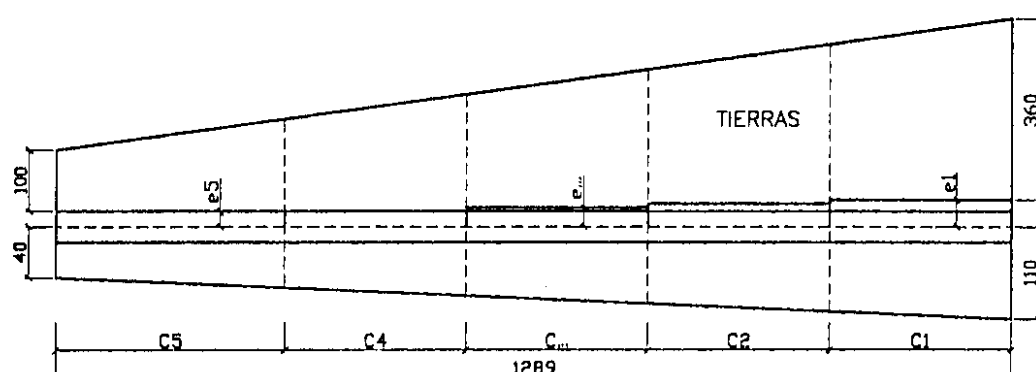
ARMADO CIMENTACION TIERRAS



TIPO	1	2	3
C1	Ø25/20cm	Ø16/25cm	Ø16/25cm
C2	Ø25/25cm	Ø16/25cm	Ø16/25cm
C3	Ø20/25cm	Ø12/25cm	Ø12/25cm
C4	Ø16/25cm	Ø12/25cm	Ø12/25cm
C5	Ø12/25cm	Ø12/25cm	Ø12/25cm

PIEZA	H	e...	Z
A1	690.0	44.0	80
A2	587.0	37.7	80
A3	484.0	31.3	60
A4	381.0	25.0	60
A5	278.0	20.0	40

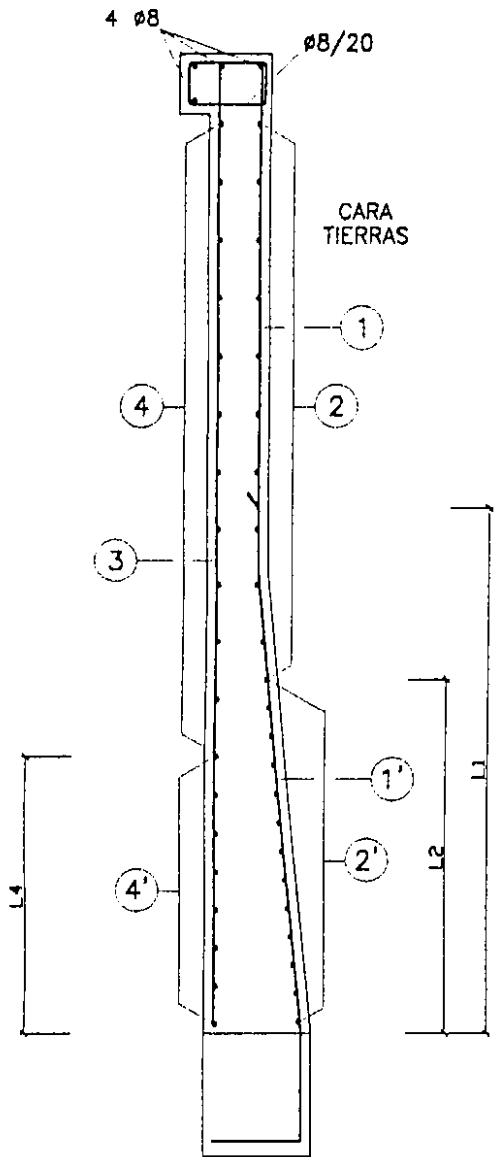
EH-91	CALIDAD	CONTROL	Coef.
ELEMENTOS PREFABRICADOS			
HORMIGON	H-300	INTENSO	1,40
ACERO	AEH-500-S	INTENSO	1,10
EJECUCION		INTENSO	1,50
OBRA IN SITU			
HORMIGON	H-250	NORMAL	1,50
ACERO	AEH-500	NORMAL	1,15
EJECUCION		NORMAL	1,60



PLANTA

* COTAS EN CM.

25/05/00	0	MODIFICACIONES	Nº PLANO
FECHA	REV.		61.1
PIEZA:	ALETA 1289x(690/100). E-1516.9.1		OBRA:
OFERTA:	99/643		CLIENTE:
OBRA:	SUBTRAMO XV		
CLIENTE:	NECSO		
ALETA 1289x(690/100)			
REVISADO:			APROBADO:
Dpto. Comercial			Dpto. Técnico
PREFABRICADOS DE HORMIGON			



DEFINICIÓN DE ARMADO

	A1	A2	A3	A4	A5
1	Ø25/22	Ø20/22	Ø16/30	Ø16/30	Ø10/25
1'	Ø25/11	Ø20/11	Ø16/10	Ø16/15	Ø10/12.5
L1	380	330	305	200	145
2	Ø10/24	Ø10/30	Ø8/30	Ø8/30	Ø6/20
2'	Ø10/8	Ø10/12.5	Ø8/12.5	Ø8/20	--
L2	304	250	200	100	--
3	Ø12/15	Ø12/25	Ø10/25	Ø6/15	Ø6/30
4	Ø8/20	Ø8/25	Ø8/25	Ø8/20	Ø8/25
4'	Ø8/10	Ø8/12.5	Ø8/15	--	--
L4	290	275	180	--	--
5	--	--	--	--	--
L5	--	--	--	--	--

Distancias en centímetros

EH-91	CALIDAD	CONTROL	Coef.
ELEMENTOS PREFABRICADOS			
HORMIGON	H-300	INTENSO	1,40
ACERO	AEH-500-S	INTENSO	1,10
EJECUCION		INTENSO	1,50
OBRA IN SITU			
HORMIGON	H-250	NORMAL	1,50
ACERO	AEH-500	NORMAL	1,15
EJECUCION		NORMAL	1,60

25/05/00	0	MODIFICACIONES		Nº PLANO
FECHA	REV.			
PIEZA:		ALETA 1289x(890/100), E-1518.9.1		61.2
OFERTA:		99/643		
OBRA:		SUBTRAMO XV		
CLIENTE:		NECSO		
ALETA 1289x(890/100)		REVISADO	APROBADO	
		Opto. Comercial	Opto. Técnico	
 ALHOSA PREFABRICADOS DE HORMIGON				

ED1-0.6

<i>ALHOSA</i> PREFABRICADOS DE HORMIGÓN	ALETAS 1000 x (668/189) y 865x(668/254) ED1-0.6
Oferta: 99/643 Obra: SUBTRAMO XV Empresa: NECSO Fecha: Julio de 2.000	

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1. Generalidades

En la presente memoria se muestran los cálculos realizados para justificar las Aletas Prefabricadas de hormigón que sostienen el terraplén.

2. Descripción

El sostenimiento de las tierras que forman el terraplén en las entradas de las obras de fábrica se realiza con aletas prefabricadas de hormigón armado.

El espesor de los muros que forman las aletas es de 20 cm. hasta los 300 cm. de profundidad y luego aumenta progresivamente, tal y como se muestra en los planos adjuntos.

La cimentación se realiza con hormigón vertido in situ

3. Instrucciones aplicadas

Para el cálculo de las Aletas, se han utilizado las siguientes Instrucciones y Normas:

* Instrucción para el Proyecto y Ejecución de Obras de Hormigón en Masa o Armado EH-91.

4. Características de los materiales

* Hormigones:

Hormigón en elemento prefabricado	H-300
Hormigón en obra in situ	H-250

* Acero:

Acero para armar corrugado	B-500 S
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5. Control de calidad

El control de calidad se atenderá a lo especificado en la EH-91, habiéndose seleccionado los siguientes niveles:

Elementos prefabricados:

a) Materiales:

- Hormigón	Control Intenso
- Armadura pasiva	Control Intenso

b) Ejecución:

- En toda la obra	Control Intenso
-------------------	-----------------

Obra in situ:

a) Materiales:

- Hormigón	Control Normal
- Armadura pasiva	Control Normal

b) Ejecución:

- En toda la obra	Control Normal
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6. Coeficientes de seguridad

De acuerdo con los niveles de control de calidad definidos, se adoptan los siguientes coeficientes de seguridad:

Elementos prefabricados:

- Coeficientes de minoración de resistencias:

Acero pasivo $\gamma_s = 1,10$

Hormigón $\gamma_c = 1,40$

- Coeficientes de ponderación de acciones:

$\gamma_f = 1,50$

Obra in situ:

- Coeficientes de minoración de resistencias:

Acero pasivo $\gamma_s = 1,15$

Hormigón $\gamma_c = 1,50$

- Coeficientes de ponderación de acciones:

$\gamma_f = 1,60$

7. Parámetros del terreno

Pese a existir un relleno de calidad adecuadamente compactado (al que correspondería un ángulo de rozamiento interno de 35°), con un talud 2H:1V. En los cálculos se ha considerado, conservadoramente, un talud de terraplén 3H:2V con ángulo de rozamiento interno de 30°. La Aleta forma un ángulo de 60° con el pie del terraplén

Peso específico	2,0ton/m ³
Ángulo de rozamiento interno	30°
Ángulo Talud coronación	18,4°
Coeficiente de empuje activo	0,427

8. Acciones consideradas

8.1 Empuje por efecto de las tierras

Se considera el empuje activo de las tierras que se encuentran en el trasdós de la Aleta.

8.2 Sobrecargas de uso

Se considera una sobrecarga de 400 Kg/m² sobre el terraplén, que es la establecida para paseos de servicio.

8.3 Sobrecargas de tráfico

En la primera pieza de la aleta, dada su proximidad a la plataforma, se considera una sobrecarga de 3.500Kg/m² en todo su alzado.

En la segunda pieza de la aleta, dada su proximidad a la plataforma, se considera una sobrecarga de 3.500Kg/m² a partir de 4,00m de profundidad.

9. Hipótesis de cálculo.

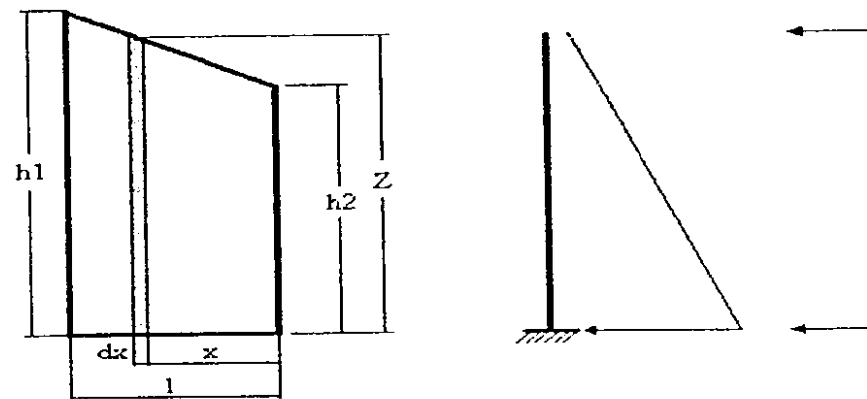
HIPÓTESIS I:

- Empuje de las tierras
 - Sobrecarga de uso
 - Sobrecarga de tráfico (En las dos primeras piezas)
- Combinación: 1,5 * [Caso (1) + Caso (2) + Caso (3)]

10. Cálculos.

Dada la geometría de la estructura en la que se reduce la altura en función de la longitud y los esfuerzos se comportan de igual manera, cada tramo de la aleta se ha armado para la altura existente a una distancia, del lado mayor, de 1/3 de su longitud, siendo en todo momento superiores las solicitaciones en este punto que la resultante sobre cada tramo.

Pza.	H.máx	H.mín	H.cál
1	668,0	564,5	634
2	564,5	461,3	530
3	461,3	357,6	427
4	357,6	254,1	323
5	254,1	189,0	232



$$M = \int_{x=0}^{x=l} dM = \int_{x=0}^{x=l} \left(\frac{1}{6} \cdot \lambda_h \cdot \gamma_t \cdot z^3 + \frac{1}{2} \cdot \lambda_h \cdot SC \cdot z^2 \right) \cdot dx =$$

$$= \frac{1}{6} \cdot \lambda_h \cdot \gamma_t \cdot \left(\frac{1}{4} \cdot \frac{h_1^4 - h_2^4}{h_1 - h_2} \right) \cdot l + \frac{1}{2} \cdot \lambda_h \cdot SC \cdot \left(\frac{1}{3} \cdot \frac{h_1^3 - h_2^3}{h_1 - h_2} \right) \cdot l \leq M \left(z = h_2 + \frac{2 \cdot (h_1 - h_2)}{3} \right)$$

$$V = \int_{x=0}^{x=l} dV = \int_{x=0}^{x=l} \left(\frac{1}{2} \cdot \lambda_h \cdot \gamma_t \cdot z^2 + \lambda_h \cdot SC \cdot z \right) \cdot dx =$$

$$= \frac{1}{2} \cdot \lambda_h \cdot \gamma_t \cdot \left(\frac{1}{3} \cdot \frac{h_1^3 - h_2^3}{h_1 - h_2} \right) \cdot l + \lambda_h \cdot SC \cdot \left(\frac{1}{2} \cdot \frac{h_1^2 - h_2^2}{h_1 - h_2} \right) \cdot l \leq V \left(z = h_2 + \frac{2 \cdot (h_1 - h_2)}{3} \right)$$

$$z = h_2 + \frac{h_1 - h_2}{l} \cdot x$$

DATOS GENERALES:

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1000x(668x189)

TERRENO:

Densidad terreno: 0,0020 Kg/cm³
 Densidad Agua: 0,0010 Kg/cm³
 Indice Huecos: 30,0 %
 Densidad Aparente: 0,0013 Kg/cm³
 Angulo Roz.Int: 30,0 °
 Angulo Roz. Tmo/Mro: 0,0 °
 Angulo de Talud: 0,0 °
 Coef. Empuje Activo Hztal: 0,333
 Coef. Empuje Activo Vtal: 0,000

MURO:

Altura máxima: 668 cm Quiebro: 300 cm
 Resguardo Tierras: 0 cm Canto C.: 20 cm
 Longitud Muro: 100 cm Canto Z.: 41,8 cm
 Peso del Muro: 4.343 Kg/ml Xcdg (m): 14,0 cm

ACCIONES:

Prof. Nivel Freático: 1200 cm
 Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,3500 Kg/cm²
 Prof. Aplic. (S.C.p.): 0 cm

MATERIALES ALZADO:

Fc,k	300 Kg/cm ²	Gc	(1,40)
Fy,k	5100 Kg/cm ²	Gs	(1,10)
Fc,d	214,3 Kg/cm ²	Gf	(1,50)
Fy,d	4.636,4 Kg/cm ²	Recubrimiento:	4,0 cm.
Fyv,d	4.200,0 Kg/cm ²		

ESFUERZOS:

	H_Calc cm	Canto cm	Md Kg x cm	As1 cm ²	As2 cm ²	Vd Kg	Vcu Kg	Ast cm ² /ml
1	634	41,8	8.150.575	55,24	0,00	32.420	27.667	3,33

ESFUERZOS

Aleta

Aleta 1000x(668x189)

Tierras: 2.000 Kg/m3 SC_c: 400 Kg/m2 Gc: 1,40
Talud: 0,00° SC_p: 3.500 Kg/m2 Gs: 1,10
C.E.h: 0,333 Z_SCp: 0 cm Gf: 1,50

Z (cm)	Eh (Kg)				Vd (Kg)	M (Kg)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
0	0	0	0	0	0	0	0	0	0	0
20	13	0	27	233	410	89	0	267	2.333	4.033
40	53	0	53	467	860	711	0	1.067	9.333	16.667
60	120	0	80	700	1.350	2.400	0	2.400	21.000	38.700
80	213	0	107	933	1.880	5.689	0	4.267	37.333	70.933
100	333	0	133	1.167	2.450	11.111	0	6.667	58.333	114.167
120	480	0	160	1.400	3.060	19.200	0	9.600	84.000	169.200
140	653	0	187	1.633	3.710	30.489	0	13.067	114.333	236.833
160	853	0	213	1.867	4.400	45.511	0	17.067	149.333	317.867
180	1.080	0	240	2.100	5.130	64.800	0	21.600	189.000	413.100
200	1.333	0	267	2.333	5.900	88.889	0	26.667	233.333	523.333
220	1.613	0	293	2.567	6.710	118.311	0	32.267	282.333	649.367
240	1.920	0	320	2.800	7.560	153.600	0	38.400	336.000	792.000
260	2.253	0	347	3.033	8.450	195.289	0	45.067	394.333	952.033
280	2.613	0	373	3.267	9.380	243.911	0	52.267	457.333	1.130.267
300	3.000	0	400	3.500	10.350	300.000	0	60.000	525.000	1.327.500
320	3.413	0	427	3.733	11.360	364.089	0	68.267	597.333	1.544.533
340	3.853	0	453	3.967	12.410	436.711	0	77.067	674.333	1.782.167
360	4.320	0	480	4.200	13.500	518.400	0	86.400	756.000	2.041.200
380	4.813	0	507	4.433	14.630	609.689	0	96.267	842.333	2.322.433
400	5.333	0	533	4.667	15.800	711.111	0	106.667	933.333	2.626.667
420	5.880	0	560	4.900	17.010	823.200	0	117.600	1.029.000	2.954.700
440	6.453	0	587	5.133	18.260	946.489	0	129.067	1.129.333	3.307.333
460	7.053	0	613	5.367	19.550	1.081.511	0	141.067	1.234.333	3.685.367
480	7.680	0	640	5.600	20.880	1.228.800	0	153.600	1.344.000	4.089.600
500	8.333	0	667	5.833	22.250	1.388.889	0	166.667	1.458.333	4.520.833
520	9.013	0	693	6.067	23.660	1.562.311	0	180.267	1.577.333	4.979.867
540	9.720	0	720	6.300	25.110	1.749.600	0	194.400	1.701.000	5.467.500
560	10.453	0	747	6.533	26.600	1.951.289	0	209.067	1.829.333	5.984.533
580	11.213	0	773	6.767	28.130	2.167.911	0	224.267	1.962.333	6.531.767
600	12.000	0	800	7.000	29.700	2.400.000	0	240.000	2.100.000	7.110.000
620	12.813	0	827	7.233	31.310	2.648.089	0	256.267	2.242.333	7.720.033
640	13.653	0	853	7.467	32.960	2.912.711	0	273.067	2.389.333	8.362.667
660	14.520	0	880	7.700	34.650	3.194.400	0	290.400	2.541.000	9.038.700

DATOS GENERALES:

Obra: SUBTRAMO XV
Cliente: NECSO
Nº Oferta: 99/643
Pieza: Aleta 1000x(668x189)

TERRENO:

Densidad terreno: 0,0020 Kg/cm3
Densidad Agua: 0,0010 Kg/cm3
Indice Huecos: 30,0 %
Densidad Aparente: 0,0013 Kg/cm3
Angulo Roz.Int: 30,0 °
Angulo Roz. Trno/Mro: 0,0 °
Angulo de Talud: 18,4 °
Coef. Empuje Activo Hztal: 0,427
Coef. Empuje Activo Vtcal: 0,000

MURO:

Altura máxima: 668 cm Quiebro 300 cm
Resguardo Tierras: 0 cm Canto C. 20 cm
Longitud Muro: 100 cm Canto Z. 41,8 cm
Peso del Muro 4.343 Kg/ml Xcdg (m) 14,0 cm

ACCIONES:

Prof. Nivel Freatico 1200 cm
Sobrecarga (coron.): 0,0400 Kg/cm2
Sobrecarga (prof.): 0,3500 Kg/cm2
Prof. Aplic. (S.C.p.) 400 cm

MATERIALES ALZADO:

Fc,k 300 Kg/cm2 Gc (1,40)
Fy,k 5100 Kg/cm2 Gs (1,10)
Fc,d 214,3 Kg/cm2 Gf (1,50)
Fy,d 4.636,4 Kg/cm2 Recubrimiento: 4,0 cm.
Fyv,d 4.200,0 Kg/cm2

ESFUERZOS:

H_Calc cm	Canto cm	Md Kg x cm	As1 cm2	As2 cm2	Vd Kg	Vcu Kg	Ast cm2/ml	
2	530	35,7	3.727.723	28,08	0,00	22.261	23.181	0,00

ESFUERZOS

Aleta

Aleta 1000x(668x189)

Tierras: 2.000 Kg/m3 SC_c: 400 Kg/m2 Gc: 1,40
Talud: 18,40° SC_p: 3.500 Kg/m2 Gs: 1,10
C.E.h: 0,427 Z_SCp: 400 cm Gf: 1,50

Z (cm)	Eh (Kg)			Vd (Kg)	M (Kg)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
0	0	0	0	0	0	0	0	0	0
20	17	0	34	77	114	0	341	0	683
40	68	0	68	205	911	0	1.366	0	3.415
60	154	0	102	384	3.073	0	3.073	0	9.220
80	273	0	137	615	7.285	0	5.464	0	19.124
100	427	0	171	896	14.229	0	8.537	0	34.150
120	615	0	205	1.229	24.588	0	12.294	0	55.322
140	837	0	239	1.614	39.044	0	16.733	0	83.667
160	1.093	0	273	2.049	58.282	0	21.856	0	120.207
180	1.383	0	307	2.536	82.984	0	27.661	0	165.967
200	1.707	0	341	3.073	113.832	0	34.150	0	221.973
220	2.066	0	376	3.663	151.511	0	41.321	0	289.247
240	2.459	0	410	4.303	196.702	0	49.175	0	368.816
260	2.886	0	444	4.994	250.089	0	57.713	0	461.703
280	3.347	0	478	5.737	312.355	0	66.933	0	568.933
300	3.842	0	512	6.531	384.183	0	76.837	0	691.530
320	4.371	0	546	7.376	466.256	0	87.423	0	830.519
340	4.935	0	581	8.273	559.257	0	98.692	0	986.925
360	5.532	0	615	9.220	663.869	0	110.645	0	1.161.771
380	6.164	0	649	10.219	780.775	0	123.280	0	1.356.082
400	6.830	0	683	11.269	910.657	0	136.599	0	1.570.884
420	7.530	0	717	12.819	1.054.199	0	150.600	2.988	1.811.681
440	8.264	0	751	14.420	1.212.085	0	165.284	11.952	2.083.982
460	9.033	0	785	16.072	1.384.996	0	180.652	26.893	2.388.810
480	9.835	0	820	17.775	1.573.616	0	196.702	47.809	2.727.190
500	10.672	0	854	19.529	1.778.627	0	213.435	74.702	3.100.147
520	11.543	0	888	21.335	2.000.714	0	230.852	107.571	3.508.705
540	12.448	0	922	23.192	2.240.558	0	248.951	146.417	3.953.888
560	13.387	0	956	25.100	2.498.843	0	267.733	191.238	4.436.722

DATOS GENERALES:

Obra: SUBTRAMO XV
Cliente: NECSO
Nº Oferta: 99/643
Pieza: Aleta 1000x(668x189)

TERRENO:

Densidad terreno: 0,0020 Kg/cm3
Densidad Agua: 0,0010 Kg/cm3
Indice Huecos: 30,0 %
Densidad Aparente: 0,0013 Kg/cm3
Angulo Roz. Int: 30,0 °
Angulo Roz. Trno/Mro: 0,0 °
Angulo de Talud: 18,4 °
Coef. Empuje Activo Hztal: 0,427
Coef. Empuje Activo Vtcal: 0,000

MURO:

Altura máxima: 668 cm Quiebro 300 cm
Resguardo Tierras: 0 cm Canto C. 20 cm
Longitud Muro: 100 cm Canto Z. 41,8 cm
Peso del Muro 4.343 Kg/ml Xcdg (m) 14,0 cm

ACCIONES:

Prof. Nivel Freatico 1200 cm
Sobrecarga (coron.): 0,0400 Kg/cm2
Sobrecarga (prof.): 0,0000 Kg/cm2
Prof. Aplic. (S.C.p) 0 cm

MATERIALES ALZADO:

Fc,k 300 Kg/cm2 Gc (1,40)
Fy,k 5100 Kg/cm2 Gs (1,10)
Fc,d 214,3 Kg/cm2 Gf (1,50)
Fy,d 4.636,4 Kg/cm2 Recubrimiento: 4,0 cm
Fyv,d 4.200,0 Kg/cm2

ESFUERZOS:

	H_Calc cm	Canto cm	Md Kg x cm	As1 cm2	As2 cm2	Vd Kg	Vcu Kg	Ast cm2/ml
3	427	29,5	1.889.875	17,21	0,00	12.744	18.695	0,00
4	323	23,4	853.746	10,05	0,00	7.513	14.209	0,00
5	232	20,0	337.186	4,69	0,00	4.054	11.711	0,00

Aleta 1000x(668x189)

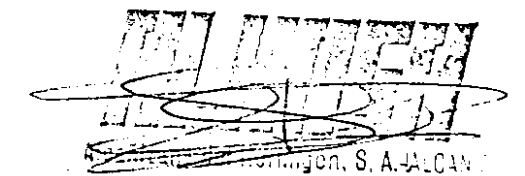
Tierras: 2.000 Kg/m³ SC_c: 400 Kg/m² Gc: 1,40
 Talud: 18,40° SC_p: 0 Kg/m² Gs: 1,10
 C.E.h: 0,427 Z SCp: 0 cm Gf: 1,50

Z (cm)	Eh (Kg)				Vd (Kg)	M (Kg)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
0	0	0	0	0	0	0	0	0	0	0
20	17	0	34	0	77	114	0	341	0	683
40	68	0	68	0	205	911	0	1.366	0	3.415
60	154	0	102	0	384	3.073	0	3.073	0	9.220
80	273	0	137	0	615	7.285	0	5.464	0	19.124
100	427	0	171	0	896	14.229	0	8.537	0	34.150
120	615	0	205	0	1.229	24.588	0	12.294	0	55.322
140	837	0	239	0	1.614	39.044	0	16.733	0	83.667
160	1.093	0	273	0	2.049	58.282	0	21.856	0	120.207
180	1.383	0	307	0	2.536	82.984	0	27.661	0	165.967
200	1.707	0	341	0	3.073	113.832	0	34.150	0	221.973
220	2.066	0	376	0	3.663	151.511	0	41.321	0	289.247
240	2.459	0	410	0	4.303	196.702	0	49.175	0	368.816
260	2.886	0	444	0	4.994	250.089	0	57.713	0	461.703
280	3.347	0	478	0	5.737	312.355	0	66.933	0	568.933
300	3.842	0	512	0	6.531	384.183	0	76.837	0	691.530
320	4.371	0	546	0	7.376	466.256	0	87.423	0	830.519
340	4.935	0	581	0	8.273	559.257	0	98.692	0	986.925
360	5.532	0	615	0	9.220	663.869	0	110.645	0	1.161.771
380	6.164	0	649	0	10.219	780.775	0	123.280	0	1.356.082
400	6.830	0	683	0	11.269	910.657	0	136.599	0	1.570.884
420	7.530	0	717	0	12.371	1.054.199	0	150.600	0	1.807.199
440	8.264	0	751	0	13.523	1.212.085	0	165.284	0	2.066.053
460	9.033	0	785	0	14.727	1.384.996	0	180.652	0	2.348.471

11. CIMENTACIONES

En las páginas siguientes se muestran los cálculos de la cimentación de la aleta.

En Alcañiz, Junio de 2.000



Javier Tello Sánchez
Dpto. Técnico ALHOSA

- El presente informe se ha realizado con los datos aportados por el cliente para esta pieza prefabricada concreta.
 Salvo comunicación escrita de lo contrario, las consideraciones en él realizadas, así como los resultados aportados, se ajustan a lo solicitado por el cliente.

DATOS GENERALES:

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1000x(668/189)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 0,0 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 1
 Altura del Muro: 633,5 cm Quiebro 265,5 cm
 Altura tierras: 633,5 cm Canto.C 20,0 cm
 Canto.Z 41,8 cm
 Longitud Muro: 100,0 cm Xcdg (m) 14,2 cm
 Peso del Muro: 4.170 Kg/ml Xcdg (t) 171,3 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,3500 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigon: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 154 cm
 Vuelo del Talón: 358 cm
 Canto de la Zapata: 90 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (H_ztal): 0,333
 Base de la Zapata: 553,8 cm

	Fh	Fv	e _x	Mv	Mr
F (coron.)			-113	0	0
Muro:		-4170	-109		-727394
Tierras:	-17449	-47380	90	4208184	-17746708
Sobrecarga (coron.):	-965	-1521	87	348980	-569751
Sobrecarga (prof.):	-8441	-13310	87	3053573	-4985319
Zapata:		-12461	0		-3450312
	-26855	-78842		7610736	-27479485

C_{sd} = 1,69 C_{sv} = 3,61 e = -46,7 cm.

Aleta 1000x(668/189) Pza. 1

TENSION DEL TERRENO: 1,78 < 2,00 (Servicio)
 2,17 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
 SP= 2,14 (Kg/cm²) ST= 0,70 (Kg/cm²) Le= 553,8 (cm)

CIMENTACIÓN:

F_{cd} = 166,7 Kg/cm² Mayoración Cargas: 1,60
 F_{yd} = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S₁= 343,06 SP_f= 276,54 ST_f= 264,36 S₂= 112,51
 q_vP= -36,00 q_vT= -309,87

Puntera: VP_f= 159,8 MP= 3.636,963 U_s= 44.115 9,95
 Talón: VT_f= 364,8 (cm) MT= -9.761.699 (Kgxcn) U_s= 122.518 27,63
 (cm) (Kg) (cm²)
 A_{s,min}= 13,50 cm²
 1,5 ‰

Cortante:

S₁= 343,06 SP_c= 296,63 ST_c= 226,78 S₂= 112,51
 q_vP= -36,00 q_vT= -309,87

Puntera: VP_c= 111,5 VP= 31.654 V_{cu}= 54.222 0,00
 Talón: VT_c= 274,5 (cm) VT= -38.490 (Kg) (cm²/ml)

Armado Superior (Talón):

Perpendicular Muro: Ø20 /10cm
 Paralelo Muro: Ø16 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø16 /15cm
 Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

Armado a cortante: No necesario.

DATOS GENERALES:

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1000x(668/189)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 18,4 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 3
 Altura del Muro: 405,0 cm Quiebro 265,5 cm
 Altura tierras: 405,0 cm Canto.C 20,0 cm
 Canto.Z 28,3 cm
 Longitud Muro: 100,0 cm Xcdg (m) 10,8 cm
 Peso del Muro: 2.169 Kg/ml Xcdg (t) 142,7 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigon: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 111 cm
 Vuelo del Talon: 282 cm
 Canto de la Zapata: 60 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (Hztal): 0,427
 Base de la Zapata: 421,0 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-90	0	0
Muro:		-2169	-89		-270558
Tierras:	-9231	-26217	71	1430919	-7338948
Sobrecarga (coron.):	-794	-1162	65	184623	-325200
Sobrecarga (prof.):	0	0	65	0	0
Zapata:		-6315	0		-1329401
	-10025	-35863		1615542	-9264108

Csd = 2,06

Csv = 5,73

e = 3,6

cm.

Aleta 1000x(668/189) Pza. 3

TENSION DEL TERRENO:

0,83 < 2,00 (Servicio)
 0,97 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal

SP= 0,81 ST= 0,90 Le= 421,0
 (Kg/cm²) (Kg/cm²) (cm)

CIMENTACIÓN:

Fcd = 166,7 Kg/cm² Mayoración Cargas: 1,60
 Fyd = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S1= 129,21 SPf= 133,07 STf= 133,74 S2= 143,38
 qvP= -24,00 qvT= -179,06

Puntera: VPf= 114,8 MP= 702.105 Us= 13.114 2,96
 Talón: VTf= 286,4 MT= -1.595.348 Us= 30.137 6,80
 (cm) (Kgxcn) (Kg) (cm²)
 As,min= 9,00 cm²
 1,5 ‰

Cortante:

S1= 129,21 SPc= 132,02 STc= 135,70 S2= 143,38
 qvP= -24,00 qvT= -179,06

Puntera: VPc= 83,6 VP= 8.912 Vcu= 34.857 0,00
 Talón: VTc= 228,2 VT= -9.018 (Kg) (cm²/ml)
 (cm) (Kg)

Armado Superior (Talón):

Perpendicular Muro: Ø16 /20cm
 Paralelo Muro: Ø12 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø12 /25cm
 Paralelo Muro: Ø12 /25cm

Armado a cortante: No necesario.

Armado a cortante: No necesario.

DATOS GENERALES:

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1000x(668/189)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 18,4 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 5
 Altura del Muro: 210,9 cm Quiebro 278,3 cm
 Altura tierras: 210,9 cm Canto.C 20,0 cm
 Canto.Z 20,0 cm
 Longitud Muro: 100,0 cm Xcdg (m) 10,0 cm
 Peso del Muro: 1.054 Kg/ml Xcdg (t) 114,0 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigón: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 74 cm
 Vuelo del Talón: 217 cm
 Canto de la Zapata: 60 cm

COMPROBACION DE ESTABILIDAD:

Coefficiente Empuje Activo (H_ztal): 0,427
 Base de la Zapata: 311,4 cm

	Fh	Fv	e _x	Mv	Mr
F (coron.)			-72	0	0
Muro:		-1054	-72		-88683
Tierras:	-3132	-10736	52	282799	-2176817
Sobrecarga (coron.):	-463	-869	47	62641	-176247
Sobrecarga (prof.):	0	0	47	0	0
Zapata:		-4671	0		-727353
	-3595	-17331		345441	-3169100

C_{sd} = 2,78 C_{sv} = 9,17 e = 10,5 cm.

Aleta 1000x(668/189) Pza. 5

TENSION DEL TERRENO: 0,50 < 2,00 (Servicio)
 0,55 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
 SP= 0,44 ST= 0,67 Le= 311,4
 (Kg/cm²) (Kg/cm²) (cm)

CIMENTACIÓN:

F_{cd} = 166,7 Kg/cm² Mayoración Cargas: 1,60
 F_{yd} = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:

Flexión:
 S₁= 71,02 SP_f= 79,95 ST_f= 81,57 S₂= 107,06
 qvP= -24,00 qvT= -109,45

Puntera: VP_f= 77,1 MP= 148.638 U_s= 2.758 0,62
 Talón: VT_f= 220,3 MT= -264.116 U_s= 4.907 1,11
 (cm) (Kgxcn) (Kg) (cm²)
 As,min= 9,00 cm²
 1,5 ‰

Cortante:
 S₁= 71,02 SP_c= 76,47 ST_c= 88,16 S₂= 107,06
 qvP= -24,00 qvT= -109,45

Puntera: VP_c= 47,1 VP= 2.344 V_{cu}= 34.857 0,00
 Talón: VT_c= 163,3 VT= -1.933 (Kg) (cm²/ml)
 (cm) (Kg)

Armado Superior (Talón):

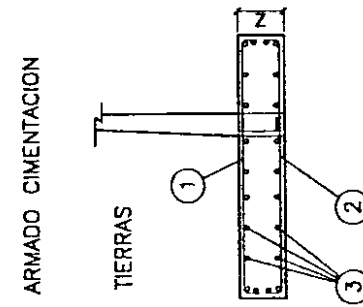
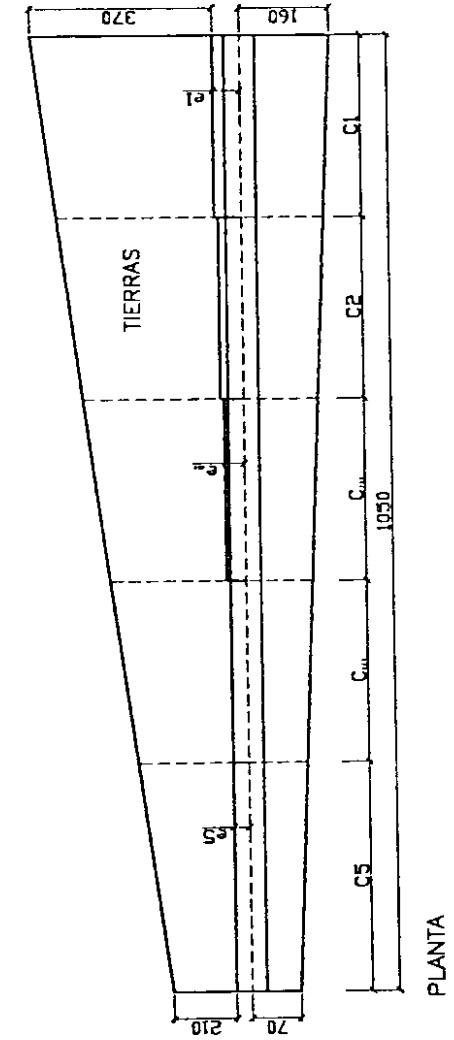
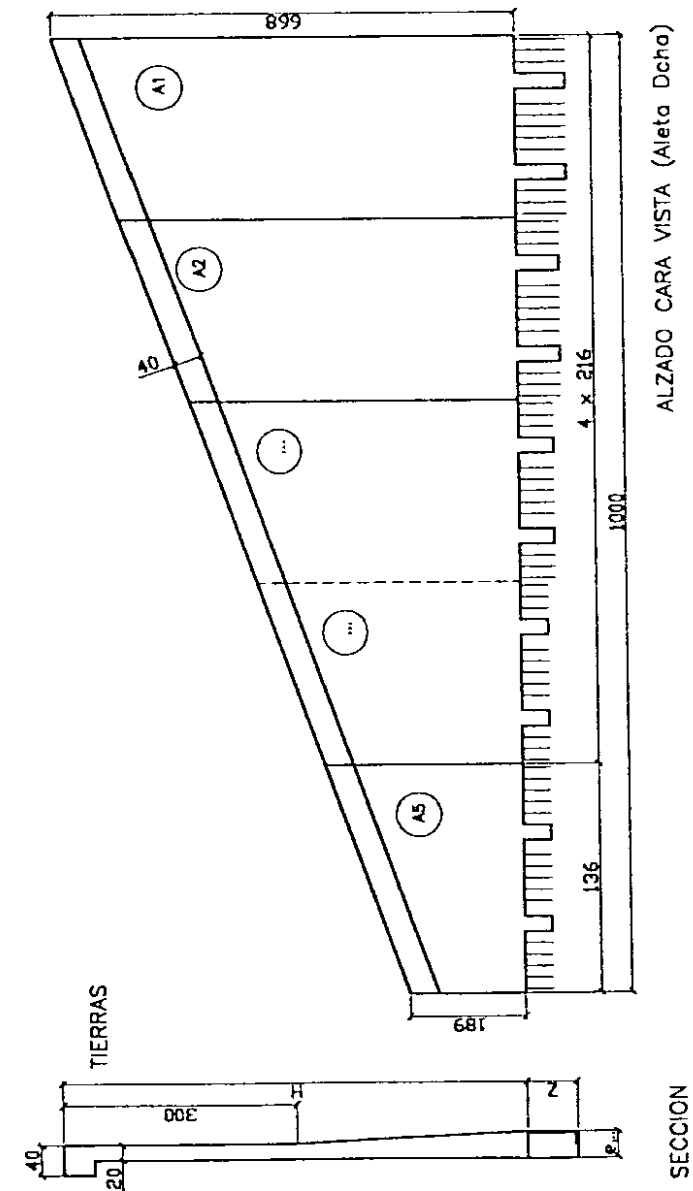
Perpendicular Muro: Ø12 /20cm
 Paralelo Muro: Ø12 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø12 /25cm
 Paralelo Muro: Ø12 /25cm

Armado a cortante: No necesario.

12. PLANOS

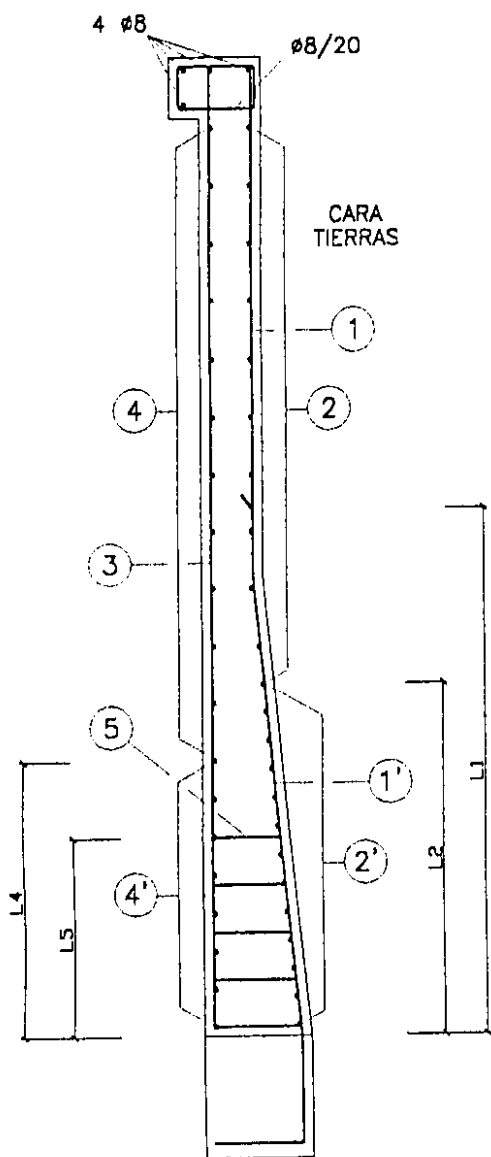


	ARMADO CIMENTACION		
TIPO	1	2	3
C1	Ø20/10cm	Ø18/15cm	Ø16/25cm
C2	Ø20/13cm	Ø16/25cm	Ø16/25cm
C3	Ø18/20cm	Ø12/25cm	Ø12/25cm
C4	Ø12/20cm	Ø12/25cm	Ø12/25cm
C5	Ø12/20cm	Ø12/25cm	Ø12/25cm

PIEZA	H	$\sigma_{H\%}$	Z
A1	668.0	41.8	90
A2	564.4	35.7	90
A3	439.5	28.3	60
A4	336.1	22.1	60
A5	232.6	20.0	60

En-91	CALIDAD	CONTROL	Coef.
ELEMENTOS PREFABRICADOS			
HORMIGÓN	H-300	INTENSO	1,40
ACERO	ACh-500-S	INTENSO	1,10
EJECUCIÓN		INTENSO	1,30
OBRA IN SITU			
HORMIGÓN	H-250	NORMAL	1,30
ACERO	ACh-500	NORMAL	1,15
EJECUCIÓN		NORMAL	1,30

[illegible]



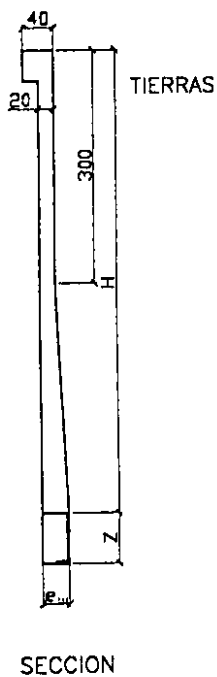
DEFINICIÓN DE ARMADO

	A1	A2	A3	A4	A5
1	Ø25/24	Ø20/22	Ø16/30	Ø12/30	Ø10/30
1'	Ø25/8	Ø20/11	Ø16/10	Ø12/10	Ø10/15
L1	525	305	280	225	150
2	Ø12/24	Ø10/30	Ø8/30	Ø8/25	Ø6/20
2'	Ø12/8	Ø10/12.5	Ø8/12.5	--	--
L2	344	225	175	--	--
3	Ø12/15	Ø10/20	Ø10/25	Ø6/15	Ø6/25
4	Ø8/25	Ø8/25	Ø8/25	Ø8/20	Ø8/25
4'	Ø8/12.5	Ø8/12.5	Ø8/15	--	--
L4	375	250	150	--	--
5	10Ø8/25	10Ø8/25	--	--	--
L5	175	100	--	--	--

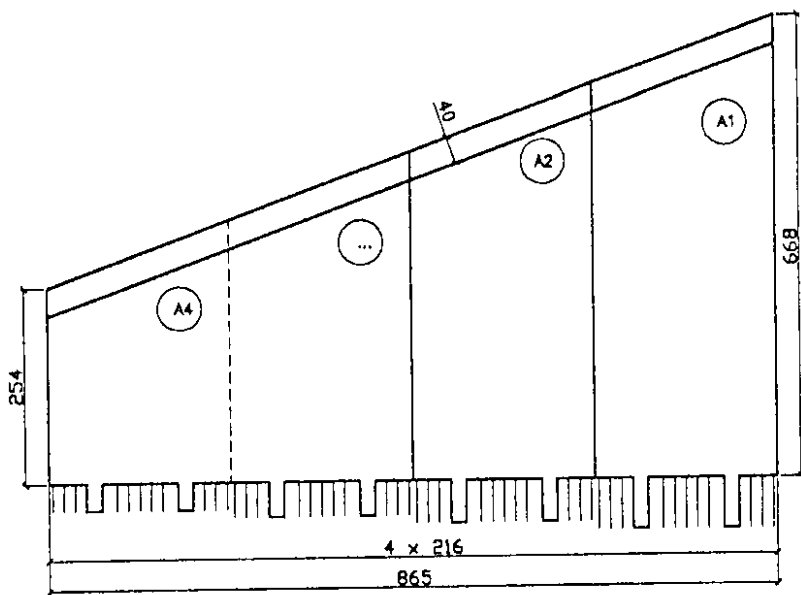
Distancias en centímetros

EH-91	CALIDAD	CONTROL	Coef.
ELEMENTOS PREFABRICADOS			
HORMIGON	H-300	INTENSO	1,40
ACERO	AEH-500-S	INTENSO	1,10
EJECUCION		INTENSO	1,50
OBRA IN SITU			
HORMIGON	H-250	NORMAL	1,50
ACERO	AEH-500	NORMAL	1,15
EJECUCION		NORMAL	1,60

08/07/00	0		
FECHA	REV.	MODIFICACIONES	Nº PLANO
			66.2
PIEZA:	ALETA 1000x(668/189). ED1-0.6		
OFERTA:	99/643		
OBRA:	ZARAGOZA		
CLIENTE:	NECSO		
ALETA 1000x(668/189)		REVISADO:	APROBADO:
		Dpto. Comercial	Dpto. Técnico
PREFABRICADOS DE HORMIGON			

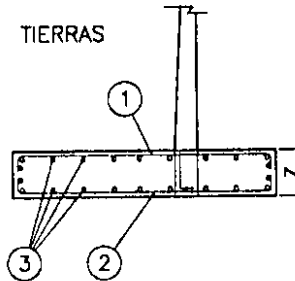


SECCION



ALZADO CARA VISTA (Aleta Dcha)

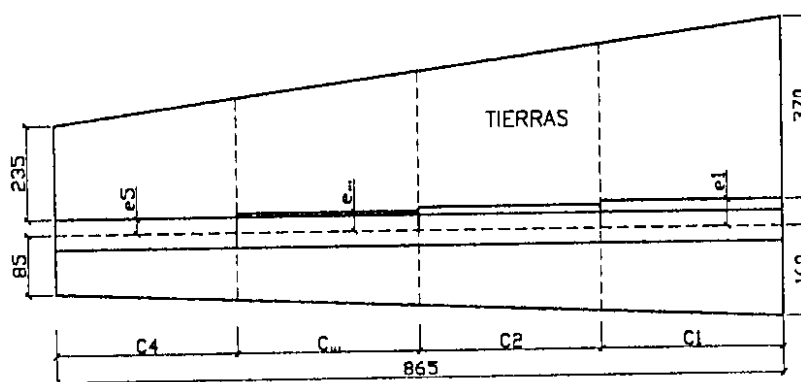
ARMADO CIMENTACION



	1	2	3
C1	Ø20/10cm	Ø18/15cm	Ø16/25cm
C2	Ø20/15cm	Ø16/25cm	Ø16/25cm
C3	Ø18/20cm	Ø12/25cm	Ø12/25cm
C4	Ø12/20cm	Ø12/25cm	Ø12/25cm

PIEZA	H	e...	Z
A1	668,0	41,8	90
A2	564,4	35,7	90
A3	439,5	28,3	60
A4	336,1	22,1	60

EH-91	CALIDAD	CONTROL	Coef.
ELEMENTOS PREFABRICADOS			
HORMIGON	H-300	INTENSO	1,40
ACERO	AEH-500-S	INTENSO	1,10
EJECUCION		INTENSO	1,50
OBRA IN SITU			
HORMIGON	H-250	NORMAL	1,50
ACERO	AEH-500	NORMAL	1,15
EJECUCION		NORMAL	1,60



PLANTA

08/07/00	0		
FECHA	REV.	MODIFICACIONES	Nº PLANO
			67.1
PIEZA:	ALETA 865x(668/254). ED1-0.6		
OFERTA:	99/643		
OBRA:	SUBTRAMO XV		
CLIENTE:	NECSO		
ALETA 865(668/254)		REVISADO:	APROBADO:
		Dpto. Comercial	Dpto. Técnico
PREFABRICADOS DE HORMIGON			

* COTAS EN CM.

<i>ALHOSA</i> PREFABRICADOS DE HORMIGÓN	ALETAS 1050 x (668/165) y 950x(668/213) ED1-0.6
Oferta: 99/643 Obra: SUBTRAMO XV Empresa: NECSO Fecha: Julio de 2.000	

ÍNDICE

- 1.- Generalidades
- 2.- Descripción
- 3.- Instrucciones aplicadas
- 4.- Características de los materiales
- 5.- Control de calidad
- 6.- Coeficientes de seguridad
- 7.- Parámetros del terreno
- 8.- Acciones consideradas
- 9.- Hipótesis de cálculo
- 10.- Cálculos
- 11.- Cimentación
- 12.- Planos

1. Generalidades

En la presente memoria se muestran los cálculos realizados para justificar las Aletas Prefabricadas de hormigón que sostienen el terraplén.

