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4.- CÁLCULOS

5.- PROCESO CONSTRUCTIVO

6.- RESUMEN DEL CONTROL DE CALIDAD (EMPRESA CONSTRUCTORA Y ASISTENCIA TÉCNICA)

7.- ACCESOS Y ELEMENTOS PARA MANTENIMIENTO.

8.-RECOMENDACIONES PARA LA CONSERVACIÓN Y MANTENIMIENTO.

- MOVIMIENTOS PREVISTOS EN LAS ESTRUCTURAS.

1. Cuadro resumen

LINEA DE ALTA VELOCIDAD
MADRID - ZARAGOZA - BARCELONA - FRONTERA FRANCESA
TRAMO: LLEIDA - MARTORELL
SUBTRAMO V
PLATAFORMA

CUADRO RESUMEN DE PUENTES DE FERROCARRIL

ESTRUCTURA	TIPOLOGIA TABLERO	LUCES VANOS (m)	ANCHO TABLERO (m)	CANTO TABLERO EN EL EJE (m)	ALTURA MÁXIMA DE PILAS (m)	TIPOLOGIA CIMENTACIÓN	APARATOS DE APOYO	JUNTAS DE DILATACIÓN	DRENAJE
VIADUCTO DEL FRANCOLI	Tablero vigas prefabricadas	32-40-40-40-32	14,00	2,89	45, 607 m (Pila 2)	Estribo 1: profunda mediante pilotes Ø 1,20 m de 17 m de longitud; Pila 1: profunda mediante micropilotes Ø 300 mm de 22 m de longitud; directa en Pilas 2, 4 (18 anclajes de 120 tn y 12 de 80 tn en talud ladera bajo zapata) y Estribo 2 (39 anclajes de 100 tn y 13 bulones Ø 32 mm en talud ladera bajo zapata);Pila 3: profunda mediante pilotes Ø 1,65 m de 6,60 m de longitud.	En Estribos y Pilas dos aparatos POT (unidireccional y bidireccional).	Chapa de acero. Estribo 1 móvil y Estribo 2 anclado (armadura pasante de acero inoxidable).	Impermeabilización asfáltica + lámina geodren + tubo dren Ø 150 mm en trasdos Estribos 1 y 2. 10 sumideros en tablero.
E1	Tablero vigas prefabricadas	20-27-27-27-20	14,00	2,34	14,100 m (Pila 2)	Estribo 1, Pilas 1, 2, 3, 4 y Estribo 2: directa	En Estribos y Pilas dos aparatos POT (unidireccional y bidireccional) .	Chapa de acero. Estribo 1 anclado (tendones postesados) y Estribo 2 móvil.	Impermeabilización asfáltica + lámina geodren + tubo dren Ø 150 mm en trasdos Estribo 1. 10 sumideros en tablero.
E2	Losa "in situ" postesada	18	14,00	1,20		Estribos 1 y 2: directa.	En Estribo 1 tres aparatos Pot (uno unidireccional y dos multidireccionales) y en Estribo 2 tres aparatos POT (dos unidireccionales y uno multidireccional).	Chapa de acero. Estribo 1 móvil y Estribo 2 anclado (mediante colocación aparatos de apoyo)	Impermeabilización asfáltica + lámina geodren + tubo dren Ø 150 mm en trasdos Estribo 1. Impermeabilización asfáltica + capa de 3 cm de microaglomerado + 10 sumideros en tablero.

LINEA DE ALTA VELOCIDAD
MADRID - ZARAGOZA - BARCELONA - FRONTERA FRANCESA
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PLATAFORMA

CUADRO RESUMEN DE PASOS SUPERIORES

ESTRUCTURA	TIPOLOGIA TABLERO	LUCES VANOS (m)	ANCHO TABLERO (m)	CANTO TABLERO EN EL EJE (m)	ALTURA MÁXIMA DE PILAS (m)	TIPOLOGIA CIMENTACIÓN	APOYOS	JUNTA DILATACIÓN	DRENAJE
PS 504.9	Losa "in situ" postesada	25,80	8,40	1,20		Estribos 1 y 2: directa.	Estribos: 2 neoprenos zunchados rectangulares.	Composan módelo JNA-70 en Estribos 1 y 2.	Impermeabilización asfáltica + lámina geodren + tubo dren Ø 150 mm en trasdos Estribos 1 y 2. 10 sumideros en tablero.
PS 507.1	Losa "in situ" postesada	19-24-19	12,05	1,10	9,840 m (Pilas 1 y 2)	Estribos 1 y 2: directa.	Estribos: 2 neoprenos zunchados rectangulares y en Pilas: 1 neopreno armado circular.	Composan módelo JNA-70 en Estribos 1 y 2.	Impermeabilización asfáltica + lámina geodren + tubo dren Ø 150 mm en trasdos Estribos 1 y 2. 10 sumideros en tablero.

LINEA DE ALTA VELOCIDAD
MADRID - ZARAGOZA - BARCELONA - FRONTERA FRANCESA
TRAMO: LLEIDA - MARTORELL
SUBTRAMO V
PLATAFORMA