2. Descripción

El sostenimiento de las tierras que forman el terraplén en las entradas de las obras de fábrica se realiza con aletas prefabricadas de hormigón armado.

El espesor de los muros que forman las aletas es de 20 cm. hasta los 300 cm. de profundidad y luego aumenta progresivamente, tal y como se muestra en los planos adjuntos.

La cimentación se realiza con hormigón vertido in situ

3. Instrucciones aplicadas

Para el cálculo de las Aletas, se han utilizado las siguientes Instrucciones y Normas:

* Instrucción para el Proyecto y Ejecución de Obras de Hormigón en Masa o Armado EH-91.

4. Características de los materiales

* Hormigones:

Hormigón en elemento prefabricado	H-300
Hormigón en obra in situ	H-250

* Acero:

Acero para armar corrugado	B-500 S
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5. Control de calidad

El control de calidad se atenderá a lo especificado en la EH-91, habiéndose seleccionado los siguientes niveles:

Elementos prefabricados:

a) Materiales:

- Hormigón	Control Intenso
- Armadura pasiva	Control Intenso

b) Ejecución:

- En toda la obra	Control Intenso
-------------------	-----------------

Obra in situ:

a) Materiales:

- Hormigón	Control Normal
- Armadura pasiva	Control Normal

b) Ejecución:

- En toda la obra	Control Normal
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6. Coeficientes de seguridad

De acuerdo con los niveles de control de calidad definidos, se adoptan los siguientes coeficientes de seguridad:

Elementos prefabricados:

- Coeficientes de minoración de resistencias:

Acero pasivo $\gamma_s = 1,10$

Hormigón $\gamma_c = 1,40$

- Coeficientes de ponderación de acciones:

$\gamma_f = 1,50$

Obra in situ:

- Coeficientes de minoración de resistencias:

Acero pasivo $\gamma_s = 1,15$

Hormigón $\gamma_c = 1,50$

- Coeficientes de ponderación de acciones:

$\gamma_f = 1,60$

7. Parámetros del terreno

Pese a existir un relleno de calidad adecuadamente compactado (al que correspondería un ángulo de rozamiento interno de 35°), con un talud 2H:1V. En los cálculos se ha considerado, conservadoramente, un talud de terraplén 3H:2V con ángulo de rozamiento interno de 30°. La Aleta forma un ángulo de 60° con el pie del terraplén

Peso específico	2,0ton/m ³
Ángulo de rozamiento interno	30°
Ángulo Talud coronación	18,4°
Coeficiente de empuje activo	0,427

8. Acciones consideradas

8.1 Empuje por efecto de las tierras

Se considera el empuje activo de las tierras que se encuentran en el trasdós de la Aleta.

8.2 Sobrecargas de uso

Se considera una sobrecarga de 400 Kg/m² sobre el terraplén, que es la establecida para paseos de servicio.

8.3 Sobrecargas de tráfico

En la primera pieza de la aleta, dada su proximidad a la plataforma, se considera una sobrecarga de 3.500Kg/m² en todo su alzado.

En la segunda pieza de la aleta, dada su proximidad a la plataforma, se considera una sobrecarga de 3.500Kg/m² a partir de 4,00m de profundidad.

9. Hipótesis de cálculo.

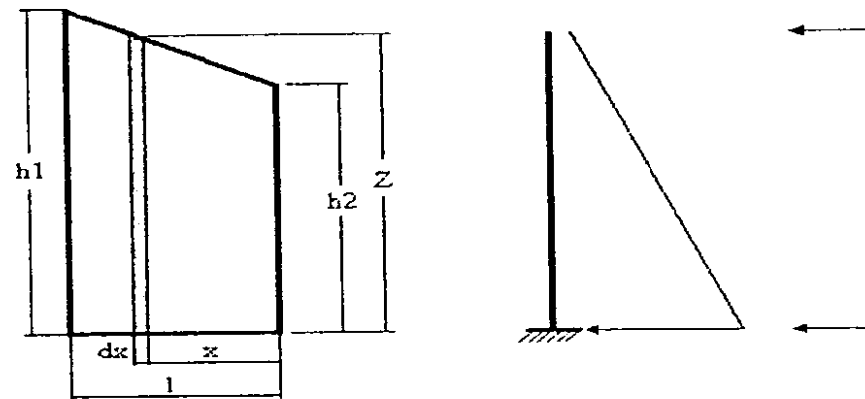
HIPÓTESIS I:

- Empuje de las tierras
 - Sobrecarga de uso
 - Sobrecarga de tráfico (En las dos primeras piezas)
- Combinación: $1,5 * [\text{Caso (1)} + \text{Caso (2)} + \text{Caso (3)}]$

10. Cálculos.

Dada la geometría de la estructura en la que se reduce la altura en función de la longitud y los esfuerzos se comportan de igual manera, cada tramo de la aleta se ha armado para la altura existente a una distancia, del lado mayor, de 1/3 de su longitud, siendo en todo momento superiores las solicitaciones en este punto que la resultante sobre cada tramo.

Pza.	H.máx	H.mín	H.cál
1	668,0	554,2	630
2	554,2	440,5	516
3	440,5	326,7	403
4	326,7	212,9	213
5	212,9	165,0	197



$$M = \int_{x=0}^{x=l} dM = \int_{x=0}^{x=l} \left(\frac{1}{6} \cdot \lambda_h \cdot \gamma_t \cdot z^3 + \frac{1}{2} \cdot \lambda_h \cdot SC \cdot z^2 \right) \cdot dx =$$

$$= \frac{1}{6} \cdot \lambda_h \cdot \gamma_t \cdot \left(\frac{1}{4} \cdot \frac{h_1^4 - h_2^4}{h_1 - h_2} \right) \cdot l + \frac{1}{2} \cdot \lambda_h \cdot SC \cdot \left(\frac{1}{3} \cdot \frac{h_1^3 - h_2^3}{h_1 - h_2} \right) \cdot l \leq M \left(z = h_2 + \frac{2 \cdot (h_1 - h_2)}{3} \right)$$

$$V = \int_{x=0}^{x=l} dV = \int_{x=0}^{x=l} \left(\frac{1}{2} \cdot \lambda_h \cdot \gamma_t \cdot z^2 + \lambda_h \cdot SC \cdot z \right) \cdot dx =$$

$$= \frac{1}{2} \cdot \lambda_h \cdot \gamma_t \cdot \left(\frac{1}{3} \cdot \frac{h_1^3 - h_2^3}{h_1 - h_2} \right) \cdot l + \lambda_h \cdot SC \cdot \left(\frac{1}{2} \cdot \frac{h_1^2 - h_2^2}{h_1 - h_2} \right) \cdot l \leq V \left(z = h_2 + \frac{2 \cdot (h_1 - h_2)}{3} \right)$$

$$z = h_2 + \frac{h_1 - h_2}{l} \cdot x$$

DATOS GENERALES:

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1050x(668x165)

TERRENO:

Densidad terreno: 0,0020 Kg/cm³
 Densidad Agua: 0,0010 Kg/cm³
 Índice Huecos: 30,0 %
 Densidad Aparente: 0,0013 Kg/cm³
 Angulo Roz.Int: 30,0 °
 Angulo Roz. Trmo/Mro: 0,0 °
 Angulo de Talud: 0,0 °
 Coef. Empuje Activo Hztal: 0,333
 Coef. Empuje Activo Vtcal: 0,000

MURO:

Altura máxima: 668 cm Quiebro: 300 cm
 Resguardo Tierras: 0 cm Canto C: 20 cm
 Longitud Muro: 100 cm Canto Z: 41,8 cm
 Peso del Muro: 4.343 Kg/ml Xcdg (m): 14,0 cm

ACCIONES:

Prof. Nivel Freático: 1200 cm
 Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,3500 Kg/cm²
 Prof. Aplic. (S.C.p.): 0 cm

MATERIALES ALZADO:

Fc,k	300 Kg/cm ²	Gc	(1,40)
Fy,k	5100 Kg/cm ²	Gs	(1,10)
Fc,d	214,3 Kg/cm ²	Gf	(1,50)
Fy,d	4.636,4 Kg/cm ²	Recubrimiento:	4,0 cm.
Fyv,d	4.200,0 Kg/cm ²		

ESFUERZOS:

	H_Calc cm	Canto cm	Md Kg x cm	As1 cm ²	As2 cm ²	Vd Kg	Vcu Kg	Ast cm ² /ml
1	630	41,8	8.039.648	54,32	0,00	32.136	27.667	3,13

ESFUERZOS

Aleta

Aleta 1050x(668x165)

Tierras: 2.000 Kg/m3 SC_c: 400 Kg/m2 Gc: 1,40
Talud: 0,00° SC_p: 3.500 Kg/m2 Gs: 1,10
C.E.h: 0,333 Z_SCp: 0 cm Gf: 1,50

Z (cm)	Eh (Kg)				Vd (Kg)	M (Kg)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
0	0	0	0	0	0	0	0	0	0	0
20	13	0	27	233	410	89	0	267	2.333	4.033
40	53	0	53	467	860	711	0	1.067	9.333	16.667
60	120	0	80	700	1.350	2.400	0	2.400	21.000	38.700
80	213	0	107	933	1.880	5.689	0	4.267	37.333	70.933
100	333	0	133	1.167	2.450	11.111	0	6.667	58.333	114.167
120	480	0	160	1.400	3.060	19.200	0	9.600	84.000	169.200
140	653	0	187	1.633	3.710	30.489	0	13.067	114.333	236.833
160	853	0	213	1.867	4.400	45.511	0	17.067	149.333	317.867
180	1.080	0	240	2.100	5.130	64.800	0	21.600	189.000	413.100
200	1.333	0	267	2.333	5.900	88.889	0	26.667	233.333	523.333
220	1.613	0	293	2.567	6.710	118.311	0	32.267	282.333	649.367
240	1.920	0	320	2.800	7.560	153.600	0	38.400	336.000	792.000
260	2.253	0	347	3.033	8.450	195.289	0	45.067	394.333	952.033
280	2.613	0	373	3.267	9.380	243.911	0	52.267	457.333	1.130.267
300	3.000	0	400	3.500	10.350	300.000	0	60.000	525.000	1.327.500
320	3.413	0	427	3.733	11.360	364.089	0	68.267	597.333	1.544.533
340	3.853	0	453	3.967	12.410	436.711	0	77.067	674.333	1.782.167
360	4.320	0	480	4.200	13.500	518.400	0	86.400	756.000	2.041.200
380	4.813	0	507	4.433	14.630	609.689	0	96.267	842.333	2.322.433
400	5.333	0	533	4.667	15.800	711.111	0	106.667	933.333	2.626.667
420	5.880	0	560	4.900	17.010	823.200	0	117.600	1.029.000	2.954.700
440	6.453	0	587	5.133	18.260	946.489	0	129.067	1.129.333	3.307.333
460	7.053	0	613	5.367	19.550	1.081.511	0	141.067	1.234.333	3.685.367
480	7.680	0	640	5.600	20.880	1.228.800	0	153.600	1.344.000	4.089.600
500	8.333	0	667	5.833	22.250	1.388.889	0	166.667	1.458.333	4.520.833
520	9.013	0	693	6.067	23.660	1.562.311	0	180.267	1.577.333	4.979.867
540	9.720	0	720	6.300	25.110	1.749.600	0	194.400	1.701.000	5.467.500
560	10.453	0	747	6.533	26.600	1.951.289	0	209.067	1.829.333	5.984.533
580	11.213	0	773	6.767	28.130	2.167.911	0	224.267	1.962.333	6.531.767
600	12.000	0	800	7.000	29.700	2.400.000	0	240.000	2.100.000	7.110.000
620	12.813	0	827	7.233	31.310	2.648.089	0	256.267	2.242.333	7.720.033
640	13.653	0	853	7.467	32.960	2.912.711	0	273.067	2.389.333	8.362.667
660	14.520	0	880	7.700	34.650	3.194.400	0	290.400	2.541.000	9.038.700

DATOS GENERALES:

Obra: SUBTRAMO XV
Cliente: NECSO
Nº Oferta: 99/643
Pieza: Aleta 1050x(668x165)

TERRENO:

Densidad terreno: 0,0020 Kg/cm3
Densidad Agua: 0,0010 Kg/cm3
Indice Huecos: 30,0 %
Densidad Aparente: 0,0013 Kg/cm3
Angulo Roz.Int: 30,0 °
Angulo Roz. Trno/Mro: 0,0 °
Angulo de Talud: 18,4 °
Coef. Empuje Activo Hztal: 0,427
Coef. Empuje Activo Vtcal: 0,000

MURO:

Altura máxima: 668 cm Quiebro 300 cm
Resguardo Tierras: 0 cm Canto C. 20 cm
Longitud Muro: 100 cm Canto Z. 41,8 cm
Peso del Muro 4.343 Kg/ml Xcdg (m) 14,0 cm

ACCIONES:

Prof. Nivel Freatico 1200 cm
Sobrecarga (coron.): 0,0400 Kg/cm2
Sobrecarga (prof.): 0,3500 Kg/cm2
Prof. Aplic. (S.C.p) 400 cm

MATERIALES ALZADO:

Fc,k 300 Kg/cm2 Gc (1,40)
Fy,k 5100 Kg/cm2 Gs (1,10)
Fc,d 214,3 Kg/cm2 Gf (1,50)
Fy,d 4.636,4 Kg/cm2 Recubrimiento: 4,0 cm.
Fyv,d 4.200,0 Kg/cm2

ESFUERZOS:

H_Calc cm	Canto cm	Md Kg x cm	As1 cm2	As2 cm2	Vd Kg	Vcu Kg	Ast cm2/ml	
2	516	35,1	3.430.425	26,21	0,00	20.997	22.734	0,00

ESFUERZOS

Aleta

la

8x165)
2.0 Kg/m3 SC_c: 400 Kg/m2 Gc: 1,40
18,40 SC_p: 3.500 Kg/m2 Gs: 1,10
0,427 Z_SCp: 400 cm Gf: 1,50

Eh (Kg)			Vd (Kg)	M (Kg)				Md (Kg x cm)
Agua	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
0	0	0	0	0	0	0	0	0
0	34	0	77	114	0	341	0	683
0	68	0	205	911	0	1.366	0	3.415
0	102	0	384	3.073	0	3.073	0	9.220
0	137	0	615	7.285	0	5.464	0	19.124
0	171	0	896	14.229	0	8.537	0	34.150
0	205	0	1.229	24.588	0	12.294	0	55.322
0	239	0	1.614	39.044	0	16.733	0	83.667
0	273	0	2.049	58.282	0	21.856	0	120.207
0	307	0	2.536	82.984	0	27.661	0	165.967
0	341	0	3.073	113.832	0	34.150	0	221.973
0	376	0	3.663	151.511	0	41.321	0	289.247
0	410	0	4.303	196.702	0	49.175	0	368.816
0	444	0	4.994	250.089	0	57.713	0	461.703
0	478	0	5.737	312.355	0	66.933	0	568.933
0	512	0	6.531	384.183	0	76.837	0	691.530
0	546	0	7.376	466.256	0	87.423	0	830.519
0	581	0	8.273	559.257	0	98.692	0	986.925
0	615	0	9.220	663.869	0	110.645	0	1.161.771
0	649	0	10.219	780.775	0	123.280	0	1.356.082
0	683	0	11.269	910.657	0	136.599	0	1.570.884
0	717	299	12.819	1.054.199	0	150.600	2.988	1.811.681
0	751	598	14.420	1.212.085	0	165.284	11.952	2.083.982
0	785	896	16.072	1.384.996	0	180.652	26.893	2.388.810
0	820	1.195	17.775	1.573.616	0	196.702	47.809	2.727.190
0	854	1.494	19.529	1.778.627	0	213.435	74.702	3.100.147
0	888	1.793	21.335	2.000.714	0	230.852	107.571	3.508.705
0	922	2.092	23.192	2.240.558	0	248.951	146.417	3.953.888
0	956	2.390	25.100	2.498.843	0	267.733	191.238	4.436.722

DATOS GENERALES:

Obra: SUBTRAMO XV
Cliente: NECSO
Nº Oferta: 99/643
Pieza: Aleta 1050x(668x165)

TERRENO:

Densidad terreno: 0,0020 Kg/cm3
Densidad Agua: 0,0010 Kg/cm3
Indice Huecos: 30,0 %
Densidad Aparente: 0,0013 Kg/cm3
Angulo Roz.Int: 30,0 °
Angulo Roz. Trno/Mro: 0,0 °
Angulo de Talud: 18,4 °
Coef. Empuje Activo Hztal: 0,427
Coef. Empuje Activo Vtcal: 0,000

MURO:

Altura máxima: 668 cm Quiebro 300 cm
Resguardo Tierras: 0 cm Canto C. 20 cm
Longitud Muro: 100 cm Canto Z. 41,8 cm
Peso del Muro 4.343 Kg/ml Xcdg (m) 14,0 cm

ACCIONES:

Prof. Nivel Freatico 1200 cm
Sobrecarga (coron.): 0,0400 Kg/cm2
Sobrecarga (prof.): 0,0000 Kg/cm2
Prof. Aplic. (S.C.p.) 0 cm

MATERIALES ALZADO:

Fc,k 300 Kg/cm2 Gc (1,40)
Fy,k 5100 Kg/cm2 Gs (1,10)
Fc,d 214,3 Kg/cm2 Gf (1,50)
Fy,d 4.636,4 Kg/cm2 Recubrimiento: 4,0 cm.
Fyv,d 4.200,0 Kg/cm2

ESFUERZOS:

	H_Calc cm	Canto cm	Md Kg x cm	As1 cm2	As2 cm2	Vd Kg	Vcu Kg	Ast cm2/ml
3	403	28,3	1.599.542	15,22	0,00	11.406	17.801	0,00
4	289	21,6	620.642	8,01	0,00	6.078	12.868	0,00
5	197	20,0	212.689	3,23	0,00	2.988	11.711	0,00

00

z

3A

11. CIMENTACIÓN

Cimentación

Cimentación

DATOS GENERALES:

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1050x(668/165)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 0,0 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza:	1		
Altura del Muro:	632,6 cm	Quiebro	264,6 cm
Altura tierras:	632,6 cm	Canto.C	20,0 cm
		Canto.Z	41,8 cm
Longitud Muro:	100,0 cm	Xcdg (m)	14,2 cm
Peso del Muro:	4.166 Kg/ml	Xcdg (t)	170,7 cm

ACCIONES:

Sobrecarga (coron.):	0,0400 Kg/cm ²		
Sobrecarga (prof.):	0,3500 Kg/cm ²	Prof.(S.C.p)	0 cm

RESISTENCIAS:

Hormigón:	250 Kg/cm ²	(1,50)
Acero:	5.100 Kg/cm ²	(1,15)
Acciones:		(1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera:	152 cm
Vuelo del Talón:	357 cm
Canto de la Zapata:	90 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (H _z tal):	0,333
Base de la Zapata:	551,4 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-113	0	0
Muro:		-4166	-109		-722180
Tierras:	-17405	-47146	89	4192197	-17578545
Sobrecarga (coron.):	-963	-1516	86	348095	-565217
Sobrecarga (prof.):	-8430	-13264	86	3045834	-4945648
Zapata:		-12407	0		-3421004
	-26798	-78500		7586127	-27232594

C_{sd} = 1,69 C_{sv} = 3,59 e = -47,2 cm.

Aleta 1050x(668/165) Pza. 1

TENSION DEL TERRENO:

1,79	<	2,00	(Servicio)	
2,18	<	4,00	(Empuje mayorado)	(1,50)

Distribucion Trapezoidal

SP= 2,15	ST= 0,69	Le= 551,4
(Kg/cm ²)	(Kg/cm ²)	(cm)

CIMENTACIÓN:

F _{cd} =	166,7 Kg/cm ²	Mayoración Cargas:	1,60
F _{yd} =	4.434,8 Kg/cm ²	Recubrimiento:	6,0 cm.

CÁLCULO ZAPATA:

Flexión:

S1= 344,70	SPf= 277,38	STf= 264,97	S2= 110,83
qvP= -36,00		qvT= -309,59	

Puntera:	VPf= 158,7	MP= 3.606.250	Us= 43.735	9,86
Talón:	VTf= 363,5	MT= -9.734.426	Us= 122.156	27,54
	(cm)	(Kgxcn)	(Kg)	(cm ²)
As,min=	13,50 cm ²			
	1,5 ‰			

Cortante:

S1= 344,70	SPc= 297,86	STc= 226,69	S2= 110,83
qvP= -36,00		qvT= -309,59	

Puntera:	VPc= 110,5	VP= 31.512	Vcu= 54.222	0,00
Talón:	VTc= 273,2	VT= -38.473		
	(cm)	(Kg)	(Kg)	(cm ² /ml)

Armado Superior (Talón):

Perpendicular Muro:	Ø20 /10cm
Paralelo Muro:	Ø16 /25cm

Armado Inferior (Puntera):

Perpendicular Muro:	Ø16 /15cm
Paralelo Muro:	Ø16 /25cm

Armado a cortante: No necesario.

DATOS GENERALES:

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1050x(668/165)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 18,4 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza:	2		
Altura del Muro:	523,1 cm	Quiebro	261,3 cm
Altura tierras:	523,1 cm	Canto C	20,0 cm
		Canto Z	35,5 cm
Longitud Muro:	100,0 cm	Xcdg (m)	12,5 cm
Peso del Muro:	3.123 Kg/ml	Xcdg (t)	158,7 cm

ACCIONES:

Sobrecarga (coron.):	0,0400 Kg/cm ²		
Sobrecarga (prof.):	0,3500 Kg/cm ²	Prof.(S.C.p)	400 cm

RESISTENCIAS:

Hormigón:	250 Kg/cm ²	(1,50)
Acero:	5.100 Kg/cm ²	(1,15)
Acciones:		(1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera:	130 cm
Vuelo del Talón:	319 cm
Canto de la Zapata:	90 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (H _z tal):	0,427
Base de la Zapata:	484,1 cm

	F _h	F _v	e _x	M _v	M _r
F (coron.)			-102	0	0
Muro:		-3123	-100		-460951
Tierras:	-16047	-38280	82	3279576	-12429998
Sobrecarga (coron.):	-1047	-1337	75	320938	-434127
Sobrecarga (prof.):	-3184	-11698	75	339309	-3798614
Zapata:		-10892	0		-2636243
	-20278	-65330		3939823	-19759935

C_{sd} = 1,86C_{sv} = 5,02

e = -15,5 cm.

Aleta 1050x(668/165) Pza. 2

TENSION DEL TERRENO: 1,48 < 2,00 (Servicio)
 1,73 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal

SP= 1,61 (Kg/cm²) ST= 1,09 (Kg/cm²) Le= 484,1 (cm)

CIMENTACIÓN:

F _{cd} =	166,7 Kg/cm ²	Mayoración Cargas:	1,60
F _{yd} =	4.434,8 Kg/cm ²	Recubrimiento:	6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S ₁ = 257,41	SP _f = 234,25	ST _f = 229,99	S ₂ = 174,45
qv _P = -36,00		qv _T = -290,56	

Puntera:	VP _f = 135,2	MP = 1.952.084	U _s = 23.471	5,29
Talón:	VT _f = 324,1 (cm)	MT = -5.124.524 (Kgxcn)	U _s = 62.656 (Kg)	14,13 (cm ²)
As _{min} =	13,50 cm ²			
	1,5 ‰			

Cortante:

S ₁ = 257,41	SP _c = 242,36	ST _c = 214,68	S ₂ = 174,45
qv _P = -36,00		qv _T = -290,56	

Puntera:	VP _c = 87,8	VP = 18.788	V _{cu} = 54.222	0,00
Talón:	VT _c = 234,7 (cm)	VT = -22.533 (Kg)		(cm ² /ml)

Armado Superior (Talón):

Perpendicular Muro: Ø20 /15cm
 Paralelo Muro: Ø16 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø16 /25cm
 Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

Armado a cortante: No necesario.

DATOS GENERALES:

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1050x(668/165)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 18,4 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 4
 Altura del Muro: 291,2 cm Quiebro 261,3 cm
 Altura tierras: 291,2 cm Canto.C 20,0 cm
 Canto.Z 21,8 cm
 Longitud Muro: 100,0 cm Xcdg (m) 10,0 cm
 Peso del Muro: 1.462 Kg/ml Xcdg (t) 125,0 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigón: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 85 cm
 Vuelo del Talón: 242 cm
 Canto de la Zapata: 60 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (Hztal): 0,427
 Base de la Zapata: 348,2 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-79	0	0
Muro:		-1462	-79		-139636
Tierras:	-5264	-16153	57	616139	-3671358
Sobrecarga (coron.):	-600	-974	52	105276	-221456
Sobrecarga (prof.):	0	0	52	0	0
Zapata:		-5223	0		-909298
	-5863	-23813		721415	-4941749

Csd = 2,34 Csv = 6,85 e = 5,8 cm.

Aleta 1050x(668/165) Pza. 4

TENSION DEL TERRENO: 0,65 < 2,00 (Servicio)
 0,74 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
 SP= 0,62 (Kg/cm²) ST= 0,75 (Kg/cm²) Le= 348,2 (cm)

CIMENTACIÓN:

Fcd = 166,7 Kg/cm² Mayoración Cargas: 1,60
 Fyd = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S1= 98,42 SPf= 103,97 STf= 104,94 S2= 120,43
 qvP= -24,00 qvT= -137,28

Puntera: VPf= 87,9 MP= 294.434 Us= 5.472 1,23
 Talón: VTf= 245,1 (cm) MT= -661.108 (Kgxcn) Us= 12.342 2,78
 As,min= 9,00 cm² 1,5 ‰

Cortante:

S1= 98,42 SPc= 102,06 STc= 108,56 S2= 120,43
 qvP= -24,00 qvT= -137,28

Puntera: VPc= 57,6 VP= 4.392 Vcu= 34.857 0,00
 Talón: VTc= 187,8 (cm) VT= -4.279 (Kg) (cm²/ml)

Armado Superior (Talón):

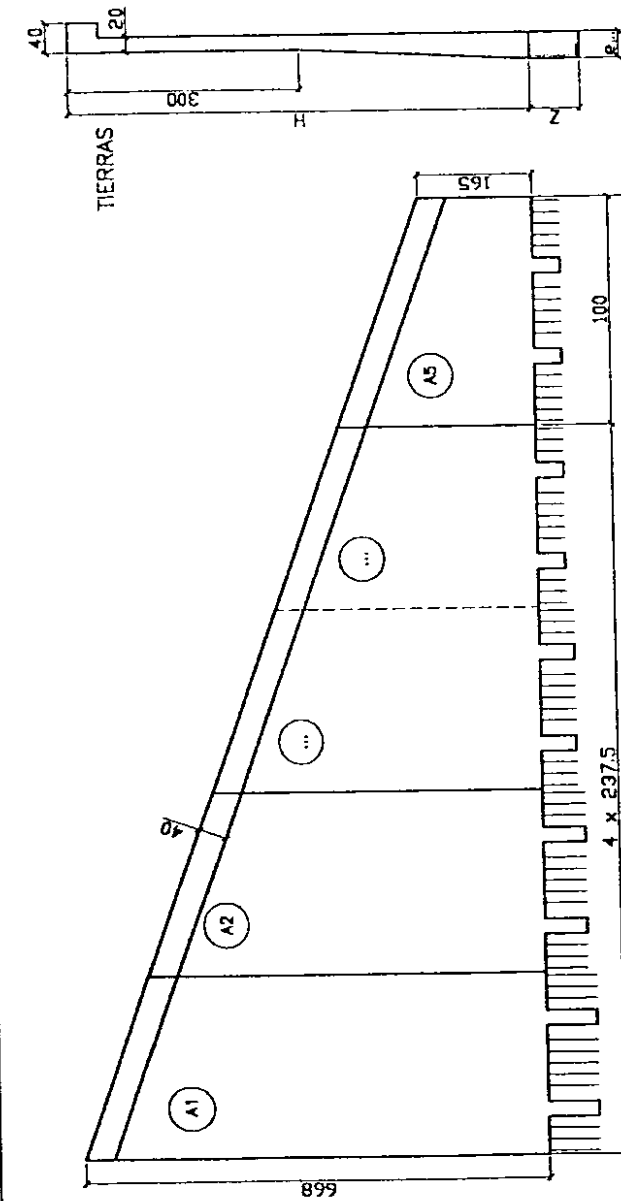
Perpendicular Muro: Ø12 /20cm
 Paralelo Muro: Ø12 /25cm

Armado Inferior (Puntera):

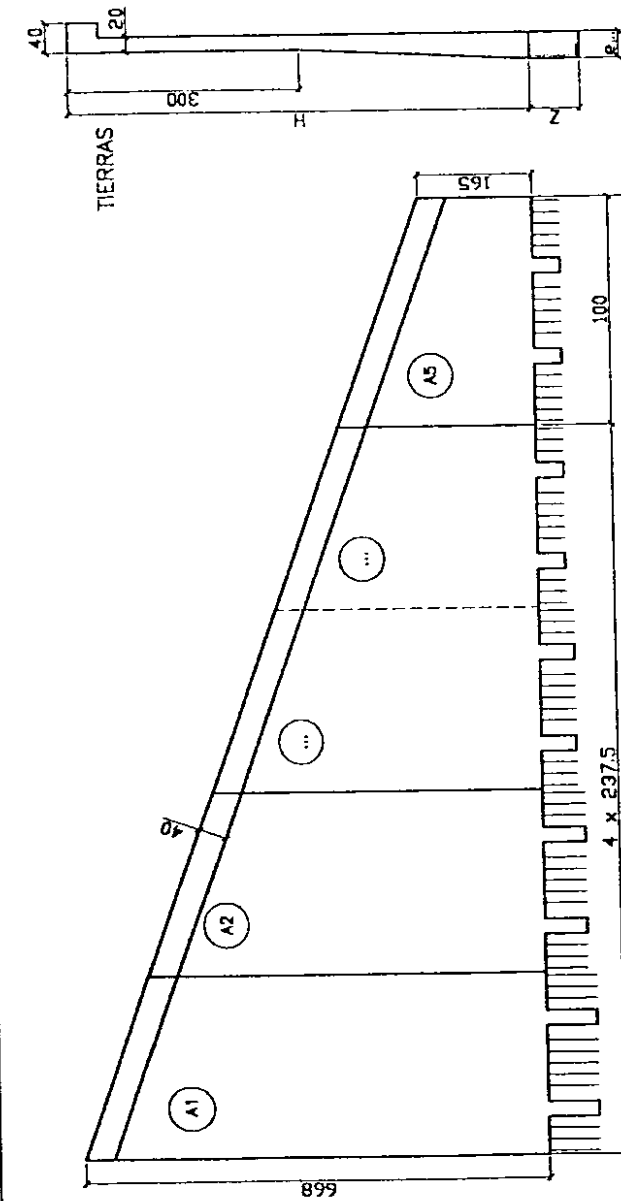
Perpendicular Muro: Ø12 /25cm
 Paralelo Muro: Ø12 /25cm

Armado a cortante: No necesario.

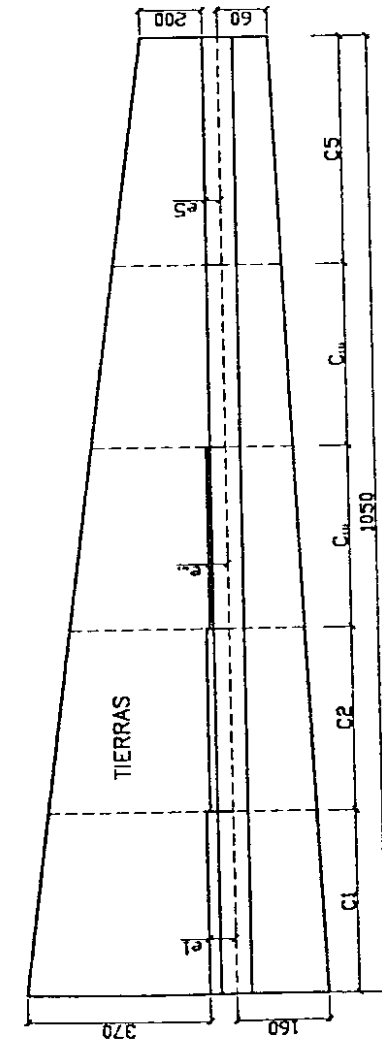
12. PLANOS



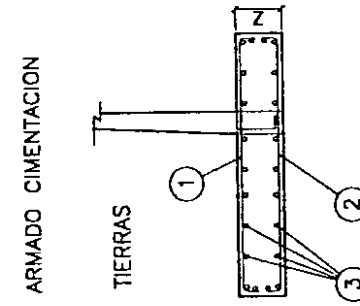
ALZADO CARA VISTA (Aleta Izda)



SECCION



PLANTA



ARMADO CIMENTACION

ARMADO CIMENTACION		
TIPO	1	2
C1	Ø20 / 10cm	Ø18 / 15cm
C2	Ø20 / 15cm	Ø18 / 25cm
C3	Ø18 / 20cm	Ø12 / 25cm
C4	Ø12 / 20cm	Ø12 / 25cm
C5	Ø12 / 20cm	Ø12 / 25cm

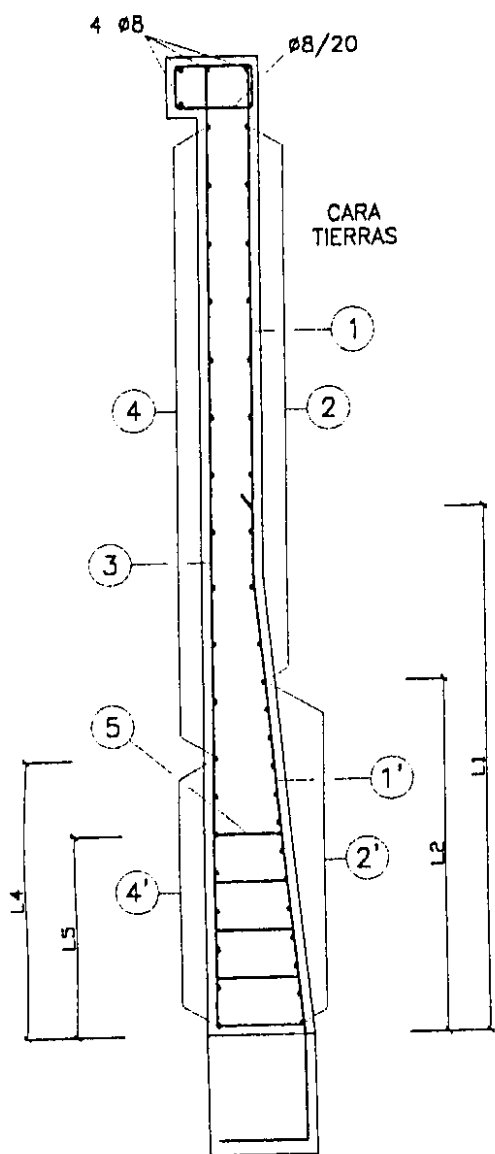
CUADRO MEDIDAS			
PIEZA	H	a...	Z
A1	668.0	41.9	90
A2	554.0	35.1	90
A3	440.2	28.3	60
A4	326.4	21.6	60

EH-81	CALIDAD	CONTROL	Grat.
ELEMENTOS PREFABRICADOS			
HORMIGON	H-300	INTENSO	1,40
ACERO	AEN-500-S	INTENSO	1,10
EJECUCION		INTENSO	1,50
OBRA IN SITU			
HORMIGON	H-250	NORMAL	1,50
ACERO	AEN-500	NORMAL	1,15
EJECUCION		NORMAL	1,80

[illegible]

High 7th

• COTAS EN CM.



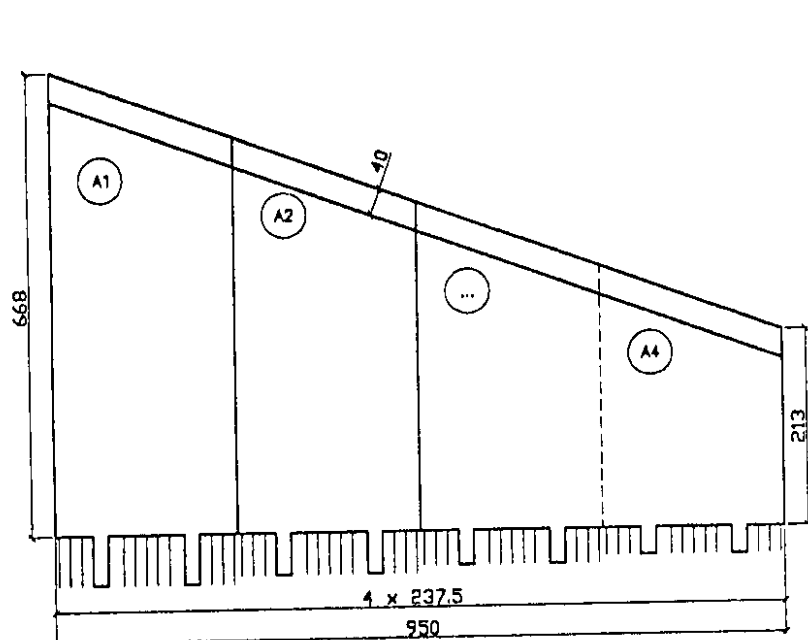
DEFINICIÓN DE ARMADO

	A1	A2	A3	A4	A5
1	Ø25/24	Ø20/22	Ø16/25	Ø10/24	Ø8/25
1'	Ø25/8	Ø20/11	Ø16/12.5	Ø10/8	Ø8/12.5
L1	515	295	275	205	125
2	Ø12/24	Ø10/30	Ø8/30	Ø8/25	Ø6/20
2'	Ø12/8	Ø10/12.5	Ø8/15	--	--
L2	344	225	150	--	--
3	Ø12/15	Ø10/20	Ø8/20	Ø8/20	Ø6/25
4	Ø8/25	Ø8/25	Ø8/25	Ø8/20	Ø8/25
4'	Ø8/12.5	Ø8/12.5	Ø8/15	--	--
L4	375	250	135	--	--
5	10Ø8/25	10Ø8/25	--	--	--
L5	175	100	--	--	--

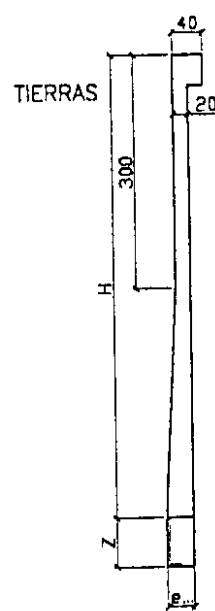
Distancias en centímetros

EH-91	CALIDAD	CONTROL	Coef.
ELEMENTOS PREFABRICADOS			
HORMIGON	H-300	INTENSO	1,40
ACERO	AEH-500-S	INTENSO	1,10
EJECUCION		INTENSO	1,50
OBRA IN SITU			
HORMIGON	H-250	NORMAL	1,50
ACERO	AEH-500	NORMAL	1,15
EJECUCION		NORMAL	1,60

06/07/00	0		
FECHA	REV.	MODIFICACIONES	Nº PLANO
PIEZA:	Aleta 1050x(668/165). ED1-0.6		64.2
OFERTA:	99/643		
OBRA:	ZARAGOZA		
CLIENTE:	NECSO		
Aleta 1050x(668/165)		REVISADO:	APROBADO:
		Dpto. Comercial	Dpto. Técnico
PREFABRICADOS DE HORMIGON			

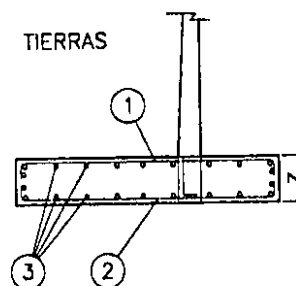


ALZADO CARA VISTA (Aleta Izda)



SECCION

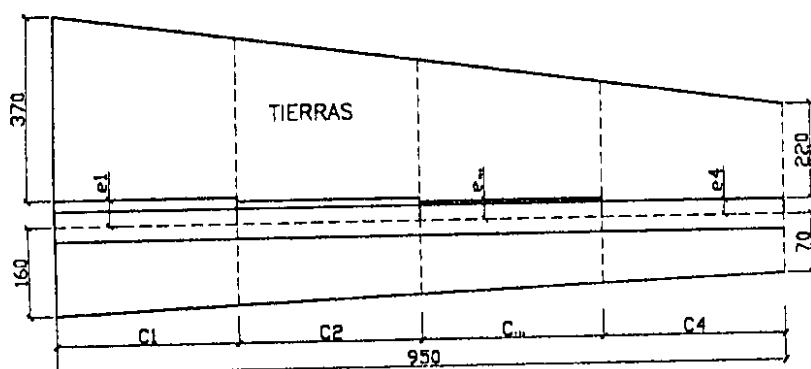
ARMADO CIMENTACION



	ARMADO CIMENTACION		
TIPO	1	2	3
C1	Ø20/10cm	Ø16/15cm	Ø16/25cm
C2	Ø20/15cm	Ø16/25cm	Ø16/25cm
C3	Ø18/20cm	Ø12/25cm	Ø12/25cm
C4	Ø12/20cm	Ø12/25cm	Ø12/25cm

PIEZA	H	e...	Z
A1	668.0	41.8	80
A2	554.0	35.1	80
A3	440.2	28.3	60
A4	326.4	21.6	60

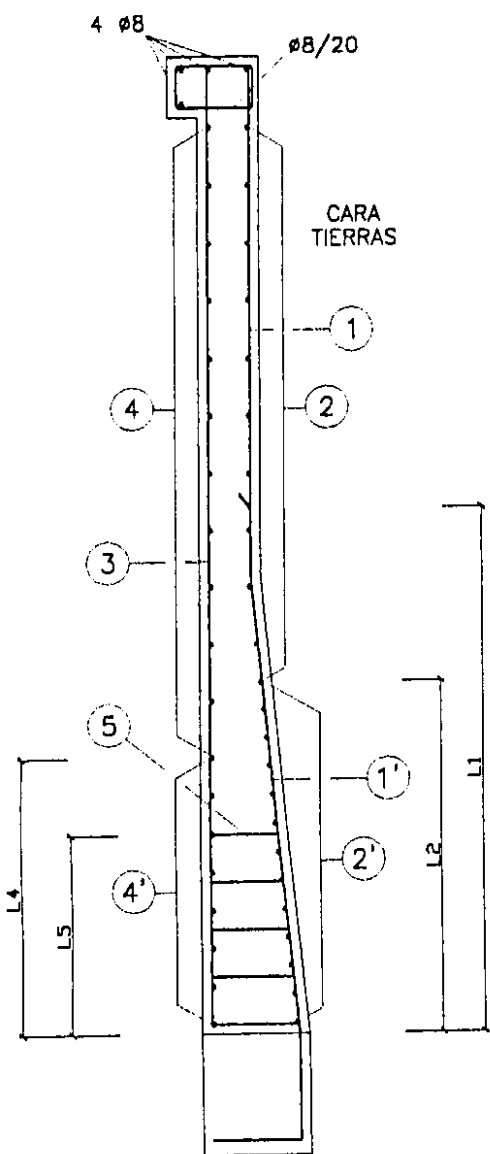
EH-91	CALIDAD	CONTROL	Coef.
ELEMENTOS PREFABRICADOS			
HORMIGON	H-300	INTENSO	1,40
ACERO	AEH-500-S	INTENSO	1,10
EJECUCION		INTENSO	1,50
OBRA IN SITU			
HORMIGON	H-250	NORMAL	1,50
ACERO	AEH-500	NORMAL	1,15
EJECUCION		NORMAL	1,60



PLANTA

06/07/00	0		
FECHA	REV.	MODIFICACIONES	Nº PLANO
PIEZA:	Aleta 950x(668/213). ED1-0.6		65.1
OFERTA:	99/643		
OBRA:	SUBTRAMO XV		
CLIENTE:	NECSO		
Aleta 950(668/213)		REVISADO:	APROBADO:
		Dpto. Comercial	Dpto. Técnico
PREFABRICADOS DE HORMIGON			

• COTAS EN CM.



DEFINICIÓN DE ARMADO

	A1	A2	A3	A4
1	Ø25/24	Ø20/22	Ø16/25	Ø10/24
1'	Ø25/8	Ø20/11	Ø16/12.5	Ø10/8
L1	515	295	275	205
2	Ø12/24	Ø10/30	Ø8/30	Ø8/25
2'	Ø12/8	Ø10/12.5	Ø8/15	--
L2	344	225	150	--
3	Ø12/15	Ø10/20	Ø8/20	Ø8/20
4	Ø8/25	Ø8/25	Ø8/25	Ø8/20
4'	Ø8/12.5	Ø8/12.5	Ø8/15	--
L4	375	250	135	--
5	10Ø8/25	10Ø8/25	--	--
L5	175	100	--	--

Distancias en centímetros

EH-91	CALIDAD	CONTROL	Coef.
ELEMENTOS PREFABRICADOS			
HORMIGON	H-300	INTENSO	1,40
ACERO	AEH-500-S	INTENSO	1,10
EJECUCION		INTENSO	1,50
OBRA IN SITU			
HORMIGON	H-250	NORMAL	1,50
ACERO	AEH-500	NORMAL	1,15
EJECUCION		NORMAL	1,60

08/07/00	0		
FECHA	REV.	MODIFICACIONES	
PIEZA:	ALETA 950x(668/213). ED1-0.8		65.2
OFERTA:	98/843		
OBRA:	ZARAGOZA		
CLIENTE:	NECSO		
ALETA 950x(668/213)		REVISADO:	APROBADO:
		Dpto. Comercial	Dpto. Técnico
 ALHOSA PREFABRICADOS DE HORMIGON			

<i>ALHOSA</i> PREFABRICADOS DE HORMIGÓN	ALETAS 1000x(667/320) EVN1-0.9
Oferta: 99/643 Obra: SUBTRAMO XV Empresa: NECSO Fecha: Agosto de 2.000	

ÍNDICE

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2.-	Descripción
3.-	Instrucciones aplicadas
4.-	Características de los materiales
5.-	Control de calidad
6.-	Coefficientes de seguridad
7.-	Parámetros del terreno
8.-	Acciones consideradas
9.-	Hipótesis de cálculo
10.-	Cálculos
11.-	Cimentación
12.-	Planos

1. Generalidades

En la presente memoria se muestran los cálculos realizados para justificar las Aletas Prefabricadas de hormigón que sostienen el terraplén.

2. Descripción

El sostenimiento de las tierras que forman el terraplén en las entradas de las obras de fábrica se realiza con aletas prefabricadas de hormigón armado.

El espesor de los muros que forman las aletas es de 20 cm. hasta los 300 cm. de profundidad y luego aumenta progresivamente, tal y como se muestra en los planos adjuntos.

La cimentación se realiza con hormigón vertido in situ

3. Instrucciones aplicadas

Para el cálculo de las Aletas, se han utilizado las siguientes Instrucciones y Normas:

* Instrucción para el Proyecto y Ejecución de Obras de Hormigón en Masa o Armado EH-91.

4. Características de los materiales

* Hormigones:

Hormigón en elemento prefabricado	H-300
Hormigón en obra in situ	H-250

* Acero:

Acero para armar corrugado	B-500 S
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5. Control de calidad

El control de calidad se atenderá a lo especificado en la EH-91, habiéndose seleccionado los siguientes niveles:

Elementos prefabricados:

a) Materiales:	
- Hormigón	Control Intenso
- Armadura pasiva	Control Intenso
b) Ejecución:	
- En toda la obra	Control Intenso

Obra in situ:

a) Materiales:	
- Hormigón	Control Normal
- Armadura pasiva	Control Normal
b) Ejecución:	
- En toda la obra	Control Normal

6. Coeficientes de seguridad

De acuerdo con los niveles de control de calidad definidos, se adoptan los siguientes coeficientes de seguridad:

Elementos prefabricados:

- Coeficientes de minoración de resistencias:

Acero pasivo

$\gamma_s = 1,10$

Hormigón

$\gamma_c = 1,40$

- Coeficientes de ponderación de acciones:

$\gamma_f = 1,50$

Obra in situ:

- Coeficientes de minoración de resistencias:

Acero pasivo

$\gamma_s = 1,15$

Hormigón

$\gamma_c = 1,50$

- Coeficientes de ponderación de acciones:

$\gamma_f = 1,60$

7. Parámetros del terreno

Pese a existir un relleno de calidad adecuadamente compactado (al que correspondería un ángulo de rozamiento interno de 35°), con un talud 2H:1V. En los cálculos se ha considerado, conservadoramente, un talud de terraplén 3H:2V con ángulo de rozamiento interno de 30°. La Aleta forma un ángulo de 60° con el pie del terraplén

Peso específico 2,0ton/m³

Ángulo de rozamiento interno 30°

Ángulo Talud coronación 18,4°

Coeficiente de empuje activo 0,427

8. Acciones consideradas**8.1 Empuje por efecto de las tierras**

Se considera el empuje activo de las tierras que se encuentran en el trasdós de la Aleta.

8.2 Sobrecargas de uso

Se considera una sobrecarga de 400 Kg/m² sobre el terraplén, que es la establecida para paseos de servicio.

8.3 Sobrecargas de tráfico

En la primera pieza de la aleta, dada su proximidad a la plataforma, se considera una sobrecarga de 3.500Kg/m² en todo su alzado.

En la segunda pieza de la aleta, dada su proximidad a la plataforma, se considera una sobrecarga de 3.500Kg/m² a partir de 4,00m de profundidad.

9. Hipótesis de cálculo.**HIPÓTESIS I:**

- Empuje de las tierras

- Sobrecarga de uso

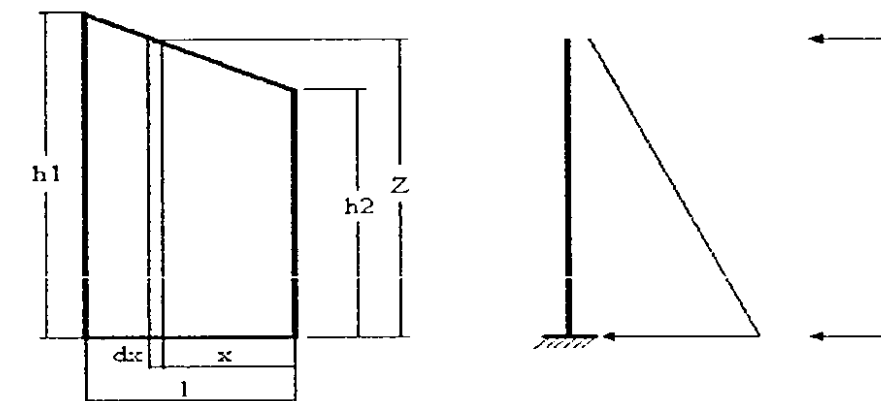
- Sobrecarga de tráfico (En las dos primeras piezas)

Combinación: 1,5 * [Caso (1) + Caso (2) + Caso (3)]

10. Cálculos.

Dada la geometría de la estructura en la que se reduce la altura en función de la longitud y los esfuerzos se comportan de igual manera, cada tramo de la aleta se ha armado para la altura existente a una distancia, del lado mayor, de 1/3 de su longitud, siendo en todo momento superiores las solicitaciones en este punto que la resultante sobre cada tramo.

Pza.	H.máx	H.mín	H.cál
1	667,0	579,8	638
2	579,4	492,4	550
3	492,0	405,0	463
4	404,6	317,6	376
5	317,2	230,0	288



$$M = \int_{x=0}^{x=l} dM = \int_{x=0}^{x=l} \left(\frac{1}{6} \cdot \lambda_h \cdot \gamma_t \cdot z^3 + \frac{1}{2} \cdot \lambda_h \cdot SC \cdot z^2 \right) \cdot dx =$$

$$= \frac{1}{6} \cdot \lambda_h \cdot \gamma_t \cdot \left(\frac{1}{4} \cdot \frac{h_1^4 - h_2^4}{h_1 - h_2} \right) \cdot l + \frac{1}{2} \cdot \lambda_h \cdot SC \cdot \left(\frac{1}{3} \cdot \frac{h_1^3 - h_2^3}{h_1 - h_2} \right) \cdot l \leq M \left(z = h_2 + \frac{2 \cdot (h_1 - h_2)}{3} \right)$$

$$V = \int_{x=0}^{x=l} dV = \int_{x=0}^{x=l} \left(\frac{1}{2} \cdot \lambda_h \cdot \gamma_t \cdot z^2 + \lambda_h \cdot SC \cdot z \right) \cdot dx =$$

$$= \frac{1}{2} \cdot \lambda_h \cdot \gamma_t \cdot \left(\frac{1}{3} \cdot \frac{h_1^3 - h_2^3}{h_1 - h_2} \right) \cdot l + \lambda_h \cdot SC \cdot \left(\frac{1}{2} \cdot \frac{h_1^2 - h_2^2}{h_1 - h_2} \right) \cdot l \leq V \left(z = h_2 + \frac{2 \cdot (h_1 - h_2)}{3} \right)$$

$$z = h_2 + \frac{h_1 - h_2}{l} \cdot x$$

DATOS GENERALES:

Obra: SUBTRAMO XV (EVNI-0.9)
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1000x(667x230)

TERRENO:

Densidad terreno: 0,0020 Kg/cm³
 Densidad Agua: 0,0010 Kg/cm³
 Indice Huecos: 30,0 %
 Densidad Aparente: 0,0013 Kg/cm³
 Angulo Roz. Int: 30,0 °
 Angulo Roz. Trno/Mro: 0,0 °
 Angulo de Talud: 0,0 °
 Coef. Empuje Activo Hztal: 0,333
 Coef. Empuje Activo Vtal: 0,000

MURO:

Altura máxima: 667 cm Quiebro 300 cm
 Resguardo Tierras: 0 cm Canto C. 20 cm
 Longitud Muro: 100 cm Canto Z. 41,7 cm
 Peso del Muro 4.330 Kg/ml Xcdg (m) 14,0 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,3500 Kg/cm²
 Prof. Aplic. (S.C.p.) 0 cm

MATERIALES ALZADO:

Fc,k 300 Kg/cm² Gc (1,40)
 Fy,k 5100 Kg/cm² Gs (1,10)
 Fc,d 214,3 Kg/cm² Gf (1,50)
 Fy,d 4.636,4 Kg/cm²
 Fyv,d 4.200,0 Kg/cm²
 Recubrimiento: 4,0 cm.

ESFUERZOS:

	H_Calc cm	Canto cm	Md Kg x cm	As1 cm ²	As2 cm ²	Vd Kg	Vcu Kg	Ast cm ² /ml
1	638	41,7	8.292.542	56,65	0,00	32.782	27.594	3,64

Aleta 1000x(667x230)

Tierras: 2.000 Kg/m³ SC_c: 400 Kg/m² Gc: 1,40
 Talud: 0,00° SC_p: 3.500 Kg/m² Gs: 1,10
 C.E.h: 0,333 Z_SCp: 0 cm Gf: 1,50

Z (cm)	Eh (Kg)				Vd (Kg)	M (Kg)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
0	0	0	0	0	0	0	0	0	0	0
10	3	0	13	117	200	11	0	67	583	992
20	13	0	27	233	410	89	0	267	2.333	4.033
30	30	0	40	350	630	300	0	600	5.250	9.225
40	53	0	53	467	860	711	0	1.067	9.333	16.667
50	83	0	67	583	1.100	1.389	0	1.667	14.583	26.458
60	120	0	80	700	1.350	2.400	0	2.400	21.000	38.700
70	163	0	93	817	1.610	3.811	0	3.267	28.583	53.492
80	213	0	107	933	1.880	5.689	0	4.267	37.333	70.933
90	270	0	120	1.050	2.160	8.100	0	5.400	47.250	91.125
100	333	0	133	1.167	2.450	11.111	0	6.667	58.333	114.167
110	403	0	147	1.283	2.750	14.789	0	8.067	70.583	140.158
120	480	0	160	1.400	3.060	19.200	0	9.600	84.000	169.200
130	563	0	173	1.517	3.380	24.411	0	11.267	98.583	201.392
140	653	0	187	1.633	3.710	30.489	0	13.067	114.333	236.833
150	750	0	200	1.750	4.050	37.500	0	15.000	131.250	275.625
160	853	0	213	1.867	4.400	45.511	0	17.067	149.333	317.867
170	963	0	227	1.983	4.760	54.589	0	19.267	168.583	363.658
180	1.080	0	240	2.100	5.130	64.800	0	21.600	189.000	413.100
190	1.203	0	253	2.217	5.510	76.211	0	24.067	210.583	466.292
200	1.333	0	267	2.333	5.900	88.889	0	26.667	233.333	523.333
210	1.470	0	280	2.450	6.300	102.900	0	29.400	257.250	584.325
220	1.613	0	293	2.567	6.710	118.311	0	32.267	282.333	649.367
230	1.763	0	307	2.683	7.130	135.189	0	35.267	308.583	718.558
240	1.920	0	320	2.800	7.560	153.600	0	38.400	336.000	792.000
250	2.083	0	333	2.917	8.000	173.611	0	41.667	364.583	869.792
260	2.253	0	347	3.033	8.450	195.289	0	45.067	394.333	952.033
270	2.430	0	360	3.150	8.910	218.700	0	48.600	425.250	1.038.825
280	2.613	0	373	3.267	9.380	243.911	0	52.267	457.333	1.130.267
290	2.803	0	387	3.383	9.860	270.989	0	56.067	490.583	1.226.458
300	3.000	0	400	3.500	10.350	300.000	0	60.000	525.000	1.327.500
310	3.203	0	413	3.617	10.850	331.011	0	64.067	560.583	1.433.492
320	3.413	0	427	3.733	11.360	364.089	0	68.267	597.333	1.544.533
330	3.630	0	440	3.850	11.880	399.300	0	72.600	635.250	1.660.725
340	3.853	0	453	3.967	12.410	436.711	0	77.067	674.333	1.782.167
350	4.083	0	467	4.083	12.950	476.389	0	81.667	714.583	1.908.958
360	4.320	0	480	4.200	13.500	518.400	0	86.400	756.000	2.041.200
370	4.563	0	493	4.317	14.060	562.811	0	91.267	798.583	2.178.992
380	4.813	0	507	4.433	14.630	609.689	0	96.267	842.333	2.322.433
390	5.070	0	520	4.550	15.210	659.100	0	101.400	887.250	2.471.625
400	5.333	0	533	4.667	15.800	711.111	0	106.667	933.333	2.626.667
410	5.603	0	547	4.783	16.400	765.789	0	112.067	980.583	2.787.658
420	5.880	0	560	4.900	17.010	823.200	0	117.600	1.029.000	2.954.700
430	6.163	0	573	5.017	17.630	883.411	0	123.267	1.078.583	3.127.892
440	6.453	0	587	5.133	18.260	946.489	0	129.067	1.129.333	3.307.333
450	6.750	0	600	5.250	18.900	1.012.500	0	135.000	1.181.250	3.493.125
460	7.053	0	613	5.367	19.550	1.081.511	0	141.067	1.234.333	3.685.367
470	7.363	0	627	5.483	20.210	1.153.589	0	147.267	1.288.583	3.884.158
480	7.680	0	640	5.600	20.880	1.228.800	0	153.600	1.344.000	4.089.600

ESFUERZOS

Aleta

Aleta 1000x(667x230)

Tierras: 2.000 Kg/m3 SC_c: 400 Kg./m2 Gc: 1,40
Talud: 0,00° SC_p: 3.500 Kg./m2 Gs: 1,10
C.E.h: 0,333 Z_SCp: 0 cm Gf: 1,50

Z (cm)	Eh (Kg)				Vd (Kg)	M (Kg)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
490	8.003	0	653	5.717	21.560	1.307.211	0	160.067	1.400.583	4.301.792
500	8.333	0	667	5.833	22.250	1.388.889	0	166.667	1.458.333	4.520.833
510	8.670	0	680	5.950	22.950	1.473.900	0	173.400	1.517.250	4.746.825
520	9.013	0	693	6.067	23.660	1.562.311	0	180.267	1.577.333	4.979.867
530	9.363	0	707	6.183	24.380	1.654.189	0	187.267	1.638.583	5.220.058
540	9.720	0	720	6.300	25.110	1.749.600	0	194.400	1.701.000	5.467.500
550	10.083	0	733	6.417	25.850	1.848.611	0	201.667	1.764.583	5.722.292
560	10.453	0	747	6.533	26.600	1.951.289	0	209.067	1.829.333	5.984.533
570	10.830	0	760	6.650	27.360	2.057.700	0	216.600	1.895.250	6.254.325
580	11.213	0	773	6.767	28.130	2.167.911	0	224.267	1.962.333	6.531.767
590	11.603	0	787	6.883	28.910	2.281.989	0	232.067	2.030.583	6.816.958
600	12.000	0	800	7.000	29.700	2.400.000	0	240.000	2.100.000	7.110.000
610	12.403	0	813	7.117	30.500	2.522.011	0	248.067	2.170.583	7.410.992
620	12.813	0	827	7.233	31.310	2.648.089	0	256.267	2.242.333	7.720.033
630	13.230	0	840	7.350	32.130	2.778.300	0	264.600	2.315.250	8.037.225
640	13.653	0	853	7.467	32.960	2.912.711	0	273.067	2.389.333	8.362.667
650	14.083	0	867	7.583	33.800	3.051.389	0	281.667	2.464.583	8.696.458
660	14.520	0	880	7.700	34.650	3.194.400	0	290.400	2.541.000	9.038.700

DATOS GENERALES:

Obra: SUBTRAMO XV (EVNI-0.9)
Cliente: NECSO
Nº Oferta: 99/643
Pieza: Aleta 1000x(667x230)

TERRENO:

Densidad terreno: 0,0020 Kg/cm3
Densidad Agua: 0,0010 Kg/cm3
Indice Huecos: 30,0 %
Densidad Aparente: 0,0013 Kg/cm3
Angulo Roz.Int: 30,0 °
Angulo Roz. Tmo/Mro: 0,0 °
Angulo de Talud: 18,4 °
Coef. Empuje Activo Hztal: 0,427
Coef. Empuje Activo Vtal: 0,000

MURO:

Altura máxima: 667 cm Quiebro 300 cm
Resguardo Tierras: 0 cm Canto C. 20 cm
Longitud Muro: 100 cm Canto Z. 41,7 cm
Peso del Muro 4.330 Kg/ml Xcdg (m) 14,0 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm2
Sobrecarga (prof.): 0,3500 Kg/cm2
Prof. Aplic. (S.C.p.) 400 cm

MATERIALES ALZADO:

Fc,k 300 Kg/cm2 Gc (1,40)
Fy,k 5100 Kg/cm2 Gs (1,10)
Fc,d 214,3 Kg/cm2 Gf (1,50)
Fy,d 4.636,4 Kg/cm2 Recubrimiento: 4,0 cm.
Fyv,d 4.200,0 Kg/cm2

ESFUERZOS:

H_Calc cm	Canto cm	Md Kg x cm	As1 cm2	As2 cm2	Vd Kg	Vcu Kg	Ast cm2/ml	
2	550	36,5	4.201.810	31,07	0,00	24.184	23.811	0,30

ESFUERZOS

Aleta 1000x(667x230)

Tierras: 2.000 Kg/m3 SC_c: 400 Kg/m2 Gc: 1,40
Talud: 18,40° SC_p: 3.500 Kg/m2 Gs: 1,10
C.E.h: 0,427 Z_SCp: 400 cm Gf: 1,50

Z (cm)	Eh (Kg)				Vd (Kg)	M (Kg)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
0	0	0	0	0	0	0	0	0	0	0
10	4	0	17	0	32	14	0	85	0	149
20	17	0	34	0	77	114	0	341	0	683
30	38	0	51	0	134	384	0	768	0	1.729
40	68	0	68	0	205	911	0	1.366	0	3.415
50	107	0	85	0	288	1.779	0	2.134	0	5.869
60	154	0	102	0	384	3.073	0	3.073	0	9.220
70	209	0	120	0	493	4.881	0	4.183	0	13.596
80	273	0	137	0	615	7.285	0	5.464	0	19.124
90	346	0	154	0	749	10.373	0	6.915	0	25.932
100	427	0	171	0	896	14.229	0	8.537	0	34.150
110	517	0	188	0	1.057	18.939	0	10.330	0	43.904
120	615	0	205	0	1.229	24.588	0	12.294	0	55.322
130	721	0	222	0	1.415	31.261	0	14.428	0	68.534
140	837	0	239	0	1.614	39.044	0	16.733	0	83.667
150	960	0	256	0	1.825	48.023	0	19.209	0	100.848
160	1.093	0	273	0	2.049	58.282	0	21.856	0	120.207
170	1.234	0	290	0	2.286	69.907	0	24.673	0	141.870
180	1.383	0	307	0	2.536	82.984	0	27.661	0	165.967
190	1.541	0	324	0	2.798	97.597	0	30.820	0	192.625
200	1.707	0	341	0	3.073	113.832	0	34.150	0	221.973
210	1.882	0	359	0	3.362	131.775	0	37.650	0	254.137
220	2.066	0	376	0	3.663	151.511	0	41.321	0	289.247
230	2.258	0	393	0	3.976	173.124	0	45.163	0	327.431
240	2.459	0	410	0	4.303	196.702	0	49.175	0	368.816
250	2.668	0	427	0	4.642	222.328	0	53.359	0	413.531
260	2.886	0	444	0	4.994	250.089	0	57.713	0	461.703
270	3.112	0	461	0	5.359	280.070	0	62.238	0	513.461
280	3.347	0	478	0	5.737	312.355	0	66.933	0	568.933
290	3.590	0	495	0	6.128	347.032	0	71.800	0	628.247
300	3.842	0	512	0	6.531	384.183	0	76.837	0	691.530
310	4.102	0	529	0	6.947	423.897	0	82.045	0	758.912
320	4.371	0	546	0	7.376	466.256	0	87.423	0	830.519
330	4.649	0	563	0	7.818	511.348	0	92.972	0	906.481
340	4.935	0	581	0	8.273	559.257	0	98.692	0	986.925
350	5.229	0	598	0	8.740	610.069	0	104.583	0	1.071.979
360	5.532	0	615	0	9.220	663.869	0	110.645	0	1.161.771
370	5.844	0	632	0	9.713	720.742	0	116.877	0	1.256.429
380	6.164	0	649	0	10.219	780.775	0	123.280	0	1.356.082
390	6.493	0	666	0	10.738	844.051	0	129.854	0	1.460.858
400	6.830	0	683	0	11.269	910.657	0	136.599	0	1.570.884
410	7.176	0	700	149	12.038	980.678	0	143.514	747	1.687.409
420	7.530	0	717	299	12.819	1.054.199	0	150.600	2.988	1.811.681
430	7.893	0	734	448	13.613	1.131.307	0	157.857	6.723	1.943.830
440	8.264	0	751	598	14.420	1.212.085	0	165.284	11.952	2.083.982
450	8.644	0	768	747	15.239	1.296.619	0	172.883	18.676	2.232.266
460	9.033	0	785	896	16.072	1.384.996	0	180.652	26.893	2.388.810
470	9.430	0	803	1.046	16.917	1.477.299	0	188.591	36.604	2.553.742
480	9.835	0	820	1.195	17.775	1.573.616	0	196.702	47.809	2.727.190

ESFUERZOS

Aleta 1000x(667x230)

Tierras: 2.000 Kg/m3 SC_c: 400 Kg/m2 Gc: 1,40
Talud: 18,40° SC_p: 3.500 Kg/m2 Gs: 1,10
C.E.h: 0,427 Z_SCp: 400 cm Gf: 1,50

Z (cm)	Eh (Kg)				Vd (Kg)	M (Kg)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
490	10.249	0	837	1.345	18.646	1.674.030	0	204.983	60.509	2.909.283
500	10.672	0	854	1.494	19.529	1.778.627	0	213.435	74.702	3.100.147
510	11.103	0	871	1.643	20.426	1.887.493	0	222.058	90.390	3.299.912
520	11.543	0	888	1.793	21.335	2.000.714	0	230.852	107.571	3.508.705
530	11.991	0	905	1.942	22.257	2.118.373	0	239.816	126.247	3.726.654
540	12.448	0	922	2.092	23.192	2.240.558	0	248.951	146.417	3.953.888
550	12.913	0	939	2.241	24.140	2.367.353	0	258.257	168.080	4.190.535
560	13.387	0	956	2.390	25.100	2.498.843	0	267.733	191.238	4.436.722
570	13.869	0	973	2.540	26.073	2.635.115	0	277.380	215.890	4.692.577
580	14.360	0	990	2.689	27.059	2.776.252	0	287.198	242.036	4.958.229

DATOS GENERALES:

Obra: SUBTRAMO XV (EVN1-0.9)
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1000x(667x230)

TERRENO:

Densidad terreno: 0,0020 Kg/cm³
 Densidad Agua: 0,0010 Kg/cm³
 Indice Huecos: 30,0 %
 Densidad Aparente: 0,0013 Kg/cm³
 Angulo Roz.Int: 30,0 °
 Angulo Roz. Trno/Mro: 0,0 °
 Angulo de Talud: 18,4 °
 Coef. Empuje Activo Hztal: 0,427
 Coef. Empuje Activo Vtal: 0,000

MURO:

Altura máxima: 667 cm Quiebro 300 cm
 Resguardo Tierras: 0 cm Canto C. 20 cm
 Longitud Muro: 100 cm Canto Z. 41,7 cm
 Peso del Muro 4.330 Kg/ml Xcdg (m) 14,0 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm²
 Prof. Aplic. (S.C.p.) 0 cm

MATERIALES ALZADO:

Fc,k 300 Kg/cm² Gc (1,40)
 Fy,k 5100 Kg/cm² Gs (1,10)
 Fc,d 214,3 Kg/cm² Gf (1,50)
 Fy,d 4.636,4 Kg/cm² Recubrimiento: 4,0 cm.
 Fyv,d 4.200,0 Kg/cm²

ESFUERZOS:

	H_Calc cm	Canto cm	Md Kg x cm	As1 cm ²	As2 cm ²	Vd Kg	Vcu Kg	Ast cm ² /ml
3	463	31,4	2.393.923	20,54	0,00	14.916	20.029	0,00
4	376	26,2	1.312.278	13,66	0,00	9.999	16.246	0,00
5	288	21,0	617.685	8,26	0,00	6.059	12.464	0,00

Aleta 1000x(667x230)

Tierras: 2.000 Kg/m³ SC_c: 400 Kg/m² Gc: 1,40
 Talud: 18,40° SC_p: 0 Kg/m² Gs: 1,10
 C.E.h: 0,427 Z_SCp: 0 cm Gf: 1,50

Z (cm)	Eh (Kg)				Vd (Kg)	M (Kg)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
0	0	0	0	0	0	0	0	0	0	0
10	4	0	17	0	32	14	0	85	0	149
20	17	0	34	0	77	114	0	341	0	683
30	38	0	51	0	134	384	0	768	0	1.729
40	68	0	68	0	205	911	0	1.366	0	3.415
50	107	0	85	0	288	1.779	0	2.134	0	5.869
60	154	0	102	0	384	3.073	0	3.073	0	9.220
70	209	0	120	0	493	4.881	0	4.183	0	13.596
80	273	0	137	0	615	7.285	0	5.464	0	19.124
90	346	0	154	0	749	10.373	0	6.915	0	25.932
100	427	0	171	0	896	14.229	0	8.537	0	34.150
110	517	0	188	0	1.057	18.939	0	10.330	0	43.904
120	615	0	205	0	1.229	24.588	0	12.294	0	55.322
130	721	0	222	0	1.415	31.261	0	14.428	0	68.534
140	837	0	239	0	1.614	39.044	0	16.733	0	83.667
150	960	0	256	0	1.825	48.023	0	19.209	0	100.848
160	1.093	0	273	0	2.049	58.282	0	21.856	0	120.207
170	1.234	0	290	0	2.286	69.907	0	24.673	0	141.870
180	1.383	0	307	0	2.536	82.984	0	27.661	0	165.967
190	1.541	0	324	0	2.798	97.597	0	30.820	0	192.625
200	1.707	0	341	0	3.073	113.832	0	34.150	0	221.973
210	1.882	0	359	0	3.362	131.775	0	37.650	0	254.137
220	2.066	0	376	0	3.663	151.511	0	41.321	0	289.247
230	2.258	0	393	0	3.976	173.124	0	45.163	0	327.431
240	2.459	0	410	0	4.303	196.702	0	49.175	0	368.816
250	2.668	0	427	0	4.642	222.328	0	53.359	0	413.531
260	2.886	0	444	0	4.994	250.089	0	57.713	0	461.703
270	3.112	0	461	0	5.359	280.070	0	62.238	0	513.461
280	3.347	0	478	0	5.737	312.355	0	66.933	0	568.933
290	3.590	0	495	0	6.128	347.032	0	71.800	0	628.247
300	3.842	0	512	0	6.531	384.183	0	76.837	0	691.530
310	4.102	0	529	0	6.947	423.897	0	82.045	0	758.912
320	4.371	0	546	0	7.376	466.256	0	87.423	0	830.519
330	4.649	0	563	0	7.818	511.348	0	92.972	0	906.481
340	4.935	0	581	0	8.273	559.257	0	98.692	0	986.925
350	5.229	0	598	0	8.740	610.069	0	104.583	0	1.071.979
360	5.532	0	615	0	9.220	663.869	0	110.645	0	1.161.771
370	5.844	0	632	0	9.713	720.742	0	116.877	0	1.256.429
380	6.164	0	649	0	10.219	780.775	0	123.280	0	1.356.082
390	6.493	0	666	0	10.738	844.051	0	129.854	0	1.460.858
400	6.830	0	683	0	11.269	910.657	0	136.599	0	1.570.884
410	7.176	0	700	0	11.814	980.678	0	143.514	0	1.686.288
420	7.530	0	717	0	12.371	1.054.199	0	150.600	0	1.807.199
430	7.893	0	734	0	12.941	1.131.307	0	157.857	0	1.933.745
440	8.264	0	751	0	13.523	1.212.085	0	165.284	0	2.066.053
450	8.644	0	768	0	14.119	1.296.619	0	172.883	0	2.204.253
460	9.033	0	785	0	14.727	1.384.996	0	180.652	0	2.348.471
470	9.430	0	803	0	15.348	1.477.299	0	188.591	0	2.498.836
480	9.835	0	820	0	15.982	1.573.616	0	196.702	0	2.655.476

ESFUERZOS

Aleta 1000x(667x230)

Tierras:	2.000 Kg/m3	SC_c:	400 Kg./m2	Gc:	1,40						
Talud:	18,40°	SC_p:	0 Kg./m2	Gs:	1,10						
C.E.h:	0,427	Z_SCp:	0 cm	Gf:	1,50						
Z	Eh (Kg)				M (Kg)	Vd					Md
(cm)	(Tierras)	(Agua)	(SC.c)	(SC.p)			(Tierras)	(Agua)	(SC.c)	(SC.p)	
490	10.249	0	837	0	16.629	1.674.030	0	204.983	0	2.818.519	

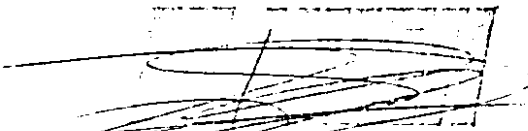
ALHOSA. Prefabricados de Hormigón.

Aleta Prefabricada

11. CIMENTACIONES

En las páginas siguientes se muestran los cálculos de la cimentación de la aleta.

En Alcañiz, Agosto de 2.000


ALHOSA Prefabricados de Hormigón, S. A. -ALCAÑIZ-

Javier Tello Sánchez
Dpto. Técnico ALHOSA

- El presente informe se ha realizado con los datos aportados por el cliente para esta pieza prefabricada concreta.
Salvo comunicación escrita de lo contrario, las consideraciones en él realizadas, así como los resultados aportados, se ajustan a lo solicitado por el cliente.

DATOS GENERALES:

Obra: SUBTRAMO XV (EVN1-0.9)
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1000x(667/230)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 0,0 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 1
 Altura del Muro: 637,9 cm Quiebro 270,9 cm
 Altura tierras: 637,9 cm Canto.C 20,0 cm
 Canto.Z 41,7 cm
 Longitud Muro: 100,0 cm Xcdg (m) 14,1 cm
 Peso del Muro: 4.185 Kg/ml Xcdg (t) 171,4 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,3500 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigon: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 153 cm
 Vuelo del Talón: 359 cm
 Canto de la Zapata: 90 cm

COMPROBACION DE ESTABILIDAD:

Coefficiente Empuje Activo (H_ztal): 0,333
 Base de la Zapata: 553,7 cm

	Fh	Fv	e _x	Mv	Mr
F (coron.)			-114	0	0
Muro:		-4185	-109		-728926
Tierras:	-17660	-47728	90	4284627	-17867867
Sobrecarga (coron.):	-970	-1521	87	353193	-569586
Sobrecarga (prof.):	-8492	-13313	87	3090441	-4983881
Zapata:		-12458	0		-3449067
	-27122	-79206		7728261	-27599327

Csd = 1,69

C_{sv} = 3,57

e = -47,7 cm.

Aleta 1000x(667/230) Pza. 1

TENSION DEL TERRENO: 1,80 < 2,00 (Servicio)
 2,20 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
 SP= 2,17 (Kg/cm²) ST= 0,69 (Kg/cm²) Le= 553,7 (cm)

CIMENTACIÓN:

Fcd = 166,7 Kg/cm² Mayoración Cargas: 1,60
 Fyd = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S1= 347,17 SPf= 278,98 STf= 266,51 S2= 110,58
 qvP= -36,00 qvT= -311,31

Puntera: VPf= 159,6 MP= 3.673.096 Us= 44.562 10,05
 Talón: VTf= 364,9 (cm) MT= -9.904.879 (Kgxcn) Us= 124.420 28,06
 (cm) (Kg) (cm²)
 As,min= 13,50 cm²
 1,5 ‰

Cortante:

S1= 347,17 SPc= 299,60 STc= 227,94 S2= 110,58
 qvP= -36,00 qvT= -311,31

Puntera: VPc= 111,3 VP= 31.996 Vcu= 54.222 0,00
 Talón: VTc= 274,7 (cm) VT= -39.017 (Kg) (cm²/ml)

Armado Superior (Talón):

Perpendicular Muro: Ø25 /15cm
 Paralelo Muro: Ø16 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø16 /15cm
 Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

DATOS GENERALES:

Obra: SUBTRAMO XV (EVN1-0.9)
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1000x(667/230)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 18,4 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 4
 Altura del Muro: 375,7 cm Quiebro 270,9 cm
 Altura tierras: 375,7 cm Canto.C 20,0 cm
 Canto.Z 26,2 cm
 Longitud Muro: 100,0 cm Xcdg (m) 10,5 cm
 Peso del Muro: 1.960 Kg/ml Xcdg (t) 130,2 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigon: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 93 cm
 Vuelo del Talon: 257 cm
 Canto de la Zapata: 60 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (H_ztal): 0,427
 Base de la Zapata: 376,2 cm

	Fh	Fv	e _x	Mv	Mr
F (coron.)			-85	0	0
Muro:		-1960	-84		-208554
Tierras:	-8102	-21983	62	1176625	-5448880
Sobrecarga (coron.):	-744	-1051	57	162045	-260617
Sobrecarga (prof.):	0	0	57	0	0
Zapata:		-5643	0		-1061429
	-8846	-30637		1338669	-6979480

C_{sd} = 2,00 C_{sv} = 5,21 e = -2,9 cm.

Aleta 1000x(667/230) Pza. 4

TENSION DEL TERRENO: 0,83 < 2,00 (Servicio)
 0,98 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
 SP= 0,85 ST= 0,78 Le= 376,2
 (Kg/cm²) (Kg/cm²) (cm)

CIMENTACIÓN:

F_{cd} = 166,7 Kg/cm² Mayoración Cargas: 1,60
 F_{yd} = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S₁= 136,38 SP_f= 133,24 ST_f= 132,64 S₂= 124,23
 q_{vP}= -24,00 q_{vT}= -167,44

Puntera: VP_f= 97,3 MP= 526.588 U_s= 9.815 2,21
 Talón: VT_f= 260,6 MT= -1.371.918 U_s= 25.842 5,83
 (cm) (Kgxcn) (Kg) (cm²)
 A_{s,min}= 9,00 cm²
 1,5 ‰

Cortante:

S₁= 136,38 SP_c= 134,23 ST_c= 130,77 S₂= 124,23
 q_{vP}= -24,00 q_{vT}= -167,44

Puntera: VP_c= 66,3 VP= 7.383 V_{cu}= 34.857 0,00
 Talón: VT_c= 202,7 VT= -8.094 (Kg) (cm²/ml)
 (cm) (Kg)

Armado Superior (Talón):

Perpendicular Muro: Ø12 /15cm
 Paralelo Muro: Ø12 /25cm

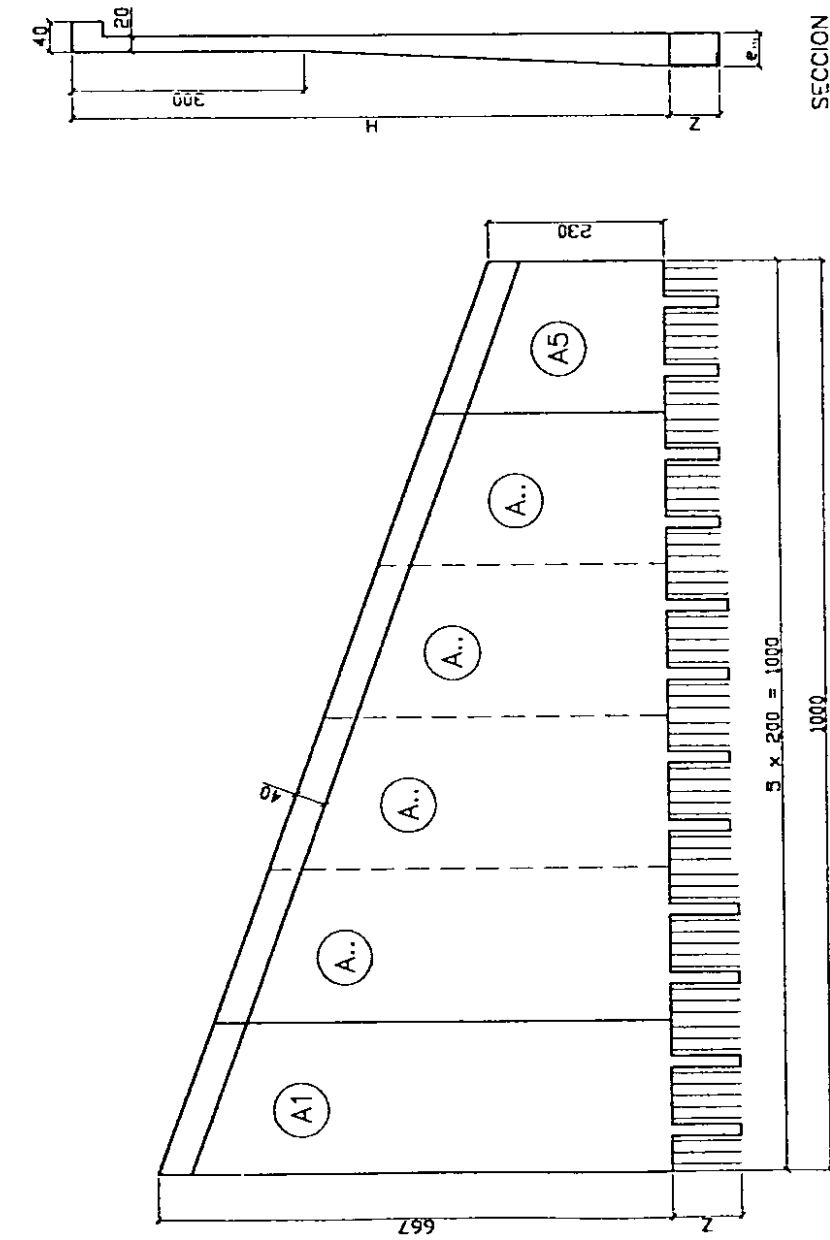
Armado Inferior (Puntera):

Perpendicular Muro: Ø12 /25cm
 Paralelo Muro: Ø12 /25cm

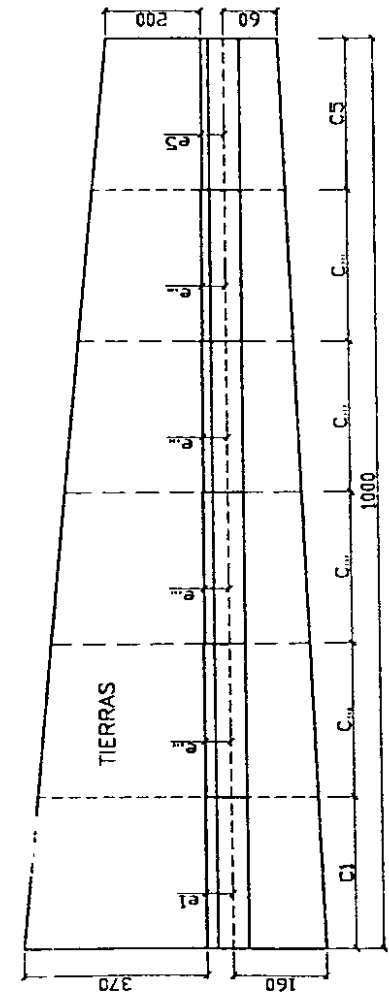
Armado a cortante: No necesario.

Armado a cortante: No necesario.

12. PLANOS



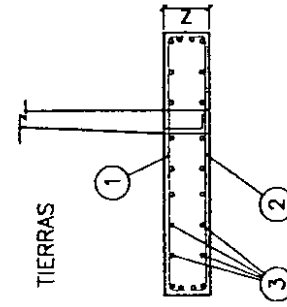
ALZADO CARA VISTA (Aleta Izda)



PLANTA

• COTAS EN CM.

ARMADO CIMENTACION



ARMADO CIMENTACION	
TIPO	
	1
C1	Ø25/15cm
C2	Ø20/13cm
C3	Ø16/10cm
C4	Ø12/15cm
C5	Ø12/25cm

PIEZA	H	e...	Z
A1	667.0	41.7	90
A2	579.4	36.5	90
A3	492.0	31.4	80
A4	404.8	28.2	60
A5	312.2	21.0	50

EM-81	CAUDAL	CONTROL	Cost.
ELEMENTOS PREFABRICADOS			
HORMIGON	H-300	INTENSO	1,40
ACERO	AEN-300-S	INTENSO	1,10
EJECUCION		INTENSO	1,90
OBRA IN SITU			
HORMIGON	H-250	NORMAL	1,80
ACERO	AEN-300	NORMAL	1,15
EJECUCION		NORMAL	1,80

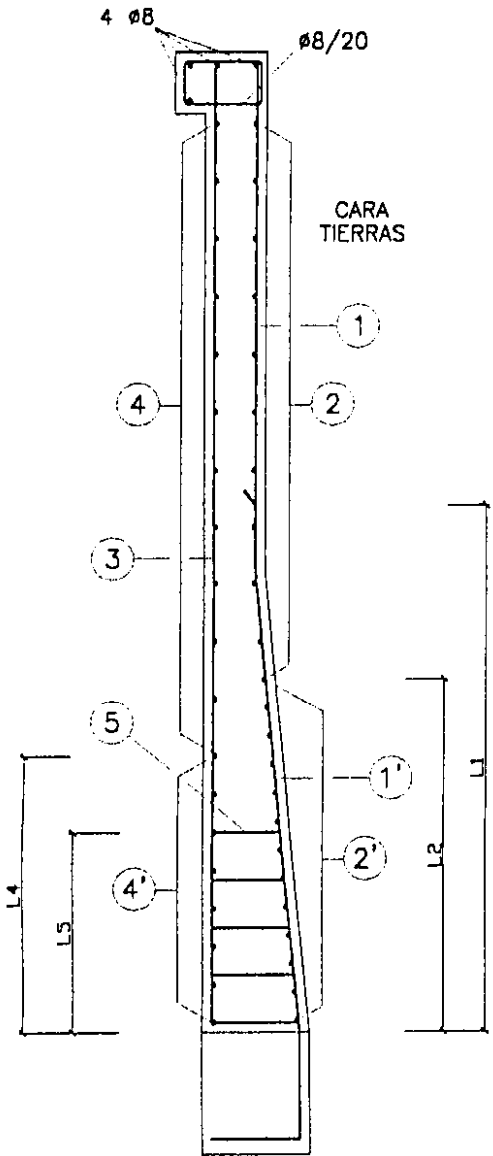
03/09/00		0		
FECHA	REV.	MODIFICACIONES		
PIEZA:	ALETA 1000x(867/230). EVN1-0.9			
OFERTA:	99/643			
OBRA:	SUBRAMO XV			
CLIENTE:	NECSO			
ALETA 1000x(867/230)		REVISADO:	APROBADO:	
		Obso. Comercial	Grig. Técnica	
				
		74.1		
		TOTAL		



ASTORIA

PREPARED BY THE ASTORIA CITY BOARD OF COMMISSIONERS

PREFABRICADOS DE HORMIGON



DEFINICIÓN DE ARMADO

	A 1	A 2	A 3	A 4	A 5
1	ø25/24	ø20/30	ø20/30	ø12/24	ø10/24
1'	ø25/8	ø20/10	ø20/15	ø12/8	ø10/8
L1	515	375	290	240	185
2	ø12/24	ø10/30	ø8/30	ø8/30	ø8/25
2'	ø12/8	ø10/12.5	ø8/10	ø8/15	--
L2	344	250	200	105	--
3	ø12/15	ø12/25	ø10/25	ø8/20	ø6/25
4	ø8/25	ø8/25	ø8/25	ø8/25	ø8/20
4'	ø8/12.5	ø8/12.5	ø8/15	ø8/15	--
L4	375	275	180	90	--
5	3ø8(pml)/25	3ø8(pml)/25	--	--	--
L5	275	100	--	--	--

Distancias en centímetros

EH-91	CALIDAD	CONTROL	Coef.
ELEMENTOS PREFABRICADOS			
HORMIGON	H-300	INTENSO	1,40
ACERO	AEH-500-S	INTENSO	1,10
EJECUCION		INTENSO	1,50
OBRA IN SITU			
HORMIGON	H-250	NORMAL	1,50
ACERO	AEH-500	NORMAL	1,15
EJECUCION		NORMAL	1,60

03/08/00	0		
FECHA	REV.	MODIFICACIONES	Nº PLANO
PIEZA:	ALETA 1000x(667/230). EVN1-0.8		74.2
OFERTA:	99/643		
OBRA:	ZARAGOZA		
CLIENTE:	NECSO		
ALETA 1000x(667/230)		REVISADO:	APPROBADO:
		Dpto. Comercial	Dpto. Técnica

<i>ALHOSA</i> PREFABRICADOS DE HORMIGÓN	ALETAS 600x(777/280) EVN2-1.7
Oferta: 99/643 Obra: SUBTRAMO XV Empresa: NECSO Fecha: Agosto de 2.000	

ÍNDICE

1.-	Generalidades
2.-	Descripción
3.-	Instrucciones aplicadas
4.-	Características de los materiales
5.-	Control de calidad
6.-	Coefficientes de seguridad
7.-	Parámetros del terreno
8.-	Acciones consideradas
9.-	Hipótesis de cálculo
10.-	Cálculos
11.-	Cimentación
12.-	Planos

1. Generalidades

En la presente memoria se muestran los cálculos realizados para justificar las Aletas Prefabricadas de hormigón que sostienen el terraplén.

2. Descripción

El sostenimiento de las tierras que forman el terraplén en las entradas de las obras de fábrica se realiza con aletas prefabricadas de hormigón armado.

El espesor de los muros que forman las aletas es de 20 cm. hasta los 300 cm. de profundidad y luego aumenta progresivamente, tal y como se muestra en los planos adjuntos.

La cimentación se realiza con hormigón vertido in situ

3. Instrucciones aplicadas

Para el cálculo de las Aletas, se han utilizado las siguientes Instrucciones y Normas:

* Instrucción para el Proyecto y Ejecución de Obras de Hormigón en Masa o Armado EH-91.

4. Características de los materiales

*** Hormigones:**

Hormigón en elemento prefabricado	H-300
Hormigón en obra in situ	H-250

*** Acero:**

Acero para armar corrugado	B-500 S
----------------------------	---------

5. Control de calidad

El control de calidad se atenderá a lo especificado en la EH-91, habiéndose seleccionado los siguientes niveles:

Elementos prefabricados:

a) Materiales:

- Hormigón	Control Intenso
- Armadura pasiva	Control Intenso

b) Ejecución:

- En toda la obra	Control Intenso
-------------------	-----------------

Obra in situ:

a) Materiales:

- Hormigón	Control Normal
- Armadura pasiva	Control Normal

b) Ejecución:

- En toda la obra	Control Normal
-------------------	----------------

6. Coeficientes de seguridad

De acuerdo con los niveles de control de calidad definidos, se adoptan los siguientes coeficientes de seguridad:

Elementos prefabricados:

- Coeficientes de minoración de resistencias:

Acero pasivo

$\gamma_s = 1,10$

Hormigón

$\gamma_c = 1,40$

- Coeficientes de ponderación de acciones:

$\gamma_f = 1,50$

Obra in situ:

- Coeficientes de minoración de resistencias:

Acero pasivo

$\gamma_s = 1,15$

Hormigón

$\gamma_c = 1,50$

- Coeficientes de ponderación de acciones:

$\gamma_f = 1,60$

7. Parámetros del terreno

En los cálculos se ha considerado un talud de terraplén 2H:1V con ángulo de rozamiento interno de 30°. La Aleta forma un ángulo de 60° con el pie del terraplén

Peso específico 2,0ton/m³

Ángulo de rozamiento interno 30°

Ángulo Talud coronación 14,1°

Coeficiente de empuje activo 0,396

8. Acciones consideradas**8.1 Empuje por efecto de las tierras**

Se considera el empuje activo de las tierras que se encuentran en el trasdós de la Aleta.

8.2 Sobrecargas de uso

Se considera una sobrecarga de 400 Kg/m² sobre el terraplén, que es la establecida para paseos de servicio.

9. Hipótesis de cálculo.**HIPÓTESIS I:**

- Empuje de las tierras

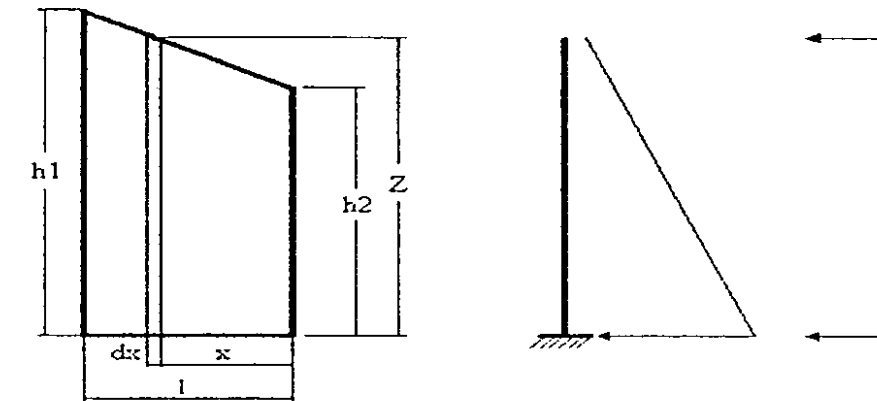
- Sobrecarga de uso

Combinación: 1,5 * [Caso (1) + Caso (2)]

10. Cálculos.

Dada la geometría de la estructura en la que se reduce la altura en función de la longitud y los esfuerzos se comportan de igual manera, cada tramo de la aleta se ha armado para la altura existente a una distancia, del lado mayor, de 1/3 de su longitud, siendo en todo momento superiores las sollicitaciones en este punto que la resultante sobre cada tramo.