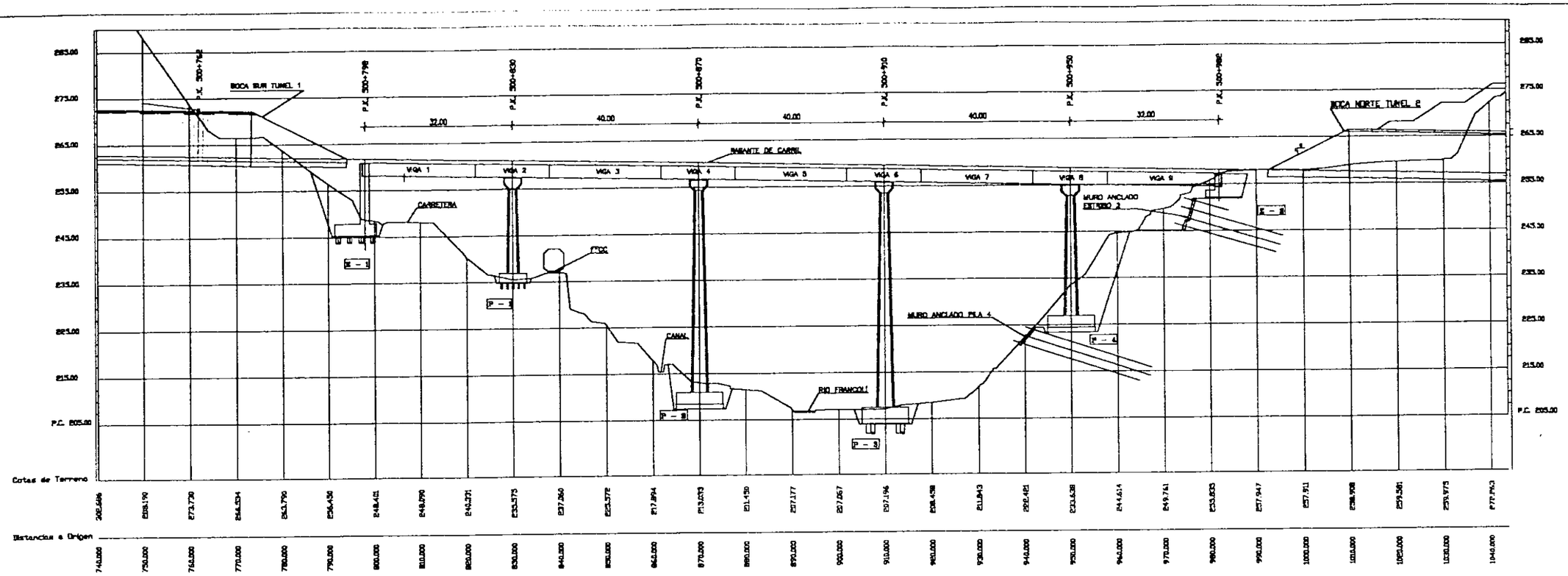
CUADRO RESUMEN DE PASOS INFERIORES

ESTRUCTURA	TIPOLOGIA	SECCION TRANSVERSAL (m)	LONGITUD (m)	CUÑAS DE TRANSICION	DRENAJE TRASDOS
PI 503.5	Marco y aletas "in situ"	6,00 x 5,00	29,58	SC + QS3	Impermeabilización asfáltica + lámina geodren + tubo dren Ø 150 mm .
PI 504.3	Marco y aletas "in situ"	8,00 x 5,40	30,00	SC + QS3	Impermeabilización asfáltica + lámina geodren + tubo dren Ø 150 mm .
PI 506.7	Marco y aletas "in situ"	8,00 x 5,40	17,00	SC + QS3	Impermeabilización asfáltica + lámina geodren + tubo dren Ø 150 mm .

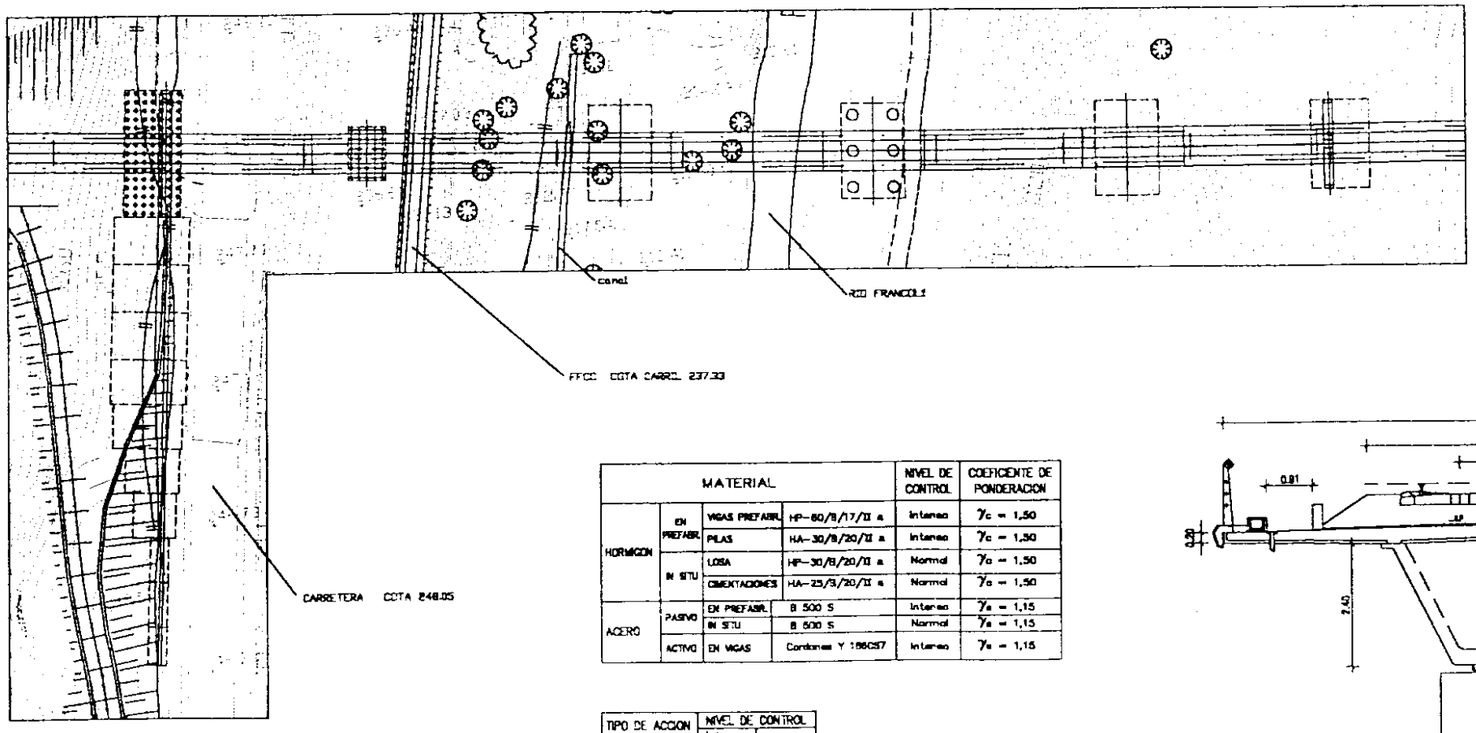
2. Descripción: tipología, aparatos de apoyo, juntas, impermeabilización, etc

Incluido en epígrafe nº 1 Cuadro resumen.