Pza.	H.máx	H.mín	H.cál
1	777,0	611,7	722
2	610,9	446,1	556
3	445,3	280,0	390



$$M = \int_{x=0}^{x=l} dM = \int_{x=0}^{x=l} \left(\frac{1}{6} \cdot \lambda_h \cdot \gamma_t \cdot z^3 + \frac{1}{2} \cdot \lambda_h \cdot SC \cdot z^2 \right) \cdot dx =$$

$$= \frac{1}{6} \cdot \lambda_h \cdot \gamma_t \cdot \left(\frac{1}{4} \cdot \frac{h_1^4 - h_2^4}{h_1 - h_2} \right) \cdot l + \frac{1}{2} \cdot \lambda_h \cdot SC \cdot \left(\frac{1}{3} \cdot \frac{h_1^3 - h_2^3}{h_1 - h_2} \right) \cdot l \leq M \left(z = h_2 + \frac{2 \cdot (h_1 - h_2)}{3} \right)$$

$$V = \int_{x=0}^{x=l} dV = \int_{x=0}^{x=l} \left(\frac{1}{2} \cdot \lambda_h \cdot \gamma_t \cdot z^2 + \lambda_h \cdot SC \cdot z \right) \cdot dx =$$

$$= \frac{1}{2} \cdot \lambda_h \cdot \gamma_t \cdot \left(\frac{1}{3} \cdot \frac{h_1^3 - h_2^3}{h_1 - h_2} \right) \cdot l + \lambda_h \cdot SC \cdot \left(\frac{1}{2} \cdot \frac{h_1^2 - h_2^2}{h_1 - h_2} \right) \cdot l \leq V \left(z = h_2 + \frac{2 \cdot (h_1 - h_2)}{3} \right)$$

$$z = h_2 + \frac{h_1 - h_2}{l} \cdot x$$

DATOS GENERALES:

Obra: SUBTRAMO XV (EVN2-1.7)
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 600x(777x280)

TERRENO:

Densidad terreno: 0,0020 Kg/cm3
 Densidad Agua: 0,0010 Kg/cm3
 Indice Huecos: 30,0 %
 Densidad Aparente: 0,0013 Kg/cm3
 Angulo Roz.Int: 30,0 °
 Angulo Roz. Trno/Mro: 0,0 °
 Angulo de Talud: 14,1 °
 Coef. Empuje Activo Hztal: 0,396
 Coef. Empuje Activo Vtal: 0,000

MURO:

Altura máxima: 777 cm Quiebro 300 cm
 Resguardo Tierras: 0 cm Canto C. 20 cm
 Longitud Muro: 100 cm Canto Z. 52,7 cm
 Peso del Muro 5.835 Kg/ml Xcdg (m) 17,0 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm2
 Sobrecarga (prof.): 0,0000 Kg/cm2
 Prof. Aplic. (S.C.p.) 0 cm

MATERIALES ALZADO:

Fc,k 300 Kg/cm2 Gc (1,40)
 Fy,k 5100 Kg/cm2 Gs (1,10)
 Fc,d 214,3 Kg/cm2 Gf (1,50)
 Fy,d 4.636,4 Kg/cm2 Recubrimiento: 4,0 cm
 Fyv,d 4.200,0 Kg/cm2

ESFUERZOS:

	H_Calc cm	Canto cm	Md Kg x cm	As1 cm2	As2 cm2	Vd Kg	Vcu Kg	Ast cm2/ml
1	727	52,7	8.068.696	39,14	0,00	32.679	35.645	0,00
2	556	41,3	3.774.811	23,39	0,00	19.703	27.332	0,00
3	390	30,0	1.360.419	11,88	0,00	9.989	19.020	0,00

Aleta 600x(777x280)

Tierras: 2.000 Kg/m3 SC_c: 400 Kg/m2 Gc: 1,40
 Talud: 14,10° SC_p: 0 Kg/m2 Gs: 1,10
 C.E.h: 0,396 Z_SCp: 0 cm Gf: 1,50

Z (cm)	Eh (Kg)				Vd (Kg)	M (Kg)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
0	0	0	0	0	0	0	0	0	0	0
10	4	0	16	0	30	13	0	79	0	139
20	16	0	32	0	71	106	0	317	0	634
30	36	0	48	0	125	357	0	713	0	1.605
40	63	0	63	0	190	845	0	1.268	0	3.170
50	99	0	79	0	267	1.651	0	1.981	0	5.448
60	143	0	95	0	357	2.853	0	2.853	0	8.558
70	194	0	111	0	458	4.530	0	3.883	0	12.620
80	254	0	127	0	571	6.762	0	5.072	0	17.751
90	321	0	143	0	695	9.628	0	6.419	0	24.071
100	396	0	158	0	832	13.208	0	7.925	0	31.698
110	479	0	174	0	981	17.579	0	9.589	0	40.752
120	571	0	190	0	1.141	22.823	0	11.411	0	51.351
130	670	0	206	0	1.313	29.017	0	13.392	0	63.614
140	777	0	222	0	1.498	36.241	0	15.532	0	77.660
150	892	0	238	0	1.694	44.575	0	17.830	0	93.608
160	1.014	0	254	0	1.902	54.098	0	20.287	0	111.577
170	1.145	0	269	0	2.122	64.889	0	22.902	0	131.686
180	1.284	0	285	0	2.354	77.026	0	25.675	0	154.053
190	1.430	0	301	0	2.597	90.590	0	28.608	0	178.797
200	1.585	0	317	0	2.853	105.660	0	31.698	0	206.038
210	1.747	0	333	0	3.120	122.315	0	34.947	0	235.893
220	1.918	0	349	0	3.400	140.634	0	38.355	0	268.483
230	2.096	0	365	0	3.691	160.696	0	41.921	0	303.925
240	2.282	0	380	0	3.994	182.581	0	45.645	0	342.339
250	2.476	0	396	0	4.309	206.368	0	49.528	0	383.844
260	2.678	0	412	0	4.636	232.136	0	53.570	0	428.558
270	2.888	0	428	0	4.975	259.964	0	57.770	0	476.601
280	3.106	0	444	0	5.325	289.932	0	62.128	0	528.090
290	3.332	0	460	0	5.688	322.119	0	66.645	0	583.146
300	3.566	0	475	0	6.062	356.603	0	71.321	0	641.886
310	3.808	0	491	0	6.449	393.466	0	76.155	0	704.430
320	4.057	0	507	0	6.847	432.785	0	81.147	0	770.897
330	4.315	0	523	0	7.257	474.639	0	86.298	0	841.406
340	4.580	0	539	0	7.679	519.109	0	91.607	0	916.075
350	4.854	0	555	0	8.113	566.273	0	97.075	0	995.023
360	5.135	0	571	0	8.558	616.211	0	102.702	0	1.078.369
370	5.424	0	586	0	9.016	669.001	0	108.487	0	1.166.232
380	5.722	0	602	0	9.486	724.724	0	114.430	0	1.258.731
390	6.027	0	618	0	9.967	783.458	0	120.532	0	1.355.985
400	6.340	0	634	0	10.460	845.282	0	126.792	0	1.458.112
410	6.661	0	650	0	10.966	910.277	0	133.211	0	1.565.232
420	6.989	0	666	0	11.483	978.520	0	139.789	0	1.677.463
430	7.326	0	682	0	12.012	1.050.092	0	146.524	0	1.794.924
440	7.671	0	697	0	12.552	1.125.071	0	153.419	0	1.917.734
450	8.024	0	713	0	13.105	1.203.537	0	160.472	0	2.046.012
460	8.384	0	729	0	13.670	1.285.569	0	167.683	0	2.179.877
470	8.753	0	745	0	14.246	1.371.246	0	175.053	0	2.319.448
480	9.129	0	761	0	14.835	1.460.648	0	182.581	0	2.464.843

Aleta 600x(777x280)

Tierras: 2.000 Kg/m3

Talud: 14,10°

C.E.h: 0,396

SC_c: 400 Kg/m2

SC_p: 0 Kg/m2

Z_SCp: 0 cm

Gc: 1,40

Gs: 1,10

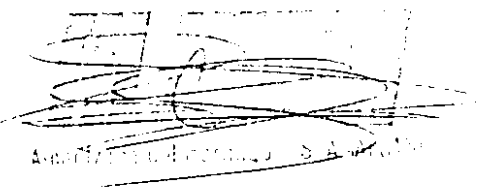
Gf: 1,50

Z (cm)	Eh (Kg)				Vd (Kg)	M (Kg)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
490	9.513	0	777	0	15.435	1.553.853	0	190.268	0	2.616.182
500	9.906	0	792	0	16.047	1.650.942	0	198.113	0	2.773.582
510	10.306	0	808	0	16.671	1.751.993	0	206.117	0	2.937.164
520	10.714	0	824	0	17.307	1.857.085	0	214.279	0	3.107.046
530	11.130	0	840	0	17.955	1.966.298	0	222.600	0	3.283.347
540	11.554	0	856	0	18.615	2.079.711	0	231.079	0	3.466.186
550	11.986	0	872	0	19.286	2.197.404	0	239.717	0	3.655.681
560	12.426	0	888	0	19.970	2.319.455	0	248.513	0	3.851.951
570	12.873	0	903	0	20.665	2.445.943	0	257.468	0	4.055.116
580	13.329	0	919	0	21.372	2.576.949	0	266.581	0	4.265.294
590	13.793	0	935	0	22.092	2.712.550	0	275.853	0	4.482.604
600	14.264	0	951	0	22.823	2.852.828	0	285.283	0	4.707.166
610	14.744	0	967	0	23.566	2.997.860	0	294.871	0	4.939.096
620	15.231	0	983	0	24.320	3.147.725	0	304.619	0	5.178.516
630	15.726	0	998	0	25.087	3.302.505	0	314.524	0	5.425.543
640	16.229	0	1.014	0	25.866	3.462.276	0	324.588	0	5.680.297
650	16.741	0	1.030	0	26.656	3.627.119	0	334.811	0	5.942.896
660	17.260	0	1.046	0	27.458	3.797.114	0	345.192	0	6.213.459
670	17.787	0	1.062	0	28.273	3.972.338	0	355.732	0	6.492.105
680	18.321	0	1.078	0	29.099	4.152.872	0	366.430	0	6.778.952
690	18.864	0	1.094	0	29.937	4.338.794	0	377.286	0	7.074.121
700	19.415	0	1.109	0	30.787	4.530.185	0	388.302	0	7.377.729
710	19.974	0	1.125	0	31.649	4.727.122	0	399.475	0	7.689.896
720	20.540	0	1.141	0	32.522	4.929.686	0	410.807	0	8.010.740
730	21.115	0	1.157	0	33.408	5.137.956	0	422.298	0	8.340.380
740	21.697	0	1.173	0	34.305	5.352.010	0	433.947	0	8.678.936
750	22.288	0	1.189	0	35.215	5.571.929	0	445.754	0	9.026.525
760	22.886	0	1.205	0	36.136	5.797.791	0	457.720	0	9.383.267
770	23.492	0	1.220	0	37.069	6.029.676	0	469.845	0	9.749.281
780	24.106	0	1.236	0	38.014	6.267.662	0	482.128	0	10.124.685

11. CIMENTACIONES

En las páginas siguientes se muestran los cálculos de la cimentación de la aleta.

En Alcañiz, Agosto de 2.000



Javier Tello Sánchez
Dpto. Técnico ALHOSA

- El presente informe se ha realizado con los datos aportados por el cliente para esta pieza prefabricada concreta.
Salvo comunicación escrita de lo contrario, las consideraciones en él realizadas, así como los resultados aportados, se ajustan a lo solicitado por el cliente.

DATOS GENERALES:

Obra: SUBTRAMO XV (EVN2-1.7)
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 600x(777/280)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 14,1 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 1
 Altura del Muro: 721,8 cm Quiebro 244,8 cm
 Altura tierras: 721,8 cm Canto.C 20,0 cm
 Canto.Z 52,7 cm
 Longitud Muro: 100,0 cm Xcdg (m) 17,3 cm
 Peso del Muro: 5.559 Kg/ml Xcdg (t) 188,8 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigón: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 129 cm
 Vuelo del Talón: 391 cm
 Canto de la Zapata: 90 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (Hztal): 0,396
 Base de la Zapata: 572,7 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-147	0	0
Muro:		-5559	-140		-862915
Tierras:	-26111	-64131	84	7065343	-24186777
Sobrecarga (coron.):	-1287	-1695	74	522213	-639352
Sobrecarga (prof.):	0	0	74	0	0
Zapata:		-12886	0		-3689835
	-27397	-84271		7587555	-29378879

Csd = 1,77 Csv = 3,87 e = -33,8 cm.

Aleta 600x(777/280) Pza. 1

TENSION DEL TERRENO: 1,73 < 2,00 (Servicio)
 2,08 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
 SP= 1,99 ST= 0,95 Le= 572,7
 (Kg/cm²) (Kg/cm²) (cm)

CIMENTACIÓN:

Fcd = 166,7 Kg/cm² Mayoración Cargas: 1,60
 Fyd = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S1= 318,88 SPf= 279,02 STf= 268,27 S2= 151,99
 qvP= -36,00 qvT= -304,76

Puntera: VPf= 136,8 MP= 2.522.369 Us= 30.417 6,86
 Talón: VTf= 399,0 MT= -9.075.656 Us= 113.452 25,58
 (cm) (Kgxcn) (Kg) (cm²)
 As,min= 13,50 cm²
 1,5 ‰

Cortante:

S1= 318,88 SPc= 293,56 STc= 241,48 S2= 151,99
 qvP= -36,00 qvT= -304,76

Puntera: VPc= 86,9 VP= 23.479 Vcu= 54.222 0,00
 Talón: VTc= 307,1 VT= -33.173 (Kg) (cm²/ml)
 (cm) (Kg)

Armado Superior (Talón):

Perpendicular Muro: Ø25 /15cm
 Paralelo Muro: Ø16 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø16 /20cm
 Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

Armado a cortante: No necesario.

DATOS GENERALES:

Obra: SUBTRAMO XV (EVN2-1.7)
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 600x(777/280)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 14,1 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 3
 Altura del Muro: 390,4 cm Quiebro 244,8 cm
 Altura tierras: 390,4 cm Canto.C 20,0 cm
 Canto.Z 30,0 cm
 Longitud Muro: 100,0 cm Xcdg (m) 11,1 cm
 Peso del Muro: 2.134 Kg/ml Xcdg (t) 138,8 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigón: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 62 cm
 Vuelo del Talón: 278 cm
 Canto de la Zapata: 90 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (H_ztal): 0,396
 Base de la Zapata: 370,0 cm

	Fh	Fv	e _x	Mv	Mr
F (coron.)			-113	0	0
Muro:		-2134	-112		-164781
Tierras:	-9146	-24406	46	1464709	-5640081
Sobrecarga (coron.):	-761	-1151	41	182919	-266005
Sobrecarga (prof.):	0	0	41	0	0
Zapata:		-8325	0		-1540008
	-9907	-36015		1647628	-7610876

C_{sd} = 2,10 C_{sv} = 4,62 e = -19,9 cm.

Aleta 600x(777/280) Pza. 3

TENSION DEL TERRENO: 1,13 < 2,00 (Servicio)
 1,31 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal

SP= 1,29 (Kg/cm²) ST= 0,66 (Kg/cm²) Le= 370,0 (cm)

CIMENTACIÓN:

F_{cd} = 166,7 Kg/cm² Mayoración Cargas: 1,60
 F_{yd} = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S1= 205,92 SPf= 187,83 STf= 182,13 S2= 105,57
 qvP= -36,00 qvT= -182,98

Puntera: VPf= 66,7 MP= 364.790 Us= 4.351 0,98
 Talón: VTf= 282,3 (cm) MT= -2.067.031 Us= 24.867 5,61
 (Kgxcn) (Kg) (cm²)
 A_{s,min}= 13,50 cm² 1,5 ‰

Cortante:

S1= 205,92 SPc= 200,44 STc= 158,13 S2= 105,57
 qvP= -36,00 qvT= -182,98

Puntera: VPc= 20,2 VP= 3.381 Vcu= 54.222 0,00
 Talón: VTc= 193,8 (cm) VT= -9.907 (Kg) (cm²/ml)

Armado Superior (Talón):

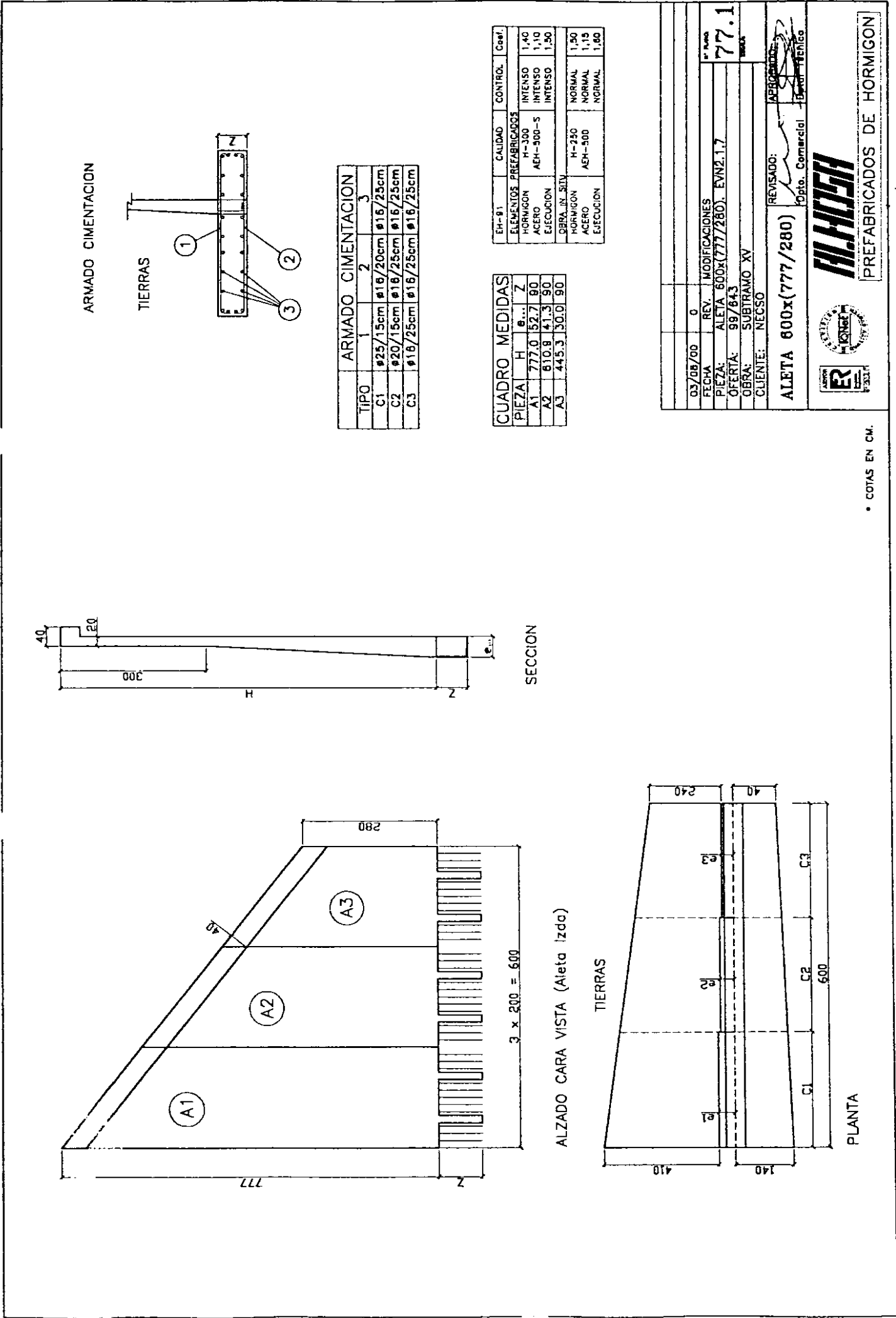
Perpendicular Muro: Ø16 /25cm
 Paralelo Muro: Ø16 /25cm

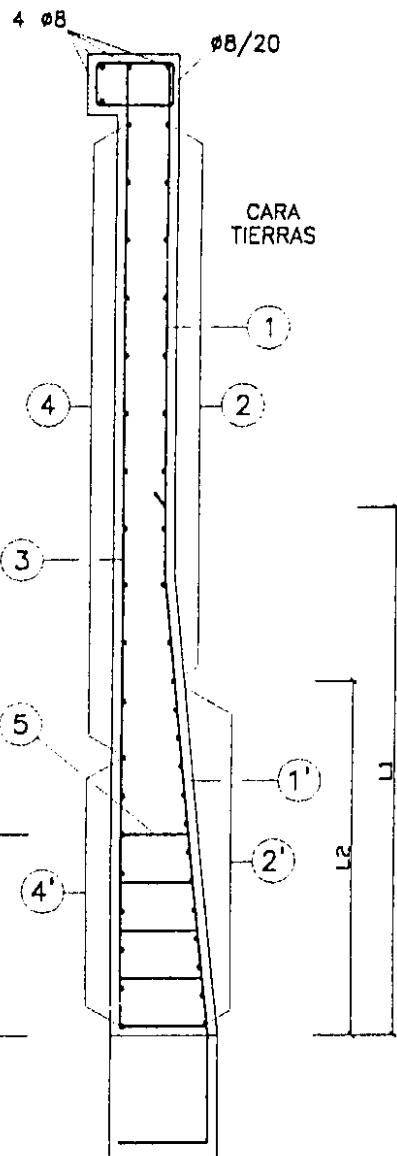
Armado Inferior (Puntera):

Perpendicular Muro: Ø16 /25cm
 Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

12. PLANOS





DEFINICIÓN DE ARMADO

	A 1	A 2	A 3
1	Ø25/22	Ø20/22	Ø16/30
1'	Ø25/11	Ø20/11	Ø16/15
L1	450	345	265
2	Ø10/24	Ø10/30	Ø8/30
2'	Ø10/8	Ø10/10	Ø8/15
L2	384	270	150
3	Ø16/20	Ø12/25	Ø8/20
4	Ø10/30	Ø8/25	Ø8/25
4'	Ø10/15	Ø8/12.5	Ø8/15
L4	375	300	135
5	5Ø8/25	--	--
L5	100	--	--

Distancias en centímetros

EH-91	CALIDAD	CONTROL	Coef.
ELEMENTOS PREFABRICADOS			
HORMIGÓN	H-300	INTENSO	1,40
ACERO	AEH-500-S	INTENSO	1,10
EJECUCIÓN		INTENSO	1,50
OBRA IN SITU			
HORMIGÓN	H-250	NORMAL	1,50
ACERO	AEH-500	NORMAL	1,15
EJECUCIÓN		NORMAL	1,60

03/08/00	0		
FECHA	REV.	MODIFICACIONES	Nº PLANO
PIEZA:	ALETA 600x(777/280).	EVN2.1.7	77.2
OFERTA:	99/643		
OBRA:	ZARAGOZA		
CLIENTE:	NECSO		
ALETA 600x(777/280)		REVISADO:	APROBADO:
		Opto. Comercial	Opto. Técnico

<i>ALHOSA</i> PREFABRICADOS DE HORMIGÓN	ALETAS 1400x(777/485) y 1200x(777/527) EVN2-1.7
Oferta: 99/643 Obra: SUBTRAMO XV Empresa: NECSO Fecha: Agosto de 2.000	

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1.-	Generalidades
2.-	Descripción
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4.-	Características de los materiales
5.-	Control de calidad
6.-	Coeficientes de seguridad
7.-	Parámetros del terreno
8.-	Acciones consideradas
9.-	Hipótesis de cálculo
10.-	Cálculos
11.-	Cimentación
12.-	Planos

1. Generalidades

En la presente memoria se muestran los cálculos realizados para justificar las Aletas Prefabricadas de hormigón que sostienen el terraplén.

2. Descripción

El sostenimiento de las tierras que forman el terraplén en las entradas de las obras de fábrica se realiza con aletas prefabricadas de hormigón armado.

El espesor de los muros que forman las aletas es de 20 cm. hasta los 300 cm. de profundidad y luego aumenta progresivamente, tal y como se muestra en los planos adjuntos.

La cimentación se realiza con hormigón vertido in situ

3. Instrucciones aplicadas

Para el cálculo de las Aletas, se han utilizado las siguientes Instrucciones y Normas:

* Instrucción para el Proyecto y Ejecución de Obras de Hormigón en Masa o Armado EH-91.

4. Características de los materiales

* Hormigones:

Hormigón en elemento prefabricado	H-300
Hormigón en obra in situ	H-250

* Acero:

Acero para armar corrugado	B-500 S
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5. Control de calidad

El control de calidad se atenderá a lo especificado en la EH-91, habiéndose seleccionado los siguientes niveles:

Elementos prefabricados:

a) Materiales:

- Hormigón	Control Intenso
- Armadura pasiva	Control Intenso

b) Ejecución:

- En toda la obra	Control Intenso
-------------------	-----------------

Obra in situ:

a) Materiales:

- Hormigón	Control Normal
- Armadura pasiva	Control Normal

b) Ejecución:

- En toda la obra	Control Normal
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6. Coeficientes de seguridad

De acuerdo con los niveles de control de calidad definidos, se adoptan los siguientes coeficientes de seguridad:

Elementos prefabricados:

- Coeficientes de minoración de resistencias:

Acero pasivo

$\gamma_s = 1,10$

Hormigón

$\gamma_c = 1,40$

- Coeficientes de ponderación de acciones:

$\gamma_f = 1,50$

Obra in situ:

- Coeficientes de minoración de resistencias:

Acero pasivo

$\gamma_s = 1,15$

Hormigón

$\gamma_c = 1,50$

- Coeficientes de ponderación de acciones:

$\gamma_f = 1,60$

7. Parámetros del terreno

En los cálculos se ha considerado un talud de terraplén 2H:1V con ángulo de rozamiento interno de 30°. La Aleta forma un ángulo de 25° con el pie del terraplén

Peso específico 2,0ton/m³

Ángulo de rozamiento interno 30°

Ángulo Talud coronación 24,4°

Coeficiente de empuje activo 0,495

8. Acciones consideradas**8.1 Empuje por efecto de las tierras**

Se considera el empuje activo de las tierras que se encuentran en el trasdós de la Aleta.

8.2 Sobrecargas de uso

Se considera una sobrecarga de 400 Kg/m² sobre el terraplén, que es la establecida para paseos de servicio.

9. Hipótesis de cálculo.**HIPÓTESIS I:**

- Empuje de las tierras

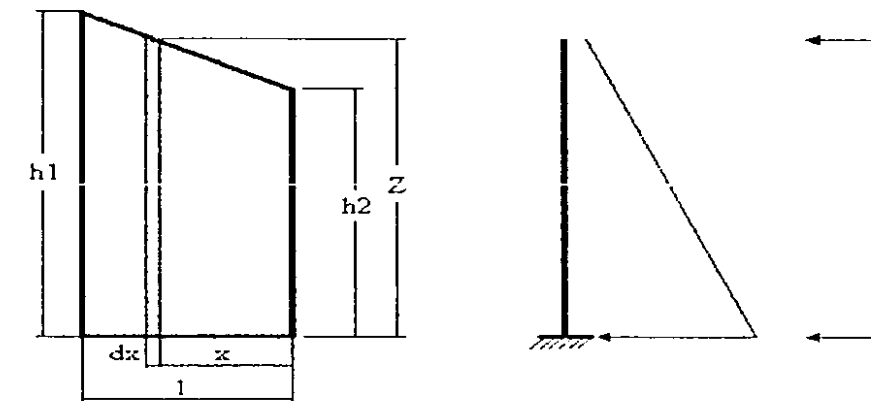
- Sobrecarga de uso

Combinación: 1,5 * [Caso (1) + Caso (2)]

10. Cálculos.

Dada la geometría de la estructura en la que se reduce la altura en función de la longitud y los esfuerzos se comportan de igual manera, cada tramo de la aleta se ha armado para la altura existente a una distancia, del lado mayor, de 1/3 de su longitud, siendo en todo momento superiores las sollicitaciones en este punto que la resultante sobre cada tramo.

Pza.	H.máx	H.mín	H.cálc
1	777,0	735,4	763
2	735,2	693,7	721
3	693,5	652,0	680
4	651,8	610,2	638
5	610,0	568,5	596
6	568,3	526,8	554
7	526,8	485,0	513



$$M = \int_{x=0}^{x=l} dM = \int_{x=0}^{x=l} \left(\frac{1}{6} \cdot \lambda_h \cdot \gamma_t \cdot z^3 + \frac{1}{2} \cdot \lambda_h \cdot SC \cdot z^2 \right) \cdot dx =$$

$$= \frac{1}{6} \cdot \lambda_h \cdot \gamma_t \cdot \left(\frac{1}{4} \cdot \frac{h_1^4 - h_2^4}{h_1 - h_2} \right) \cdot l + \frac{1}{2} \cdot \lambda_h \cdot SC \cdot \left(\frac{1}{3} \cdot \frac{h_1^3 - h_2^3}{h_1 - h_2} \right) \cdot l \leq M \left(z = h_2 + \frac{2 \cdot (h_1 - h_2)}{3} \right)$$

$$V = \int_{x=0}^{x=l} dV = \int_{x=0}^{x=l} \left(\frac{1}{2} \cdot \lambda_h \cdot \gamma_t \cdot z^2 + \lambda_h \cdot SC \cdot z \right) \cdot dx =$$

$$= \frac{1}{2} \cdot \lambda_h \cdot \gamma_t \cdot \left(\frac{1}{3} \cdot \frac{h_1^3 - h_2^3}{h_1 - h_2} \right) \cdot l + \lambda_h \cdot SC \cdot \left(\frac{1}{2} \cdot \frac{h_1^2 - h_2^2}{h_1 - h_2} \right) \cdot l \leq V \left(z = h_2 + \frac{2 \cdot (h_1 - h_2)}{3} \right)$$

$$z = h_2 + \frac{h_1 - h_2}{l} \cdot x$$

DATOS GENERALES:

Obra:
 Cliente:
 Nº Oferta:
 Pieza: Aleta 1400x(777x485)

TERRENO:

Densidad terreno: 0,0020 Kg/cm³
 Densidad Agua: 0,0010 Kg/cm³
 Indice Huecos: 30,0 %
 Densidad Aparente: 0,0013 Kg/cm³
 Angulo Roz.Int: 30,0 °
 Angulo Roz. Trno/Mro: 0,0 °
 Angulo de Talud: 24,4 °
 Coef. Empuje Activo Hztal: 0,495
 Coef. Empuje Activo Vtcal: 0,000

MURO:

Altura máxima: 777 cm Quiebro 300 cm
 Resguardo Tierras: 0 cm Canto C. 20 cm
 Longitud Muro: 100 cm Canto Z. 52,7 cm
 Peso del Muro 5.835 Kg/ml Xcdg (m) 17,0 cm

ACCIONES:

Prof. Nivel Freatico 1200 cm
 Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm²
 Prof. Aplic. (S.C.p.) 0 cm

MATERIALES ALZADO:

Fc,k 300 Kg/cm² Gc (1,40)
 Fy,k 5100 Kg/cm² Gs (1,10)
 Fc,d 214,3 Kg/cm² Gf (1,50)
 Fy,d 4.636,4 Kg/cm² Recubrimiento: 4,0 cm
 Fyv,d 4.200,0 Kg/cm²

ESFUERZOS:

	H_Calc cm	Canto cm	Md Kg x cm	As1 cm ²	As2 cm ²	Vd Kg	Vcu Kg	Ast cm ² /ml
1	763	52,7	11.852.055	60,67	0,00	45.462	35.645	5,33
2	721	49,8	10.054.912	54,26	0,00	40.745	33.552	4,15
3	680	47,0	8.449.171	48,26	0,00	36.286	31.459	2,97
4	638	44,1	7.024.063	42,67	0,00	32.084	29.366	1,79
5	596	41,3	5.768.820	37,47	0,00	28.141	27.273	0,62
6	555	38,4	4.672.671	32,65	0,00	24.457	25.179	0,00
7	513	35,5	3.724.847	28,20	0,00	21.030	23.086	0,00

Aleta 1400x(777x485)

Tierras: 2.000 Kg/m³ SC_c: 400 Kg/m² Gc: 1,40
 Talud: 24,40° SC_p: 0 Kg/m² Gs: 1,10
 C.E.h: 0,495 Z_SCp: 0 cm Gf: 1,50

Z (cm)	Eh (Kg)				Vd (Kg)	M (Kg)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
0	0	0	0	0	0	0	0	0	0	0
10	5	0	20	0	37	16	0	99	0	173
20	20	0	40	0	89	132	0	396	0	791
30	45	0	59	0	156	445	0	890	0	2.003
40	79	0	79	0	237	1.055	0	1.583	0	3.956
50	124	0	99	0	334	2.061	0	2.473	0	6.800
60	178	0	119	0	445	3.561	0	3.561	0	10.682
70	242	0	138	0	571	5.654	0	4.847	0	15.752
80	317	0	158	0	712	8.440	0	6.330	0	22.156
90	401	0	178	0	868	12.018	0	8.012	0	30.044
100	495	0	198	0	1.039	16.485	0	9.891	0	39.565
110	598	0	218	0	1.224	21.942	0	11.968	0	50.865
120	712	0	237	0	1.424	28.486	0	14.243	0	64.095
130	836	0	257	0	1.639	36.218	0	16.716	0	79.401
140	969	0	277	0	1.869	45.235	0	19.387	0	96.933
150	1.113	0	297	0	2.114	55.638	0	22.255	0	116.839
160	1.266	0	317	0	2.374	67.523	0	25.321	0	139.267
170	1.429	0	336	0	2.648	80.992	0	28.585	0	164.366
180	1.602	0	356	0	2.938	96.142	0	32.047	0	192.284
190	1.785	0	376	0	3.242	113.072	0	35.707	0	223.169
200	1.978	0	396	0	3.561	131.882	0	39.565	0	257.169
210	2.181	0	415	0	3.895	152.670	0	43.620	0	294.434
220	2.394	0	435	0	4.243	175.535	0	47.873	0	335.112
230	2.616	0	455	0	4.607	200.576	0	52.324	0	379.350
240	2.849	0	475	0	4.985	227.892	0	56.973	0	427.297
250	3.091	0	495	0	5.378	257.582	0	61.820	0	479.102
260	3.343	0	514	0	5.786	289.744	0	66.864	0	534.913
270	3.605	0	534	0	6.209	324.479	0	72.106	0	594.878
280	3.877	0	554	0	6.647	361.884	0	77.546	0	659.145
290	4.159	0	574	0	7.099	402.058	0	83.184	0	727.864
300	4.451	0	593	0	7.567	445.101	0	89.020	0	801.182
310	4.753	0	613	0	8.049	491.111	0	95.054	0	879.248
320	5.064	0	633	0	8.546	540.188	0	101.285	0	962.210
330	5.386	0	653	0	9.058	592.429	0	107.714	0	1.050.216
340	5.717	0	673	0	9.585	647.935	0	114.342	0	1.143.415
350	6.058	0	692	0	10.126	706.804	0	121.166	0	1.241.956
360	6.409	0	712	0	10.682	769.135	0	128.189	0	1.345.986
370	6.770	0	732	0	11.254	835.026	0	135.410	0	1.455.653
380	7.141	0	752	0	11.840	904.577	0	142.828	0	1.571.108
390	7.522	0	772	0	12.441	977.887	0	150.444	0	1.692.497
400	7.913	0	791	0	13.056	1.055.054	0	158.258	0	1.819.969
410	8.313	0	811	0	13.687	1.136.178	0	166.270	0	1.953.672
420	8.724	0	831	0	14.332	1.221.357	0	174.480	0	2.093.755
430	9.144	0	851	0	14.992	1.310.691	0	182.887	0	2.240.367
440	9.575	0	870	0	15.668	1.404.277	0	191.492	0	2.393.654
450	10.015	0	890	0	16.357	1.502.216	0	200.295	0	2.553.767
460	10.465	0	910	0	17.062	1.604.606	0	209.296	0	2.720.853
470	10.925	0	930	0	17.782	1.711.545	0	218.495	0	2.895.061
480	11.395	0	950	0	18.516	1.823.134	0	227.892	0	3.076.538

ESFUERZOS

Aleta 1400x(777x485)

Tierras: 2.000 Kg/m3 SC_c: 400 Kg./m2 Gc: 1,40
 Talud: 24,40° SC_p: 0 Kg./m2 Gs: 1,10
 C.E.h: 0,495 Z_SCp: 0 cm Gf: 1,50

Z (cm)	Eh (Kg)				Vd (Kg)	M (Kg)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
490	11.874	0	969	0	19.265	1.939.470	0	237.486	0	3.265.434
500	12.364	0	989	0	20.030	2.060.653	0	247.278	0	3.461.897
510	12.863	0	1.009	0	20.808	2.186.781	0	257.268	0	3.666.075
520	13.373	0	1.029	0	21.602	2.317.954	0	267.456	0	3.878.116
530	13.892	0	1.048	0	22.411	2.454.271	0	277.842	0	4.098.169
540	14.421	0	1.068	0	23.234	2.595.829	0	288.425	0	4.326.382
550	14.960	0	1.088	0	24.073	2.742.729	0	299.207	0	4.562.904
560	15.509	0	1.108	0	24.926	2.895.069	0	310.186	0	4.807.882
570	16.068	0	1.128	0	25.794	3.052.948	0	321.363	0	5.061.466
580	16.637	0	1.147	0	26.676	3.216.465	0	332.738	0	5.323.804
590	17.216	0	1.167	0	27.574	3.385.719	0	344.310	0	5.595.044
600	17.804	0	1.187	0	28.486	3.560.808	0	356.081	0	5.875.334
610	18.402	0	1.207	0	29.414	3.741.833	0	368.049	0	6.164.822
620	19.011	0	1.227	0	30.356	3.928.890	0	380.215	0	6.463.658
630	19.629	0	1.246	0	31.313	4.122.081	0	392.579	0	6.771.990
640	20.257	0	1.266	0	32.285	4.321.502	0	405.141	0	7.089.965
650	20.895	0	1.286	0	33.271	4.527.254	0	417.900	0	7.417.732
660	21.543	0	1.306	0	34.273	4.739.436	0	430.858	0	7.755.440
670	22.201	0	1.325	0	35.289	4.958.145	0	444.013	0	8.103.237
680	22.868	0	1.345	0	36.320	5.183.482	0	457.366	0	8.461.272
690	23.546	0	1.365	0	37.366	5.415.544	0	470.917	0	8.829.692
700	24.233	0	1.385	0	38.427	5.654.432	0	484.666	0	9.208.646
710	24.931	0	1.405	0	39.503	5.900.243	0	498.612	0	9.598.282
720	25.638	0	1.424	0	40.593	6.153.077	0	512.756	0	9.998.750
730	26.355	0	1.444	0	41.699	6.413.032	0	527.099	0	10.410.196
740	27.082	0	1.464	0	42.819	6.680.208	0	541.638	0	10.832.770
750	27.819	0	1.484	0	43.954	6.954.704	0	556.376	0	11.266.620
760	28.566	0	1.503	0	45.104	7.236.617	0	571.312	0	11.711.894
770	29.322	0	1.523	0	46.268	7.526.049	0	586.445	0	12.168.741
780	30.089	0	1.543	0	47.448	7.823.096	0	601.777	0	12.637.309

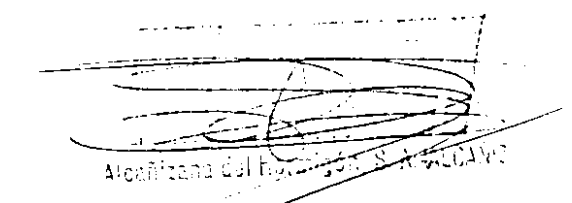
ALHOSA. Prefabricados de Hormigón.

Aleta Prefabricada

11. CIMENTACIONES

En las páginas siguientes se muestran los cálculos de la cimentación de la aleta.

En Alcañiz, Agosto de 2.000



Javier Tello Sánchez
Dpto. Técnico ALHOSA

- El presente informe se ha realizado con los datos aportados por el cliente para esta pieza prefabricada concreta.
 Salvo comunicación escrita de lo contrario, las consideraciones en él realizadas, así como los resultados aportados, se ajustan a lo solicitado por el cliente.

DATOS GENERALES:

Obra: SUBTRAMO XV (EVN2-1.7)
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1400x(777/485)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 24,4 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 1
 Altura del Muro: 764,3 cm Quiebro 287,3 cm
 Altura tierras: 764,3 cm Canto.C 20,0 cm
 Canto.Z 52,7 cm
 Longitud Muro: 100,0 cm Xcdg (m) 17,1 cm
 Peso del Muro: 5.771 Kg/ml Xcdg (t) 234,6 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigón: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 155 cm
 Vuelo del Talón: 471 cm
 Canto de la Zapata: 100 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (H_ztal): 0,495
 Base de la Zapata: 679,4 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-174	0	0
Muro:		-5771	-167		-1047992
Tierras:	-36944	-87030	103	10643756	-38611199
Sobrecarga (coron.):	-1710	-2017	88	738889	-894631
Sobrecarga (prof.):	0	0	88	0	0
Zapata:		-16984	0		-5769238
	-38654	-111802		11382646	-46323061

C_{sd} = 1,67 C_{sv} = 4,07 e = -28,8 cm.

Aleta 1400x(777/485) Pza. 1

TENSION DEL TERRENO: 1,85 < 2,00 (Servicio)
 2,22 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
 SP= 2,06 ST= 1,23 Le= 679,4
 (Kg/cm²) (Kg/cm²) (cm)

CIMENTACIÓN:

F_{cd} = 166,7 Kg/cm² Mayoración Cargas: 1,60
 F_{yd} = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S₁ = 330,26 SP_f = 298,10 ST_f = 290,83 S₂ = 196,36
 q_vP = -40,00 q_vT = -341,78

Puntera: VP_f = 163,1 MP = 3.720.064 Us = 40.181 9,06
 Talón: VT_f = 479,3 MT = -13.087.593 Us = 147.386 33,23
 (cm) (Kgxcn) (Kg) (cm²)
 A_{s,min} = 15,00 cm²
 1,5 ‰

Cortante:

S₁ = 330,26 SP_c = 308,92 ST_c = 270,75 S₂ = 196,36
 q_vP = -40,00 q_vT = -341,78

Puntera: VP_c = 108,2 VP = 30.262 V_{cu} = 60.677 0,00
 Talón: VT_c = 377,4 VT = -40.846 (Kg) (cm²/ml)
 (cm) (Kg)

Armado Superior (Talón):

Perpendicular Muro: Ø25 /13cm
 Paralelo Muro: Ø16 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø16 /20cm
 Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

Armado a cortante: No necesario.

DATOS GENERALES:

Obra: SUBTRAMO XV (EVN2-1.7)
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1400x(777/485)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 24,4 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 3
 Altura del Muro: 682,5 cm Quiebro 285,9 cm
 Altura tierras: 682,5 cm Canto.C 20,0 cm
 Canto.Z 47,2 cm
 Longitud Muro: 100,0 cm Xcdg (m) 15,4 cm
 Peso del Muro: 4.760 Kg/ml Xcdg (t) 209,4 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigon: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 127 cm
 Vuelo del Talón: 420 cm
 Canto de la Zapata: 100 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (Hztal): 0,495
 Base de la Zapata: 593,9 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-160	0	0
Muro:		-4760	-155		-715280
Tierras:	-30281	-69033	86	7898193	-26498699
Sobrecarga (coron.):	-1548	-1789	73	605622	-686620
Sobrecarga (prof.):	0	0	73	0	0
Zapata:		-14846	0		-4408291
	-31829	-90429		8503815	-32308890

Csd = 1,64 Csv = 3,80 e = -34,8 cm.

Aleta 1400x(777/485) Pza. 3

TENSION DEL TERRENO: 1,79 < 2,00 (Servicio)
 2,15 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
 SP= 2,06 (Kg/cm²) ST= 0,99 (Kg/cm²) Le= 593,9 (cm)

CIMENTACIÓN:

Fcd = 166,7 Kg/cm² Mayoración Cargas: 1,60
 Fyd = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S1= 329,38 SPf= 290,76 STf= 281,22 S2= 157,90
 qvP= -40,00 qvT= -309,38

Puntera: VPf= 133,7 MP= 2.473.022 Us= 26.574 5,99
 Talón: VTf= 427,1 MT= -10.066.266 Us= 111.779 25,21
 (cm) (Kgxcn) (Kg) (cm²)
 As,min= 15,00 cm²
 1,5 ‰

Cortante:

S1= 329,38 SPc= 306,37 STc= 252,03 S2= 157,90
 qvP= -40,00 qvT= -309,38

Puntera: VPc= 79,7 VP= 22.138 Vcu= 60.677 0,00
 Talón: VTc= 326,0 VT= -34.040 (Kg) (cm²/ml)
 (cm) (Kg)

Armado Superior (Talón):

Perpendicular Muro: Ø25 /16cm
 Paralelo Muro: Ø16 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø16 /20cm
 Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

Obra: SUBTRAMO XV (EVN2-1.7)
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1400x(777/485)

TERRENO:

Densidad terreno:	0,00200 Kg/cm3
Angulo rozamiento interno:	30,0 °
Angulo rozamiento terreno muro:	0,0 °
Angulo de Talud:	24,4 °
Coefficiente de rozamiento:	0,58
Tensión Admisible:	2,0 Kg/cm2
Densidad del hormigón:	0,0025 Kg/cm3

DATOS DEL MURO:

Nº Pza:	4		
Altura del Muro:	640,2 cm	Quiebro	285,9 cm
Altura tierras:	640,2 cm	Canto.C	20,0 cm
		Canto.Z	44,3 cm
Longitud Muro:	100,0 cm	Xcdg (m)	14,6 cm
Peso del Muro:	4.276 Kg/ml	Xcdg (t)	196,9 cm

ACCIONES:

Sobrecarga (coron.):	0,0400 Kg/cm2		
Sobrecarga (prof.):	0,0000 Kg/cm2	Prof.(S.C.p)	0 cm

RESISTENCIAS:

Hormigon:	250 Kg/cm2	(1,50)
Acero:	5.100 Kg/cm2	(1,15)
Acciones:		(1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera:	112 cm
Vuelo del Talon:	394 cm
Canto de la Zapata:	80 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (H _z tal):	0,495
Base de la Zapata:	551,0 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-153	0	0
Muro:		-4276	-149		-575276
Tierras:	-25650	-60679	78	6157412	-21468723
Sobrecarga (coron.):	-1425	-1674	66	512997	-592382
Sobrecarga (prof.):	0	0	66	0	0
Zapata:		-11019	0		-3035497
	-27075	-77648		6670410	-25671878

Csd = 1,65 Csv = 3,85 c = -31,7 cm.

Aleta 1400x(777/485) Pza. 4

TENSION DEL TERRENO:	1,65	<	2,00	(Servicio)	
	1,98	<	4,00	(Empuje mayorado)	(1,50)

Distribucion Trapezoidal
SP= 1,90 ST= 0,92 Le= 551,0
(Kg/cm2) (Kg/cm2) (cm)

CIMENTACIÓN:

Fcd =	166,7 Kg/cm ²	Mayoración Cargas:	1,60
Fyd =	4.434,8 Kg/cm ²	Recubrimiento:	6,0 cm.

CÁLCULO ZAPATA:

Flexión:

S1= 303,23	SPf= 269,64	STf= 260,89	S2= 147,76
qvP= -32,00		qvT= -284,63	

Puntera:	VPf= 119,0	MP= 1.841.903	Us= 25.193	5,68
Talón:	VTf= 400,9	MT= -7.969.592	Us= 113.883	25,68
	(cm)	(Kgxcn)	(Kg)	(cm2)
As,min=	12,00 cm2			
	1,5 ‰			

Cortante:

S1= 303,23	SPc= 281,96	STc= 238,14	S2= 147,76
qvP= -32,00		qvT= -284,63	

Puntera:	VPc= 75,4	VP= 19.644	Vcu= 47.767	0,00
Talón:	VTc= 320,3	VT= -29.364	(Kg)	(cm2/ml)
	(cm)	(Kg)		

<u>Armado Superior (Talón):</u>	<u>Armado Inferior (Puntera):</u>
Perpendicular Muro: Ø25 /16cm	Perpendicular Muro: Ø16 /25cm
Paralelo Muro: Ø16 /25cm	Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

DATOS GENERALES:

Obra: SUBTRAMO XV (EVN2-1.7)
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1400x(777/485)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 24,4 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 5
 Altura del Muro: 597,9 cm Quiebro 285,9 cm
 Altura tierras: 597,9 cm Canto.C 20,0 cm
 Canto.Z 41,4 cm
 Longitud Muro: 100,0 cm Xcdg (m) 13,7 cm
 Peso del Muro: 3.823 Kg/ml Xcdg (t) 184,4 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigon: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 98 cm
 Vuelo del Talón: 369 cm
 Canto de la Zapata: 80 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (H_ztal): 0,495
 Base de la Zapata: 508,1 cm

	Fh	Fv	e _x	Mv	Mr
F (coron.)			-146	0	0
Muro:		-3823	-142		-454148
Tierras:	-22724	-52858	70	5134476	-17113689
Sobrecarga (coron.):	-1341	-1560	59	454479	-505020
Sobrecarga (prof.):	0	0	59	0	0
Zapata:		-10161	0		-2581172
	-24065	-68402		5588954	-20654029

C_{sd} = 1,64 C_{sv} = 3,70 e = -34,4 cm.

Aleta 1400x(777/485) Pza. 5

TENSION DEL TERRENO: 1,62 < 2,00 (Servicio)
 1,94 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
 SP= 1,89 (Kg/cm²) ST= 0,80 (Kg/cm²) Le= 508,1 (cm)

CIMENTACIÓN:

F_{cd} = 166,7 Kg/cm² Mayoración Cargas: 1,60
 F_{yd} = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S₁= 302,84 SP_f= 266,94 ST_f= 256,97 S₂= 128,00
 q_vP= -32,00 q_vT= -267,86

Puntera: VP_f= 104,3 MP= 1.408.151 Us= 19.205 4,33
 Talón: VT_f= 374,8 (cm) MT= -6.803.256 (Kgxcn) Us= 96.365 21,73
 As,min= 12,00 cm² 1,5 ‰

Cortante:

S₁= 302,84 SP_c= 281,81 ST_c= 229,37 S₂= 128,00
 q_vP= -32,00 q_vT= -267,86

Puntera: VP_c= 61,1 VP= 15.905 V_{cu}= 47.767 0,00
 Talón: VT_c= 294,6 (cm) VT= -26.269 (Kg) (cm²/ml)

Armado Superior (Talón):

Perpendicular Muro: Ø20 /13cm
 Paralelo Muro: Ø16 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø16 /25cm
 Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

DATOS GENERALES:

Obra: SUBTRAMO XV (EVN2-1.7)
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1400x(777/485)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 24,4 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 6
 Altura del Muro: 555,5 cm Quiebro 285,9 cm
 Altura tierras: 555,5 cm Canto.C 20,0 cm
 Canto.Z 38,5 cm
 Longitud Muro: 100,0 cm Xcdg (m) 13,0 cm
 Peso del Muro: 3.401 Kg/ml Xcdg (t) 171,9 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigon: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 84 cm
 Vuelo del Talón: 343 cm
 Canto de la Zapata: 80 cm

COMPROBACIÓN DE ESTABILIDAD:

Coeficiente Empuje Activo (H_ztal): 0,495
 Base de la Zapata: 465,2 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-139	0	0
Muro:		-3401	-136		-350446
Tierras:	-19975	-45572	62	4231612	-13385455
Sobrecarga (coron.):	-1257	-1445	52	399503	-424537
Sobrecarga (prof.):	0	0	52	0	0
Zapata:		-9303	0		-2163657
	-21232	-59721		4631115	-16324095

C_{sd} = 1,62 C_{sv} = 3,52 e = -37,0 cm.