3. Definición geométrica



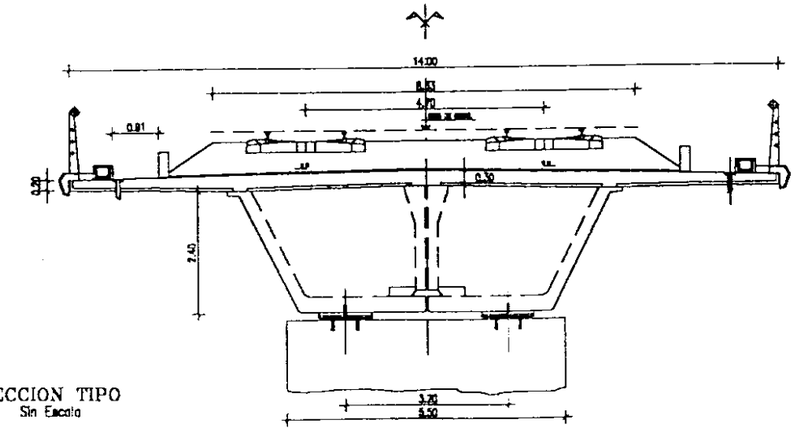
LONGITUDINAL
E 1 :1000



PLANTA
E 1 :1000

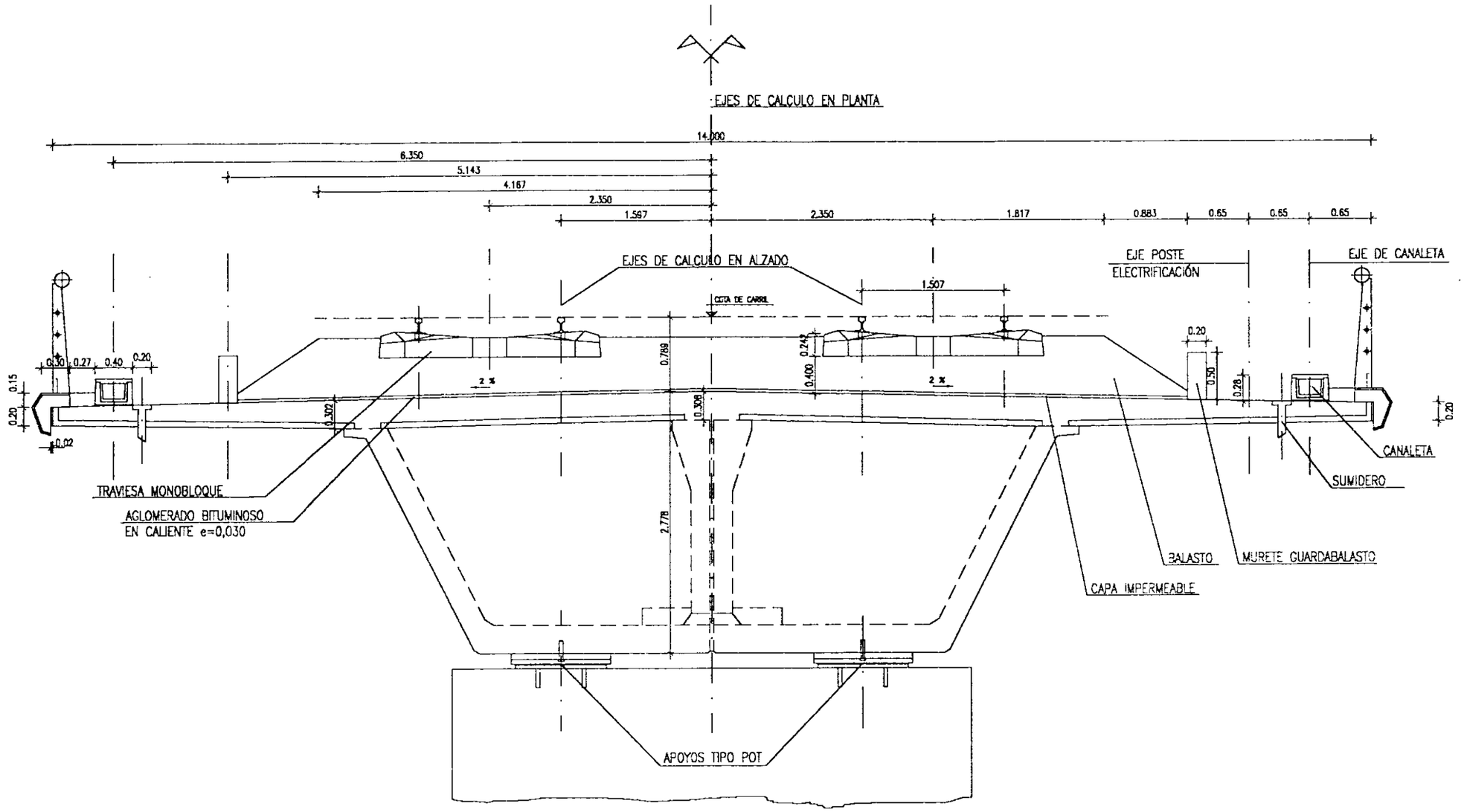
MATERIAL				NIVEL DE CONTROL	COEFICIENTE DE PONDERACION
HORMIGON	EN PREFABR.	VIGAS PREFABR.	HP-60/B/17/II a	Intenso	γ_c = 1,50
		PILAS	HA-30/B/20/II a	Intenso	γ_c = 1,50
	IN SITU	LOSA	HP-30/B/20/II a	Normal	γ_c = 1,50
		CIMENTACIONES	HA-25/S/20/II a	Normal	γ_c = 1,50
ACERO	PASIVO	EN PREFABR.	B 500 S	Intenso	γ_s = 1,15
		IN SITU	B 500 S	Normal	γ_s = 1,15
	ACTIVO	EN VIGAS	Cordones Y 1860S7	Intenso	γ_s = 1,15

TIPO DE ACCION	NIVEL DE CONTROL	
	Intenso	
PERMANENTE	1.35	
VARIABLE	1.50	



SECCION TIPO
Sin Escala

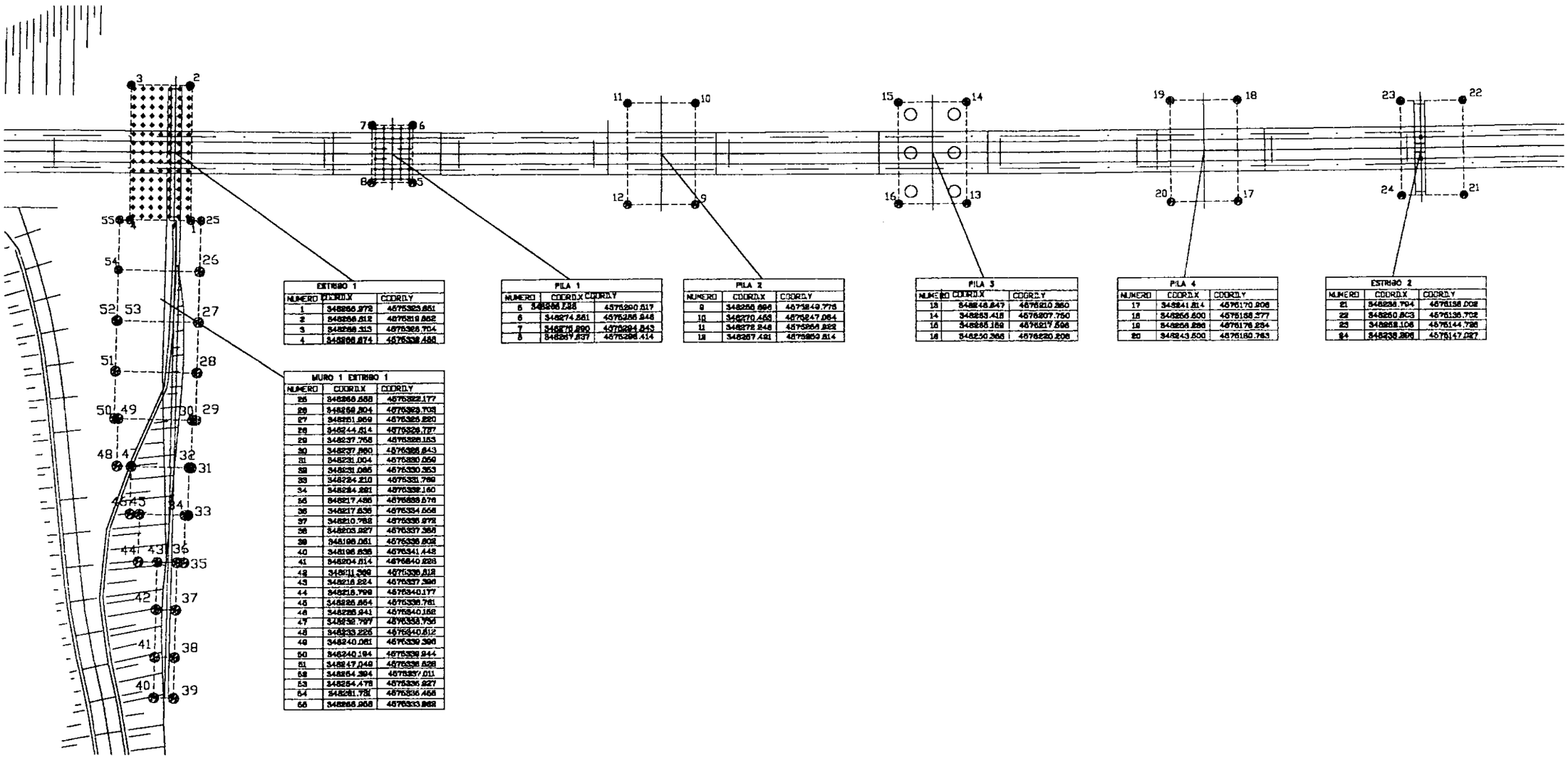
GIF	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID-ZARAGOZA-BARCELONA-FRONTERA FRANCESA TRAMO: LLEIDA-MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo: D. JAIME GARCIA-GERMAN LOPEZ-BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo: RAUL FERNANDEZ CAMARA	CONSULTOR (ASISTENCIA AL CONTROL DE OBRAS) AEPO	ESCALA NORMAL 1/600 1/100 Numérica Gráfica 0 6 12 18m 0 1 2 3m	FECHA NOVIEMBRE 2003	TITULO DEL PLANO ESTRUCTURAS PUENTE SOBRE EL RIO FRANCOLI PLANTA Y ALZADO	N° DE PLANO 2.9.1 Hoja 1 de 36