Aleta 1400x(777/485) Pza. 6

TENSION DEL TERRENO: 1,59 < 2,00 (Servicio)
 1,91 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
 SP= 1,90 ST= 0,67 Le= 465,2
 (Kg/cm²) (Kg/cm²) (cm)

CIMENTACIÓN:

F_{cd} = 166,7 Kg/cm² Mayoración Cargas: 1,60
 F_{yd} = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S₁= 303,57 SP_f= 265,76 ST_f= 254,40 S₂= 107,28
 q_vP= -32,00 q_vT= -251,07

Puntera: VP_f= 89,6 MP= 1.039.095 U_s= 14.137 3,19
 Talón: VT_f= 348,6 MT= -5.757.956 U_s= 80.934 18,25
 (cm) (Kgxcn) (Kg) (cm²)
 A_{s,min}= 12,00 cm²
 1,5 ‰

Cortante:

S₁= 303,57 SP_c= 283,81 ST_c= 220,73 S₂= 107,28
 q_vP= -32,00 q_vT= -251,07

Puntera: VP_c= 46,8 VP= 12.250 V_{cu}= 47.767 0,00
 Talón: VT_c= 268,9 VT= -23.407 (Kg) (cm²/ml)
 (cm) (Kg)

Armado Superior (Talón):

Perpendicular Muro: Ø20 /13cm
 Paralelo Muro: Ø16 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø16 /25cm
 Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

DATOS GENERALES:

Obra: SUBTRAMO XV (EVN2-1.7)
Cliente: NECSO
Nº Oferta: 99/643
Pieza: Aleta 1400x(777/485)

TERRENO:
Densidad terreno: 0,00200 Kg/cm3
Angulo rozamiento interno: 30,0 °
Angulo rozamiento terreno muro: 0,0 °
Angulo de Talud: 24,4 °
Coeficiente de rozamiento: 0,58
Tensión Admisible: 2,0 Kg/cm2
Densidad del hormigón: 0,0025 Kg/cm3

DATOS DEL MURO:
Nº Pza: 7
Altura del Muro: 513,2 cm Quiebro 285,9 cm
Altura tierras: 513,2 cm Canto.C 20,0 cm
Canto.Z 35,6 cm
Longitud Muro: 100,0 cm Xcdg (m) 12,2 cm
Peso del Muro: 3.009 Kg/ml Xcdg (t) 159,4 cm

ACCIONES:
Sobrecarga (coron.): 0,0400 Kg/cm2
Sobrecarga (prof.): 0,0000 Kg/cm2 Prof.(S.C.p) 0 cm

RESISTENCIAS:
Hormigon: 250 Kg/cm2 (1,50)
Acero: 5.100 Kg/cm2 (1,15)
Acciones: (1,60)

DATOS DE LA ZAPATA:
Vuelo Puntera: 70 cm
Vuelo del Talon: 317 cm
Canto de la Zapata: 60 cm

COMPROBACION DE ESTABILIDAD:
Coeficiente Empuje Activo (Hztal): 0,495
Base de la Zapata: 422,3 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-132	0	0
Muro:		-3009	-129		-262721
Tierras:	-16250	-38820	53	3104859	-10235879
Sobrecarga (coron.):	-1134	-1331	45	324996	-350931
Sobrecarga (prof.):	0	0	45	0	0
Zapata:		-6334	0		-1337214
	-17384	-49493		3429855	-12186745

Csd = 1,64 Csv = 3,55 e = -34,1 cm.

Aleta 1400x(777/485) Pza. 7

TENSION DEL TERRENO: 1,46 < 2,00 (Servicio)
1,74 < 4,00 (Empuje mayorado) (1,50)
Distribucion Trapezoidal
SP= 1,74 (Kg/cm2) ST= 0,60 (Kg/cm2) Le= 422,3 (cm)

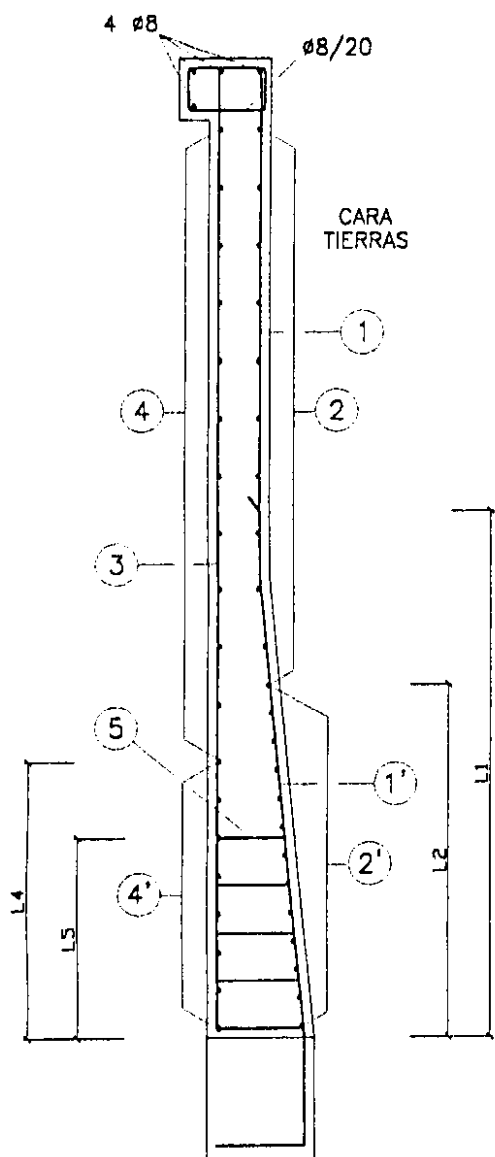
CIMENTACIÓN:
Fcd = 166,7 Kg/cm2 Mayoración Cargas: 1,60
Fyd = 4.434,8 Kg/cm2 Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:
Flexión:
S1= 278,44 SPf= 246,21 STf= 235,48 S2= 96,64
qvP= -24,00 qvT= -226,25
Puntera: VPf= 74,9 MP= 682.853 Us= 12.752 2,88
Talón: VTf= 322,5 (cm) MT= -4.332.503 (Kgxcn) Us= 84.948 19,15
As,min= 9,00 cm2 (Kg) (cm2)
1,5 ‰

Cortante:
S1= 278,44 SPc= 260,13 STc= 209,94 S2= 96,64
qvP= -24,00 qvT= -226,25
Puntera: VPc= 42,5 VP= 10.430 Vcu= 34.857 0,00
Talón: VTc= 263,1 (cm) VT= -19.198 (Kg) (cm2/ml)
(Kg)

Armado Superior (Talón): Armado Inferior (Puntera):
Perpendicular Muro: Ø20 /16cm Perpendicular Muro: Ø12 /25cm
Paralelo Muro: Ø12 /25cm Paralelo Muro: Ø12 /25cm

Armado a cortante: No necesario.



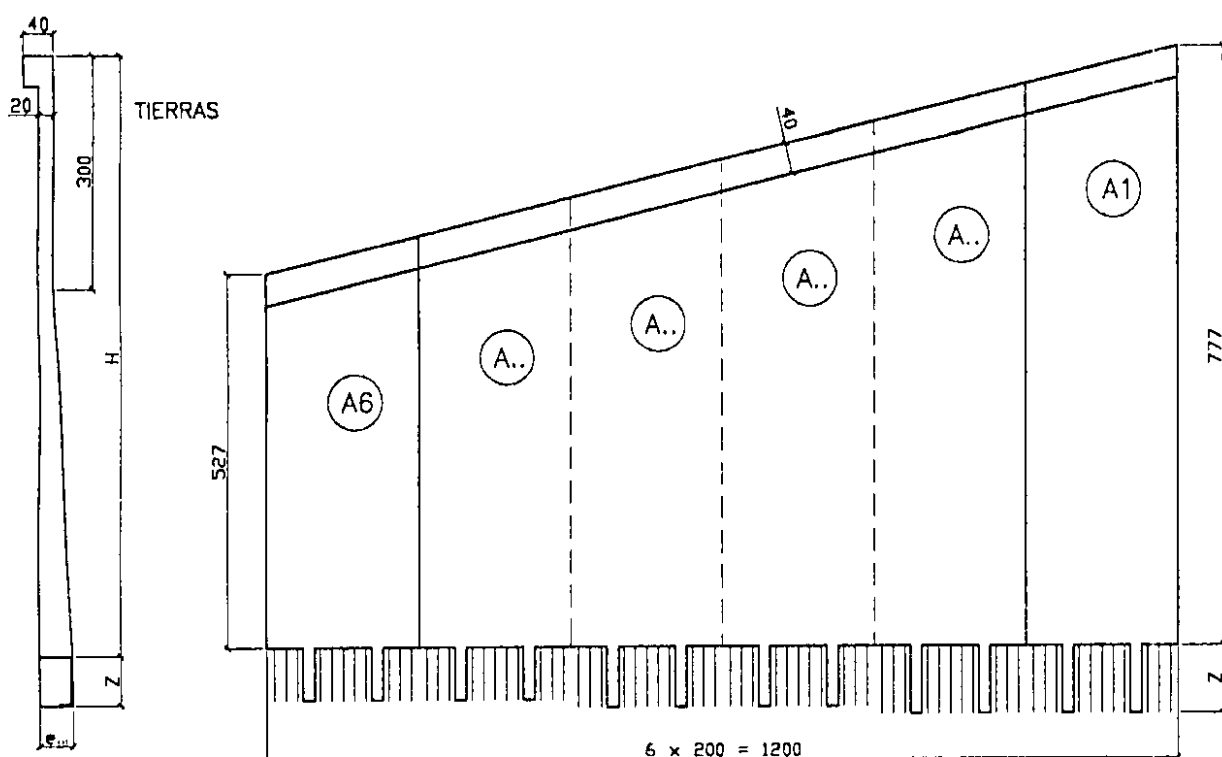
DEFINICIÓN DE ARMADO

	A1	A2	A3	A4	A5	A6	A7
1	Ø25/24	Ø25/27	Ø25/20	Ø25/22	Ø20/16	Ø20/27	Ø20/22
1'	Ø25/8	Ø25/9	Ø25/10	Ø25/11	Ø20/8	Ø20/9	Ø20/11
L1	510	490	380	360	315	375	295
2	Ø12/24	Ø12/30	Ø10/24	Ø10/24	Ø10/30	Ø10/30	Ø10/30
2'	Ø12/8	Ø12/10	Ø10/8	Ø10/8	Ø10/10	Ø10/10	Ø10/12.5
L2	328	350	336	296	300	250	225
3	Ø20/25	Ø16/20	Ø12/15	Ø12/15	Ø12/20	Ø12/25	Ø10/20
4	Ø10/30	Ø8/20	Ø8/20	Ø8/20	Ø8/25	Ø8/25	Ø8/25
4'	Ø10/15	Ø8/10	Ø8/10	Ø8/10	Ø8/12.5	Ø8/12.5	Ø8/12.5
L4	375	350	310	270	300	275	225
5	3Ø8(pml)/25	3Ø8(pml)/25	3Ø8(pml)/25	3Ø8(pml)/25	3Ø8(pml)/25	--	--
L5	250	200	150	125	75	--	--

Distancias en centímetros

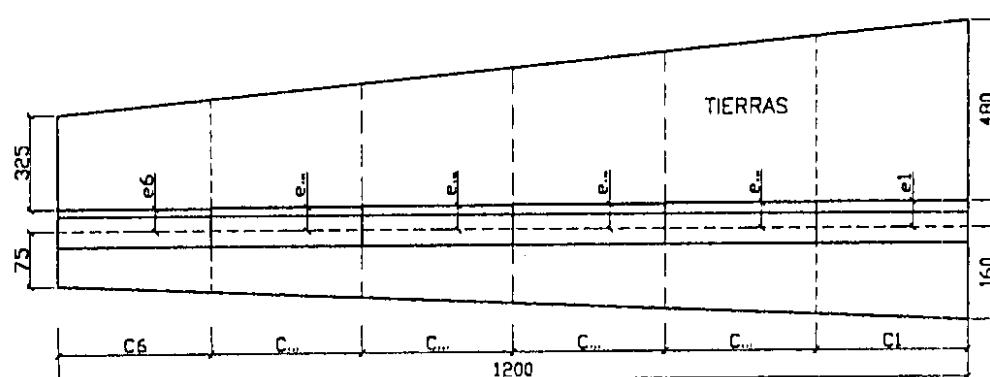
EH-91	CALIDAD	CONTROL	Coef.
ELEMENTOS PREFABRICADOS			
HORMIGON	H-300	INTENSO	1,40
ACERO	AEH-500-S	INTENSO	1,10
EJECUCION		INTENSO	1,50
OBRA IN SITU			
HORMIGON	H-250	NORMAL	1,50
ACERO	AEH-500	NORMAL	1,15
EJECUCION		NORMAL	1,60

03/08/00	0	MODIFICACIONES	Nº PLANO
FECHA	REV.		75.2
PIEZA:	Aleta 1400x(777/485). EVN2-1.7		
OFERTA:	99/643		
OBRA:	ZARAGOZA		
CLIENTE:	NECSO		
Aleta 1400x(777/485)			REVISADO: APROBADO:
			Dpto. Comercial Dpto. Técnico
ALFALCER PREFABRICADOS DE HORMIGON			



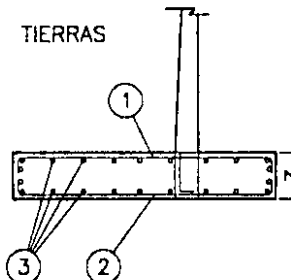
SECCION

ALZADO CARA VISTA (Aleta Dcha)



PLANTA

ARMADO CIMENTACION



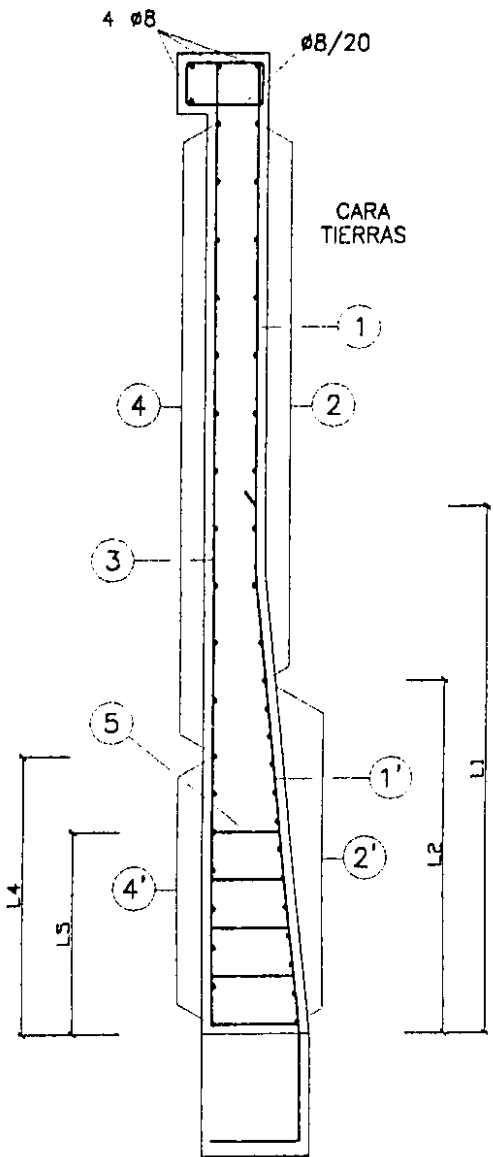
TIPO	1	2	3
C1	Ø25/13cm	Ø16/20cm	Ø16/25cm
C2	Ø25/13cm	Ø16/20cm	Ø16/25cm
C3	Ø25/16cm	Ø16/20cm	Ø16/25cm
C4	Ø25/16cm	Ø16/25cm	Ø16/25cm
C5	Ø20/13cm	Ø16/25cm	Ø16/25cm
C6	Ø20/13cm	Ø16/25cm	Ø16/25cm

PIEZA	H	e...	Z
A1	777.0	52.7	100
A2	735.2	49.8	100
A3	693.5	47.0	100
A4	651.8	44.1	80
A5	610.0	41.3	80
A6	568.3	38.4	80

EH-91	CALIDAD	CONTROL	Coef.
ELEMENTOS PREFABRICADOS			
HORMIGON	H-300	INTENSO	1,40
ACERO	AEH-500-S	INTENSO	1,10
EJECUCION		INTENSO	1,50
OBRA IN SITU			
HORMIGON	H-250	NORMAL	1,50
ACERO	AEH-500	NORMAL	1,15
EJECUCION		NORMAL	1,60

03/08/00	0	MODIFICACIONES	Nº PLANO
FECHA	REV.		76.1
PIEZA:	Aleta 1200x(777/527). EVN2-1.7		
OFERTA:	99/643		
OBRA:	SUBTRAMO XV		
CLIENTE:	NECSO		
Aleta 1200x(777/527)			REVISADO: APROBADO:
			Dpto. Comercial Dpto. Técnico
ALFALCER PREFABRICADOS DE HORMIGON			

* COTAS EN CM.



DEFINICIÓN DE ARMADO

	A1	A2	A3	A4	A5	A6
1	Ø25/24	Ø25/27	Ø25/20	Ø25/22	Ø20/16	Ø20/27
1'	Ø25/8	Ø25/9	Ø25/10	Ø25/11	Ø20/8	Ø20/9
L1	510	490	380	360	315	375
2	Ø12/24	Ø12/30	Ø10/24	Ø10/24	Ø10/30	Ø10/30
2'	Ø12/8	Ø12/10	Ø10/8	Ø10/8	Ø10/10	Ø10/10
L2	328	350	336	296	300	250
3	Ø20/25	Ø16/20	Ø12/15	Ø12/15	Ø12/20	Ø12/25
4	Ø10/30	Ø8/20	Ø8/20	Ø8/20	Ø8/25	Ø8/25
4'	Ø10/15	Ø8/10	Ø8/10	Ø8/10	Ø8/12.5	Ø8/12.5
L4	375	350	310	270	300	275
5	3Ø8(pml)/25	3Ø8(pml)/25	3Ø8(pml)/25	3Ø8(pml)/25	3Ø8(pml)/25	--
L5	250	200	150	125	75	--

Distancias en centímetros

EH-91	CALIDAD	CONTROL	Coef.
ELEMENTOS PREFABRICADOS			
HORMIGON	H-300	INTENSO	1,40
ACERO	AEH-500-S	INTENSO	1,10
EJECUCION		INTENSO	1,50
OBRA IN SITU			
HORMIGON	H-250	NORMAL	1,50
ACERO	AEH-500	NORMAL	1,15
EJECUCION		NORMAL	1,60

03/08/00	0	
FECHA	REV.	MODIFICACIONES
PIEZA:	ALETA 1200x(777/527)	EVN2-1.7
OFERTA:	99/643	
OBRA:	ZARAGOZA	
CLIENTE:	NECSO	
ALETA 1200x(777/527)		REVISADO: APROBADO:
		Opto. Comercial Opto. Técnico
PREFABRICADOS DE HORMIGON		

<i>ALHOSA</i> PREFABRICADOS DE HORMIGÓN	ALETAS 630x(777/488) EVN2-1.7
Oferta: 99/643 Obra: SUBTRAMO XV Empresa: NECSO Fecha: Agosto de 2.000	

ÍNDICE

- 1.- Generalidades
- 2.- Descripción
- 3.- Instrucciones aplicadas
- 4.- Características de los materiales
- 5.- Control de calidad
- 6.- Coeficientes de seguridad
- 7.- Parámetros del terreno
- 8.- Acciones consideradas
- 9.- Hipótesis de cálculo
- 10.- Cálculos
- 11.- Cimentación
- 12.- Planos

1. Generalidades

En la presente memoria se muestran los cálculos realizados para justificar las Aletas Prefabricadas de hormigón que sostienen el terraplén.

2. Descripción

El sostenimiento de las tierras que forman el terraplén en las entradas de las obras de fábrica se realiza con aletas prefabricadas de hormigón armado.

El espesor de los muros que forman las aletas es de 20 cm. hasta los 300 cm. de profundidad y luego aumenta progresivamente, tal y como se muestra en los planos adjuntos.

La cimentación se realiza con hormigón vertido in situ

3. Instrucciones aplicadas

Para el cálculo de las Aletas, se han utilizado las siguientes Instrucciones y Normas:

* Instrucción para el Proyecto y Ejecución de Obras de Hormigón en Masa o Armado EH-91.

4. Características de los materiales*** Hormigones:**

Hormigón en elemento prefabricado	H-300
Hormigón en obra in situ	H-250

*** Acero:**

Acero para armar corrugado	B-500 S
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5. Control de calidad

El control de calidad se atenderá a lo especificado en la EH-91, habiéndose seleccionado los siguientes niveles:

Elementos prefabricados:**a) Materiales:**

- Hormigón	Control Intenso
- Armadura pasiva	Control Intenso

b) Ejecución:

- En toda la obra	Control Intenso
-------------------	-----------------

Obra in situ:**a) Materiales:**

- Hormigón	Control Normal
- Armadura pasiva	Control Normal

b) Ejecución:

- En toda la obra	Control Normal
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6. Coeficientes de seguridad

De acuerdo con los niveles de control de calidad definidos, se adoptan los siguientes coeficientes de seguridad:

Elementos prefabricados:

- Coeficientes de minoración de resistencias:

Acero pasivo

$\gamma_s = 1,10$

Hormigón

$\gamma_c = 1,40$

- Coeficientes de ponderación de acciones:

$\gamma_f = 1,50$

Obra in situ:

- Coeficientes de minoración de resistencias:

Acero pasivo

$\gamma_s = 1,15$

Hormigón

$\gamma_c = 1,50$

- Coeficientes de ponderación de acciones:

$\gamma_f = 1,60$

7. Parámetros del terreno

En los cálculos se ha considerado un talud de terraplén 2H:1V con ángulo de rozamiento interno de 30°. La Aleta forma un ángulo de 60° con el pie del terraplén

Peso específico 2,0ton/m³

Ángulo de rozamiento interno 30°

Ángulo Talud coronación 14,1°

Coeficiente de empuje activo 0,396

8. Acciones consideradas**8.1 Empuje por efecto de las tierras**

Se considera el empuje activo de las tierras que se encuentran en el trasdós de la Aleta.

8.2 Sobrecargas de uso

Se considera una sobrecarga de 400 Kg/m² sobre el terraplén, que es la establecida para paseos de servicio.

9. Hipótesis de cálculo.**HIPÓTESIS I:**

- Empuje de las tierras

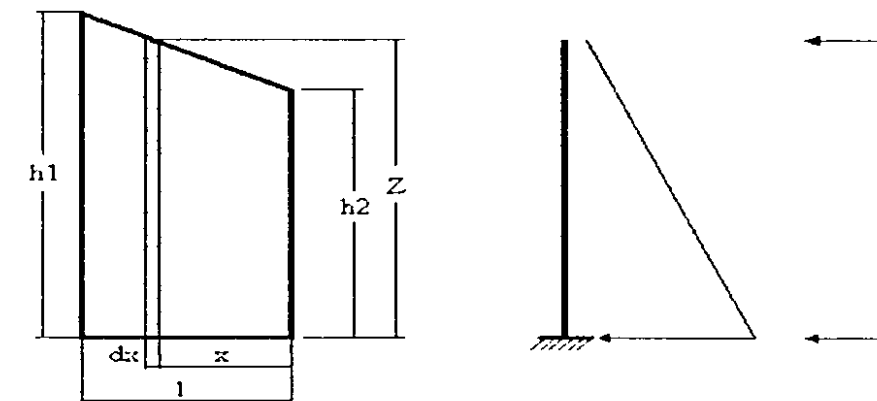
- Sobrecarga de uso

Combinación: 1,5 * [Caso (1) + Caso (2)]

10. Cálculos.

Dada la geometría de la estructura en la que se reduce la altura en función de la longitud y los esfuerzos se comportan de igual manera, cada tramo de la aleta se ha armado para la altura existente a una distancia, del lado mayor, de 1/3 de su longitud, siendo en todo momento superiores las solicitaciones en este punto que la resultante sobre cada tramo.

Pza.	H.máx	H.mín	H.cálculo
1	777,0	680,8	745
2	680,8	584,6	649
3	584,6	488,0	553



$$M = \int_{x=0}^{x=l} dM = \int_{x=0}^{x=l} \left(\frac{1}{6} \cdot \lambda_h \cdot \gamma_t \cdot z^3 + \frac{1}{2} \cdot \lambda_h \cdot SC \cdot z^2 \right) \cdot dx =$$

$$= \frac{1}{6} \cdot \lambda_h \cdot \gamma_t \cdot \left(\frac{1}{4} \cdot \frac{h_1^4 - h_2^4}{h_1 - h_2} \right) \cdot l + \frac{1}{2} \cdot \lambda_h \cdot SC \cdot \left(\frac{1}{3} \cdot \frac{h_1^3 - h_2^3}{h_1 - h_2} \right) \cdot l \leq M \left(z = h_2 + \frac{2 \cdot (h_1 - h_2)}{3} \right)$$

$$V = \int_{x=0}^{x=l} dV = \int_{x=0}^{x=l} \left(\frac{1}{2} \cdot \lambda_h \cdot \gamma_t \cdot z^2 + \lambda_h \cdot SC \cdot z \right) \cdot dx =$$

$$= \frac{1}{2} \cdot \lambda_h \cdot \gamma_t \cdot \left(\frac{1}{3} \cdot \frac{h_1^3 - h_2^3}{h_1 - h_2} \right) \cdot l + \lambda_h \cdot SC \cdot \left(\frac{1}{2} \cdot \frac{h_1^2 - h_2^2}{h_1 - h_2} \right) \cdot l \leq V \left(z = h_2 + \frac{2 \cdot (h_1 - h_2)}{3} \right)$$

$$z = h_2 + \frac{h_1 - h_2}{l} \cdot x$$

DATOS GENERALES:

Obra: SUBTRAMO XV (EVN2-1,7)
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 630x(777x488)

TERRENO:

Densidad terreno: 0,0020 Kg/cm³
 Densidad Agua: 0,0010 Kg/cm³
 Indice Huecos: 30,0 %
 Densidad Aparente: 0,0013 Kg/cm³
 Angulo Roz.Int: 30,0 °
 Angulo Roz. Trno/Mro: 0,0 °
 Angulo de Talud: 14,1 °
 Coef. Empuje Activo Hztal: 0,396
 Coef. Empuje Activo Vtcal: 0,000

MURO:

Altura máxima: 777 cm Quiebro 300 cm
 Resguardo Tierras: 0 cm Canto C. 20 cm
 Longitud Muro: 100 cm Canto Z. 52,7 cm
 Peso del Muro: 5.835 Kg/ml Xcdg (m) 17,0 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm²
 Prof. Aplic. (S.C.p.) 0 cm

MATERIALES ALZADO:

Fc,k 300 Kg/cm² Gc (1,40)
 Fy,k 5100 Kg/cm² Gs (1,10)
 Fc,d 214,3 Kg/cm² Gf (1,50)
 Fy,d 4.636,4 Kg/cm² Recubrimiento: 4,0 cm
 Fyv,d 4.200,0 Kg/cm²

ESFUERZOS:

	H_Calc	Canto	Md	As1	As2	Vd	Vcu	Ast
	cm	cm	Kg x cm	cm ²	cm ²	Kg	Kg	cm ² /ml
1	745	52,7	8.847.732	43,36	0,00	34.748	35.645	0,00
2	649	46,1	5.904.475	33,06	0,00	26.541	30.811	0,00
3	552	39,5	3.698.707	24,27	0,00	19.437	25.978	0,00

Aleta 630x(777x488)

Tierras: 2.000 Kg/m³ SC_c: 400 Kg/m² Gc: 1,40
 Talud: 14,10° SC_p: 0 Kg/m² Gs: 1,10
 C.E.h: 0,396 Z_SCp: 0 cm Gf: 1,50

Z	Eh (Kg)				Vd	M (Kg)				Md
(cm)	(Tierras)	(Agua)	(SC.c)	(SC.p)	(Kg)	(Tierras)	(Agua)	(SC.c)	(SC.p)	(Kg x cm)
0	0	0	0	0	0	0	0	0	0	0
10	4	0	16	0	30	13	0	79	0	139
20	16	0	32	0	71	106	0	317	0	634
30	36	0	48	0	125	357	0	713	0	1.605
40	63	0	63	0	190	845	0	1.268	0	3.170
50	99	0	79	0	267	1.651	0	1.981	0	5.448
60	143	0	95	0	357	2.853	0	2.853	0	8.558
70	194	0	111	0	458	4.530	0	3.883	0	12.620
80	254	0	127	0	571	6.762	0	5.072	0	17.751
90	321	0	143	0	695	9.628	0	6.419	0	24.071
100	396	0	158	0	832	13.208	0	7.925	0	31.698
110	479	0	174	0	981	17.579	0	9.589	0	40.752
120	571	0	190	0	1.141	22.823	0	11.411	0	51.351
130	670	0	206	0	1.313	29.017	0	13.392	0	63.614
140	777	0	222	0	1.498	36.241	0	15.532	0	77.660
150	892	0	238	0	1.694	44.575	0	17.830	0	93.608
160	1.014	0	254	0	1.902	54.098	0	20.287	0	111.577
170	1.145	0	269	0	2.122	64.889	0	22.902	0	131.686
180	1.284	0	285	0	2.354	77.026	0	25.675	0	154.053
190	1.430	0	301	0	2.597	90.590	0	28.608	0	178.797
200	1.585	0	317	0	2.853	105.660	0	31.698	0	206.038
210	1.747	0	333	0	3.120	122.315	0	34.947	0	235.893
220	1.918	0	349	0	3.400	140.634	0	38.355	0	268.483
230	2.096	0	365	0	3.691	160.696	0	41.921	0	303.925
240	2.282	0	380	0	3.994	182.581	0	45.645	0	342.339
250	2.476	0	396	0	4.309	206.368	0	49.528	0	383.844
260	2.678	0	412	0	4.636	232.136	0	53.570	0	428.558
270	2.888	0	428	0	4.975	259.964	0	57.770	0	476.601
280	3.106	0	444	0	5.325	289.932	0	62.128	0	528.090
290	3.332	0	460	0	5.688	322.119	0	66.645	0	583.146
300	3.566	0	475	0	6.062	356.603	0	71.321	0	641.886
310	3.808	0	491	0	6.449	393.466	0	76.155	0	704.430
320	4.057	0	507	0	6.847	432.785	0	81.147	0	770.897
330	4.315	0	523	0	7.257	474.639	0	86.298	0	841.406
340	4.580	0	539	0	7.679	519.109	0	91.607	0	916.075
350	4.854	0	555	0	8.113	566.273	0	97.075	0	995.023
360	5.135	0	571	0	8.558	616.211	0	102.702	0	1.078.369
370	5.424	0	586	0	9.016	669.001	0	108.487	0	1.166.232
380	5.722	0	602	0	9.486	724.724	0	114.430	0	1.258.731
390	6.027	0	618	0	9.967	783.458	0	120.532	0	1.355.985
400	6.340	0	634	0	10.460	845.282	0	126.792	0	1.458.112
410	6.661	0	650	0	10.966	910.277	0	133.211	0	1.565.232
420	6.989	0	666	0	11.483	978.520	0	139.789	0	1.677.463
430	7.326	0	682	0	12.012	1.050.092	0	146.524	0	1.794.924
440	7.671	0	697	0	12.552	1.125.071	0	153.419	0	1.917.734
450	8.024	0	713	0	13.105	1.203.537	0	160.472	0	2.046.012
460	8.384	0	729	0	13.670	1.285.569	0	167.683	0	2.179.877
470	8.753	0	745	0	14.246	1.371.246	0	175.053	0	2.319.448
480	9.129	0	761	0	14.835	1.460.648	0	182.581	0	2.464.843

Aleta 630x(777x488)

Tierras: 2.000 Kg/m3 SC_c: 400 Kg/m2 Gc: 1,40
 Talud: 14,10° SC_p: 0 Kg/m2 Gs: 1,10
 C.E.h: 0,396 Z_SCp: 0 cm Gf: 1,50

Z (cm)	Eh (Kg)				Vd (Kg)	M (Kg)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
490	9.513	0	777	0	15.435	1.553.853	0	190.268	0	2.616.182
500	9.906	0	792	0	16.047	1.650.942	0	198.113	0	2.773.582
510	10.306	0	808	0	16.671	1.751.993	0	206.117	0	2.937.164
520	10.714	0	824	0	17.307	1.857.085	0	214.279	0	3.107.046
530	11.130	0	840	0	17.955	1.966.298	0	222.600	0	3.283.347
540	11.554	0	856	0	18.615	2.079.711	0	231.079	0	3.466.186
550	11.986	0	872	0	19.286	2.197.404	0	239.717	0	3.655.681
560	12.426	0	888	0	19.970	2.319.455	0	248.513	0	3.851.951
570	12.873	0	903	0	20.665	2.445.943	0	257.468	0	4.055.116
580	13.329	0	919	0	21.372	2.576.949	0	266.581	0	4.265.294
590	13.793	0	935	0	22.092	2.712.550	0	275.853	0	4.482.604
600	14.264	0	951	0	22.823	2.852.828	0	285.283	0	4.707.166
610	14.744	0	967	0	23.566	2.997.860	0	294.871	0	4.939.096
620	15.231	0	983	0	24.320	3.147.725	0	304.619	0	5.178.516
630	15.726	0	998	0	25.087	3.302.505	0	314.524	0	5.425.543
640	16.229	0	1.014	0	25.866	3.462.276	0	324.588	0	5.680.297
650	16.741	0	1.030	0	26.656	3.627.119	0	334.811	0	5.942.896
660	17.260	0	1.046	0	27.458	3.797.114	0	345.192	0	6.213.459
670	17.787	0	1.062	0	28.273	3.972.338	0	355.732	0	6.492.105
680	18.321	0	1.078	0	29.099	4.152.872	0	366.430	0	6.778.952
690	18.864	0	1.094	0	29.937	4.338.794	0	377.286	0	7.074.121
700	19.415	0	1.109	0	30.787	4.530.185	0	388.302	0	7.377.729
710	19.974	0	1.125	0	31.649	4.727.122	0	399.475	0	7.689.896
720	20.540	0	1.141	0	32.522	4.929.686	0	410.807	0	8.010.740
730	21.115	0	1.157	0	33.408	5.137.956	0	422.298	0	8.340.380
740	21.697	0	1.173	0	34.305	5.352.010	0	433.947	0	8.678.936
750	22.288	0	1.189	0	35.215	5.571.929	0	445.754	0	9.026.525
760	22.886	0	1.205	0	36.136	5.797.791	0	457.720	0	9.383.267
770	23.492	0	1.220	0	37.069	6.029.676	0	469.845	0	9.749.281
780	24.106	0	1.236	0	38.014	6.267.662	0	482.128	0	10.124.685

11. CIMENTACIONES

En las páginas siguientes se muestran los cálculos de la cimentación de la aleta.

En Alcañiz, Agosto de 2.000



Javier Tello Sánchez

Dpto. Técnico ALHOSA

- El presente informe se ha realizado con los datos aportados por el cliente para esta pieza prefabricada concreta.
 Salvo comunicación escrita de lo contrario, las consideraciones en él realizadas, así como los resultados aportados, se ajustan a lo solicitado por el cliente.

DATOS GENERALES:

Obra: SUBTRAMO XV (EVN2-1.7)
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 630x(777/488)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 0,0 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 1
 Altura del Muro: 747,0 cm Quiebro 270,0 cm
 Altura tierras: 747,0 cm Canto.C 20,0 cm
 Canto.Z 52,7 cm
 Longitud Muro: 100,0 cm Xcdg (m) 17,2 cm
 Peso del Muro: 5.685 Kg/ml Xcdg (t) 187,9 cm

ACCIONES:

Sobrecarga (coron.): 0,1000 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigón: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 133 cm
 Vuelo del Talón: 399 cm
 Canto de la Zapata: 90 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (Hztal): 0,333
 Base de la Zapata: 584,9 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-149	0	0
Muro:		-5685	-142		-907753
Tierras:	-23352	-62919	81	6515164	-24253922
Sobrecarga (coron.):	-2790	-4316	77	1167600	-1663679
Sobrecarga (prof.):	0	0	77	0	0
Zapata:		-13161	0		-3849008
	-26142	-86080		7682764	-30674362

Csd = 1,90 Csv = 3,99 e = -35,2 cm.

Aleta 630x(777/488) Pza. 1

TENSION DEL TERRENO: 1,74 < 2,00 (Servicio)
 2,07 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
 SP= 2,00 (Kg/cm²) ST= 0,94 (Kg/cm²) Le= 584,9 (cm)

CIMENTACIÓN:

Fcd = 166,7 Kg/cm² Mayoración Cargas: 1,60
 Fyd = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S1= 320,55 SPf= 279,46 STf= 268,73 S2= 150,38
 qvP= -36,00 qvT= -304,38

Puntera: VPf= 141,2 MP= 2.701.562 Us= 32.608 7,35
 Talón: VTf= 406,8 MT= -9.477.980 Us= 118.759 26,78
 (cm) (Kgxcn) (Kg) (cm2)
 As,min= 13,50 cm²
 1,5 ‰

Cortante:

S1= 320,55 SPc= 293,98 STc= 241,99 S2= 150,38
 qvP= -36,00 qvT= -304,38

Puntera: VPc= 91,3 VP= 24.776 Vcu= 54.222 0,00
 Talón: VTc= 314,9 VT= -34.069 (Kg) (cm2/ml)
 (cm) (Kg)

Armado Superior (Talón):

Perpendicular Muro: Ø25 /15cm
 Paralelo Muro: Ø16 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø16 /20cm
 Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

DATOS GENERALES:

Obra: SUBTRAMO XV (EVN2-1.7)
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 630x(777/488)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 0,0 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 2
 Altura del Muro: 653,8 cm
 Altura tierras: 653,8 cm
 Longitud Muro: 100,0 cm
 Peso del Muro: 4.552 Kg/ml

Quiebro: 266,8 cm
 Canto.C: 20,0 cm
 Canto.Z: 46,5 cm
 Xcdg (m): 15,3 cm
 Xcdg (t): 173,2 cm

ACCIONES:

Sobrecarga (coron.): 0,1000 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigón: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 113 cm
 Vuelo del Talón: 366 cm
 Canto de la Zapata: 90 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (Hztal): 0,333
 Base de la Zapata: 525,4 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-139	0	0
Muro:		-4552	-134		-621846
Tierras:	-18442	-50244	70	4572571	-17215577
Sobrecarga (coron.):	-2479	-3921	67	922113	-1343439
Sobrecarga (prof.):	0	0	67	0	0
Zapata:		-11822	0		-3105720
	-20922	-70539		5494684	-22286584

Csd = 1,95 Csv = 4,06 e = -32,8 cm.

Aleta 630x(777/488) Pza. 2

TENSION DEL TERRENO: 1,59 < 2,00 (Servicio)
 1,89 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
 SP= 1,84 (Kg/cm²) ST= 0,84 (Kg/cm²) Le= 525,4 (cm)

CIMENTACIÓN:

Fcd = 166,7 Kg/cm² Mayoración Cargas: 1,60
 Fyd = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S1= 295,17 SPf= 258,36 STf= 248,40 S2= 134,44
 qvP= -36,00 qvT= -271,91

Puntera: VPf= 120,3 MP= 1.786.944 Us= 21.467 4,84
 Talón: VTf= 372,5 (cm) MT= -6.903.230 (Kgxcn) Us= 85.234 (Kg) 19,22 (cm²)
 As,min= 13,50 cm² 1,5 ‰

Cortante:

S1= 295,17 SPc= 273,35 STc= 220,57 S2= 134,44
 qvP= -36,00 qvT= -271,91

Puntera: VPc= 71,3 VP= 17.709 Vcu= 54.222 0,00
 Talón: VTc= 281,6 (cm) VT= -26.580 (Kg) (Kg) (cm²/ml)

Armado Superior (Talón):

Perpendicular Muro: Ø25 /20cm
 Paralelo Muro: Ø16 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø16 /25cm
 Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

DATOS GENERALES:

Obra: SUBTRAMO XV (EVN2-1.7)
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 630x(777/488)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 0,0 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 3
 Altura del Muro: 554,3 cm Quiebro 266,8 cm
 Altura tierras: 554,3 cm Canto.C 20,0 cm
 Canto.Z 39,7 cm
 Longitud Muro: 100,0 cm Xcdg (m) 13,4 cm
 Peso del Muro: 3.480 Kg/ml Xcdg (t) 158,7 cm

ACCIONES:

Sobrecarga (coron.): 0,1000 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigón: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 93 cm
 Vuelo del Talón: 332 cm
 Canto de la Zapata: 90 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (H_ztal): 0,333
 Base de la Zapata: 465,3 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-129	0	0
Muro:		-3480	-126		-393881
Tierras:	-13839	-38450	59	2972201	-11502553
Sobrecarga (coron.):	-2148	-3519	57	691931	-1052811
Sobrecarga (prof.):	0	0	57	0	0
Zapata:		-10468	0		-2435295
	-15986	-55918		3664132	-15384541

C_{sd} = 2,02 C_{sv} = 4,20 e = -29,2 cm.

Aleta 630x(777/488) Pza. 3

TENSION DEL TERRENO: 1,43 < 2,00 (Servicio)
 1,68 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
 SP= 1,65 ST= 0,75 Le= 465,3
 (Kg/cm²) (Kg/cm²) (cm)

CIMENTACIÓN:

F_{cd} = 166,7 Kg/cm² Mayoración Cargas: 1,60
 F_{yd} = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S₁= 264,66 SP_f= 233,78 ST_f= 225,13 S₂= 119,93
 q_vP= -36,00 q_vT= -237,18

Puntera: VP_f= 99,3 MP= 1.076.383 U_s= 12.884 2,91
 Talón: VT_f= 338,2 MT= -4.699.380 U_s= 57.326 12,93
 (cm) (Kgxc_m) (Kg) (cm²)
 As,min= 13,50 cm²
 1,5 ‰

Cortante:

S₁= 264,66 SP_c= 248,70 ST_c= 197,15 S₂= 119,93
 q_vP= -36,00 q_vT= -237,18

Puntera: VP_c= 51,3 VP= 11.328 V_{cu}= 54.222 0,00
 Talón: VT_c= 248,2 VT= -19.520 (Kg) (cm²/ml)
 (cm) (Kg)

Armado Superior (Talón):

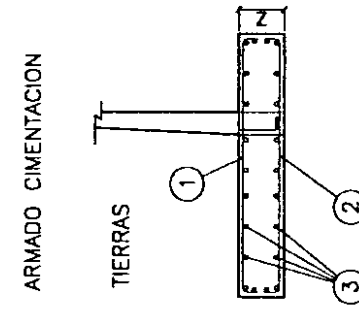
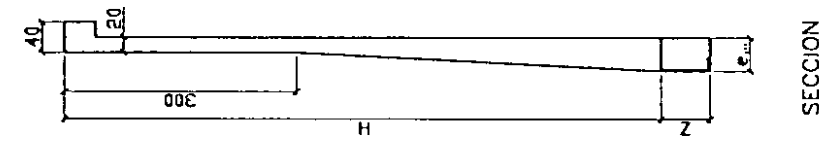
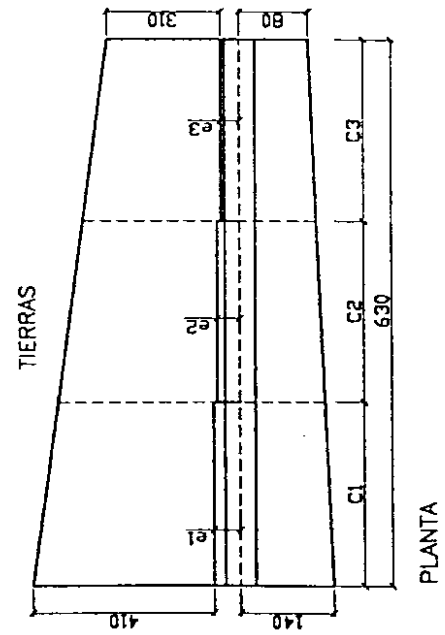
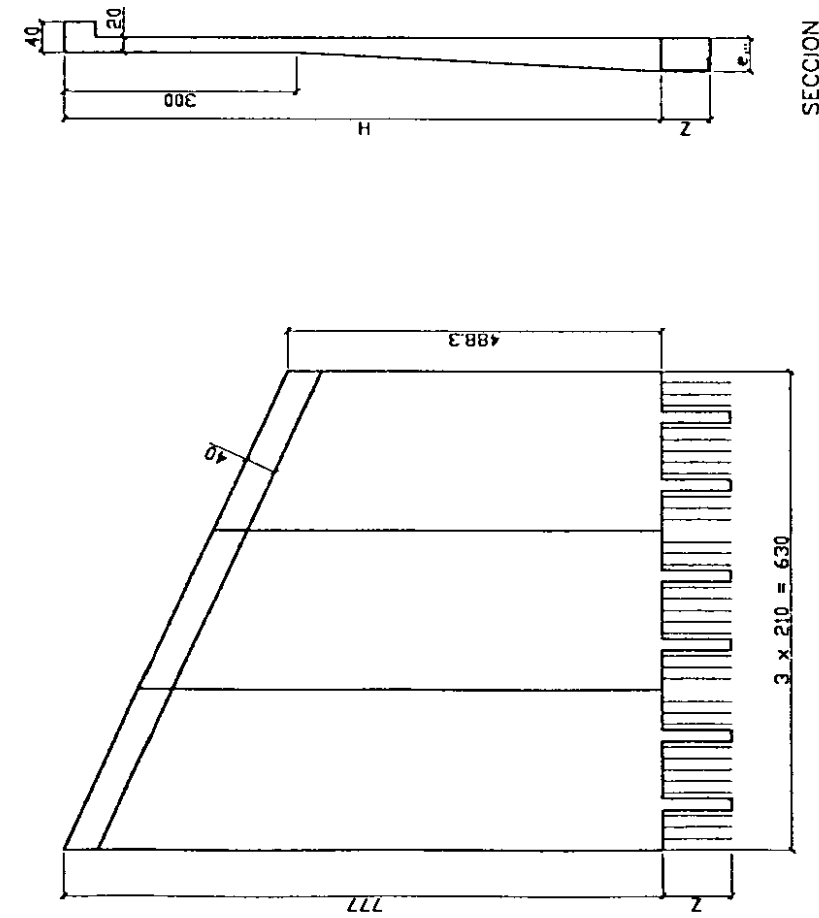
Perpendicular Muro: Ø20 /20cm
 Paralelo Muro: Ø16 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø16 /25cm
 Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

12. PLANOS



	ARMADO CIMENTACION		
TIPO	1	2	3
C1	ø25/15cm	ø16/20cm	ø16/25cm
C2	ø25/20cm	ø16/25cm	ø16/25cm
C3	ø20/20cm	ø18/25cm	ø16/25cm

PIEZA	H	a...	Z
A1	777.0	52.7	90
A2	580.8	45.1	90
A3	584.5	30.5	90

EH-81	CALIDAD	CONTROL	Ceaf.
ELEMENTOS PREFABRICADOS			
	H-300	INTENSO	1,40
HORMIGON		INTENSO	1,10
ACERO	AH-500-S	INTENSO	1,50
EJECUCION			
OBRA EN SITIO			
	H-250	NORMAL	1,50
HORMIGON		NORMAL	1,15
ACERO	AH-500	NORMAL	1,80
EJECUCION			

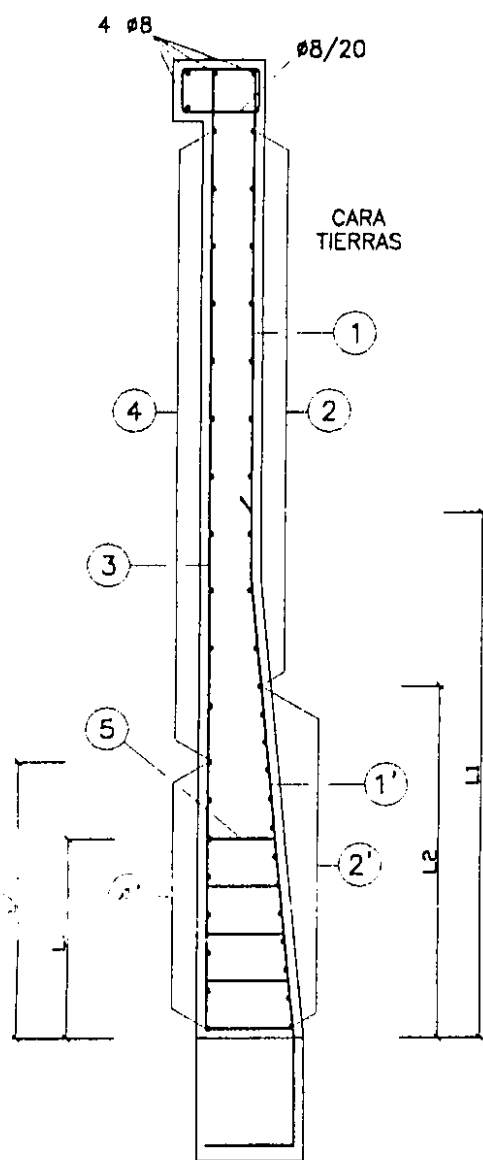
27/07/00	0	MODIFICACIONES	1 ^{er} PLAZA	72.1
FECHA	REV.	PIEZA: ALETA 630x(777/488)	ENV2.1.7 (3)	BASE
OFERTA:	89/843			
OBRA:	SUBIRANO XV			
CLIENTE:	NECSO			
ALETA 630x(777/488)		REVISOR: <i>[Signature]</i>	APROBADO: <i>[Signature]</i>	
		Dpto. Comercial		
		Dpto. Técnico		



PREFABRICADOS DE HORMIGÓN




• COTAS EN CM.