SECCIÓN TIPO VIA DOBLE VIADUCTO

E/ 1:50

GIF	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA TRAMO: LLEIDA–MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo: D. JAIME GARCIA–GERMAN LOPEZ–BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo: RAÚL FERNÁNDEZ CÁMARA	CONSULTOR (ASISTENCIA AL CONTROL DE OBRAS) AEPO	ESCALA NORMAL 1:50 Numérica | Gráfica 0 0,5 1 1,5m	FECHA NOVIEMBRE 2003	TITULO DEL PLANO ESTRUCTURAS PUENTE SOBRE EL RIO FRANCOLI SECCIÓN TIPO VIA DOBLE	Nº DE PLANO 2.9.1 Hoja 2 de 36



ESTRIBO 1		
NUMERO	COORD.X	COORD.Y
1	348256.978	4575325.851
2	348258.518	4575319.862
3	348258.515	4575328.704
4	348268.874	4575338.486

PILA 1		
NUMERO	COORD.X	COORD.Y
5	348256.738	4575290.517
6	348274.561	4575286.948
7	348271.890	4575294.843
8	348267.827	4575298.414

PILA 2		
NUMERO	COORD.X	COORD.Y
9	348256.696	4575249.778
10	348270.468	4575247.064
11	348272.248	4575255.822
12	348267.481	4575259.814

PILA 3		
NUMERO	COORD.X	COORD.Y
13	348248.847	4575210.350
14	348253.418	4575207.750
15	348265.158	4575217.596
16	348250.366	4575220.206

PILA 4		
NUMERO	COORD.X	COORD.Y
17	348241.814	4575170.906
18	348256.600	4575168.277
19	348258.286	4575176.254
20	348243.500	4575180.763

ESTRIBO 2		
NUMERO	COORD.X	COORD.Y
21	348236.794	4575136.008
22	348250.803	4575135.702
23	348258.108	4575144.786
24	348238.396	4575147.097

MURO 1 ESTRIBO 1		
NUMERO	COORD.X	COORD.Y
25	348266.658	4575322.177
26	348268.804	4575329.708
27	348281.969	4575325.880
28	348244.814	4575329.727
29	348237.758	4575328.153
30	348237.880	4575325.843
31	348231.004	4575330.650
32	348231.085	4575330.353
33	348234.210	4575331.760
34	348234.281	4575332.160
35	348217.486	4575335.576
36	348217.536	4575334.658
37	348210.768	4575336.272
38	348203.827	4575337.368
39	348198.061	4575336.802
40	348198.636	4575341.448
41	348204.614	4575340.228
42	348211.269	4575338.818
43	348218.224	4575337.396
44	348218.798	4575340.177
45	348225.864	4575338.761
46	348225.941	4575340.152
47	348232.797	4575338.756
48	348233.226	4575340.812
49	348240.081	4575339.398
50	348240.194	4575339.944
51	348247.049	4575338.528
52	348254.394	4575337.011
53	348254.478	4575336.227
54	348261.732	4575336.456
55	348266.908	4575333.882

GIF

PROYECTO CONSTRUIDO
LINEA DE ALTA VELOCIDAD
MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA
TRAMO: LLEIDA–MARTORELL. SUBTRAMO V. PLATAFORMA

El DIRECTOR DEL PROYECTO CONSTRUIDO
Fdo: D. JAIME GARCIA–GERMAN LOPEZ–BELMONTE

El AUTOR DEL PROYECTO CONSTRUIDO
Fdo: RAUL FERNANDEZ CAMARA

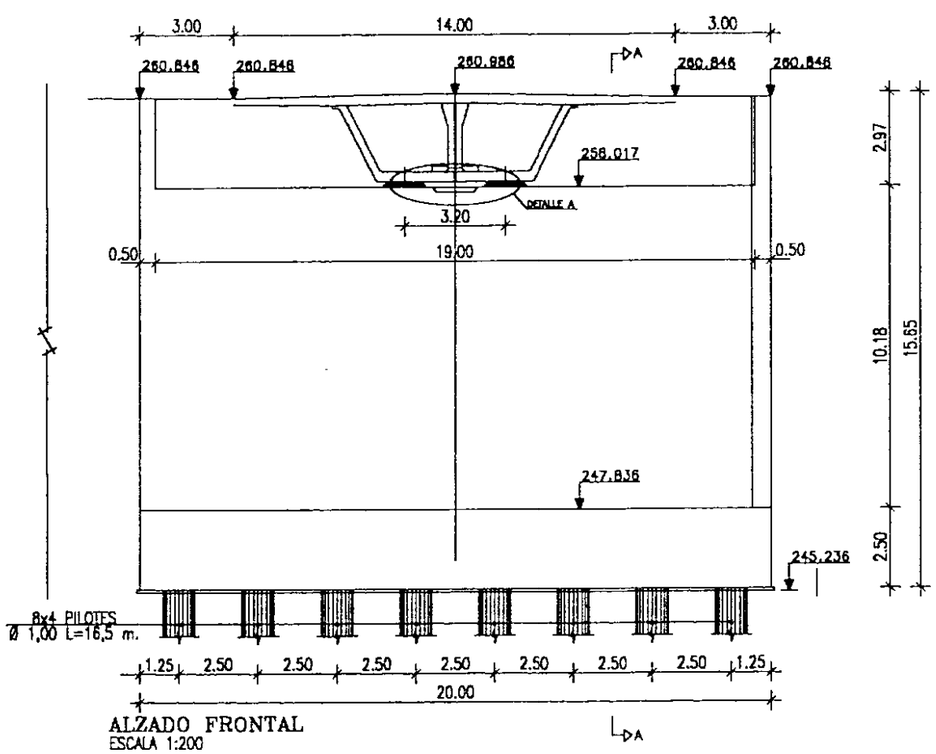
CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS)
AEPO