DEFINICIÓN DE ARMADO

	A 1	A 2	A 3
1	Ø25/20	Ø20/16	Ø20/22
1'	Ø25/10	Ø20/8	Ø20/11
L1	430	350	315
2	Ø10/24	Ø10/30	Ø10/30
2'	Ø10/8	Ø10/10	Ø10/12.5
L2	384	340	250
3	Ø20/30	Ø16/25	Ø12/24
4	Ø10/30	Ø8/20	Ø8/25
4'	Ø10/15	Ø8/10	Ø8/12.5
L4	375	300	275
5	5Ø8/25	--	--
L5	100	--	--

Distancias en centímetros

EH-91	CALIDAD	CONTROL	Coef.
ELEMENTOS PREFABRICADOS			
HORMIGON	H-300	INTENSO	1,40
ACERO	AEH-500-S	INTENSO	1,10
EJECUCION		INTENSO	1,50
OBRA IN SITU			
HORMIGON	H-250	NORMAL	1,50
ACERO	AEH-500	NORMAL	1,15
EJECUCION		NORMAL	1,60

15/05/00	0	MODIFICACIONES		72.2
FECHA	REV.			
PIEZA: ALETA 630x(777/488). EVN2.1.7 (3)				
OFERTA: 98/843				
OBRA: ZARAGOZA				
CLIENTE: NECSO				
ALETA 630x(777/488)				
REVISADO		APROBADO		
Upio. Camarero		Data. Merico		

EVN3-1.6

<i>ALHOSA</i> PREFABRICADOS DE HORMIGÓN	ALETA 1050 x (777/296) EVN3-1.6
Oferta: 99/643 Obra: SUBTRAMO XV Empresa: NECSO Fecha: Junio de 2.000	

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1.-	Generalidades
2.-	Descripción
3.-	Instrucciones aplicadas
4.-	Características de los materiales
5.-	Control de calidad
6.-	Coefficientes de seguridad
7.-	Parámetros del terreno
8.-	Acciones consideradas
9.-	Hipótesis de cálculo
10.-	Cálculos
11.-	Cimentación
12.-	Planos

1. Generalidades

En la presente memoria se muestran los cálculos realizados para justificar las Aletas Prefabricadas de hormigón que sostienen el terraplén.

2. Descripción

El sostenimiento de las tierras que forman el terraplén en las entradas de las obras de fábrica se realiza con aletas prefabricadas de hormigón armado.

El espesor de los muros que forman las aletas es de 20 cm. hasta los 300 cm. de profundidad y luego aumenta progresivamente, tal y como se muestra en los planos adjuntos.

La cimentación se realiza con hormigón vertido in situ

3. Instrucciones aplicadas

Para el cálculo de las Aletas, se han utilizado las siguientes Instrucciones y Normas:

* Instrucción para el Proyecto y Ejecución de Obras de Hormigón en Masa o Armado EH-91.

4. Características de los materiales

* Hormigones:

Hormigón en elemento prefabricado	H-300
Hormigón en obra in situ	H-250

* Acero:

Acero para armar corrugado	B-500 S
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5. Control de calidad

El control de calidad se atenderá a lo especificado en la EH-91, habiéndose seleccionado los siguientes niveles:

Elementos prefabricados:

a) Materiales:

- Hormigón	Control Intenso
- Armadura pasiva	Control Intenso

b) Ejecución:

- En toda la obra	Control Intenso
-------------------	-----------------

Obra in situ:

a) Materiales:

- Hormigón	Control Normal
- Armadura pasiva	Control Normal

b) Ejecución:

- En toda la obra	Control Normal
-------------------	----------------

6. Coeficientes de seguridad

De acuerdo con los niveles de control de calidad definidos, se adoptan los siguientes coeficientes de seguridad:

Elementos prefabricados:

- Coeficientes de minoración de resistencias:

Acero pasivo

$\gamma_s = 1,10$

Hormigón

$\gamma_c = 1,40$

- Coeficientes de ponderación de acciones:

$\gamma_f = 1,50$

Obra in situ:

- Coeficientes de minoración de resistencias:

Acero pasivo

$\gamma_s = 1,15$

Hormigón

$\gamma_c = 1,50$

- Coeficientes de ponderación de acciones:

$\gamma_f = 1,60$

7. Parámetros del terreno

Pese a existir un relleno de calidad adecuadamente compactado (al que correspondería un ángulo de rozamiento interno de 35°), con un talud 2H:1V. En los cálculos se ha considerado, conservadoramente, un talud de terraplén 3H:2V con ángulo de rozamiento interno de 30°. La Aleta forma un ángulo mínimo de 60° con el pie del terraplén

Peso específico	2,0ton/m3
Ángulo de rozamiento interno	30°
Ángulo Talud coronación	18,4°
Coefficiente de empuje activo	0,427

8. Acciones consideradas**8.1 Empuje por efecto de las tierras**

Se considera el empuje de las tierras que se encuentran en el trasdós de la Aleta con un coeficiente de empuje de 0,427.

8.2 Sobrecargas de uso

Se considera una sobrecarga de 400 Kg/m2 sobre el terraplén, que es la establecida para paseos de servicio.

9. Hipótesis de cálculo.**HIPÓTESIS I:**

- Empuje de las tierras

- Sobrecarga de uso

Combinación: 1,5 * [Caso (1) + Caso (2)]

En Alcañiz, Junio de 2.000



Alcañizana del Hormigón, S.A. -ALCAÑIZ
Javier Tello Sánchez
Dpto. Técnico ALHOSA

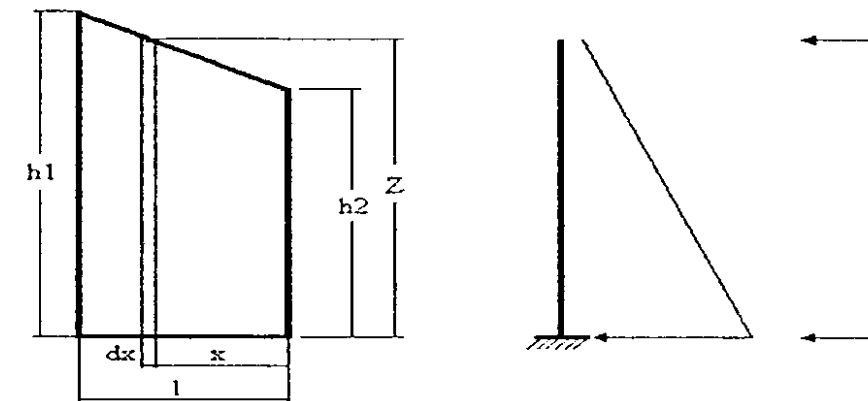
- El presente informe se ha realizado con los datos aportados por el cliente para esta pieza prefabricada concreta.

- Salvo comunicación escrita de lo contrario, las consideraciones en él realizadas, así como los resultados aportados, se ajustan a lo solicitado por el cliente.

10. Cálculos.

Dada la geometría de la estructura en la que se reduce la altura en función de la longitud y los esfuerzos se comportan de igual manera, cada tramo de la aleta se ha armado para la altura existente a una distancia, del lado mayor, de 1/3 de su longitud, siendo en todo momento superiores las solicitaciones en este punto que la resultante sobre cada tramo.

Pza.	H.máx	H.mín	H.cálculo
1	777,0	680,8	745
2	680,8	584,6	649
3	584,6	488,4	553
4	488,4	392,2	456
5	392,2	296,0	360



$$M = \int_{x=0}^{x=l} dM = \int_{x=0}^{x=l} \left(\frac{1}{6} \cdot \lambda_h \cdot \gamma_t \cdot z^3 + \frac{1}{2} \cdot \lambda_h \cdot SC \cdot z^2 \right) \cdot dx =$$

$$= \frac{1}{6} \cdot \lambda_h \cdot \gamma_t \cdot \left(\frac{1}{4} \cdot \frac{h_1^4 - h_2^4}{h_1 - h_2} \right) \cdot l + \frac{1}{2} \cdot \lambda_h \cdot SC \cdot \left(\frac{1}{3} \cdot \frac{h_1^3 - h_2^3}{h_1 - h_2} \right) \cdot l \leq M \left(z = h_2 + \frac{2 \cdot (h_1 - h_2)}{3} \right)$$

$$V = \int_{x=0}^{x=l} dV = \int_{x=0}^{x=l} \left(\frac{1}{2} \cdot \lambda_h \cdot \gamma_t \cdot z^2 + \lambda_h \cdot SC \cdot z \right) \cdot dx =$$

$$= \frac{1}{2} \cdot \lambda_h \cdot \gamma_t \cdot \left(\frac{1}{3} \cdot \frac{h_1^3 - h_2^3}{h_1 - h_2} \right) \cdot l + \lambda_h \cdot SC \cdot \left(\frac{1}{2} \cdot \frac{h_1^2 - h_2^2}{h_1 - h_2} \right) \cdot l \leq V \left(z = h_2 + \frac{2 \cdot (h_1 - h_2)}{3} \right)$$

$$z = h_2 + \frac{h_1 - h_2}{l} \cdot x$$

DATOS GENERALES:

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1050x(777x296)

TERRENO:

Densidad terreno: 0,0020 Kg/cm³
 Densidad Agua: 0,0010 Kg/cm³
 Indice Huecos: 30,0 %
 Densidad Aparente: 0,0013 Kg/cm³
 Angulo Roz.Int: 30,0 °
 Angulo Roz. Trno/Mro: 0,0 °
 Angulo de Talud: 18,4 °
 Coef. Empuje Activo Hztal: 0,427
 Coef. Empuje Activo Vtcal: 0,000

MURO:

Altura máxima: 777 cm Quiebro 300 cm
 Resguardo Tierras: 0 cm Canto C. 20 cm
 Longitud Muro: 100 cm Canto Z. 52,7 cm
 Peso del Muro 5.835 Kg/ml Xcdg (m) 17,0 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm²
 Prof. Aplic. (S.C.p.) 0 cm

MATERIALES ALZADO:

Fc,k 300 Kg/cm² Gc (1,40)
 Fy,k 5100 Kg/cm² Gs (1,10)
 Fc,d 214,3 Kg/cm² Gf (1,50)
 Fy,d 4.636,4 Kg/cm² Recubrimiento: 4,0 cm.
 Fyv,d 4.200,0 Kg/cm²

ESFUERZOS:

	H_Calc	Canto	Md	As1	As2	Vd	Vcu	Ast
	cm	cm	Kg x cm	cm ²	cm ²	Kg	Kg	cm ² /ml
1	745	52,7	9.533.687	47,17	0,00	37.440	35.645	0,98
2	649	46,1	6.366.217	35,93	0,00	28.609	30.818	0,00
3	553	39,5	3.991.286	26,36	0,00	20.963	25.991	0,00
4	456	32,9	2.294.884	18,38	0,00	14.503	21.164	0,00
5	360	26,3	1.163.001	11,93	0,00	9.227	16.337	0,00

Aleta 1050x(777x296)

Tierras: 2.000 Kg/m³ SC_c: 400 Kg/m² Gc: 1,40
 Talud: 18,40° SC_p: 0 Kg/m² Gs: 1,10
 C.E.h: 0,427 Z_SCp: 0 cm Gf: 1,50

Z (cm)	Eh (Kg)				Vd (Kg)	M (Kg)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
0	0	0	0	0	0	0	0	0	0	0
10	4	0	17	0	32	14	0	85	0	149
20	17	0	34	0	77	114	0	341	0	683
30	38	0	51	0	134	384	0	768	0	1.729
40	68	0	68	0	205	911	0	1.366	0	3.415
50	107	0	85	0	288	1.779	0	2.134	0	5.869
60	154	0	102	0	384	3.073	0	3.073	0	9.220
70	209	0	120	0	493	4.881	0	4.183	0	13.596
80	273	0	137	0	615	7.285	0	5.464	0	19.124
90	346	0	154	0	749	10.373	0	6.915	0	25.932
100	427	0	171	0	896	14.229	0	8.537	0	34.150
110	517	0	188	0	1.057	18.939	0	10.330	0	43.904
120	615	0	205	0	1.229	24.588	0	12.294	0	55.322
130	721	0	222	0	1.415	31.261	0	14.428	0	68.534
140	837	0	239	0	1.614	39.044	0	16.733	0	83.667
150	960	0	256	0	1.825	48.023	0	19.209	0	100.848
160	1.093	0	273	0	2.049	58.282	0	21.856	0	120.207
170	1.234	0	290	0	2.286	69.907	0	24.673	0	141.870
180	1.383	0	307	0	2.536	82.984	0	27.661	0	165.967
190	1.541	0	324	0	2.798	97.597	0	30.820	0	192.625
200	1.707	0	341	0	3.073	113.832	0	34.150	0	221.973
210	1.882	0	359	0	3.362	131.775	0	37.650	0	254.137
220	2.066	0	376	0	3.663	151.511	0	41.321	0	289.247
230	2.258	0	393	0	3.976	173.124	0	45.163	0	327.431
240	2.459	0	410	0	4.303	196.702	0	49.175	0	368.816
250	2.668	0	427	0	4.642	222.328	0	53.359	0	413.531
260	2.886	0	444	0	4.994	250.089	0	57.713	0	461.703
270	3.112	0	461	0	5.359	280.070	0	62.238	0	513.461
280	3.347	0	478	0	5.737	312.355	0	66.933	0	568.933
290	3.590	0	495	0	6.128	347.032	0	71.800	0	628.247
300	3.842	0	512	0	6.531	384.183	0	76.837	0	691.530
310	4.102	0	529	0	6.947	423.897	0	82.045	0	758.912
320	4.371	0	546	0	7.376	466.256	0	87.423	0	830.519
330	4.649	0	563	0	7.818	511.348	0	92.972	0	906.481
340	4.935	0	581	0	8.273	559.257	0	98.692	0	986.925
350	5.229	0	598	0	8.740	610.069	0	104.583	0	1.071.979
360	5.532	0	615	0	9.220	663.869	0	110.645	0	1.161.771
370	5.844	0	632	0	9.713	720.742	0	116.877	0	1.256.429
380	6.164	0	649	0	10.219	780.775	0	123.280	0	1.356.082
390	6.493	0	666	0	10.738	844.051	0	129.854	0	1.460.858
400	6.830	0	683	0	11.269	910.657	0	136.599	0	1.570.884
410	7.176	0	700	0	11.814	980.678	0	143.514	0	1.686.288
420	7.530	0	717	0	12.371	1.054.199	0	150.600	0	1.807.199
430	7.893	0	734	0	12.941	1.131.307	0	157.857	0	1.933.745
440	8.264	0	751	0	13.523	1.212.085	0	165.284	0	2.066.053
450	8.644	0	768	0	14.119	1.296.619	0	172.883	0	2.204.253
460	9.033	0	785	0	14.727	1.384.996	0	180.652	0	2.348.471
470	9.430	0	803	0	15.348	1.477.299	0	188.591	0	2.498.836
480	9.835	0	820	0	15.982	1.573.616	0	196.702	0	2.655.476

Aleta 1050x(777x296)

Tierras: 2.000 Kg/m3 SC_c: 400 Kg/m2 Gc: 1,40
 Talud: 18,40° SC_p: 0 Kg/m2 Gs: 1,10
 C.E.h: 0,427 Z_SCp: 0 cm Gf: 1,50

Z (cm)	Eh (Kg)				Vd (Kg)	M (Kg)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
490	10.249	0	837	0	16.629	1.674.030	0	204.983	0	2.818.519
500	10.672	0	854	0	17.288	1.778.627	0	213.435	0	2.988.094
510	11.103	0	871	0	17.961	1.887.493	0	222.058	0	3.164.327
520	11.543	0	888	0	18.646	2.000.714	0	230.852	0	3.347.348
530	11.991	0	905	0	19.344	2.118.373	0	239.816	0	3.537.284
540	12.448	0	922	0	20.054	2.240.558	0	248.951	0	3.734.263
550	12.913	0	939	0	20.778	2.367.353	0	258.257	0	3.938.414
560	13.387	0	956	0	21.514	2.498.843	0	267.733	0	4.149.865
570	13.869	0	973	0	22.263	2.635.115	0	277.380	0	4.368.742
580	14.360	0	990	0	23.025	2.776.252	0	287.198	0	4.595.176
590	14.859	0	1.007	0	23.800	2.922.341	0	297.187	0	4.829.293
600	15.367	0	1.024	0	24.588	3.073.468	0	307.347	0	5.071.222
610	15.884	0	1.042	0	25.388	3.229.717	0	317.677	0	5.321.091
620	16.409	0	1.059	0	26.201	3.391.173	0	328.178	0	5.579.027
630	16.942	0	1.076	0	27.027	3.557.923	0	338.850	0	5.845.160
640	17.485	0	1.093	0	27.866	3.730.052	0	349.692	0	6.119.616
650	18.035	0	1.110	0	28.718	3.907.644	0	360.706	0	6.402.524
660	18.594	0	1.127	0	29.582	4.090.786	0	371.890	0	6.694.013
670	19.162	0	1.144	0	30.459	4.279.562	0	383.244	0	6.994.210
680	19.738	0	1.161	0	31.349	4.474.059	0	394.770	0	7.303.243
690	20.323	0	1.178	0	32.252	4.674.360	0	406.466	0	7.621.240
700	20.917	0	1.195	0	33.168	4.880.553	0	418.333	0	7.948.329
710	21.519	0	1.212	0	34.096	5.092.722	0	430.371	0	8.284.639
720	22.129	0	1.229	0	35.038	5.310.952	0	442.579	0	8.630.298
730	22.748	0	1.246	0	35.992	5.535.330	0	454.959	0	8.985.433
740	23.375	0	1.264	0	36.958	5.765.940	0	467.509	0	9.350.172
750	24.011	0	1.281	0	37.938	6.002.867	0	480.229	0	9.724.644
760	24.656	0	1.298	0	38.931	6.246.197	0	493.121	0	10.108.977
770	25.309	0	1.315	0	39.936	6.496.016	0	506.183	0	10.503.299

11. CIMENTACIONES

En las páginas siguientes se muestran los cálculos de la cimentación de la aleta.

DATOS GENERALES:

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1050x(777/296)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 18,4 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 4
 Altura del Muro: 456,3 cm Quiebro 267,9 cm
 Altura tierras: 456,3 cm Canto.C 20,0 cm
 Canto.Z 32,9 cm
 Longitud Muro: 100,0 cm Xcdg (m) 11,7 cm
 Peso del Muro: 2.586 Kg/ml Xcdg (t) 148,3 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigón: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 73 cm
 Vuelo del Talón: 297 cm
 Canto de la Zapata: 60 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (H_ztal): 0,427
 Base de la Zapata: 402,9 cm

	Fh	Fv	e _x	Mv	Mr
F (coron.)			-118	0	0
Muro:		-2586	-116		-232184
Tierras:	-11380	-31199	53	1958689	-7942813
Sobrecarga (coron.):	-882	-1238	47	227607	-315256
Sobrecarga (prof.):	0	0	47	0	0
Zapata:		-6044	0		-1217557
	-12262	-41067		2186296	-9707810

C_{sd} = 1,93 C_{sv} = 4,44 e = -18,8 cm.

Aleta 1050x(777/296) Pza. 4

TENSION DEL TERRENO: 1,16 < 2,00 (Servicio)
 1,36 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
 SP= 1,31 ST= 0,73 Le= 402,9
 (Kg/cm²) (Kg/cm²) (cm)

CIMENTACIÓN:

F_{cd} = 166,7 Kg/cm² Mayoración Cargas: 1,60
 F_{yd} = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S₁= 208,82 SP_f= 191,05 ST_f= 185,82 S₂= 117,34
 qvP= -24,00 qvT= -198,67

Puntera: VP_f= 78,3 MP= 547.999 U_s= 10.216 2,30
 Talón: VT_f= 301,6 MT= -2.660.827 U_s= 50.973 11,49
 (cm) (Kgxcn) (Kg) (cm²)
 A_{s,min}= 9,00 cm²
 1,5 ‰

Cortante:

S₁= 208,82 SP_c= 198,30 ST_c= 172,44 S₂= 117,34
 qvP= -24,00 qvT= -198,67

Puntera: VP_c= 46,3 VP= 8.320 V_{cu}= 34.857 0,00
 Talón: VT_c= 242,7 VT= -13.051 (Kg) (cm²/ml)
 (cm) (Kg)

Armado Superior (Talón):

Perpendicular Muro: Ø16 /15cm
 Paralelo Muro: Ø12 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø12 /25cm
 Paralelo Muro: Ø12 /25cm

Armado a cortante: No necesario.

DATOS GENERALES:

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1050x(777/296)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 18,4 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 5
 Altura del Muro: 360,1 cm Quiebro 267,9 cm
 Altura tierras: 360,1 cm Canto.C 20,0 cm
 Canto.Z 26,3 cm
 Longitud Muro: 100,0 cm Xcdg (m) 10,5 cm
 Peso del Muro: 1.874 Kg/ml Xcdg (t) 133,5 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigon: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 53 cm
 Vuelo del Talón: 263 cm
 Canto de la Zapata: 60 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (Hztal): 0,427
 Base de la Zapata: 342,3 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-108	0	0
Muro:		-1874	-107		-124577
Tierras:	-7535	-21723	42	1055204	-4583253
Sobrecarga (coron.):	-717	-1076	37	150696	-227012
Sobrecarga (prof.):	0	0	37	0	0
Zapata:		-5135	0		-878876
	-8252	-29807		1205899	-5813717

Csd = 2,08 Csv = 4,82 e = -15,3 cm.

Aleta 1050x(777/296) Pza. 5

TENSION DEL TERRENO: 0,99 < 2,00 (Servicio)
 1,14 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
 SP= 1,10 ST= 0,64 Le= 342,3
 (Kg/cm²) (Kg/cm²) (cm)

CIMENTACIÓN:

Fcd = 166,7 Kg/cm² Mayoración Cargas: 1,60
 Fyd = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S1= 176,64 SPf= 164,15 STf= 160,13 S2= 102,00
 qvP= -24,00 qvT= -162,72

Puntera: VPf= 57,3 MP= 243.588 Us= 4.524 1,02
 Talón: VTf= 266,6 MT= -1.469.562 Us= 27.716 6,25
 (cm) (Kgxcn) (Kg) (cm²)
 As,min= 9,00 cm²
 1,5 ‰

Cortante:

S1= 176,64 SPc= 170,90 STc= 147,50 S2= 102,00
 qvP= -24,00 qvT= -162,72

Puntera: VPc= 26,3 VP= 3.944 Vcu= 34.857 0,00
 Talón: VTc= 208,7 VT= -7.924 (Kg) (cm²/ml)
 (cm) (Kg)

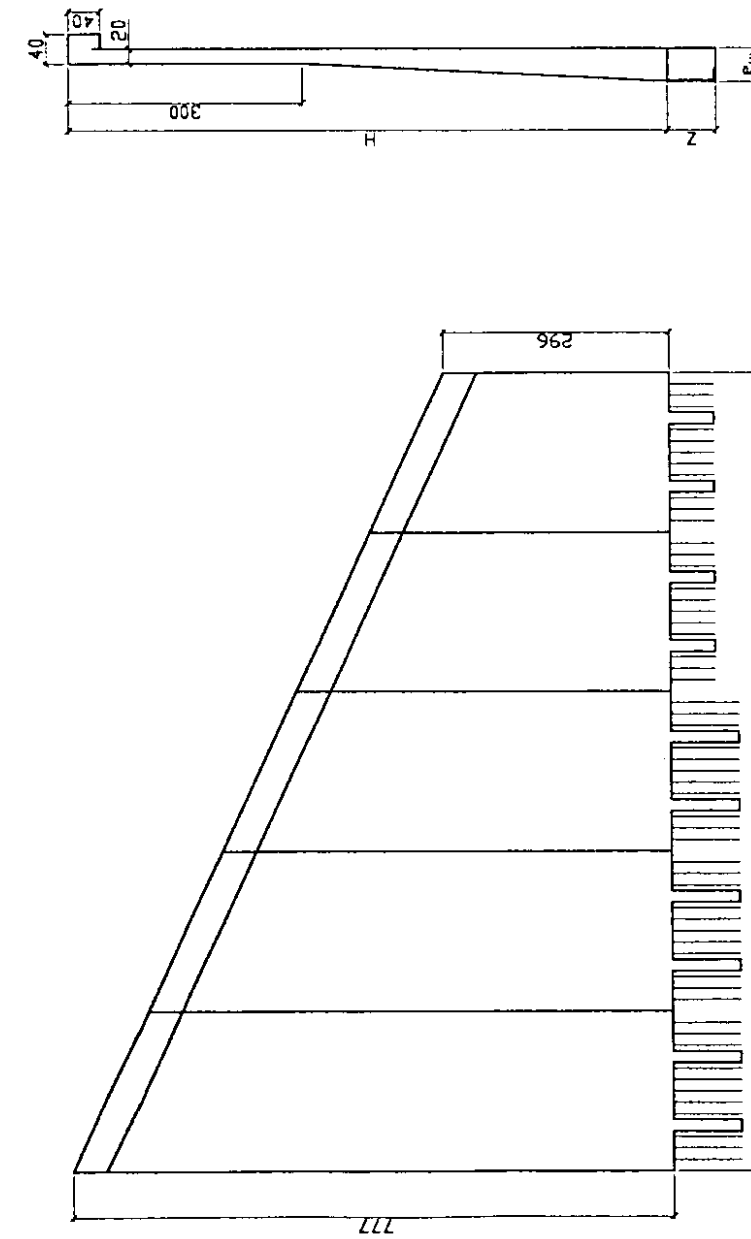
Armado Superior (Talón):

Perpendicular Muro: Ø16 /25cm
 Paralelo Muro: Ø12 /25cm

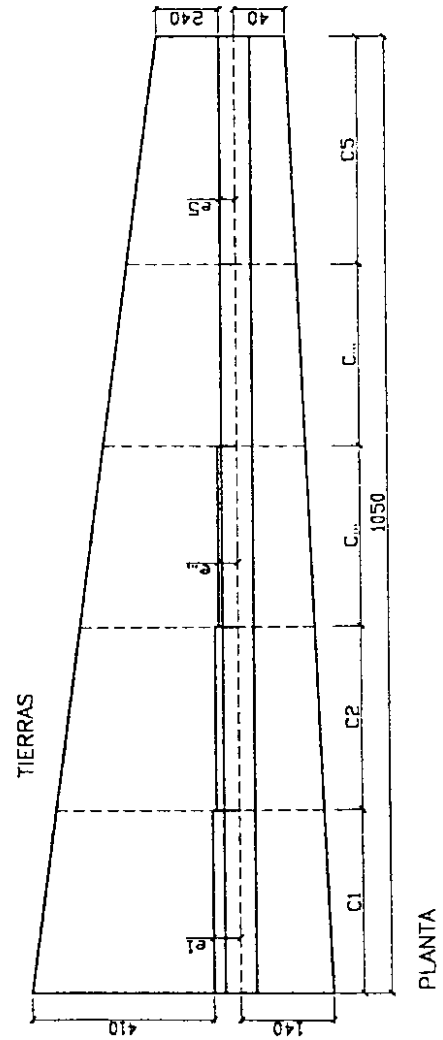
Armado Inferior (Puntera):

Perpendicular Muro: Ø12 /25cm
 Paralelo Muro: Ø12 /25cm

Armado a cortante: No necesario.

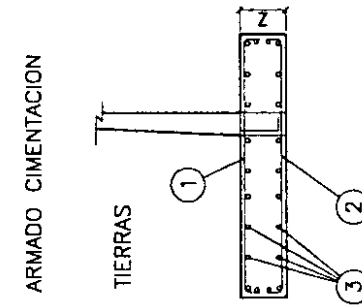


ALZADO CARA VISTA (Aleta Izda)



PLANTA

• COTAS EN CM.



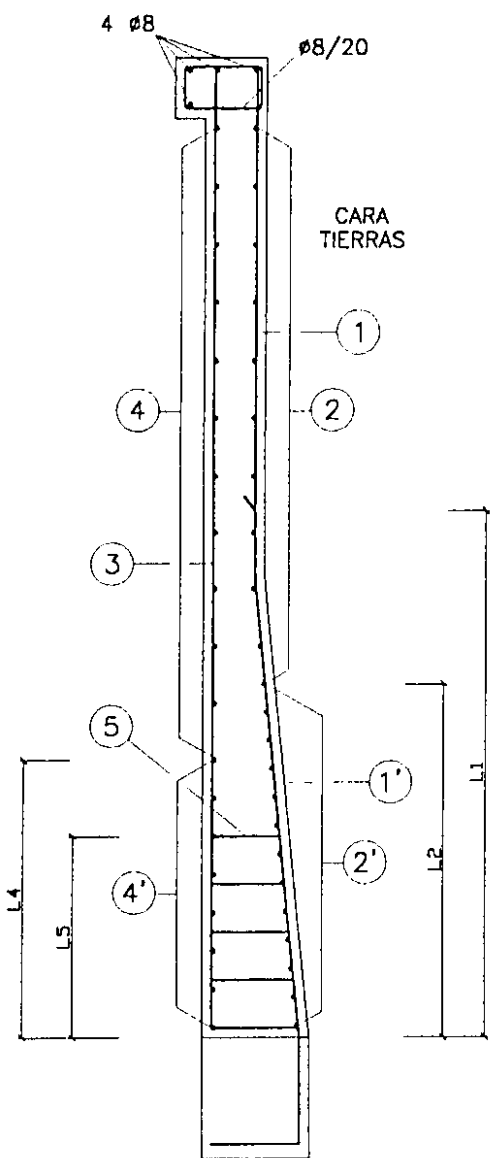
ARMADO CIMENTACION

ARMADO CIMENTACION	
TIPO	
C1	Ø25/15cm
C2	Ø25/20cm
C3	Ø20/20cm
C4	Ø16/15cm
C5	Ø16/15cm

CUADRO MEDIDAS				
PIEZA	H	e...	Z	
A1	777.0	52.7	90	
A2	680.8	46.1	90	
A3	584.6	39.5	90	
A4	488.4	32.9	60	
A5	392.2	26.3	50	

EH-91	CALIDAD	CONTROL	Coef.
ELEMENTOS PREFABRICADOS			
HORMIGÓN	H-300	INTENSO	1,40
ACERO	AEH-500-S	INTENSO	1,10
EJECUCIÓN		INTENSO	1,90
OBRA IN SITU			
HORMIGÓN	H-250	NORMAL	1,50
ACERO	AEH-500	NORMAL	1,15
EJECUCIÓN		NORMAL	1,40

15/03/00	0	MODIFICACIONES	REV. 1	57.1	57.1
FECHA	REV.	MODIFICACIONES	REV. 1	57.1	57.1
PIEZA:	ALFETA 1050x(777/296)	EVN3-1.6			
OFERTA:	99/643				
OBRA:	SUBTRAMO XV				
CLIENTE:	NECSO				
ALFETA 1050x(777/296)	REV. 3400				
	Des. Comercial				



DEFINICIÓN DE ARMADO					
	A 1	A 2	A 3	A 4	A 4
1	Ø25/20	Ø20/16	Ø20/22	Ø16/30	Ø16/30
1'	Ø25/10	Ø20/8	Ø20/11	Ø16/10	Ø16/15
L1	430	350	315	310	215
2	Ø10/24	Ø10/30	Ø10/30	Ø8/30	Ø8/30
2'	Ø10/8	Ø10/10	Ø10/12.5	Ø8/12.5	Ø8/20
L2	384	340	250	200	100
3	Ø20/30	Ø16/25	Ø12/24	Ø10/24	Ø8/30
4	Ø10/30	Ø8/20	Ø8/25	Ø8/25	Ø8/25
4'	Ø10/15	Ø8/10	Ø8/12.5	Ø8/15	8/15
L4	375	300	275	180	90
5	5Ø8/25	--	--	--	--
L5	100	--	--	--	--

Distancias en centímetros

EH-91	CALIDAD	CONTROL	Coef.
ELEMENTOS PREFABRICADOS			
HORMIGON	H-300	INTENSO	1,40
ACERO	AEH-500-S	INTENSO	1,10
EJECUCION		INTENSO	1,50
OBRA IN SITU			
HORMIGON	H-250	NORMAL	1,50
ACERO	AEH-500	NORMAL	1,15
EJECUCION		NORMAL	1,60

15/05/00	0	
FECHA	REV.	MODIFICACIONES
PIEZA:	Aleta 1050x(777/296). EVN3-1.6	
OFERTA:	99/643	
OBRA:	ZARAGOZA	
CLIENTE:	NECSO	
Aleta 1050x(777/296)		57.2
REVISADO		APROBADO
Dpto. Comercial		Dpto. Comercial
PREFABRICADOS DE HORMIGON		

EVN3-2.0

<i>ALHOSA</i> PREFABRICADOS DE HORMIGÓN	ALETA 1400 x (700/100) EVN3-2.0
Oferta: 99/643 Obra: SUBTRAMO XV Empresa: NECSO Fecha: Junio de 2.000	

ÍNDICE

1.-	Generalidades
2.-	Descripción
3.-	Instrucciones aplicadas
4.-	Características de los materiales
5.-	Control de calidad
6.-	Coeficientes de seguridad
7.-	Parámetros del terreno
8.-	Acciones consideradas
9.-	Hipótesis de cálculo
10.-	Cálculos
11.-	Cimentación
12.-	Planos

1. Generalidades

En la presente memoria se muestran los cálculos realizados para justificar las Aletas Prefabricadas de hormigón que sostienen el terraplén.

2. Descripción

El sostenimiento de las tierras que forman el terraplén en las entradas de las obras de fábrica se realiza con aletas prefabricadas de hormigón armado.

El espesor de los muros que forman las aletas es de 20 cm. hasta los 300 cm. de profundidad y luego aumenta progresivamente, tal y como se muestra en los planos adjuntos.

La cimentación se realiza con hormigón vertido in situ

3. Instrucciones aplicadas

Para el cálculo de las Aletas, se han utilizado las siguientes Instrucciones y Normas:

* Instrucción para el Proyecto y Ejecución de Obras de Hormigón en Masa o Armado EH-91.

4. Características de los materiales

*** Hormigones:**

Hormigón en elemento prefabricado	H-300
Hormigón en obra in situ	H-250

*** Acero:**

Acero para armar corrugado	B-500 S
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5. Control de calidad

El control de calidad se atenderá a lo especificado en la EH-91, habiéndose seleccionado los siguientes niveles:

Elementos prefabricados:

a) Materiales:	
- Hormigón	Control Intenso
- Armadura pasiva	Control Intenso

b) Ejecución:	
- En toda la obra	Control Intenso

Obra in situ:

a) Materiales:	
- Hormigón	Control Normal
- Armadura pasiva	Control Normal

b) Ejecución:	
- En toda la obra	Control Normal

6. Coeficientes de seguridad

De acuerdo con los niveles de control de calidad definidos, se adoptan los siguientes coeficientes de seguridad:

Elementos prefabricados:

- Coeficientes de minoración de resistencias:

Acero pasivo

$\gamma_s = 1,10$

Hormigón

$\gamma_c = 1,40$

- Coeficientes de ponderación de acciones:

$\gamma_f = 1,50$

Obra in situ:

- Coeficientes de minoración de resistencias:

Acero pasivo

$\gamma_s = 1,15$

Hormigón

$\gamma_c = 1,50$

- Coeficientes de ponderación de acciones:

$\gamma_f = 1,60$

7. Parámetros del terreno

Pese a existir un relleno de calidad adecuadamente compactado (al que correspondería un ángulo de rozamiento interno de 35°), con un talud 2H:1V. En los cálculos se ha considerado, conservadoramente, un talud de terraplén 3H:2V con ángulo de rozamiento interno de 30°. La Aleta forma un ángulo mínimo de 60° con el pie del terraplén

Peso específico	2,0ton/m ³
Ángulo de rozamiento interno	30°
Ángulo Talud coronación	18,4°
Coefficiente de empuje activo	0,427

8. Acciones consideradas**8.1 Empuje por efecto de las tierras**

Se considera el empuje de las tierras que se encuentran en el trasdós de la Aleta con un coeficiente de empuje de 0,427.

8.2 Sobrecargas de uso

Se considera una sobrecarga de 400 Kg/m² sobre el terraplén, que es la establecida para paseos de servicio.

9. Hipótesis de cálculo.**HIPÓTESIS I:**

- Empuje de las tierras

- Sobrecarga de uso

Combinación: 1,5 * [Caso (1) + Caso (2)]

En Alcañiz, Junio de 2.000

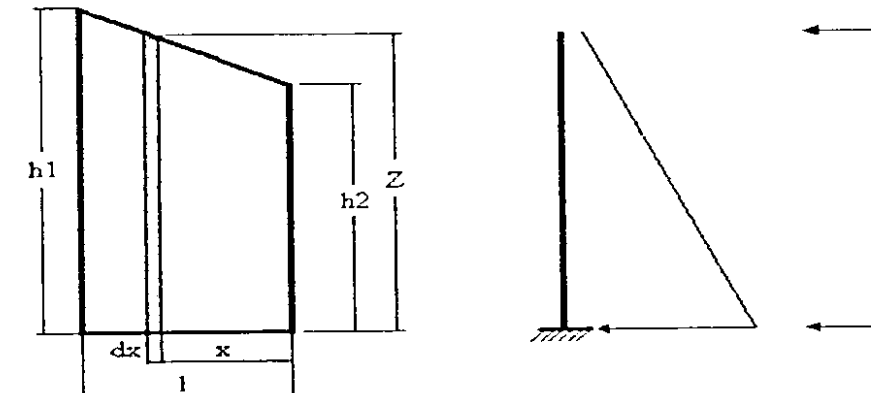
Javier Tello Sánchez
Alcañiz de Hormigón S.A. ALCAÑIZ
Dpto. Técnico ALHOSA

- El presente informe se ha realizado con los datos aportados por el cliente para esta pieza prefabricada concreta.
- Salvo comunicación escrita de lo contrario, las consideraciones en él realizadas, así como los resultados aportados, se ajustan a lo solicitado por el cliente.

10. Cálculos.

Dada la geometría de la estructura en la que se reduce la altura en función de la longitud y los esfuerzos se comportan de igual manera, cada tramo de la aleta se ha armado para la altura existente a una distancia, del lado mayor, de 1/3 de su longitud, siendo en todo momento superiores las solicitaciones en este punto que la resultante sobre cada tramo.

Pza.	H.máx	H.mín	H.cálculo
1	700,0	614,3	672
2	614,3	528,6	586
3	528,6	442,9	500
4	442,9	357,1	414
5	357,1	271,4	329
6	271,4	185,7	243
7	185,7	100,0	157



$$M = \int_{x=0}^{x=l} dM = \int_{x=0}^{x=l} \left(\frac{1}{6} \cdot \lambda_h \cdot \gamma_t \cdot z^3 + \frac{1}{2} \cdot \lambda_h \cdot SC \cdot z^2 \right) \cdot dx =$$

$$= \frac{1}{6} \cdot \lambda_h \cdot \gamma_t \cdot \left(\frac{1}{4} \cdot \frac{h_1^4 - h_2^4}{h_1 - h_2} \right) \cdot l + \frac{1}{2} \cdot \lambda_h \cdot SC \cdot \left(\frac{1}{3} \cdot \frac{h_1^3 - h_2^3}{h_1 - h_2} \right) \cdot l \leq M \left(z = h_2 + \frac{2 \cdot (h_1 - h_2)}{3} \right)$$

$$V = \int_{x=0}^{x=l} dV = \int_{x=0}^{x=l} \left(\frac{1}{2} \cdot \lambda_h \cdot \gamma_t \cdot z^2 + \lambda_h \cdot SC \cdot z \right) \cdot dx =$$

$$= \frac{1}{2} \cdot \lambda_h \cdot \gamma_t \cdot \left(\frac{1}{3} \cdot \frac{h_1^3 - h_2^3}{h_1 - h_2} \right) \cdot l + \lambda_h \cdot SC \cdot \left(\frac{1}{2} \cdot \frac{h_1^2 - h_2^2}{h_1 - h_2} \right) \cdot l \leq V \left(z = h_2 + \frac{2 \cdot (h_1 - h_2)}{3} \right)$$

$$z = h_2 + \frac{h_1 - h_2}{l} \cdot x$$

DATOS GENERALES:

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1400x(700x100)

TERRENO:

Densidad terreno: 0,0020 Kg/cm³
 Densidad Agua: 0,0010 Kg/cm³
 Indice Huecos: 30,0 %
 Densidad Aparente: 0,0013 Kg/cm³
 Angulo Roz.Int: 30,0 °
 Angulo Roz. Trno/Mro: 0,0 °
 Angulo de Talud: 18,4 °
 Coef. Empuje Activo Hztal: 0,427
 Coef. Empuje Activo Vtal: 0,000

MURO:

Altura máxima: 700 cm Quiebro 300 cm
 Resguardo Tierras: 0 cm Canto C. 20 cm
 Longitud Muro: 100 cm Canto Z. 45,0 cm
 Peso del Muro 4.750 Kg/ml Xcdg (m) 14,8 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm²
 Prof. Aplic. (S.C.p.) 0 cm

MATERIALES ALZADO:

Fc,k 300 Kg/cm² Gc (1,40)
 Fy,k 5100 Kg/cm² Gs (1,10)
 Fc,d 214,3 Kg/cm² Gf (1,50)
 Fy,d 4.636,4 Kg/cm² Recubrimiento: 4,0 cm.
 Fyv,d 4.200,0 Kg/cm²

ESFUERZOS:

	H_Calc	Canto	Md	As1	As2	Vd	Vcu	Ast
	cm	cm	Kg x cm	cm ²	cm ²	Kg	Kg	cm ² /ml
1	671	45,0	7.037.813	41,59	0,00	30.586	30.009	0,37
2	586	39,6	4.728.008	31,65	0,00	23.467	26.088	0,00
3	500	34,3	2.988.094	23,20	0,00	17.288	22.167	0,00
4	414	28,9	1.737.425	16,17	0,00	12.051	18.246	0,00
5	329	23,6	895.358	10,47	0,00	7.754	14.325	0,00
6	243	20,0	381.246	5,33	0,00	4.399	11.711	0,00
7	157	20,0	114.446	2,01	0,00	1.984	11.711	0,00

Aleta 1400x(700x100)

Tierras: 2.000 Kg/m³ SC_c: 400 Kg/m² Gc: 1,40
 Talud: 18,40° SC_p: 0 Kg/m² Gs: 1,10
 C.E.h: 0,427 Z_SCp: 0 cm Gf: 1,50

Z (cm)	Eh (Kg)				Vd (Kg)	M (Kg)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
0	0	0	0	0	0	0	0	0	0	0
10	4	0	17	0	32	14	0	85	0	149
20	17	0	34	0	77	114	0	341	0	683
30	38	0	51	0	134	384	0	768	0	1.729
40	68	0	68	0	205	911	0	1.366	0	3.415
50	107	0	85	0	288	1.779	0	2.134	0	5.869
60	154	0	102	0	384	3.073	0	3.073	0	9.220
70	209	0	120	0	493	4.881	0	4.183	0	13.596
80	273	0	137	0	615	7.285	0	5.464	0	19.124
90	346	0	154	0	749	10.373	0	6.915	0	25.932
100	427	0	171	0	896	14.229	0	8.537	0	34.150
110	517	0	188	0	1.057	18.939	0	10.330	0	43.904
120	615	0	205	0	1.229	24.588	0	12.294	0	55.322
130	721	0	222	0	1.415	31.261	0	14.428	0	68.534
140	837	0	239	0	1.614	39.044	0	16.733	0	83.667
150	960	0	256	0	1.825	48.023	0	19.209	0	100.848
160	1.093	0	273	0	2.049	58.282	0	21.856	0	120.207
170	1.234	0	290	0	2.286	69.907	0	24.673	0	141.870
180	1.383	0	307	0	2.536	82.984	0	27.661	0	165.967
190	1.541	0	324	0	2.798	97.597	0	30.820	0	192.625
200	1.707	0	341	0	3.073	113.832	0	34.150	0	221.973
210	1.882	0	359	0	3.362	131.775	0	37.650	0	254.137
220	2.066	0	376	0	3.663	151.511	0	41.321	0	289.247
230	2.258	0	393	0	3.976	173.124	0	45.163	0	327.431
240	2.459	0	410	0	4.303	196.702	0	49.175	0	368.816
250	2.668	0	427	0	4.642	222.328	0	53.359	0	413.531
260	2.886	0	444	0	4.994	250.089	0	57.713	0	461.703
270	3.112	0	461	0	5.359	280.070	0	62.238	0	513.461
280	3.347	0	478	0	5.737	312.355	0	66.933	0	568.933
290	3.590	0	495	0	6.128	347.032	0	71.800	0	628.247
300	3.842	0	512	0	6.531	384.183	0	76.837	0	691.530
310	4.102	0	529	0	6.947	423.897	0	82.045	0	758.912
320	4.371	0	546	0	7.376	466.256	0	87.423	0	830.519
330	4.649	0	563	0	7.818	511.348	0	92.972	0	906.481
340	4.935	0	581	0	8.273	559.257	0	98.692	0	986.925
350	5.229	0	598	0	8.740	610.069	0	104.583	0	1.071.979
360	5.532	0	615	0	9.220	663.869	0	110.645	0	1.161.771
370	5.844	0	632	0	9.713	720.742	0	116.877	0	1.256.429
380	6.164	0	649	0	10.219	780.775	0	123.280	0	1.356.082
390	6.493	0	666	0	10.738	844.051	0	129.854	0	1.460.858
400	6.830	0	683	0	11.269	910.657	0	136.599	0	1.570.884
410	7.176	0	700	0	11.814	980.678	0	143.514	0	1.686.288
420	7.530	0	717	0	12.371	1.054.199	0	150.600	0	1.807.199
430	7.893	0	734	0	12.941	1.131.307	0	157.857	0	1.933.745
440	8.264	0	751	0	13.523	1.212.085	0	165.284	0	2.066.053
450	8.644	0	768	0	14.119	1.296.619	0	172.883	0	2.204.253
460	9.033	0	785	0	14.727	1.384.996	0	180.652	0	2.348.471
470	9.430	0	803	0	15.348	1.477.299	0	188.591	0	2.498.836
480	9.835	0	820	0	15.982	1.573.616	0	196.702	0	2.655.476

Aleta 1400x(700x100)

Tierras: 2.000 Kg/m³ SC_c: 400 Kg/m² Gc: 1,40
 Talud: 18,40° SC_p: 0 Kg/m² Gs: 1,10
 C.E.h: 0,427 Z_SCp: 0 cm Gf: 1,50

Z (cm)	Eh (Kg)				Vd (Kg)	M (Kg)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
490	10.249	0	837	0	16.629	1.674.030	0	204.983	0	2.818.519
500	10.672	0	854	0	17.288	1.778.627	0	213.435	0	2.988.094
510	11.103	0	871	0	17.961	1.887.493	0	222.058	0	3.164.327
520	11.543	0	888	0	18.646	2.000.714	0	230.852	0	3.347.348
530	11.991	0	905	0	19.344	2.118.373	0	239.816	0	3.537.284
540	12.448	0	922	0	20.054	2.240.558	0	248.951	0	3.734.263
550	12.913	0	939	0	20.778	2.367.353	0	258.257	0	3.938.414
560	13.387	0	956	0	21.514	2.498.843	0	267.733	0	4.149.865
570	13.869	0	973	0	22.263	2.635.115	0	277.380	0	4.368.742
580	14.360	0	990	0	23.025	2.776.252	0	287.198	0	4.595.176
590	14.859	0	1.007	0	23.800	2.922.341	0	297.187	0	4.829.293
600	15.367	0	1.024	0	24.588	3.073.468	0	307.347	0	5.071.222
610	15.884	0	1.042	0	25.388	3.229.717	0	317.677	0	5.321.091
620	16.409	0	1.059	0	26.201	3.391.173	0	328.178	0	5.579.027
630	16.942	0	1.076	0	27.027	3.557.923	0	338.850	0	5.845.160
640	17.485	0	1.093	0	27.866	3.730.052	0	349.692	0	6.119.616
650	18.035	0	1.110	0	28.718	3.907.644	0	360.706	0	6.402.524
660	18.594	0	1.127	0	29.582	4.090.786	0	371.890	0	6.694.013
670	19.162	0	1.144	0	30.459	4.279.562	0	383.244	0	6.994.210
680	19.738	0	1.161	0	31.349	4.474.059	0	394.770	0	7.303.243
690	20.323	0	1.178	0	32.252	4.674.360	0	406.466	0	7.621.240
700	20.917	0	1.195	0	33.168	4.880.553	0	418.333	0	7.948.329

11. CIMENTACIONES

En las páginas siguientes se muestran los cálculos de la cimentación de la aleta.

En Alcañiz, Junio de 2.000



Javier Tello Sánchez
 Alcañizana del Hormigón, S.A. Alcañiz
 Dpto. Técnico ALHOSA

- El presente informe se ha realizado con los datos aportados por el cliente para esta pieza prefabricada concreta.
 - Salvo comunicación escrita de lo contrario, las consideraciones en él realizadas, así como los resultados aportados, se ajustan a lo solicitado por el cliente.

DATOS GENERALES:

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1400x(700/100)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 18,4 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 1
 Altura del Muro: 671,4 cm Quiebro 271,4 cm
 Altura tierras: 671,4 cm Canto.C 20,0 cm
 Canto.Z 45,0 cm
 Longitud Muro: 100,0 cm Xcdg (m) 15,0 cm
 Peso del Muro: 4.607 Kg/ml Xcdg (t) 174,3 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigon: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 116 cm
 Vuelo del Talon: 356 cm
 Canto de la Zapata: 90 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (Hztal): 0,427
 Base de la Zapata: 517,4 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-133	0	0
Muro:		-4607	-128		-638967
Tierras:	-24749	-55022	77	6281486	-18668222
Sobrecarga (coron.):	-1300	-1525	68	494976	-517330
Sobrecarga (prof.):	0	0	68	0	0
Zapata:		-11641	0		-3011434
	-26049	-72795		6776463	-22835953

Csd = 1,61 Csv = 3,37 e = -41,7 cm.