ESCALA NORMAL
1/600
1/100
Numérica
Gráfica
0 6 12 18m
0 1 2 3m

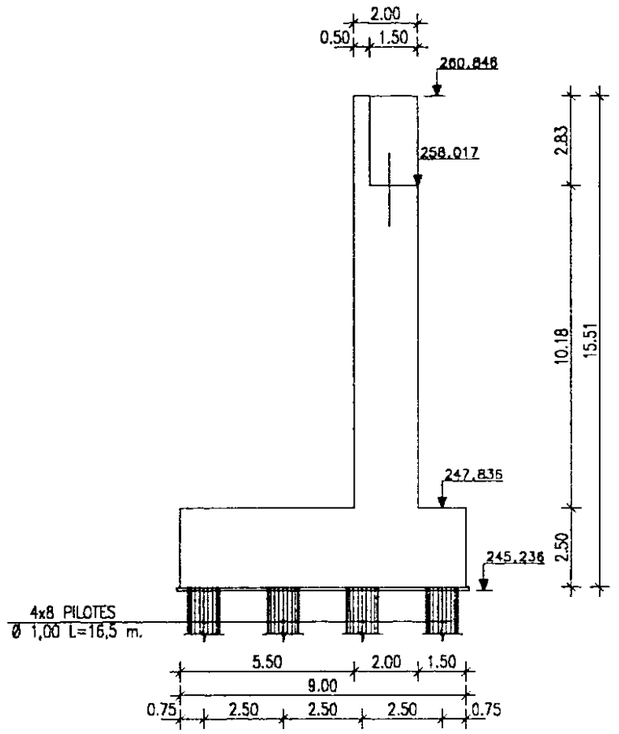
FECHA
NOVIEMBRE 2003

TITULO DEL PLANO
ESTRUCTURAS
PUENTE SOBRE EL RIO FRANCOLI
PLANTA DE REPLANTEO

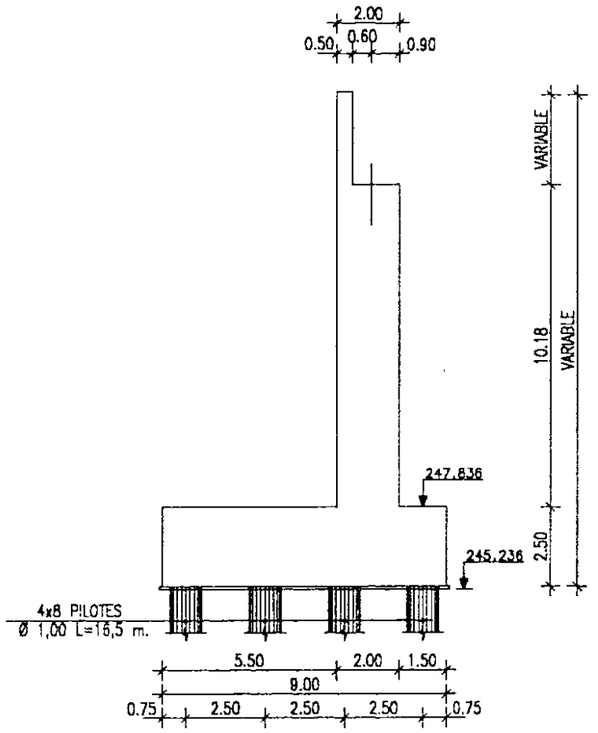
N° DE PLANO
2.9.1
Hoja 3 de 36



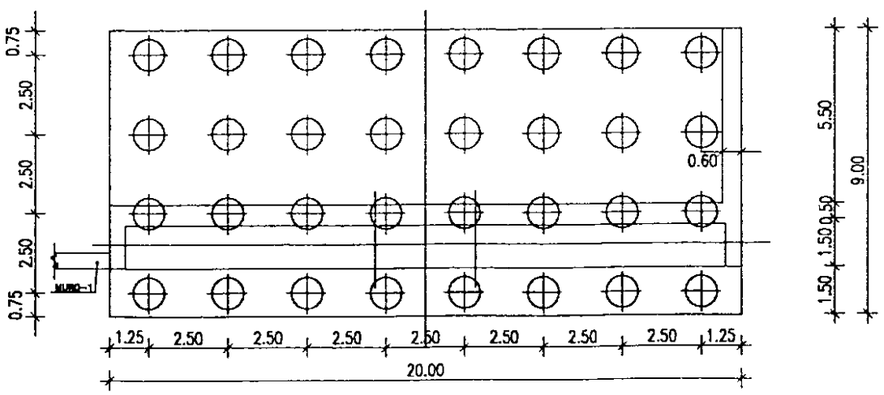
ALZADO FRONTAL
ESCALA 1:200



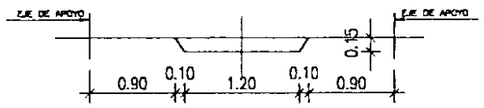
ALZADO LATERAL
ESCALA 1:200



SECCION A-A
ESCALA 1:200



PLANTA
ESCALA 1:200



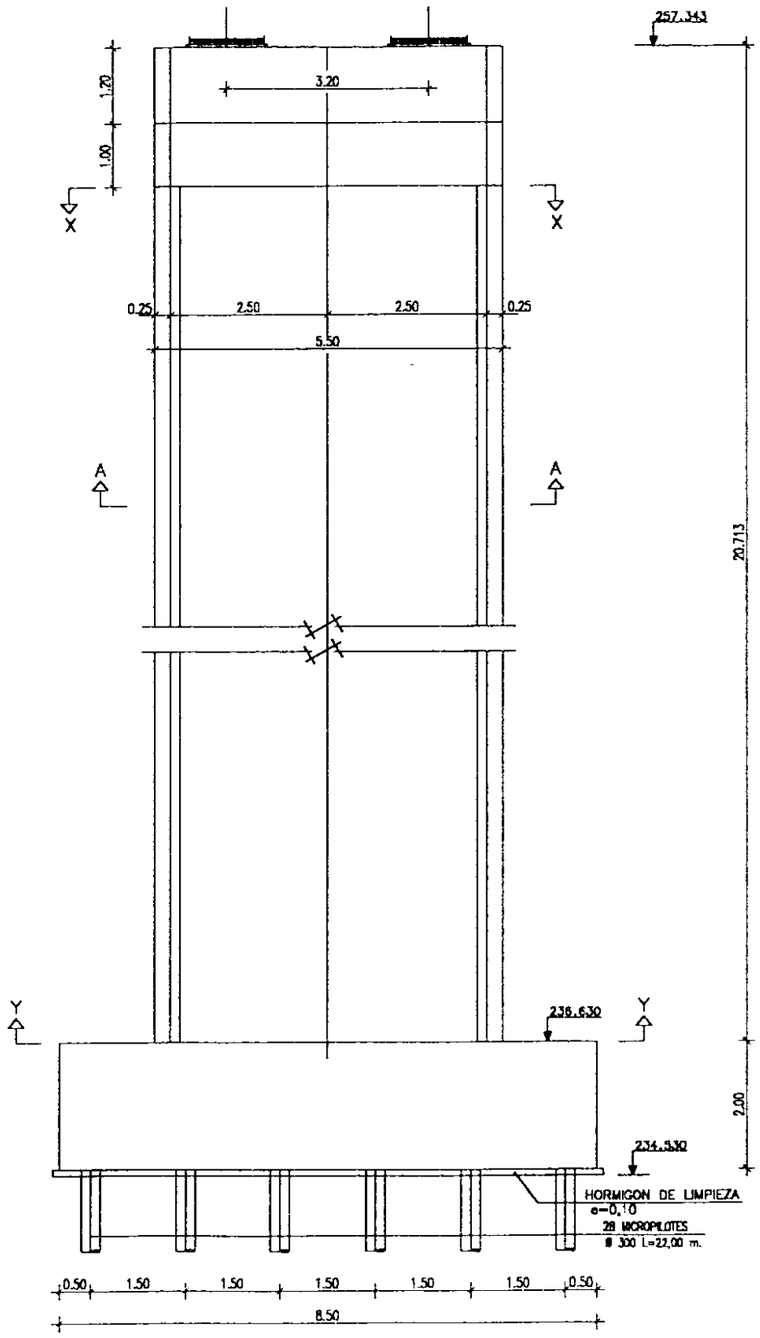
DETALLE A
SIN ESCALA

NOTA:
— CARGA DE TRABAJO POR PILOTE 390 t.

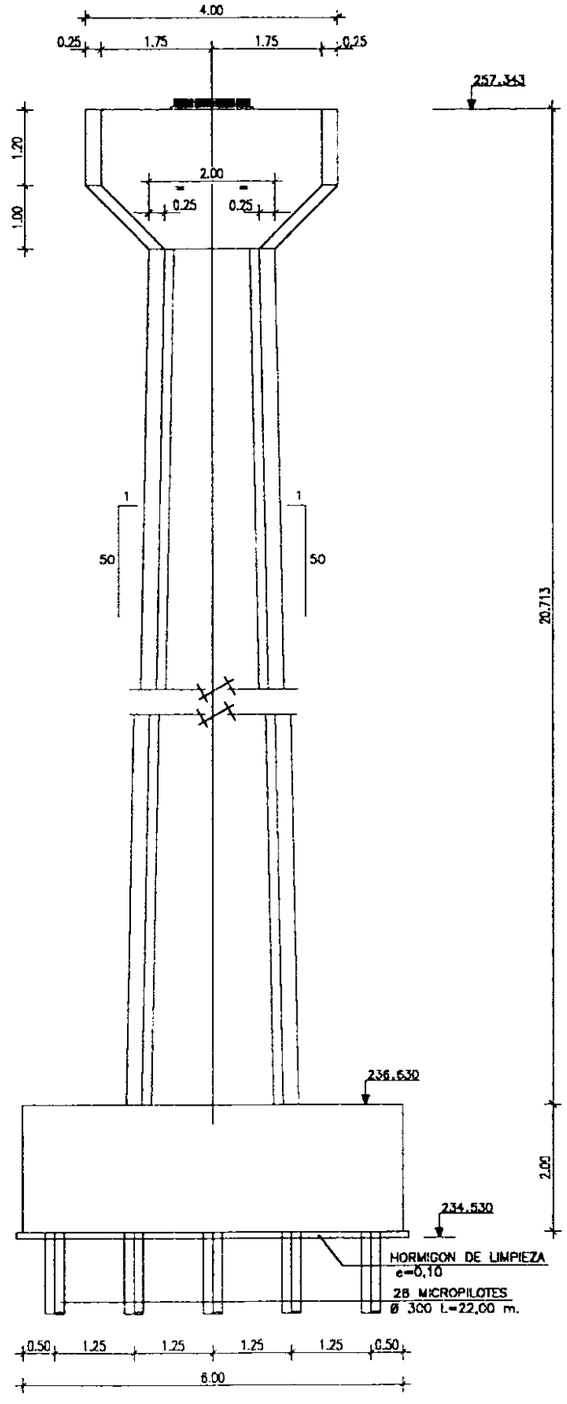
GIF	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA TRAMO: LLEIDA–MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo: D. JAIME GARCIA-GERMAN LOPEZ-BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo: RAÚL FERNÁNDEZ CAMARA	CONSULTOR (ASISTENCIA AL CONTROL DE OBRAS) AEPO	ESCALA NORMAL 1:200 Numérica | Gráfica 0 2 4 6m	FECHA NOVIEMBRE 2003	TÍTULO DEL PLANO ESTRUCTURAS PUENTE SOBRE EL RIO FRANCOLI ESTRIBO 1, DEFINICION GEOMETRICA	Nº DE PLANO 2.9.1 Hoja 4 de 36

NOTA:

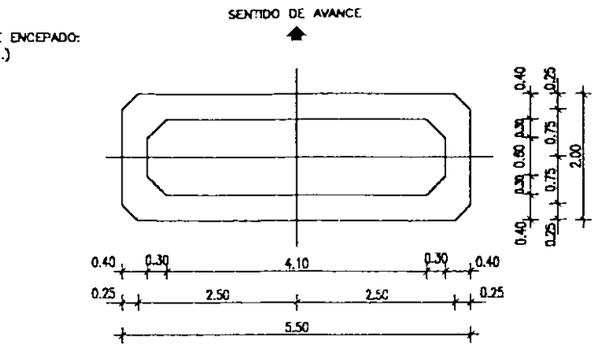
— LONGITUD DE LOS MICROPILOTES DESDE BASE DE ENCEPADO: 22.00 m. (EMPOTRAMIENTO EN ROCA DE 4.00 m.)
— CARGA ADMISIBLE POR MICROPILOTE 220 t.