Aleta 1400x(700/100) Pza. 1

TENSION DEL TERRENO: 1,75 < 2,00 (Servicio)
 2,13 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
 SP= 2,09 ST= 0,73 Le= 517,4
 (Kg/cm²) (Kg/cm²) (cm)

CIMENTACIÓN:

Fcd = 166,7 Kg/cm² Mayoración Cargas: 1,60
 Fyd = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:

Flexión:
 S1= 333,87 SPf= 282,19 STf= 268,94 S2= 116,37
 qvP= -36,00 qvT= -289,56

Puntera: VPf= 122,9 MP= 2.120.868 Us= 25.522 5,75
 Talón: VTf= 362,9 MT= -8.057.137 Us= 100.131 22,58
 (cm) (Kgxcn) (Kg) (cm²)
 As,min= 13,50 cm²
 1,5 ‰

Cortante:
 S1= 333,87 SPc= 302,68 STc= 230,79 S2= 116,37
 qvP= -36,00 qvT= -289,56

Puntera: VPc= 74,2 VP= 20.942 Vcu= 54.222 0,00
 Talón: VTc= 272,2 VT= -31.568 (Kg) (cm²/ml)
 (cm) (Kg)

Armado Superior (Talon):

Perpendicular Muro: Ø25 /20cm
 Paralelo Muro: Ø16 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø16 /25cm
 Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

Armado a cortante: No necesario.

Armado a cortante: No necesario.

DATOS GENERALES:

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1400x(700/100)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 18,4 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 4
 Altura del Muro: 414,3 cm Quiebro 271,4 cm
 Altura tierras: 414,3 cm Canto.C 20,0 cm
 Canto.Z 28,9 cm
 Longitud Muro: 100,0 cm Xcdg (m) 10,9 cm
 Peso del Muro: 2.231 Kg/ml Xcdg (t) 115,7 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigón: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 82 cm
 Vuelo del Talón: 232 cm
 Canto de la Zapata: 60 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (H_ztal): 0,427
 Base de la Zapata: 342,7 cm

	Fh	Fv	e _x	Mv	Mr
F (coron.)			-79	0	0
Muro:		-2231	-79		-214987
Tierras:	-9602	-21757	55	1518081	-4934095
Sobrecarga (coron.):	-810	-963	51	192046	-218470
Sobrecarga (prof.):	0	0	51	0	0
Zapata:		-5141	0		-881021
	-10412	-30092		1710128	-6248572

C_{sd} = 1,67 C_{sv} = 3,65 e = -21,1 cm.

Aleta 1400x(700/100) Pza. 4

TENSION DEL TERRENO: 1,04 < 2,00 (Servicio)
 1,26 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
 SP= 1,20 ST= 0,55 Le= 342,7
 (Kg/cm²) (Kg/cm²) (cm)

CIMENTACIÓN:

F_{cd} = 166,7 Kg/cm² Mayoración Cargas: 1,60
 F_{yd} = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:Flexión:

S₁= 192,43 SP_f= 166,28 ST_f= 160,14 S₂= 88,53
 q_vP= -24,00 q_vT= -180,51

Puntera: VP_f= 86,2 MP= 593.967 U_s= 11.080 2,50
 Talón: VT_f= 236,2 MT= -1.900.546 U_s= 36.044 8,13
 (cm) (Kgxcn) (Kg) (cm²)
 As,min= 9,00 cm²
 1,5 ‰

Cortante:

S₁= 192,43 SP_c= 175,78 ST_c= 142,46 S₂= 88,53
 q_vP= -24,00 q_vT= -180,51

Puntera: VP_c= 54,9 VP= 8.790 V_{cu}= 34.857 0,00
 Talón: VT_c= 177,9 VT= -11.566 (Kg) (cm²/ml)
 (cm) (Kg)

Armado Superior (Talón):

Perpendicular Muro: Ø16 /20cm
 Paralelo Muro: Ø12 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø12 /25cm
 Paralelo Muro: Ø12 /25cm

Armado a cortante: No necesario.

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1400x(700/100)

TERRENO:

Densidad terreno:	0,00200 Kg/cm3
Angulo rozamiento interno:	30,0 °
Angulo rozamiento terreno muro:	0,0 °
Angulo de Talud:	18,4 °
Coefficiente de rozamiento:	0,58
Tensión Admisible:	2,0 Kg/cm2
Densidad del hormigón:	0,0025 Kg/cm3

DATOS DEL MURO:

Nº Pza:	6		
Altura del Muro:	242,9 cm	Quiebro	271,4 cm
Altura tierras:	242,9 cm	Canto.C	20,0 cm
		Canto.Z	20,0 cm
Longitud Muro:	100,0 cm	Xcdg (m)	10,0 cm
Peso del Muro:	1.214 Kg/ml	Xcdg (t)	76,8 cm

ACCIONES:

Sobrecarga (coron.):	0,0400 Kg/cm2		
Sobrecarga (prof.):	0,0000 Kg/cm2	Prof.(S.C.p)	0 cm

RESISTENCIAS:

Hormigon:	250 Kg/cm2	(1,50)
Acero:	5.100 Kg/cm2	(1,15)
Acciones:		(1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera:	59 cm
Vuelo del Talon:	149 cm
Canto de la Zapata:	40 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (H _{ztal}):	0,427
Base de la Zapata:	228,1 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-45	0	0
Muro:		-1214	-45		-83844
Tierras:	-3415	-7978	42	322015	-1225263
Sobrecarga (coron.):	-483	-596	40	68306	-91558
Sobrecarga (prof.):	0	0	40	0	0
Zapata:		-2281	0		-260137
	-3898	-12070		390321	-1660802

Csd = 1,79 Csv = 4,25 e = -7,3 cm.

Aleta 1400x(700/100) Pza. 6

TENSION DEL TERRENO:	0,58	<	2,00	(Servicio)	
	0,69	<	4,00	(Empuje mayorado)	(1,50)

Distribucion Trapezoidal

SP= 0,63	ST= 0,43	Le= 228,1
(Kg/cm2)	(Kg/cm2)	(cm)

CIMENTACIÓN:

Fcd =	166,7 Kg/cm2	Mayoración Cargas:	1,60
Fyd =	4.434,8 Kg/cm2	Recubrimiento:	6,0 cm.

CÁLCULO ZAPATA:

Flexión:

S1= 100,85	SPf= 92,04	STf= 90,06	S2= 68,48
qvP= -16,00		qvT= -108,05	

Puntera:	VPf= 62,0	MP= 157.680	Us= 4.660	1,05
Talón:	VTf= 152,0	MT= -374.207	Us= 11.135	2,51
	(cm)	(Kgxcn)	(Kg)	(cm2)
As,min=	6,00 cm2			
	1,5 ‰			

Cortante:

S1= 100,85	SPc= 94,88	STc= 84,81	S2= 68,48
qvP= -16,00		qvT= -108,05	

Puntera:	VPc= 42,0	VP= 3.442	Vcu= 21.947	0,00
Talón:	VTc= 115,0	VT= -3.613	(Kg)	(cm2/ml)
	(cm)	(Kg)		

Armado Superior (Talón):

Perpendicular Muro: Ø12 /25cm
Paralelo Muro: Ø12 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø12 /25cm
Paralelo Muro: Ø12 /25cm

Armado a cortante: No necesario.

Obra: SUBTRAMO XV
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1400x(700/100)

TERRENO:

Densidad terreno:	0,00200 Kg/cm3
Angulo rozamiento interno:	30,0 °
Angulo rozamiento terreno muro:	0,0 °
Angulo de Talud:	18,4 °
Coefficiente de rozamiento:	0,58
Tensión Admisible:	2,0 Kg/cm2
Densidad del hormigón:	0,0025 Kg/cm3

DATOS DEL MURO:

Nº Pza:	7		
Altura del Muro:	157,1 cm	Quiebro	271,4 cm
Altura tierras:	157,1 cm	Canto.C	20,0 cm
		Canto.Z	20,0 cm
Longitud Muro:	100,0 cm	Xcdg (m)	10,0 cm
Peso del Muro:	786 Kg/ml	Xcdg (t)	55,6 cm

ACCIONES:

Sobrecarga (coron.):	0,0400 Kg/cm2		
Sobrecarga (prof.):	0,0000 Kg/cm2	Prof.(S.C.p)	0 cm

RESISTENCIAS:

Hormigon:	250 Kg/cm2	(1,50)
Acero:	5.100 Kg/cm2	(1,15)
Acciones:		(1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera:	48 cm
Vuelo del Talon:	108 cm
Canto de la Zapata:	40 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (H _{ztal}):	0,427
Base de la Zapata:	175,2 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-30	0	0
Muro:		-786	-30		-45272
Tierras:	-1659	-3768	36	109023	-457493
Sobrecarga (coron.):	-337	-430	34	33181	-52272
Sobrecarga (prof.):	0	0	34	0	0
Zapata:		-1752	0		-153542
	-1996	-6736		142204	-708579

Csd = 1,95 Csv = 4,98 e = -2,5 cm.

Aleta 1400x(700/100) Pza. 7

TENSION DEL TERRENO:	0,40	<	2,00	(Servicio)	
	0,47	<	4,00	(Empuje mayorado)	(1,50)

Distribucion Trapezoidal

SP= 0,42	ST= 0,35	Le= 175,2
(Kg/cm2)	(Kg/cm2)	(cm)

CIMENTACIÓN:

Fcd =	166,7 Kg/cm2	Mayoración Cargas:	1,60
Fyd =	4.434,8 Kg/cm2	Recubrimiento:	6,0 cm.

CÁLCULO ZAPATA:

Flexión:

S1= 66,80	SPf= 63,74	STf= 62,89	S2= 56,21
qvP= -16,00		qvT= -78,41	

Puntera:	VPf= 50,6	MP= 63.772	Us= 1.879	0,42
Talón:	VTf= 110,6	MT= -122.213	Us= 3.608	0,81
	(cm)	(Kgxcn)	(Kg)	(cm2)
As,min=	6,00 cm2			
	1,5 ‰			

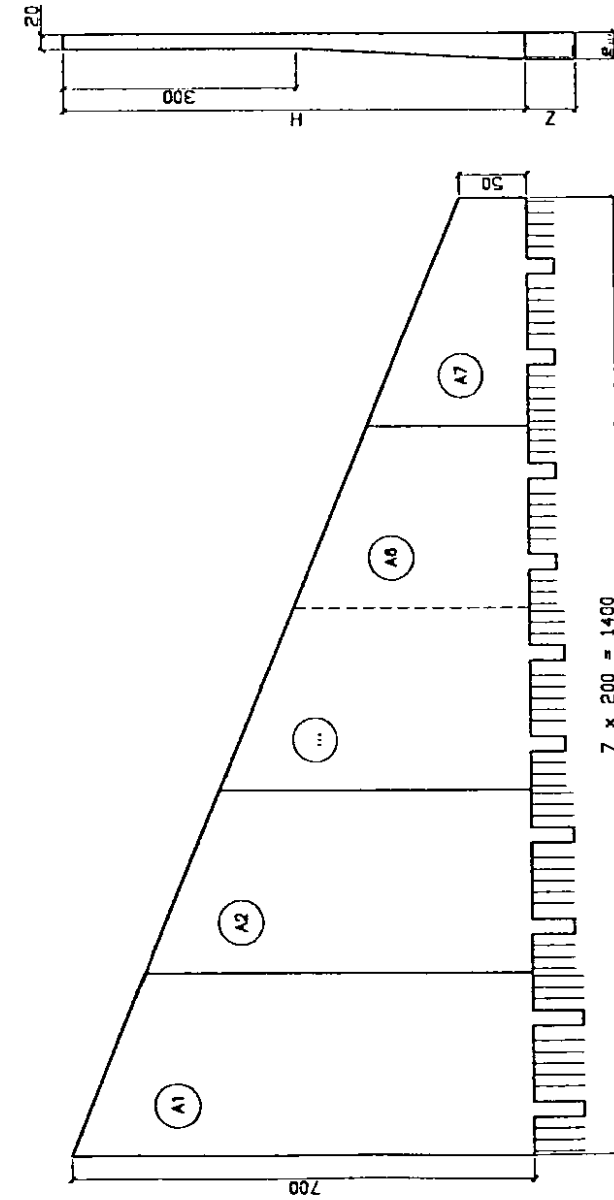
Cortante:

S1= 66,80	SPc= 64,95	STc= 60,66	S2= 56,21
qvP= -16,00		qvT= -78,41	

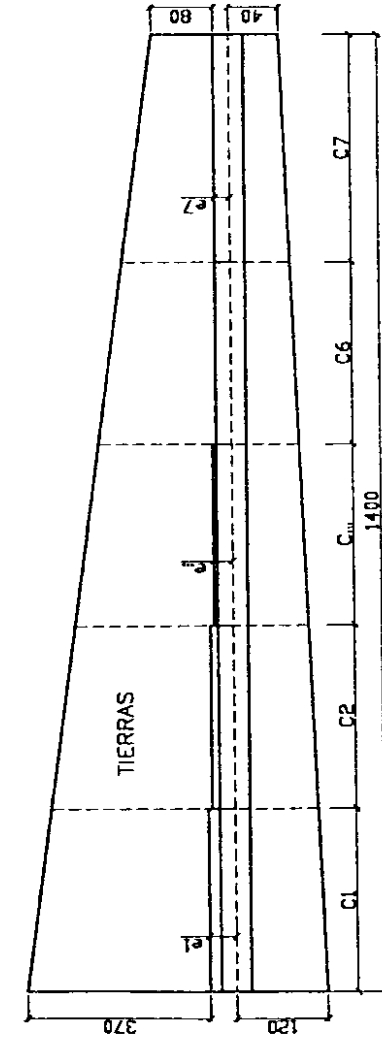
Puntera:	VPc= 30,6	VP= 1.527	Vcu= 21.947	0,00
Talón:	VTc= 73,6	VT= -1.471	(Kg)	(cm2/ml)
	(cm)	(Kg)		

<u>Armado Superior (Talón):</u>	<u>Armado Inferior (Puntera):</u>
Perpendicular Muro: Ø12 /25cm	Perpendicular Muro: Ø12 /25cm
Paralelo Muro: Ø12 /25cm	Paralelo Muro: Ø12 /25cm

Armado a cortante: No necesario.

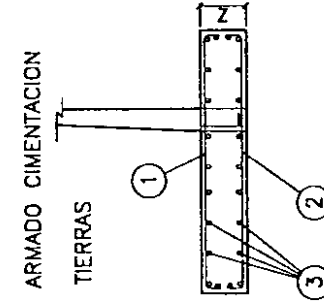


ALZADO CARA VISTA (Alata Izda)



PLANTA

• COTAS EN CM.



ARMADO CIMENTACION

TIPO	ARMADO CIMENTACION		
	1	2	3
C1	ø25/20cm	ø18/25cm	ø16/25cm
C2	ø25/25cm	ø16/25cm	ø16/25cm
C3	ø20/20cm	ø12/25cm	ø12/25cm
C4	ø16/20cm	ø12/25cm	ø12/25cm
C5	ø18/25cm	ø12/25cm	ø12/25cm
C6	ø12/25cm	ø12/25cm	ø12/25cm
C7	ø12/25cm	ø12/25cm	ø12/25cm

PIEZA	H	e...	Z
A1	700.0	45.0	90
A2	614.1	39.6	90
A3	528.4	34.3	60
A4	442.8	28.9	60
A5	356.9	23.6	40
A6	271.2	20.0	40
A7	185.2	20.0	40

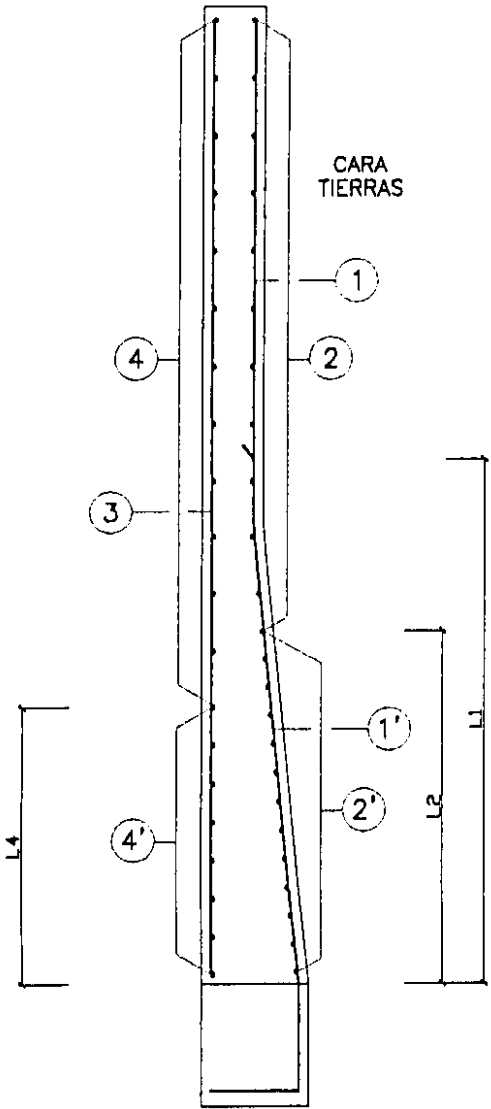
EH-81	CALIDAD	CONTROL	Cost.
ELEMENTOS PREFABRICADOS			
HORMICON	H-300	INTENSO	1.40
ACERO	AEN-500-S	INTENSO	1.10
EJECUCION		INTENSO	1.50
OBRA IN SITU			
HORMICON	H-280	NORMAL	1.50
ACERO	AEN-500	NORMAL	1.15
EJECUCION		NORMAL	1.80

20/08/00	0	MODIFICACIONES	PIEZA	63.1
PIEZA:	ALETA 1400x(700/100)	EVNS-2.0		
OFERTA:	99/643			
OBRA:	SUBTRAMO XV			
CLIENTE:	NECSO			
ALETA 1400x(700/100)		REVISADO:	APROBADO:	
			 Roberto Ramirez	
			Data Comercial	



WINTER

PREFABRICADOS DE HORMIGÓN



DEFINICIÓN DE ARMADO

	A1	A2	A3	A4	A5	A6	A7
1	ø25/22	ø20/27	ø20/25	ø16/30	ø12/30	ø10/25	ø8/25
1'	ø25/11	ø20/9	ø20/12.5	ø16/10	ø12/10	ø10/12.5	--
L1	380	395	290	265	210	140	--
2	ø10/24	ø10/30	ø8/30	ø8/30	ø8/30	ø6/20	ø6/20
2'	ø10/8	ø10/10	ø8/10	ø8/15	ø8/20	--	--
L2	312	270	230	150	60	--	--
3	ø12/15	ø12/20	ø10/20	ø8/20	ø6/25	ø6/25	ø6/25
4	ø8/20	ø8/25	ø8/25	ø8/25	ø8/20	ø8/25	ø8/25
4'	ø8/10	ø8/12.5	ø8/15	ø8/15	--	--	--
L4	310	300	225	135	--	--	--
5	10ø8/25	--	--	--	--	--	--
L5	175	--	--	--	--	--	--

Distancias en centímetros

EH-91	CALIDAD	CONTROL	Coef.
ELEMENTOS PREFABRICADOS			
HORMIGON	H-300	INTENSO	1,40
ACERO	AEH-500-S	INTENSO	1,10
EJECUCION		INTENSO	1,50
OBRA IN SITU			
HORMIGON	H-250	NORMAL	1,50
ACERO	AEH-500	NORMAL	1,15
EJECUCION		NORMAL	1,60

20/06/00	0	MODIFICACIONES	
FECHA	REV.	MODIFICACIONES	
PIEZA:	ALETA 1400x(700/100). EVN3-2.0		63.2
OFERTA:	99/643		
OBRA:	SUBTRAMO XV		
CLIENTE:	NECSO		
ALETA 1400x(700/100)		REVISADO:	APROBADO:
		Dpto. Comercial	Dpto. Técnico
PREFABRICADOS DE HORMIGON			

<i>ALHOSA</i> PREFABRICADOS DE HORMIGÓN	ALETAS 1400x(767/418) EVN3-2.5
Oferta: 99/643 Obra: SUBTRAMO XV Empresa: NECSO Fecha: Agosto de 2.000	

ÍNDICE

- 1.- Generalidades
- 2.- Descripción
- 3.- Instrucciones aplicadas
- 4.- Características de los materiales
- 5.- Control de calidad
- 6.- Coeficientes de seguridad
- 7.- Parámetros del terreno
- 8.- Acciones consideradas
- 9.- Hipótesis de cálculo
- 10.- Cálculos
- 11.- Cimentación
- 12.- Planos

1. Generalidades

En la presente memoria se muestran los cálculos realizados para justificar las Aletas Prefabricadas de hormigón que sostienen el terraplén.

2. Descripción

El sostenimiento de las tierras que forman el terraplén en las entradas de las obras de fábrica se realiza con aletas prefabricadas de hormigón armado.

El espesor de los muros que forman las aletas es de 20 cm. hasta los 300 cm. de profundidad y luego aumenta progresivamente, tal y como se muestra en los planos adjuntos.

La cimentación se realiza con hormigón vertido in situ

3. Instrucciones aplicadas

Para el cálculo de las Aletas, se han utilizado las siguientes Instrucciones y Normas:

* Instrucción para el Proyecto y Ejecución de Obras de Hormigón en Masa o Armado EH-91.

4. Características de los materiales

* Hormigones:

Hormigón en elemento prefabricado	H-300
Hormigón en obra in situ	H-250

* Acero:

Acero para armar corrugado	B-500 S
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5. Control de calidad

El control de calidad se atenderá a lo especificado en la EH-91, habiéndose seleccionado los siguientes niveles:

Elementos prefabricados:

a) Materiales:

- Hormigón	Control Intenso
- Armadura pasiva	Control Intenso

b) Ejecución:

- En toda la obra	Control Intenso
-------------------	-----------------

Obra in situ:

a) Materiales:

- Hormigón	Control Normal
- Armadura pasiva	Control Normal

b) Ejecución:

- En toda la obra	Control Normal
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6. Coeficientes de seguridad

De acuerdo con los niveles de control de calidad definidos, se adoptan los siguientes coeficientes de seguridad:

Elementos prefabricados:

- Coeficientes de minoración de resistencias:

Acero pasivo

$\gamma_s = 1,10$

Hormigón

$\gamma_c = 1,40$

- Coeficientes de ponderación de acciones:

$\gamma_f = 1,50$

Obra in situ:

- Coeficientes de minoración de resistencias:

Acero pasivo

$\gamma_s = 1,15$

Hormigón

$\gamma_c = 1,50$

- Coeficientes de ponderación de acciones:

$\gamma_f = 1,60$

7. Parámetros del terreno

En los cálculos se ha considerado un talud de terraplén 2H:1V con ángulo de rozamiento interno de 30°. La Aleta forma un ángulo de 25° con el pie del terraplén

Peso específico 2,0ton/m³

Ángulo de rozamiento interno 30°

Ángulo Talud coronación 24,4°

Coeficiente de empuje activo 0,495

8. Acciones consideradas**8.1 Empuje por efecto de las tierras**

Se considera el empuje activo de las tierras que se encuentran en el trasdós de la Aleta.

8.2 Sobrecargas de uso

Se considera una sobrecarga de 400 Kg/m² sobre el terraplén, que es la establecida para paseos de servicio.

9. Hipótesis de cálculo.**HIPÓTESIS I:**

- Empuje de las tierras

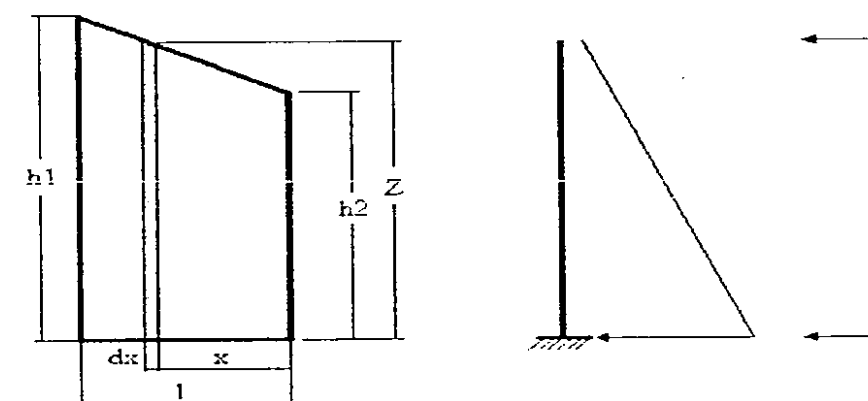
- Sobrecarga de uso

Combinación: 1,5 * [Caso (1) + Caso (2)]

10. Cálculos.

Dada la geometría de la estructura en la que se reduce la altura en función de la longitud y los esfuerzos se comportan de igual manera, cada tramo de la aleta se ha armado para la altura existente a una distancia, del lado mayor, de 1/3 de su longitud, siendo en todo momento superiores las sollicitaciones en este punto que la resultante sobre cada tramo.

Pza.	H.máx	H.mín	H.cál
1	767,0	723,5	753
2	723,3	679,9	709
3	679,6	627,5	662
4	627,3	575,2	610
5	574,9	522,8	558
6	522,6	470,5	505
7	470,2	418,0	453



$$M = \int_{x=0}^{x=l} dM = \int_{x=0}^{x=l} \left(\frac{1}{6} \cdot \lambda_h \cdot \gamma_t \cdot z^3 + \frac{1}{2} \cdot \lambda_h \cdot SC \cdot z^2 \right) \cdot dx =$$

$$= \frac{1}{6} \cdot \lambda_h \cdot \gamma_t \cdot \left(\frac{1}{4} \cdot \frac{h_1^4 - h_2^4}{h_1 - h_2} \right) \cdot l + \frac{1}{2} \cdot \lambda_h \cdot SC \cdot \left(\frac{1}{3} \cdot \frac{h_1^3 - h_2^3}{h_1 - h_2} \right) \cdot l \leq M \left(z = h_2 + \frac{2 \cdot (h_1 - h_2)}{3} \right)$$

$$V = \int_{x=0}^{x=l} dV = \int_{x=0}^{x=l} \left(\frac{1}{2} \cdot \lambda_h \cdot \gamma_t \cdot z^2 + \lambda_h \cdot SC \cdot z \right) \cdot dx =$$

$$= \frac{1}{2} \cdot \lambda_h \cdot \gamma_t \cdot \left(\frac{1}{3} \cdot \frac{h_1^3 - h_2^3}{h_1 - h_2} \right) \cdot l + \lambda_h \cdot SC \cdot \left(\frac{1}{2} \cdot \frac{h_1^2 - h_2^2}{h_1 - h_2} \right) \cdot l \leq V \left(z = h_2 + \frac{2 \cdot (h_1 - h_2)}{3} \right)$$

$$z = h_2 + \frac{h_1 - h_2}{l} \cdot x$$

DATOS GENERALES:

Obra: SUBTRAM XV (EVN3-2.5)
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1400x(767x418)

TERRENO:

Densidad terreno: 0,0020 Kg/cm³
 Densidad Agua: 0,0010 Kg/cm³
 Indice Huecos: 30,0 %
 Densidad Aparente: 0,0013 Kg/cm³
 Angulo Roz.Int: 30,0 °
 Angulo Roz. Trno/Mro: 0,0 °
 Angulo de Talud: 24,4 °
 Coef. Empuje Activo Hztal: 0,495
 Coef. Empuje Activo Vtal: 0,000

MURO:

Altura máxima: 767 cm Quiebro 300 cm
 Resguardo Tierras: 0 cm Canto C. 20 cm
 Longitud Muro: 100 cm Canto Z. 51,7 cm
 Peso del Muro 5.685 Kg/ml Xcdg (m) 16,7 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm²
 Prof. Aplic. (S.C.p.) 0 cm

MATERIALES ALZADO:

Fc,k 300 Kg/cm² Gc (1,40)
 Fy,k 5100 Kg/cm² Gs (1,10)
 Fc,d 214,3 Kg/cm² Gf (1,50)
 Fy,d 4.636,4 Kg/cm² Recubrimiento: 4,0 cm.
 Fyv,d 4.200,0 Kg/cm²

ESFUERZOS:

	H_Calc	Canto	Md	As1	As2	Vd	Vcu	Ast
	cm	cm	Kg x cm	cm ²	cm ²	Kg	Kg	cm ² /ml
1	752	51,7	11.375.018	59,45	0,00	44.235	34.913	5,17
2	709	48,7	9.552.269	52,79	0,00	39.376	32.745	3,92
3	662	45,8	7.834.535	45,90	0,00	34.505	30.578	2,49
4	610	42,2	6.163.352	39,11	0,00	29.409	27.977	0,99
5	558	38,7	4.748.308	32,92	0,00	24.720	25.376	0,00
6	505	35,1	3.568.119	27,33	0,00	20.437	22.775	0,00
7	453	31,6	2.601.498	22,31	0,00	16.560	20.174	0,00

Aleta 1400x(767x418)

Tierras: 2.000 Kg/m³ SC_c: 400 Kg/m² Gc: 1,40
 Talud: 24,40° SC_p: 0 Kg/m² Gs: 1,10
 C.E.h: 0,495 Z_SCp: 0 cm Gf: 1,50

Z (cm)	Eh (Kg)				Vd (Kg)	M (Kg)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
0	0	0	0	0	0	0	0	0	0	0
10	5	0	20	0	37	16	0	99	0	173
20	20	0	40	0	89	132	0	396	0	791
30	45	0	59	0	156	445	0	890	0	2.003
40	79	0	79	0	237	1.055	0	1.583	0	3.956
50	124	0	99	0	334	2.061	0	2.473	0	6.800
60	178	0	119	0	445	3.561	0	3.561	0	10.682
70	242	0	138	0	571	5.654	0	4.847	0	15.752
80	317	0	158	0	712	8.440	0	6.330	0	22.156
90	401	0	178	0	868	12.018	0	8.012	0	30.044
100	495	0	198	0	1.039	16.485	0	9.891	0	39.565
110	598	0	218	0	1.224	21.942	0	11.968	0	50.865
120	712	0	237	0	1.424	28.486	0	14.243	0	64.095
130	836	0	257	0	1.639	36.218	0	16.716	0	79.401
140	969	0	277	0	1.869	45.235	0	19.387	0	96.933
150	1.113	0	297	0	2.114	55.638	0	22.255	0	116.839
160	1.266	0	317	0	2.374	67.523	0	25.321	0	139.267
170	1.429	0	336	0	2.648	80.992	0	28.585	0	164.366
180	1.602	0	356	0	2.938	96.142	0	32.047	0	192.284
190	1.785	0	376	0	3.242	113.072	0	35.707	0	223.169
200	1.978	0	396	0	3.561	131.882	0	39.565	0	257.169
210	2.181	0	415	0	3.895	152.670	0	43.620	0	294.434
220	2.394	0	435	0	4.243	175.535	0	47.873	0	335.112
230	2.616	0	455	0	4.607	200.576	0	52.324	0	379.350
240	2.849	0	475	0	4.985	227.892	0	56.973	0	427.297
250	3.091	0	495	0	5.378	257.582	0	61.820	0	479.102
260	3.343	0	514	0	5.786	289.744	0	66.864	0	534.913
270	3.605	0	534	0	6.209	324.479	0	72.106	0	594.878
280	3.877	0	554	0	6.647	361.884	0	77.546	0	659.145
290	4.159	0	574	0	7.099	402.058	0	83.184	0	727.864
300	4.451	0	593	0	7.567	445.101	0	89.020	0	801.182
310	4.753	0	613	0	8.049	491.111	0	95.054	0	879.248
320	5.064	0	633	0	8.546	540.188	0	101.285	0	962.210
330	5.386	0	653	0	9.058	592.429	0	107.714	0	1.050.216
340	5.717	0	673	0	9.585	647.935	0	114.342	0	1.143.415
350	6.058	0	692	0	10.126	706.804	0	121.166	0	1.241.956
360	6.409	0	712	0	10.682	769.135	0	128.189	0	1.345.986
370	6.770	0	732	0	11.254	835.026	0	135.410	0	1.455.653
380	7.141	0	752	0	11.840	904.577	0	142.828	0	1.571.108
390	7.522	0	772	0	12.441	977.887	0	150.444	0	1.692.497
400	7.913	0	791	0	13.056	1.055.054	0	158.258	0	1.819.969
410	8.313	0	811	0	13.687	1.136.178	0	166.270	0	1.953.672
420	8.724	0	831	0	14.332	1.221.357	0	174.480	0	2.093.755
430	9.144	0	851	0	14.992	1.310.691	0	182.887	0	2.240.367
440	9.575	0	870	0	15.668	1.404.277	0	191.492	0	2.393.654
450	10.015	0	890	0	16.357	1.502.216	0	200.295	0	2.553.767
460	10.465	0	910	0	17.062	1.604.606	0	209.296	0	2.720.853
470	10.925	0	930	0	17.782	1.711.545	0	218.495	0	2.895.061
480	11.395	0	950	0	18.516	1.823.134	0	227.892	0	3.076.538

Aleta 1400x(767x418)

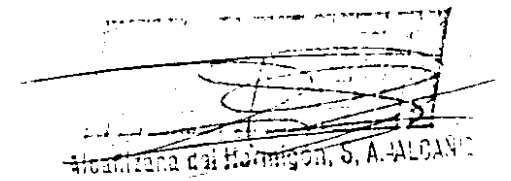
Tierras: 2.000 Kg/m³ SC_c: 400 Kg/m² Gc: 1,40
 Talud: 24,40° SC_p: 0 Kg/m² Gs: 1,10
 C.E.h: 0,495 Z_SCp: 0 cm Gf: 1,50

Z (cm)	Eh (Kg)				Vd (Kg)	M (Kg)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
490	11.874	0	969	0	19.265	1.939.470	0	237.486	0	3.265.434
500	12.364	0	989	0	20.030	2.060.653	0	247.278	0	3.461.897
510	12.863	0	1.009	0	20.808	2.186.781	0	257.268	0	3.666.075
520	13.373	0	1.029	0	21.602	2.317.954	0	267.456	0	3.878.116
530	13.892	0	1.048	0	22.411	2.454.271	0	277.842	0	4.098.169
540	14.421	0	1.068	0	23.234	2.595.829	0	288.425	0	4.326.382
550	14.960	0	1.088	0	24.073	2.742.729	0	299.207	0	4.562.904
560	15.509	0	1.108	0	24.926	2.895.069	0	310.186	0	4.807.882
570	16.068	0	1.128	0	25.794	3.052.948	0	321.363	0	5.061.466
580	16.637	0	1.147	0	26.676	3.216.465	0	332.738	0	5.323.804
590	17.216	0	1.167	0	27.574	3.385.719	0	344.310	0	5.595.044
600	17.804	0	1.187	0	28.486	3.560.808	0	356.081	0	5.875.334
610	18.402	0	1.207	0	29.414	3.741.833	0	368.049	0	6.164.822
620	19.011	0	1.227	0	30.356	3.928.890	0	380.215	0	6.463.658
630	19.629	0	1.246	0	31.313	4.122.081	0	392.579	0	6.771.990
640	20.257	0	1.266	0	32.285	4.321.502	0	405.141	0	7.089.965
650	20.895	0	1.286	0	33.271	4.527.254	0	417.900	0	7.417.732
660	21.543	0	1.306	0	34.273	4.739.436	0	430.858	0	7.755.440
670	22.201	0	1.325	0	35.289	4.958.145	0	444.013	0	8.103.237
680	22.868	0	1.345	0	36.320	5.183.482	0	457.366	0	8.461.272
690	23.546	0	1.365	0	37.366	5.415.544	0	470.917	0	8.829.692
700	24.233	0	1.385	0	38.427	5.654.432	0	484.666	0	9.208.646
710	24.931	0	1.405	0	39.503	5.900.243	0	498.612	0	9.598.282
720	25.638	0	1.424	0	40.593	6.153.077	0	512.756	0	9.998.750
730	26.355	0	1.444	0	41.699	6.413.032	0	527.099	0	10.410.196
740	27.082	0	1.464	0	42.819	6.680.208	0	541.638	0	10.832.770
750	27.819	0	1.484	0	43.954	6.954.704	0	556.376	0	11.266.620
760	28.566	0	1.503	0	45.104	7.236.617	0	571.312	0	11.711.894
770	29.322	0	1.523	0	46.268	7.526.049	0	586.445	0	12.168.741

11. CIMENTACIONES

En las páginas siguientes se muestran los cálculos de la cimentación de la aleta.

En Alcañiz, Agosto de 2.000



Javier Tello Sánchez
Dpto. Técnico ALHOSA

- El presente informe se ha realizado con los datos aportados por el cliente para esta pieza prefabricada concreta.
 Salvo comunicación escrita de lo contrario, las consideraciones en él realizadas, así como los resultados aportados, se ajustan a lo solicitado por el cliente.

DATOS GENERALES:

Obra: SUBTRAMO XV (EVN3-2.5)
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1400x(767/418)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 24,4 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 1
 Altura del Muro: 753,9 cm Quiebro 286,9 cm
 Altura tierras: 753,9 cm Canto.C 20,0 cm
 Canto.Z 51,7 cm
 Longitud Muro: 100,0 cm Xcdg (m) 16,8 cm
 Peso del Muro: 5.620 Kg/ml Xcdg (t) 224,4 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigón: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 137 cm
 Vuelo del Talón: 452 cm
 Canto de la Zapata: 100 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (H_{ztal}): 0,495
 Base de la Zapata: 640,0 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-173	0	0
Muro:		-5620	-167		-913369
Tierras:	-36063	-82003	93	10265192	-33965814
Sobrecarga (coron.):	-1689	-1933	78	721264	-800842
Sobrecarga (prof.):	0	0	78	0	0
Zapata:		-16001	0		-5120533
	-37752	-105558		10986456	-40800558

C_{sd} = 1,61 C_{sv} = 3,71 e = -39,5 cm.

Aleta 1400x(767/418) Pza. 1

TENSION DEL TERRENO: 1,95 < 2,00 (Servicio)
 2,36 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
 SP= 2,26 (Kg/cm²) ST= 1,04 (Kg/cm²) Le= 640,0 (cm)

CIMENTACIÓN:

F_{cd} = 166,7 Kg/cm² Mayoración Cargas: 1,60
 F_{yd} = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S₁= 361,54 SP_f= 317,47 ST_f= 306,42 S₂= 166,22
 q_{vP}= -40,00 q_{vT}= -336,89

Puntera: VP_f= 144,4 MP= 3.200.079 U_s= 34.490 7,78
 Talón: VT_f= 459,4 MT= -13.079.562 U_s= 147.290 33,21
 (cm) (Kgxcn) (Kg) (cm²)
 As,min= 15,00 cm²
 1,5 ‰

Cortante:

S₁= 361,54 SP_c= 334,18 ST_c= 275,37 S₂= 166,22
 q_{vP}= -40,00 q_{vT}= -336,89

Puntera: VP_c= 89,7 VP= 27.605 V_{cu}= 60.677 0,00
 Talón: VT_c= 357,7 VT= -41.524 (Kg) (cm²/ml)
 (cm) (Kg)

Armado Superior (Talón):

Perpendicular Muro: Ø25 /13cm
 Paralelo Muro: Ø16 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø16 /25cm
 Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

DATOS GENERALES:

Obra: SUBTRAMO XV (EVN3-2.5)
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1400x(767/418)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 24,4 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 2
 Altura del Muro: 713,0 cm Quiebro 285,2 cm
 Altura tierras: 713,0 cm Canto.C 20,0 cm
 Canto.Z 49,0 cm
 Longitud Muro: 100,0 cm Xcdg (m) 16,0 cm
 Peso del Muro: 5.118 Kg/ml Xcdg (t) 212,1 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigon: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 127 cm
 Vuelo del Talon: 427 cm
 Canto de la Zapata: 100 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (Hztal): 0,495
 Base de la Zapata: 602,4 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-165	0	0
Muro:		-5118	-159		-773788
Tierras:	-32693	-73166	87	8860207	-28464432
Sobrecarga (coron.):	-1608	-1823	73	653851	-709150
Sobrecarga (prof.):	0	0	73	0	0
Zapata:		-15059	0		-4535658
	-34301	-95166		9514058	-34483028

Csd = 1,60 Csv = 3,62 e = -40,5 cm.

Aleta 1400x(767/418) Pza. 2

TENSION DEL TERRENO: 1,90 < 2,00 (Servicio)
 2,29 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
 SP= 2,22 (Kg/cm²) ST= 0,94 (Kg/cm²) Le= 602,4 (cm)

CIMENTACIÓN:

Fcd = 166,7 Kg/cm² Mayoración Cargas: 1,60
 Fyd = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S1= 354,69 SPf= 309,34 STf= 297,72 S2= 150,87
 qvP= -40,00 qvT= -320,77

Puntera: VPf= 134,0 MP= 2.690.445 Us= 28.936 6,52
 Talón: VTf= 434,0 MT= -11.392.244 Us= 127.276 28,70
 (cm) (Kgxcn) (Kg) (cm2)
 As,min= 15,00 cm²
 1,5 ‰

Cortante:

S1= 354,69 SPc= 327,73 STc= 263,43 S2= 150,87
 qvP= -40,00 qvT= -320,77

Puntera: VPc= 79,7 VP= 23.996 Vcu= 60.677 0,00
 Talón: VTc= 332,7 VT= -37.799 (Kg) (cm2/ml)
 (cm) (Kg)

Armado Superior (Talon):

Perpendicular Muro: Ø25 /13cm
 Paralelo Muro: Ø16 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø16 /25cm
 Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

DATOS GENERALES:

Obra: SUBTRAMO XV (EVN3-2.5)
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1400x(767/418)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 24,4 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 3
 Altura del Muro: 665,8 cm Quiebro 282,3 cm
 Altura tierras: 665,8 cm Canto.C 20,0 cm
 Canto.Z 46,0 cm
 Longitud Muro: 100,0 cm Xcdg (m) 15,1 cm
 Peso del Muro: 4.577 Kg/ml Xcdg (t) 199,2 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigon: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 116 cm
 Vuelo del Talón: 400 cm
 Canto de la Zapata: 80 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (H_ztal): 0,495
 Base de la Zapata: 562,0 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-155	0	0
Muro:		-4577	-150		-636338
Tierras:	-27511	-63969	80	6839634	-23159082
Sobrecarga (coron.):	-1475	-1704	68	550222	-616958
Sobrecarga (prof.):	0	0	68	0	0
Zapata:		-11241	0		-3158833
	-28987	-81491		7389856	-27571212

C_{sd} = 1,62 C_{sv} = 3,73 e = -34,7 cm.

Aleta 1400x(767/418) Pza. 3

TENSION DEL TERRENO: 1,72 < 2,00 (Servicio)
 2,07 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
 SP= 1,99 ST= 0,91 Le= 562,0
 (Kg/cm²) (Kg/cm²) (cm)

CIMENTACIÓN:

F_{cd} = 166,7 Kg/cm² Mayoración Cargas: 1,60
 F_{yd} = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S₁= 318,01 SP_f= 280,39 ST_f= 270,52 S₂= 145,97
 q_vP= -32,00 q_vT= -294,28

Puntera: VP_f= 122,9 MP= 2.065.448 U_s= 28.293 6,38
 Talón: VT_f= 406,9 MT= -8.840.474 U_s= 127.180 28,68
 (cm) (Kgxcn) (Kg) (cm²)
 As,min= 12,00 cm²
 1,5 ‰

Cortante:

S₁= 318,01 SP_c= 293,83 ST_c= 245,76 S₂= 145,97
 q_vP= -32,00 q_vT= -294,28

Puntera: VP_c= 79,0 VP= 21.639 V_{cu}= 47.767 0,00
 Talón: VT_c= 326,0 VT= -32.082 (Kg) (cm²/ml)
 (cm) (Kg)

Armado Superior (Talón):

Perpendicular Muro: Ø25 /16cm
 Paralelo Muro: Ø16 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø16 /25cm
 Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

Obra: SUBTRAMO XV (EVN3-2.5)
 Cliente: NECSO
 Nº Oferta: 99/643
 Pieza: Aleta 1400x(767/418)

TERRENO:

Densidad terreno:	0,00200 Kg/cm3
Angulo rozamiento interno:	30,0 °
Angulo rozamiento terreno muro:	0,0 °
Angulo de Talud:	24,4 °
Coefficiente de rozamiento:	0,58
Tensión Admisible:	2,0 Kg/cm2
Densidad del hormigón:	0,0025 Kg/cm3

DATOS DEL MURO:

Nº Pza:	4		
Altura del Muro:	612,7 cm	Quiebro	282,3 cm
Altura tierras:	612,7 cm	Canto.C	20,0 cm
		Canto.Z	42,4 cm
Longitud Muro:	100,0 cm	Xcdg (m)	14,1 cm
Peso del Muro:	3.990 Kg/ml	Xcdg (t)	184,7 cm

ACCIONES:

Sobrecarga (coron.):	0,0400 Kg/cm2		
Sobrecarga (prof.):	0,0000 Kg/cm2	Prof.(S.C.p)	0 cm

RESISTENCIAS:

Hormigon:	250 Kg/cm ²	(1,50)
Acero:	5.100 Kg/cm ²	(1,15)
Acciones:		(1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera:	104 cm
Vuelo del Talon:	370 cm
Canto de la Zapata:	80 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (H _{ztal}):	0,495
Base de la Zapata:	516,4 cm

	Fh	Fv	e _x	Mv	Mr
F (coron.)			-144	0	0
Muro:		-3990	-140		-499622
Tierras:	-23733	-54336	73	5480124	-18008415
Sobrecarga (coron.):	-1370	-1570	62	474653	-520252
Sobrecarga (prof.):	0	0	62	0	0
Zapata:		-10329	0		-2666999
	-25103	-70224		5954777	-21695288

Csd = 1,61 Csv = 3,64 e = -35,0 cm.

Alcta 1400x(767/418) Pza. 4

TENSION DEL TERRENO:	1,64	<	2,00	(Servicio)	
	1,97	<	4,00	(Empuje mayorado)	(1,50)

Distribucion Trapezoidal

SP= 1,91	ST= 0,81	Le= 516,4
(Kg/cm2)	(Kg/cm2)	(cm)

CIMENTACIÓN:

Fcd =	166,7 Kg/cm2	Mayoración Cargas:	1,60
Fyd =	4.434,8 Kg/cm2	Recubrimiento:	6,0 cm.

CÁLCULO ZAPATA:

Flexión:

S1= 306,00	SPf= 268,20	STf= 258,03	S2= 129,14
qvP= -32,00		qvT= -273,36	

Puntera:	VPf= 110,4	MP= 1.591.950	Us= 21.738	4,90
Talón:	VTf= 376,4	MT= -7.171.890	Us= 101.867	22,97
	(cm)	(Kgxcmm)	(Kg)	(cm2)
As,min=	12,00 cm2			
	1,5 ‰			

<u>Cortante:</u>			
S1= 306,00	SPc= 283,05	STc= 230,51	S2= 129,14
qvP= -32,00		qvT= -273,36	

Puntera:	VPc= 67,0	VP= 17.589	Vcu= 47.767	0,00
Talón:	VTc= 296,0	VT= -27.688	(Kg)	(cm2/ml)
	(cm)	(Kg)		

<u>Armado Superior (Talón):</u>	<u>Armado Inferior (Puntera):</u>
Perpendicular Muro: Ø20 /13cm	Perpendicular Muro: Ø16 /25cm
Paralelo Muro: Ø16 /25cm	Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

DATOS GENERALES:

Obra: SUBTRAMO XV (EVN3-2.5)
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1400x(767/418)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 24,4 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza:	5		
Altura del Muro:	559,6 cm	Quiebro	282,3 cm
Altura tierras:	559,6 cm	Canto C	20,0 cm
		Canto Z	38,8 cm
Longitud Muro:	100,0 cm	Xcdg (m)	13,1 cm
Peso del Muro:	3.451 Kg/ml	Xcdg (l)	170,2 cm

ACCIONES:

Sobrecarga (coron.):	0,0400 Kg/cm ²		
Sobrecarga (prof.):	0,0000 Kg/cm ²	Prof.(S.C.p)	0 cm

RESISTENCIAS:

Hormigon:	250 Kg/cm ²	(1,50)
Acero:	5.100 Kg/cm ²	(1,15)
Acciones:		(1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera:	92 cm
Vuelo del Talón:	340 cm
Canto de la Zapata:	80 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (H _{ztal}):	0,495
Base de la Zapata:	470,8 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-133	0	0
Muro:		-3451	-130		-384451
Tierras:	-20233	-45480	66	4313874	-13681483
Sobrecarga (coron.):	-1265	-1435	56	404664	-431774
Sobrecarga (prof.):	0	0	56	0	0
Zapata:		-9416	0		-2216761
	-21499	-59782		4718538	-16714468

C_{sd} = 1,60 C_{sv} = 3,54 e = -35,2 cm.

Aleta 1400x(767/418) Pza. 5

TENSION DEL TERRENO: 1,55 < 2,00 (Servicio)
 1,87 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
 SP= 1,84 ST= 0,70 Le= 470,8
 (Kg/cm²) (Kg/cm²) (cm)

CIMENTACIÓN:

Fcd =	166,7 Kg/cm ²	Mayoración Cargas:	1,60
Fyd =	4.434,8 Kg/cm ²	Recubrimiento:	6,0 cm.