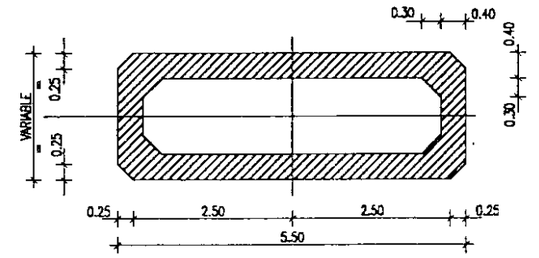
ALZADO FRONTAL DE PILA
ESCALA 1:100



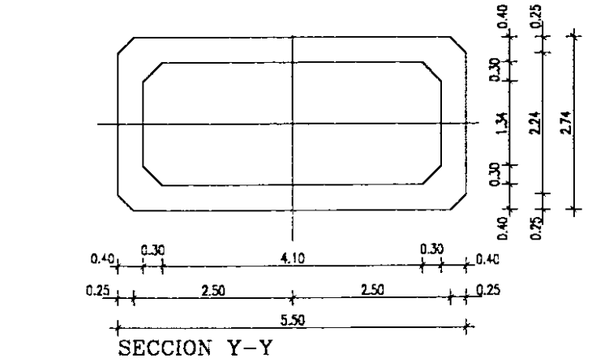
ALZADO LATERAL DE PILA
ESCALA 1:100



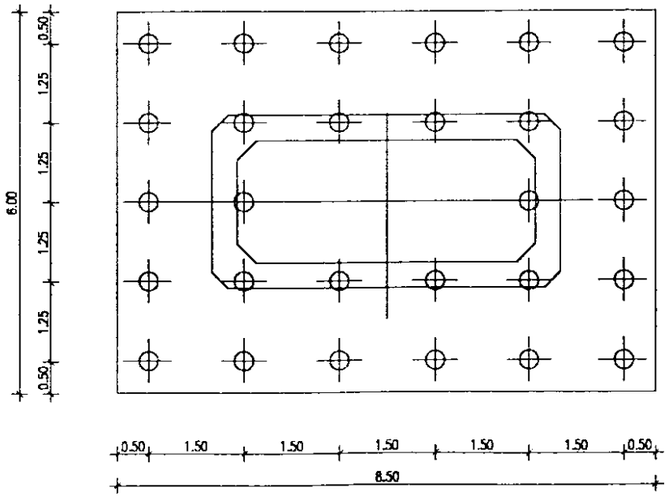
SECCION X–X
ESCALA 1:100



SECCION A–A GENERICA
ESCALA 1:100

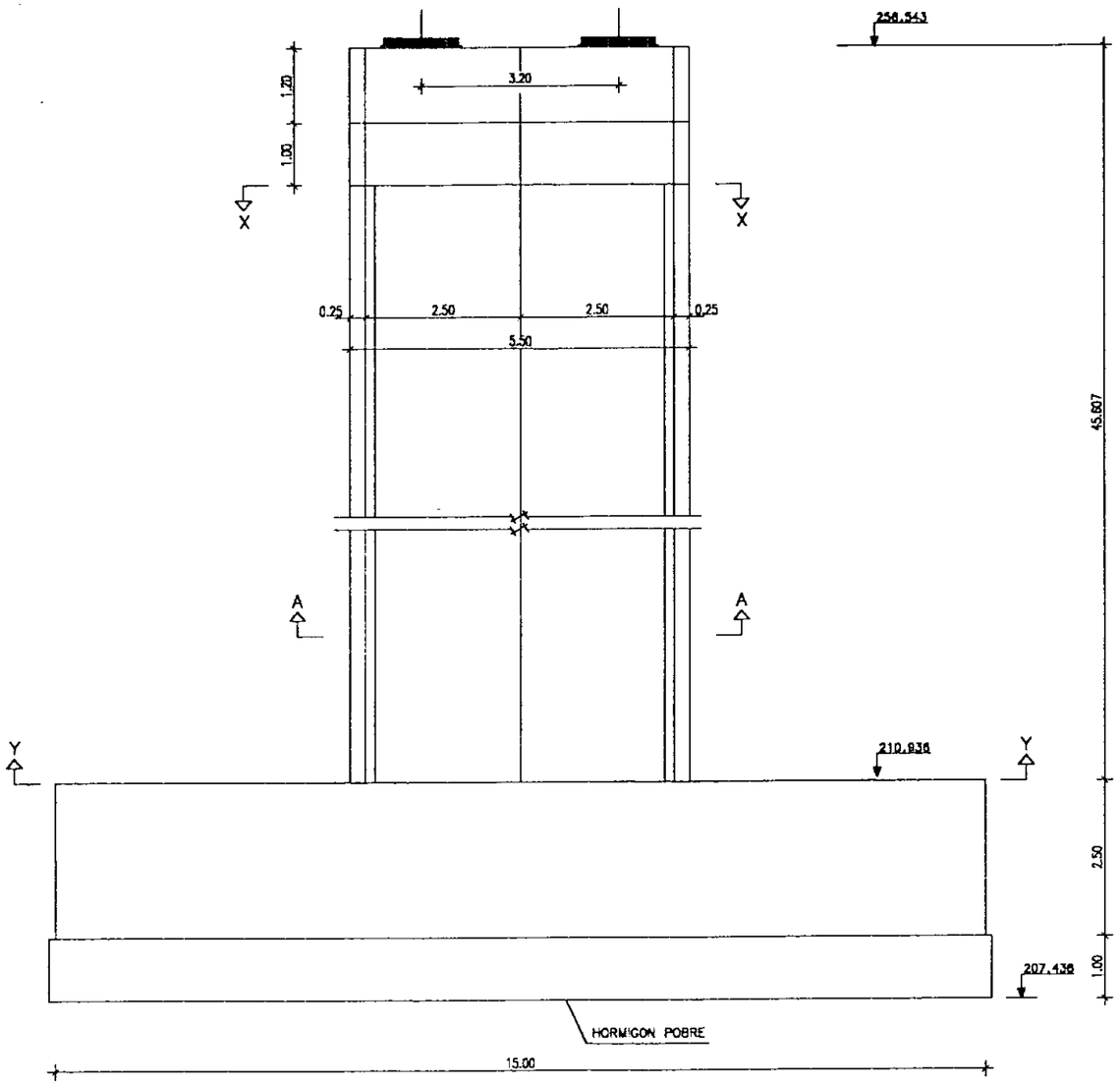


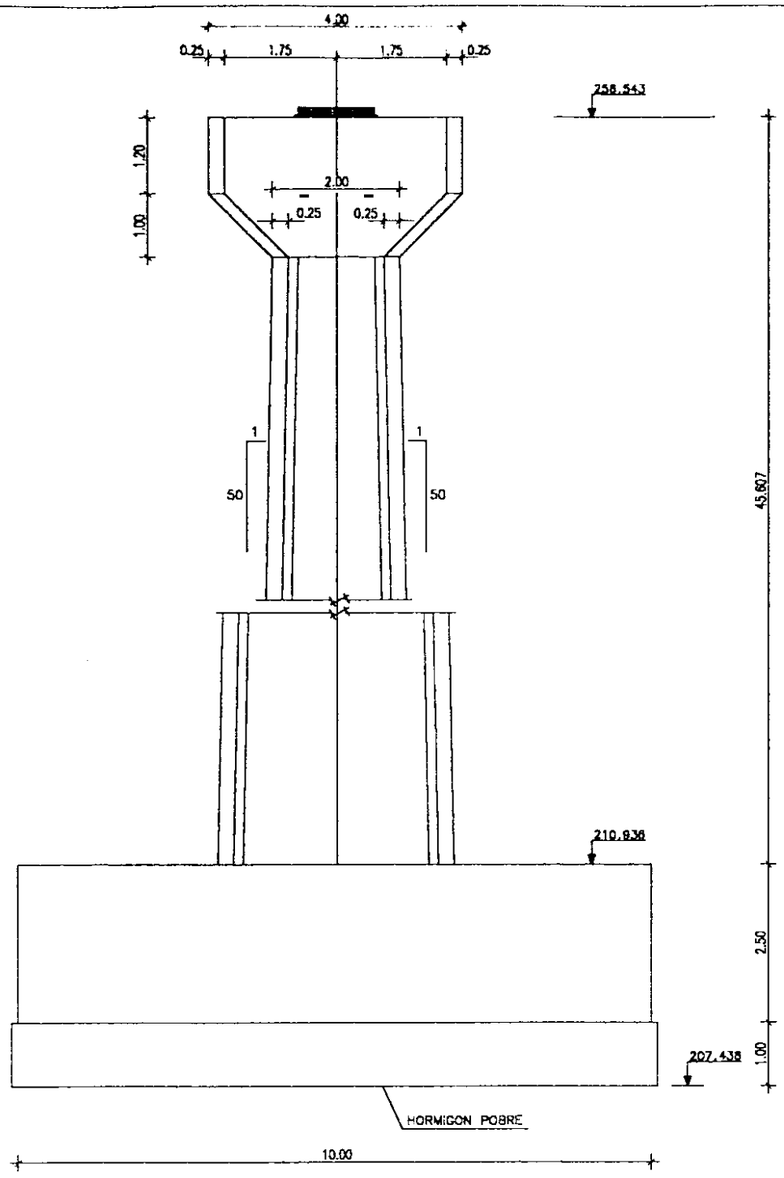
SECCION Y–Y
ESCALA 1:100



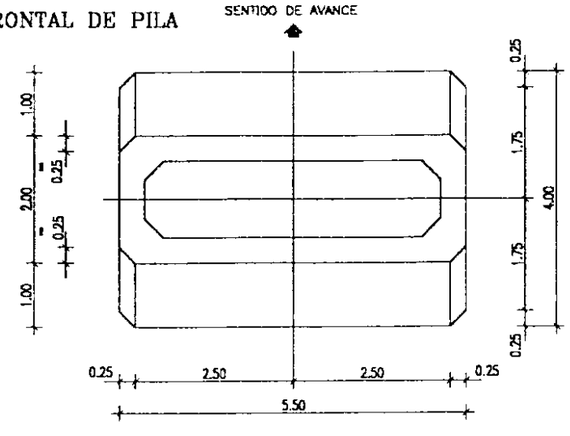
PLANTA
ESCALA 1:100

GIF	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA TRAMO: LLEIDA–MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo: D. JAIME GARCIA–GERMAN LOPEZ–BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo: RAUL FERNANDEZ OANARA	CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS) AEPO	ESCALA NORMAL 1:100 Numérica / Gráfica 0 1 2 3m	FECHA NOVIEMBRE 2003	TITULO DEL PLANO ESTRUCTURAS PUENTE SOBRE EL RIO FRANCOLI DEFINICION GEOMETRICA PILA 1	Nº DE PLANO 2.9.1 Hoja 5 de 36