CÁLCULO ZAPATA:

Flexión:
 S1= 294,30 SPf= 256,43 STf= 245,91 S2= 112,01
 qvP= -32,00 qvT= -252,42

Puntera:	VPf= 97,8	MP= 1.194.640	Us= 16.270	3,67
Talón:	VTf= 345,8	MT= -5.727.268	Us= 80.485	18,15
	(cm)	(Kgxcn)	(Kg)	(cm2)
As,min=	12,00 cm ²			
	1,5 ‰			

Cortante:
 S1= 294,30 SPc= 273,01 STc= 215,00 S2= 112,01
 qvP= -32,00 qvT= -252,42

Puntera:	VPc= 55,0	VP= 13.841	Vcu= 47.767	0,00
Talón:	VTc= 266,0	VT= -23.652	(Kg)	(cm2/ml)
	(cm)	(Kg)		

Armado Superior (Talón):

Perpendicular Muro: Ø20 /16cm
 Paralelo Muro: Ø16 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø16 /25cm
 Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

Obra: SUBTRAMO XV (EVN3-2.5)
 Cliente: NECSO
 Nº Oferta: 99/643
 Pieza: Aleta 1400x(767/418)

TERRENO:

Densidad terreno:	0,00200 Kg/cm3
Angulo rozamiento interno:	30,0 °
Angulo rozamiento terreno muro:	0,0 °
Angulo de Talud:	24,4 °
Coefficiente de rozamiento:	0,58
Tensión Admisible:	2,0 Kg/cm2
Densidad del hormigón:	0,0025 Kg/cm3

DATOS DEL MURO:

Nº Pza:	6		
Altura del Muro:	506,5 cm	Quiebro	282,3 cm
Altura tierras:	506,5 cm	Canto.C	20,0 cm
		Canto.Z	35,2 cm
Longitud Muro:	100,0 cm	Xcdg (m)	12,2 cm
Peso del Muro:	2.959 Kg/ml	Xcdg (t)	155,7 cm

ACCIONES:

Sobrecarga (coron.):	0,0400 Kg/cm2		
Sobrecarga (prof.):	0,0000 Kg/cm2	Prof.(S.C.p)	0 cm

RESISTENCIAS:

Hormigon:	250 Kg/cm2	(1,50)
Acero:	5.100 Kg/cm2	(1,15)
Acciones:		(1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera:	80 cm
Vuelo del Talon:	310 cm
Canto de la Zapata:	60 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (H _{ztal}):	0,495
Base de la Zapata:	425,2 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-123	0	0
Muro:		-2959	-120		-288842
Tierras:	-15872	-37402	58	2997284	-10106848
Sobrecarga (coron.):	-1121	-1301	50	317445	-351524
Sobrecarga (prof.):	0	0	50	0	0
Zapata:		-6378	0		-1356090
	<u>-16993</u>	<u>-48041</u>		<u>3314729</u>	<u>-12103303</u>

Csd = 1,63 Csv = 3,65 e = -29,6 cm.

Aleta 1400x(767/418) Pza. 6

TENSION DEL TERRENO:	1,37	<	2,00	(Servicio)	
	1,64	<	4,00	(Empuje mayorado)	(1,50)

Distribucion Trapezoidal

SP= 1,60	ST= 0,66	Le= 425,2
(Kg/cm2)	(Kg/cm2)	(cm)

CIMENTACIÓN:

Fcd =	166,7 Kg/cm ²	Mayoración Cargas:	1,60
Fyd =	4.434,8 Kg/cm ²	Recubrimiento:	6,0 cm.

CÁLCULO ZAPATA:

Flexión:

S1= 256,36	SPf= 226,04	STf= 217,27	S2= 105,17
qvP= -24,00		qvT= -223,44	

Puntera:	VPf= 85,3	MP= 808.255	Us= 15.117	3,41
Talón:	VTf= 315,3 (cm)	MT= -4.021.300 (Kgxcn)	Us= 78.496 (Kg)	17,70 (cm2)
As,min=	9,00 cm2 1,5 ‰			

Cortante:

S1= 256,36	SPc= 237,52	STc= 196,19	S2= 105,17
qvP= -24,00		qvT= -223,44	

Puntera:	VPc= 53,0	VP= 11.816	Vcu= 34.857	0,00
Talón:	VTc= 256,0 (cm)	VT= -18.628 (Kg)	(Kg)	(cm2/ml)

<u>Armado Superior (Talón):</u>	<u>Armado Inferior (Puntera):</u>
Perpendicular Muro: Ø20 /16cm	Perpendicular Muro: Ø12 /25cm
Paralelo Muro: Ø12 /25cm	Paralelo Muro: Ø12 /25cm

Armado a cortante: No necesario.

Obra: SUBTRAMO XV (EVN3-2.5)
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 1400x(767/418)

TERRENO:

Densidad terreno:	0,00200 Kg/cm3
Angulo rozamiento interno:	30,0 °
Angulo rozamiento terreno muro:	0,0 °
Angulo de Talud:	24,4 °
Coefficiente de rozamiento:	0,58
Tensión Admisible:	2,0 Kg/cm2
Densidad del hormigón:	0,0025 Kg/cm3

DATOS DEL MURO:

Nº Pza:	7		
Altura del Muro:	453,4 cm	Quiebro	282,3 cm
Altura tierras:	453,4 cm	Canto.C	20,0 cm
		Canto.Z	31,6 cm
Longitud Muro:	100,0 cm	Xcdg (m)	11,4 cm
Peso del Muro:	2.515 Kg/ml	Xcdg (t)	141,3 cm

ACCIONES:

Sobrecarga (coron.):	0,0400 Kg/cm2		
Sobrecarga (prof.):	0,0000 Kg/cm2	Prof.(S.C.p)	0 cm

RESISTENCIAS:

Hormigon:	250 Kg/cm2	(1,50)
Acero:	5.100 Kg/cm2	(1,15)
Acciones:		(1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera:	68 cm
Vuelo del Talon:	280 cm
Canto de la Zapata:	60 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (H _{ztal}):	0,495
Base de la Zapata:	379,6 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-112	0	0
Muro:		-2515	-110		-210814
Tierras:	-13036	-30103	51	2230885	-7213075
Sobrecarga (coron.):	-1016	-1166	44	260716	-279501
Sobrecarga (prof.):	0	0	44	0	0
Zapata:		-5694	0		-1080806
	-14051	-39479		2491601	-8784196

Csd = 1,62 **Csv** = 3,53 **e** = -29,9 cm.

Aleta 1400x(767/418) Pza. 7

TENSION DEL TERRENO:	1,29	<	2,00	(Servicio)	
	1,54	<	4,00	(Empuje mayorado)	(1,50)

Distribucion Trapezoidal

SP= 1,53	ST= 0,55	Le= 379,6
(Kg/cm2)	(Kg/cm2)	(cm)

CIMENTACIÓN:

Fcd =	166,7 Kg/cm ²	Mayoración Cargas:	1,60
Fyd =	4.434,8 Kg/cm ²	Recubrimiento:	6,0 cm.

CÁLCULO ZAPATA:

Flexión:

S1= 244,91	SPf= 214,82	STf= 205,67	S2= 87,88
qvP= -24,00		qvT= -202,42	

Puntera:	VPf= 72,7	MP= 557.934	Us= 10.403	2,35
Talón:	VTf= 284,7	MT= -3.051.549	Us= 58.767	13,25
	(cm)	(Kgxcmm)	(Kg)	(cm2)
As,min=	9,00 cm2			
	1,5 ‰			

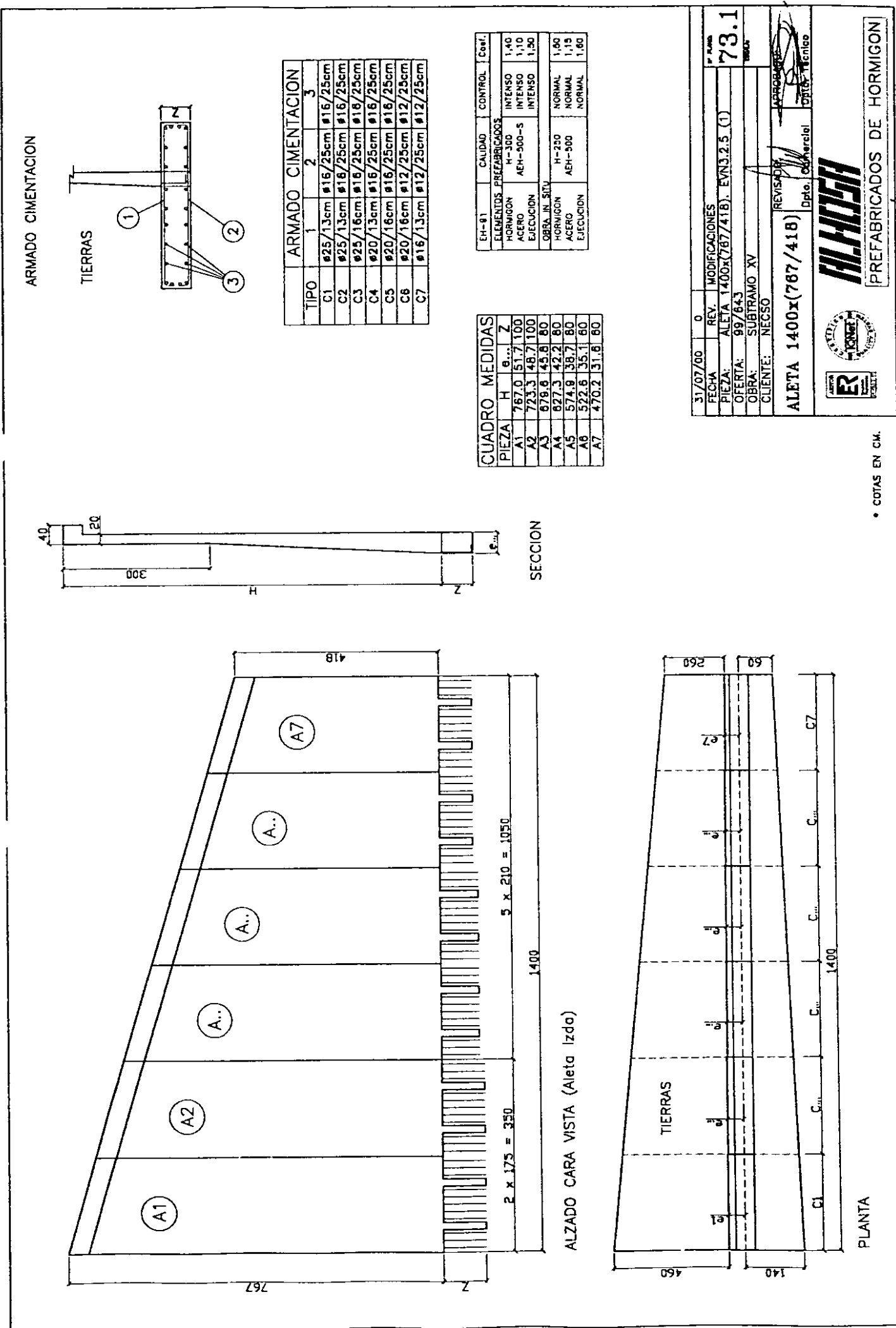
Cortante:

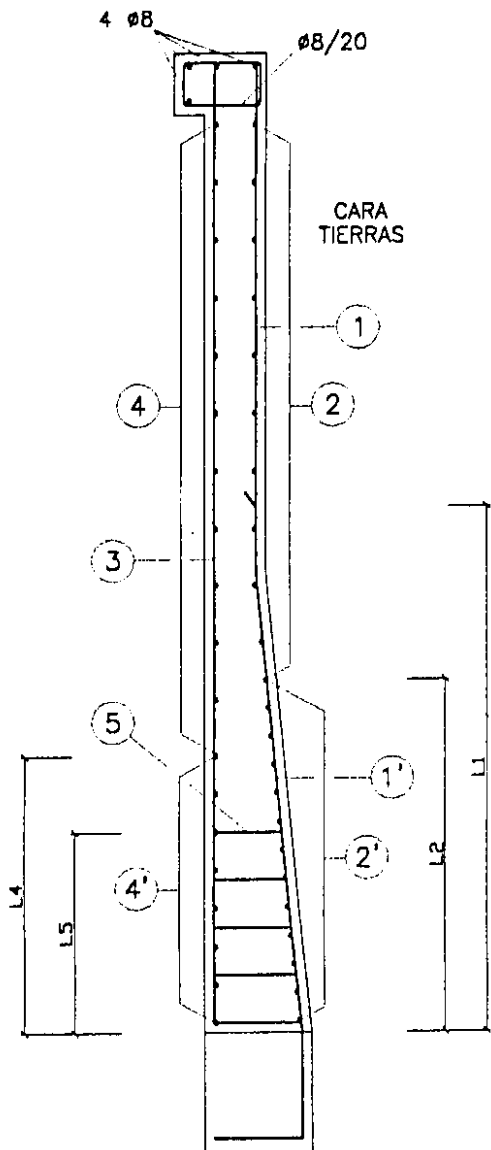
S1= 244,91	SPc= 227,95	STc= 181,37	S2= 87,88
qvP= -24,00		qvT= -202,42	

Puntera:	VPc= 41,0	VP= 8.710	Vcu= 34.857	0,00
Talón:	VTc= 226,0 (cm)	VT= -15.321 (Kg)	(Kg)	(cm2/ml)

<u>Armado Superior (Talón):</u>	<u>Armado Inferior (Puntera):</u>
Perpendicular Muro: Ø16 /13cm	Perpendicular Muro: Ø12 /25cm
Paralelo Muro: Ø12 /25cm	Paralelo Muro: Ø12 /25cm

Armado a cortante: No necesario.





DEFINICIÓN DE ARMADO

	A1	A2	A3	A4	A5	A6	A7
1	Ø25/24	Ø25/27	Ø25/20	Ø20/16	Ø20/27	Ø20/22	Ø16/27
1'	Ø25/8	Ø25/9	Ø25/10	Ø20/8	Ø20/9	Ø20/11	Ø16/9
L1	510	485	370	330	390	300	310
2	Ø12/24	Ø12/30	Ø10/24	Ø10/30	Ø10/30	Ø10/30	Ø8/30
2'	Ø12/8	Ø12/10	Ø10/8	Ø10/10	Ø10/10	Ø10/10	Ø8/10
L2	328	350	320	310	260	220	180
3	Ø16/20	Ø16/20	Ø12/15	Ø12/20	Ø10/20	Ø10/20	Ø10/25
4	Ø8/20	Ø8/20	Ø8/20	Ø8/20	Ø8/25	Ø8/25	Ø8/25
4'	Ø8/10	Ø8/10	Ø8/10	Ø8/10	Ø8/12.5	Ø8/12.5	Ø8/15
L4	380	340	290	240	275	225	165
5	3Ø8(pml)/25	3Ø8(pml)/25	3Ø8(pml)/25	3Ø8(pml)/25	---	---	---
L5	250	200	150	100	---	---	---

Distancias en centímetros

EH-91	CALIDAD	CONTROL	Coef.
ELEMENTOS PREFABRICADOS			
HORMIGON	H-300	INTENSO	1,40
ACERO	AEH-500-S	INTENSO	1,10
EJECUCION		INTENSO	1,50
OBRA IN SITU			
HORMIGON	H-250	NORMAL	1,50
ACERO	AEH-500	NORMAL	1,15
EJECUCION		NORMAL	1,60

02/08/00	0		
FECHA	REV.	MODIFICACIONES	Nº PLANO
PIEZA:	ALETA 1400x(787/418)	EVN3.2.5 (1)	73.2
OFERTA:	99/643		
OBRA:	ZARAGOZA		
CLIENTE:	NECSO		
ALETA 1400x(787/418)		REVISADO:	APROBADO:
		Dpto. Comercial	Dpto. Técnico
PREFABRICADOS DE HORMIGON			

<i>ALHOSA</i> PREFABRICADOS DE HORMIGÓN	ALETAS 840x(767/382) EVN3-2.5
Oferta: 99/643 Obra: SUBTRAMO XV Empresa: NECSO Fecha: Agosto de 2.000	

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1.-	Generalidades
2.-	Descripción
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7.-	Parámetros del terreno
8.-	Acciones consideradas
9.-	Hipótesis de cálculo
10.-	Cálculos
11.-	Cimentación
12.-	Planos

1. Generalidades

En la presente memoria se muestran los cálculos realizados para justificar las Aletas Prefabricadas de hormigón que sostienen el terraplén.

2. Descripción

El sostenimiento de las tierras que forman el terraplén en las entradas de las obras de fábrica se realiza con aletas prefabricadas de hormigón armado.

El espesor de los muros que forman las aletas es de 20 cm. hasta los 300 cm. de profundidad y luego aumenta progresivamente, tal y como se muestra en los planos adjuntos.

La cimentación se realiza con hormigón vertido in situ

3. Instrucciones aplicadas

Para el cálculo de las Aletas, se han utilizado las siguientes Instrucciones y Normas:

* Instrucción para el Proyecto y Ejecución de Obras de Hormigón en Masa o Armado EH-91.

4. Características de los materiales

* Hormigones:	
Hormigón en elemento prefabricado	H-300
Hormigón en obra in situ	H-250
* Acero:	
Acero para armar corrugado	B-500 S

5. Control de calidad

El control de calidad se atenderá a lo especificado en la EH-91, habiéndose seleccionado los siguientes niveles:

Elementos prefabricados:

a) Materiales:	
- Hormigón	Control Intenso
- Armadura pasiva	Control Intenso
b) Ejecución:	
- En toda la obra	Control Intenso
Obra in situ:	
a) Materiales:	
- Hormigón	Control Normal
- Armadura pasiva	Control Normal
b) Ejecución:	
- En toda la obra	Control Normal

6. Coeficientes de seguridad

De acuerdo con los niveles de control de calidad definidos, se adoptan los siguientes coeficientes de seguridad:

Elementos prefabricados:

- Coeficientes de minoración de resistencias:

Acero pasivo

$\gamma_s = 1,10$

Hormigón

$\gamma_c = 1,40$

- Coeficientes de ponderación de acciones:

$\gamma_f = 1,50$

Obra in situ:

- Coeficientes de minoración de resistencias:

Acero pasivo

$\gamma_s = 1,15$

Hormigón

$\gamma_c = 1,50$

- Coeficientes de ponderación de acciones:

$\gamma_f = 1,60$

7. Parámetros del terreno

En los cálculos se ha considerado un talud de terraplén 2H:1V con ángulo de rozamiento interno de 30°. La Aleta forma un ángulo de 60° con el pie del terraplén

Peso específico 2,0ton/m³

Ángulo de rozamiento interno 30°

Ángulo Talud coronación 14,1°

Coeficiente de empuje activo 0,396

8. Acciones consideradas**8.1 Empuje por efecto de las tierras**

Se considera el empuje activo de las tierras que se encuentran en el trasdós de la Aleta.

8.2 Sobrecargas de uso

Se considera una sobrecarga de 400 Kg/m² sobre el terraplén, que es la establecida para paseos de servicio.

9. Hipótesis de cálculo.**HIPÓTESIS I:**

- Empuje de las tierras

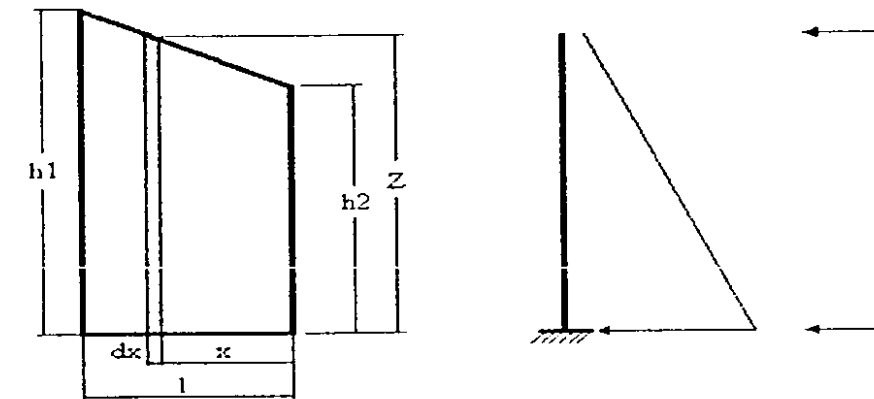
- Sobrecarga de uso

Combinación: 1,5 * [Caso (1) + Caso (2)]

10. Cálculos.

Dada la geometría de la estructura en la que se reduce la altura en función de la longitud y los esfuerzos se comportan de igual manera, cada tramo de la aleta se ha armado para la altura existente a una distancia, del lado mayor, de 1/3 de su longitud, siendo en todo momento superiores las solicitaciones en este punto que la resultante sobre cada tramo.

Pza.	H.máx	H.mín	H.cálculo
1	767,0	670,8	735
2	670,8	574,6	639
3	574,6	478,4	542
4	478,4	382,0	446



$$M = \int_{x=0}^{x=l} dM = \int_{x=0}^{x=l} \left(\frac{1}{6} \cdot \lambda_h \cdot \gamma_t \cdot z^3 + \frac{1}{2} \cdot \lambda_h \cdot SC \cdot z^2 \right) \cdot dx =$$

$$= \frac{1}{6} \cdot \lambda_h \cdot \gamma_t \cdot \left(\frac{1}{4} \cdot \frac{h_1^4 - h_2^4}{h_1 - h_2} \right) \cdot l + \frac{1}{2} \cdot \lambda_h \cdot SC \cdot \left(\frac{1}{3} \cdot \frac{h_1^3 - h_2^3}{h_1 - h_2} \right) \cdot l \leq M \left(z = h_2 + \frac{2 \cdot (h_1 - h_2)}{3} \right)$$

$$V = \int_{x=0}^{x=l} dV = \int_{x=0}^{x=l} \left(\frac{1}{2} \cdot \lambda_h \cdot \gamma_t \cdot z^2 + \lambda_h \cdot SC \cdot z \right) \cdot dx =$$

$$= \frac{1}{2} \cdot \lambda_h \cdot \gamma_t \cdot \left(\frac{1}{3} \cdot \frac{h_1^3 - h_2^3}{h_1 - h_2} \right) \cdot l + \lambda_h \cdot SC \cdot \left(\frac{1}{2} \cdot \frac{h_1^2 - h_2^2}{h_1 - h_2} \right) \cdot l \leq V \left(z = h_2 + \frac{2 \cdot (h_1 - h_2)}{3} \right)$$

$$z = h_2 + \frac{h_1 - h_2}{l} \cdot x$$

DATOS GENERALES:

Obra: SUBTRAM XV (EVN3-2.5)
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 840x(767x382)

TERRENO:

Densidad terreno: 0,0020 Kg/cm³
 Densidad Agua: 0,0010 Kg/cm³
 Indice Huecos: 30,0 %
 Densidad Aparente: 0,0013 Kg/cm³
 Angulo Roz.Int: 30,0 °
 Angulo Roz. Tmo/Mro: 0,0 °
 Angulo de Talud: 14,1 °
 Coef. Empuje Activo Hztal: 0,396
 Coef. Empuje Activo Vtcal: 0,000

MURO:

Altura máxima: 767 cm Quiebro 300 cm
 Resguardo Tierras: 0 cm Canto C. 20 cm
 Longitud Muro: 100 cm Canto Z. 51,7 cm
 Peso del Muro 5.685 Kg/ml Xcdg (m) 16,7 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm²
 Prof. Aplic. (S.C.p.) 0 cm

MATERIALES ALZADO:

Fc,k 300 Kg/cm² Gc (1,40)
 Fy,k 5100 Kg/cm² Gs (1,10)
 Fc,d 214,3 Kg/cm² Gf (1,50)
 Fy,d 4.636,4 Kg/cm² Recubrimiento: 4,0 cm.
 Fyv,d 4.200,0 Kg/cm²

ESFUERZOS:

	H_Calc cm	Canto cm	Md Kg x cm	As1 cm ²	As2 cm ²	Vd Kg	Vcu Kg	Ast cm ² /ml
1	735	51,7	8.505.715	42,57	0,00	33.848	34.913	0,00
2	639	45,2	5.645.879	32,33	0,00	25.761	30.131	0,00
3	542	38,6	3.511.366	23,61	0,00	18.776	25.349	0,00
4	446	32,1	1.996.185	16,35	0,00	12.892	20.567	0,00

Aleta 840x(767x382)

Tierras: 2.000 Kg/m³ SC_c: 400 Kg/m² Gc: 1,40
 Talud: 14,10° SC_p: 0 Kg/m² Gs: 1,10
 C.E.h: 0,396 Z_SCp: 0 cm Gf: 1,50

Z (cm)	Eh (Kg)				Vd (Kg)	M (Kg)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
490	9.513	0	777	0	15.435	1.553.853	0	190.268	0	2.616.182
500	9.906	0	792	0	16.047	1.650.942	0	198.113	0	2.773.582
510	10.306	0	808	0	16.671	1.751.993	0	206.117	0	2.937.164
520	10.714	0	824	0	17.307	1.857.085	0	214.279	0	3.107.046
530	11.130	0	840	0	17.955	1.966.298	0	222.600	0	3.283.347
540	11.554	0	856	0	18.615	2.079.711	0	231.079	0	3.466.186
550	11.986	0	872	0	19.286	2.197.404	0	239.717	0	3.655.681
560	12.426	0	888	0	19.970	2.319.455	0	248.513	0	3.851.951
570	12.873	0	903	0	20.665	2.445.943	0	257.468	0	4.055.116
580	13.329	0	919	0	21.372	2.576.949	0	266.581	0	4.265.294
590	13.793	0	935	0	22.092	2.712.550	0	275.853	0	4.482.604
600	14.264	0	951	0	22.823	2.852.828	0	285.283	0	4.707.166
610	14.744	0	967	0	23.566	2.997.860	0	294.871	0	4.939.096
620	15.231	0	983	0	24.320	3.147.725	0	304.619	0	5.178.516
630	15.726	0	998	0	25.087	3.302.505	0	314.524	0	5.425.543
640	16.229	0	1.014	0	25.866	3.462.276	0	324.588	0	5.680.297
650	16.741	0	1.030	0	26.656	3.627.119	0	334.811	0	5.942.896
660	17.260	0	1.046	0	27.458	3.797.114	0	345.192	0	6.213.459
670	17.787	0	1.062	0	28.273	3.972.338	0	355.732	0	6.492.105
680	18.321	0	1.078	0	29.099	4.152.872	0	366.430	0	6.778.952
690	18.864	0	1.094	0	29.937	4.338.794	0	377.286	0	7.074.121
700	19.415	0	1.109	0	30.787	4.530.185	0	388.302	0	7.377.729
710	19.974	0	1.125	0	31.649	4.727.122	0	399.475	0	7.689.896
720	20.540	0	1.141	0	32.522	4.929.686	0	410.807	0	8.010.740
730	21.115	0	1.157	0	33.408	5.137.956	0	422.298	0	8.340.380
740	21.697	0	1.173	0	34.305	5.352.010	0	433.947	0	8.678.936
750	22.288	0	1.189	0	35.215	5.571.929	0	445.754	0	9.026.525
760	22.886	0	1.205	0	36.136	5.797.791	0	457.720	0	9.383.267
770	23.492	0	1.220	0	37.069	6.029.676	0	469.845	0	9.749.281

Aleta 840x(767x382)

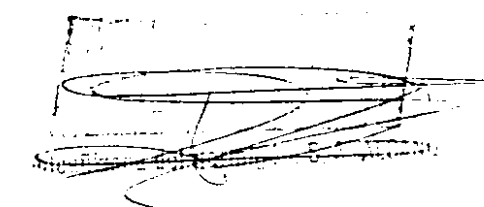
Tierras: 2.000 Kg/m³ SC_c: 400 Kg/m² Gc: 1,40
 Talud: 14,10° SC_p: 0 Kg/m² Gs: 1,10
 C.E.h: 0,396 Z_SCp: 0 cm Gf: 1,50

Z (cm)	Eh (Kg)				Vd (Kg)	M (Kg x cm)				Md (Kg x cm)
	(Tierras)	(Agua)	(SC.c)	(SC.p)		(Tierras)	(Agua)	(SC.c)	(SC.p)	
0	0	0	0	0	0	0	0	0	0	0
10	4	0	16	0	30	13	0	79	0	139
20	16	0	32	0	71	106	0	317	0	634
30	36	0	48	0	125	357	0	713	0	1.605
40	63	0	63	0	190	845	0	1.268	0	3.170
50	99	0	79	0	267	1.651	0	1.981	0	5.448
60	143	0	95	0	357	2.853	0	2.853	0	8.558
70	194	0	111	0	458	4.530	0	3.883	0	12.620
80	254	0	127	0	571	6.762	0	5.072	0	17.751
90	321	0	143	0	695	9.628	0	6.419	0	24.071
100	396	0	158	0	832	13.208	0	7.925	0	31.698
110	479	0	174	0	981	17.579	0	9.589	0	40.752
120	571	0	190	0	1.141	22.823	0	11.411	0	51.351
130	670	0	206	0	1.313	29.017	0	13.392	0	63.614
140	777	0	222	0	1.498	36.241	0	15.532	0	77.660
150	892	0	238	0	1.694	44.575	0	17.830	0	93.608
160	1.014	0	254	0	1.902	54.098	0	20.287	0	111.577
170	1.145	0	269	0	2.122	64.889	0	22.902	0	131.686
180	1.284	0	285	0	2.354	77.026	0	25.675	0	154.053
190	1.430	0	301	0	2.597	90.590	0	28.608	0	178.797
200	1.585	0	317	0	2.853	105.660	0	31.698	0	206.038
210	1.747	0	333	0	3.120	122.315	0	34.947	0	235.893
220	1.918	0	349	0	3.400	140.634	0	38.355	0	268.483
230	2.096	0	365	0	3.691	160.696	0	41.921	0	303.925
240	2.282	0	380	0	3.994	182.581	0	45.645	0	342.339
250	2.476	0	396	0	4.309	206.368	0	49.528	0	383.844
260	2.678	0	412	0	4.636	232.136	0	53.570	0	428.558
270	2.888	0	428	0	4.975	259.964	0	57.770	0	476.601
280	3.106	0	444	0	5.325	289.932	0	62.128	0	528.090
290	3.332	0	460	0	5.688	322.119	0	66.645	0	583.146
300	3.566	0	475	0	6.062	356.603	0	71.321	0	641.886
310	3.808	0	491	0	6.449	393.466	0	76.155	0	704.430
320	4.057	0	507	0	6.847	432.785	0	81.147	0	770.897
330	4.315	0	523	0	7.257	474.639	0	86.298	0	841.406
340	4.580	0	539	0	7.679	519.109	0	91.607	0	916.075
350	4.854	0	555	0	8.113	566.273	0	97.075	0	995.023
360	5.135	0	571	0	8.558	616.211	0	102.702	0	1.078.369
370	5.424	0	586	0	9.016	669.001	0	108.487	0	1.166.232
380	5.722	0	602	0	9.486	724.724	0	114.430	0	1.258.731
390	6.027	0	618	0	9.967	783.458	0	120.532	0	1.355.985
400	6.340	0	634	0	10.460	845.282	0	126.792	0	1.458.112
410	6.661	0	650	0	10.966	910.277	0	133.211	0	1.565.232
420	6.989	0	666	0	11.483	978.520	0	139.789	0	1.677.463
430	7.326	0	682	0	12.012	1.050.092	0	146.524	0	1.794.924
440	7.671	0	697	0	12.552	1.125.071	0	153.419	0	1.917.734
450	8.024	0	713	0	13.105	1.203.537	0	160.472	0	2.046.012
460	8.384	0	729	0	13.670	1.285.569	0	167.683	0	2.179.877
470	8.753	0	745	0	14.246	1.371.246	0	175.053	0	2.319.448
480	9.129	0	761	0	14.835	1.460.648	0	182.581	0	2.464.843

11. CIMENTACIONES

En las páginas siguientes se muestran los cálculos de la cimentación de la aleta.

En Alcañiz, Agosto de 2.000



Javier Tello Sánchez
Dpto. Técnico ALHOSA

- El presente informe se ha realizado con los datos aportados por el cliente para esta pieza prefabricada concreta.
 Salvo comunicación escrita de lo contrario, las consideraciones en él realizadas, así como los resultados aportados, se ajustan a lo solicitado por el cliente.

DATOS GENERALES:

Obra: SUBTRAMO XV (EVN3-2.5)
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 840x(767/382)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 14,1 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 2
 Altura del Muro: 638,7 cm Quiebro 267,9 cm
 Altura tierras: 638,7 cm Canto.C 20,0 cm
 Canto.Z 45,2 cm
 Longitud Muro: 100,0 cm Xcdg (m) 14,9 cm
 Peso del Muro: 4.360 Kg/ml Xcdg (t) 177,8 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigón: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 113 cm
 Vuelo del Talón: 365 cm
 Canto de la Zapata: 90 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (H_ztal): 0,396
 Base de la Zapata: 523,5 cm

	Fh	Fv	e_x	Mv	Mr
F (coron.)			-138	0	0
Muro:		-4360	-133		-592548
Tierras:	-21038	-52728	75	5109854	-17980233
Sobrecarga (coron.):	-1155	-1561	67	420756	-532187
Sobrecarga (prof.):	0	0	67	0	0
Zapata:		-11779	0		-3083086
	-22193	-70427		5530610	-22188054

Csd = 1,83 C_{sv} = 4,01 e = -29,5 cm.

Aleta 840x(767/382) Pza. 2

TENSION DEL TERRENO: 1,57 < 2,00 (Servicio)
 1,88 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
 SP= 1,80 ST= 0,89 Le= 523,5
 (Kg/cm²) (Kg/cm²) (cm)

CIMENTACIÓN:

Fcd = 166,7 Kg/cm² Mayoración Cargas: 1,60
 Fyd = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S1= 288,05 SPf= 254,65 STf= 245,85 S2= 142,45
 qvP= -36,00 qvT= -273,54

Puntera: VPf= 120,1 MP= 1.737.744 Us= 20.870 4,71
 Talón: VTf= 371,8 MT= -6.677.365 Us= 82.341 18,57
 (cm) (Kgxcn) (Kg) (cm²)
 As,min= 13,50 cm²
 1,5 ‰

Cortante:

S1= 288,05 SPc= 268,21 STc= 220,60 S2= 142,45
 qvP= -36,00 qvT= -273,54

Puntera: VPc= 71,3 VP= 17.272 Vcu= 54.222 0,00
 Talón: VTc= 281,0 VT= -25.855 (Kg) (cm²/ml)
 (cm) (Kg)

Armado Superior (Talón):

Perpendicular Muro: Ø25 /20cm
 Paralelo Muro: Ø16 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø16 /25cm
 Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

DATOS GENERALES:

Obra: SUBTRAMO XV (EVN3-2.5)
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 840x(767/382)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 14,1 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 3
 Altura del Muro: 542,4 cm Quiebro 267,9 cm
 Altura tierras: 542,4 cm Canto.C 20,0 cm
 Canto.Z 38,6 cm
 Longitud Muro: 100,0 cm Xcdg (m) 13,1 cm
 Peso del Muro: 3.351 Kg/ml Xcdg (t) 162,8 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigón: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 93 cm
 Vuelo del Talón: 331 cm
 Canto de la Zapata: 90 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (H_ztal): 0,396
 Base de la Zapata: 463,2 cm

	Fh	Fv	e _x	Mv	Mr
F (coron.)			-128	0	0
Muro:		-3351	-125		-377538
Tierras:	-15847	-40520	63	3340655	-12058385
Sobrecarga (coron.):	-1002	-1400	57	316942	-416489
Sobrecarga (prof.):	0	0	57	0	0
Zapata:		-10422	0		-2413906
	-16849	-55693		3657597	-15266319

C_{sd} = 1,91 C_{sv} = 4,17 e = -25,8 cm

Aleta 840x(767/382) Pza. 3

TENSION DEL TERRENO: 1,40 < 2,00 (Servicio)
 1,66 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal
 SP= 1,60 (Kg/cm²) ST= 0,80 (Kg/cm²) Le= 463,2 (cm)

CIMENTACIÓN:

F_{cd} = 166,7 Kg/cm² Mayoración Cargas: 1,60
 F_{yd} = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S₁= 256,76 SP_f= 229,20 ST_f= 221,69 S₂= 127,98
 qvP= -36,00 qvT= -238,12

Puntera: VP_f= 99,1 MP= 1.039.525 U_s= 12.440 2,81
 Talón: VT_f= 337,0 (cm) MT= -4.481.834 (Kgxcn) U_s= 54.608 (Kg) 12,31 (cm²)
 As,min= 13,50 cm² 1,5 ‰

Cortante:

S₁= 256,76 SP_c= 242,49 ST_c= 196,72 S₂= 127,98
 qvP= -36,00 qvT= -238,12

Puntera: VP_c= 51,3 VP= 10.966 V_{cu}= 54.222 0,00
 Talón: VT_c= 247,3 (cm) VT= -18.734 (Kg) (Kg) (cm²/ml)

Armado Superior (Talón):

Perpendicular Muro: Ø20 /20cm
 Paralelo Muro: Ø16 /25cm

Armado Inferior (Puntera):

Perpendicular Muro: Ø16 /25cm
 Paralelo Muro: Ø16 /25cm

Armado a cortante: No necesario.

DATOS GENERALES:

Obra: SUBTRAMO XV (EVN3-2.5)
 Cliente: NECSO
 N° Oferta: 99/643
 Pieza: Aleta 840x(767/382)

TERRENO:

Densidad terreno: 0,00200 Kg/cm³
 Angulo rozamiento interno: 30,0 °
 Angulo rozamiento terreno muro: 0,0 °
 Angulo de Talud: 14,1 °
 Coeficiente de rozamiento: 0,58
 Tensión Admisible: 2,0 Kg/cm²
 Densidad del hormigón: 0,0025 Kg/cm³

DATOS DEL MURO:

N° Pza: 4
 Altura del Muro: 446,2 cm Quiebro 267,9 cm
 Altura tierras: 446,2 cm Canto.C 20,0 cm
 Canto.Z 32,1 cm
 Longitud Muro: 100,0 cm Xcdg (m) 11,5 cm
 Peso del Muro: 2.500 Kg/ml Xcdg (t) 147,9 cm

ACCIONES:

Sobrecarga (coron.): 0,0400 Kg/cm²
 Sobrecarga (prof.): 0,0000 Kg/cm² Prof.(S.C.p) 0 cm

RESISTENCIAS:

Hormigón: 250 Kg/cm² (1,50)
 Acero: 5.100 Kg/cm² (1,15)
 Acciones: (1,60)

DATOS DE LA ZAPATA:

Vuelo Puntera: 73 cm
 Vuelo del Talón: 298 cm
 Canto de la Zapata: 60 cm

COMPROBACION DE ESTABILIDAD:

Coeficiente Empuje Activo (H_ztal): 0,396
 Base de la Zapata: 402,9 cm

	Fh	Fv	e _x	Mv	Mr
F (coron.)			-118	0	0
Muro:		-2500	-117		-223496
Tierras:	-10151	-29819	52	1712783	-7579371
Sobrecarga (coron.):	-802	-1238	47	203030	-314780
Sobrecarga (prof.):	0	0	47	0	0
Zapata:		-6044	0		-1217662
	-10954	-39601		1915813	-9335309

C_{sd} = 2,09 C_{sv} = 4,87 e = -15,2 cm.

Aleta 840x(767/382) Pza. 4

TENSION DEL TERRENO: 1,09 < 2,00 (Servicio)
 1,27 < 4,00 (Empuje mayorado) (1,50)

Distribucion Trapezoidal

SP= 1,21 ST= 0,76 Le= 402,9
 (Kg/cm²) (Kg/cm²) (cm)

CIMENTACIÓN:

F_{cd} = 166,7 Kg/cm² Mayoración Cargas: 1,60
 F_{yd} = 4.434,8 Kg/cm² Recubrimiento: 6,0 cm.

CÁLCULO ZAPATA:**Flexión:**

S₁= 192,86 SP_f= 179,05 ST_f= 175,08 S₂= 121,64
 q_vP= -24,00 q_vT= -190,77

Puntera: VP_f= 78,1 MP= 501.571 U_s= 9.345 2,11
 Talón: VT_f= 302,3 MT= -2.344.888 U_s= 44.732 10,09
 (cm) (Kgxc_m) (Kg) (cm²)
 As,min= 9,00 cm²
 1,5 ‰

Cortante:

S₁= 192,86 SP_c= 184,67 ST_c= 164,68 S₂= 121,64
 q_vP= -24,00 q_vT= -190,77

Puntera: VP_c= 46,3 VP= 7.634 V_{cu}= 34.857 0,00
 Talón: VT_c= 243,5 VT= -11.592 (Kg) (cm²/ml)
 (cm) (Kg)

Armado Superior (Talón):

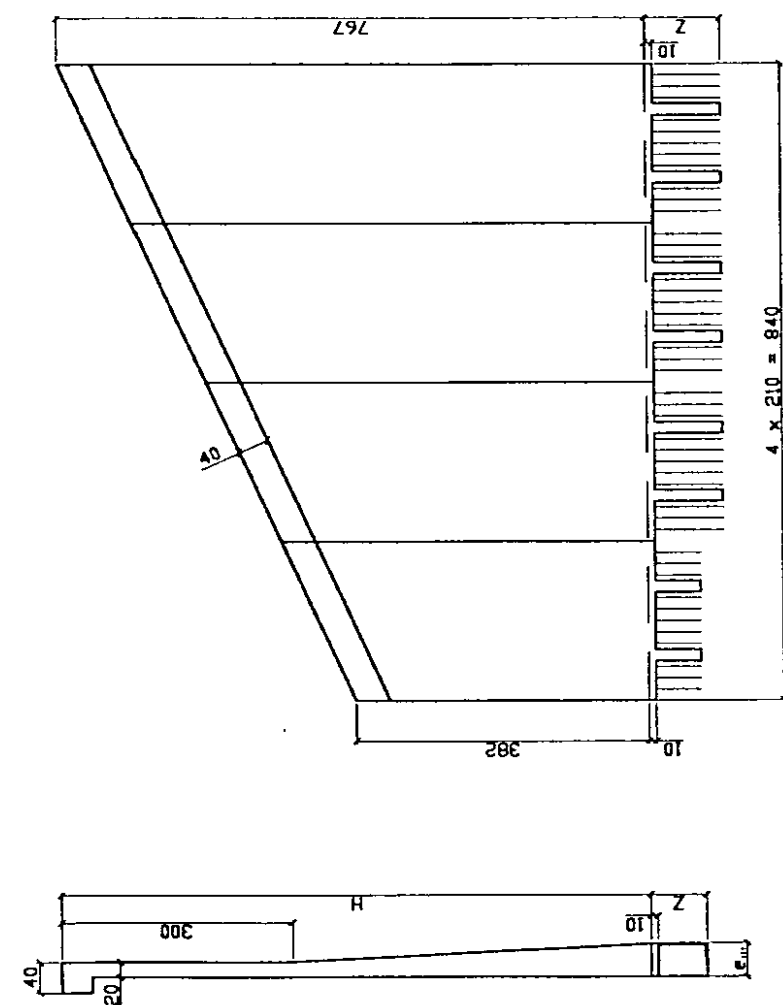
Perpendicular Muro: Ø16 /15cm
 Paralelo Muro: Ø12 /25cm

Armado Inferior (Puntera):

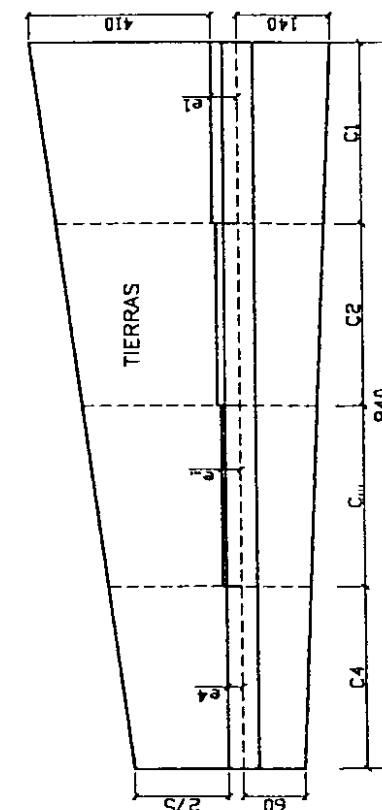
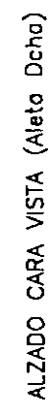
Perpendicular Muro: Ø12 /25cm
 Paralelo Muro: Ø12 /25cm

Armado a cortante: No necesario.

12. PLANOS

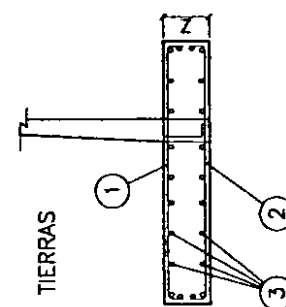


SECCION



PLANTA

• COTAS EN CM.



TIPO	ARMADO CIMENTACION		
	1	2	3
C1	ø25/15cm	ø16/20cm	ø16/25cm
C2	ø25/20cm	ø16/25cm	ø16/25cm
C3	ø20/20cm	ø16/25cm	ø16/25cm
C4	ø18/15cm	ø12/25cm	ø12/25cm

CUADRO MEDIDAS			
PIEZA	H	g...	Z
A1	767.0	52.7	100
A2	670.8	46.1	100
A3	574.6	39.5	100
A4	478.4	32.8	70

EX-91	CALIDAD	CONTROL	Car.
ELEMENTOS PREFABRICADOS			
HORMIGON	H-300	INTENSO	1,40
ACERO	AEH-500-S	INTENSO	1,10
EJECUCION		INTENSO	1,50
OBRA EN SITU			
HORMIGON	H-250	NORMAL	1,50
ACERO	AEH-500	NORMAL	1,15
EJECUCION		NORMAL	1,60

[illegible]

REVISADO

CLIENTE: NECSU
ALETA 840x(767/382) -

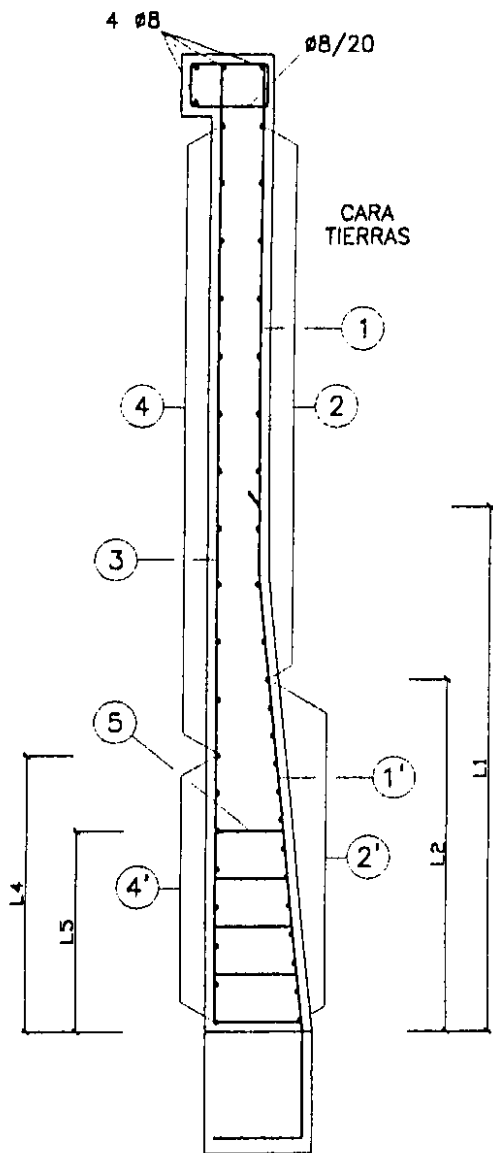
LEIA, 040X

AFRICA
ER

INTERNATIONAL
FLYNET
CITY

WATSON

PREFABRICADOS DE HORMIGON



DEFINICIÓN DE ARMADO

	A1	A2	A3	A4	A4
1	Ø25/20	Ø20/16	Ø20/22	Ø16/30	Ø16/30
1'	Ø25/10	Ø20/8	Ø20/11	Ø16/10	Ø16/15
L1	430	350	315	310	215
2	Ø10/24	Ø10/30	Ø10/30	Ø8/30	Ø8/30
2'	Ø10/8	Ø10/10	Ø10/12.5	Ø8/12.5	Ø8/20
L2	384	340	250	200	100
3	Ø20/30	Ø16/25	Ø12/24	Ø10/24	Ø8/30
4	Ø10/30	Ø8/20	Ø8/25	Ø8/25	Ø8/25
4'	Ø10/15	Ø8/10	Ø8/12.5	Ø8/15	8/15
L4	375	300	275	180	90
5	5Ø8/25	--	--	--	--
L5	100	--	--	--	--

Distancias en centímetros

EH-91	CALIDAD	CONTROL	Coef.
ELEMENTOS PREFABRICADOS			
HORMIGON	H-300	INTENSO	1,40
ACERO	AEH-500-S	INTENSO	1,10
EJECUCION		INTENSO	1,50
OBRA IN SITU			
HORMIGON	H-250	NORMAL	1,50
ACERO	AEH-500	NORMAL	1,15
EJECUCION		NORMAL	1,60

15/05/00	0		
FECHA	REV.	MODIFICACIONES	1º PLANO
PIEZA:	ALETA 840x(767/382)	EVN3.2.5 (2)	71.2
OFERTA:	99/643		
OBRA:	ZARAGOZA		
CLIENTE:	NECSO		
ALETA 840x(767/382)		REVISADO:	APROBADO:
		Dpto. Comercial	Dpto. Técnico
PREFABRICADOS DE HORMIGON			