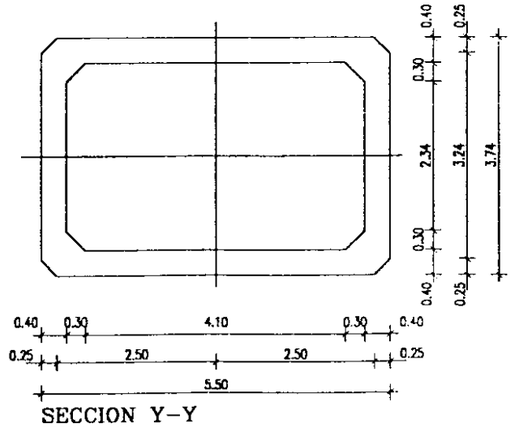




ALZADO FRONTAL DE PILA
ESCALA 1:100

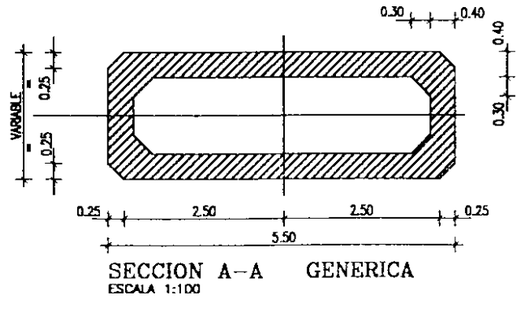


PLANTA CABECERO DE PILA
ESCALA 1:100

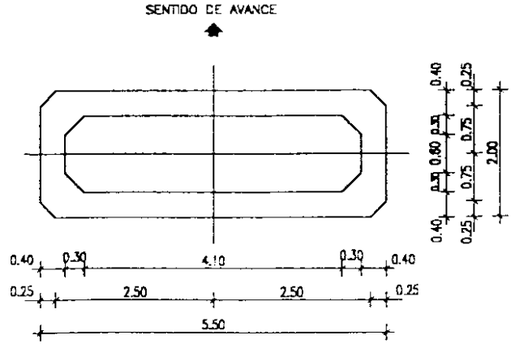


SECCION Y–Y
ESCALA 1:100

ALZADO LATERAL DE PILA
ESCALA 1:100



SECCION A–A GENERICA
ESCALA 1:100



SECCION X–X
ESCALA 1:100

GIF Grupo de Ingeniería Ferroviaria

PROYECTO CONSTRUIDO
LINEA DE ALTA VELOCIDAD
MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA
TRAMO: LLEIDA–MARTORELL. SUBTRAMO V. PLATAFORMA

EL DIRECTOR DEL PROYECTO CONSTRUIDO
Fdo.: D. JAIME GARCIA-GERMAN LOPEZ-BELMONTE

EL AUTOR DEL PROYECTO CONSTRUIDO
Fdo.: RAUL FERNANDEZ CAMARA

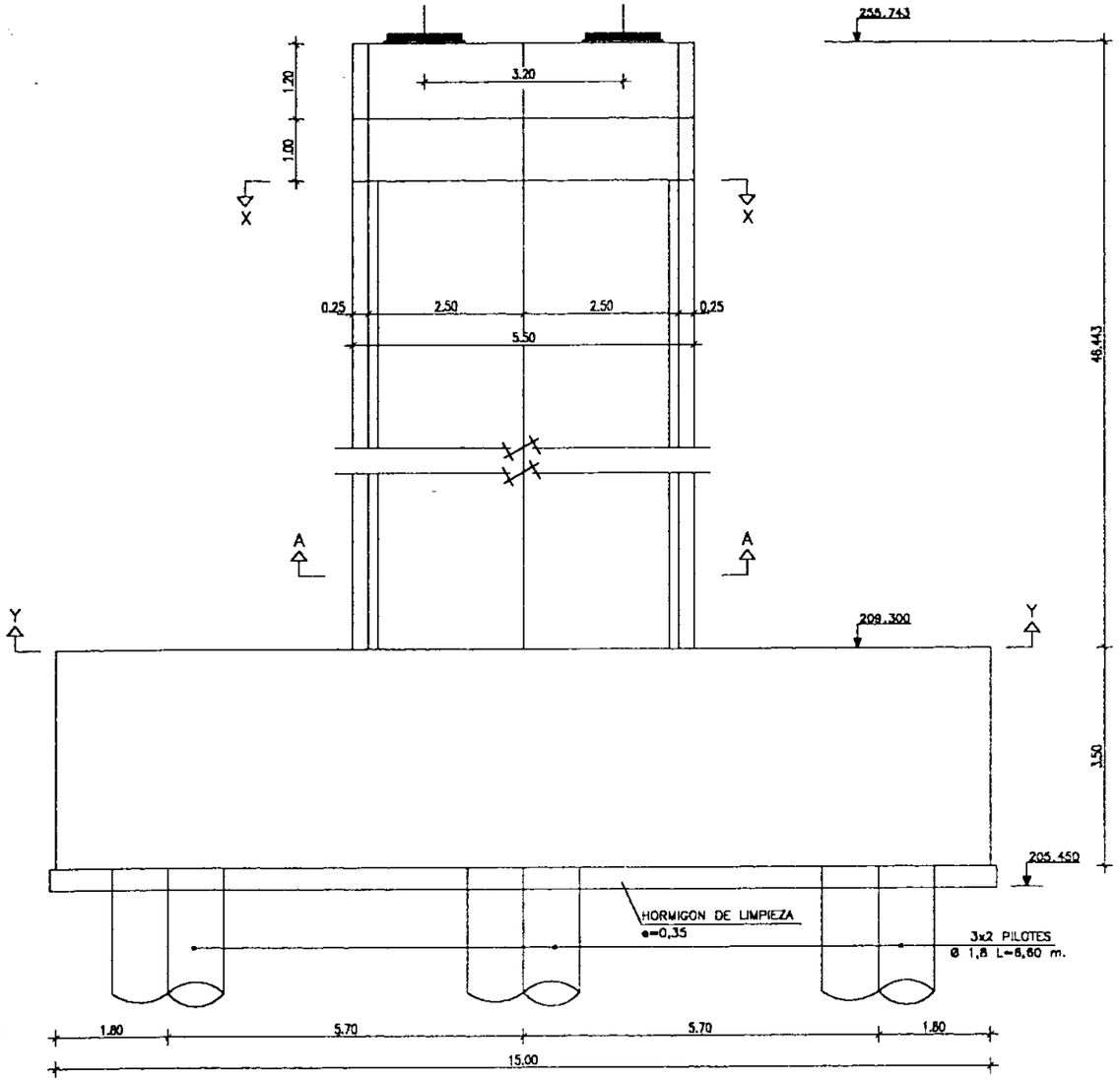
CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS)
AEPO

ESCALA NORMAL
1:100
0 1 2 3m
Numérica | Gráfica

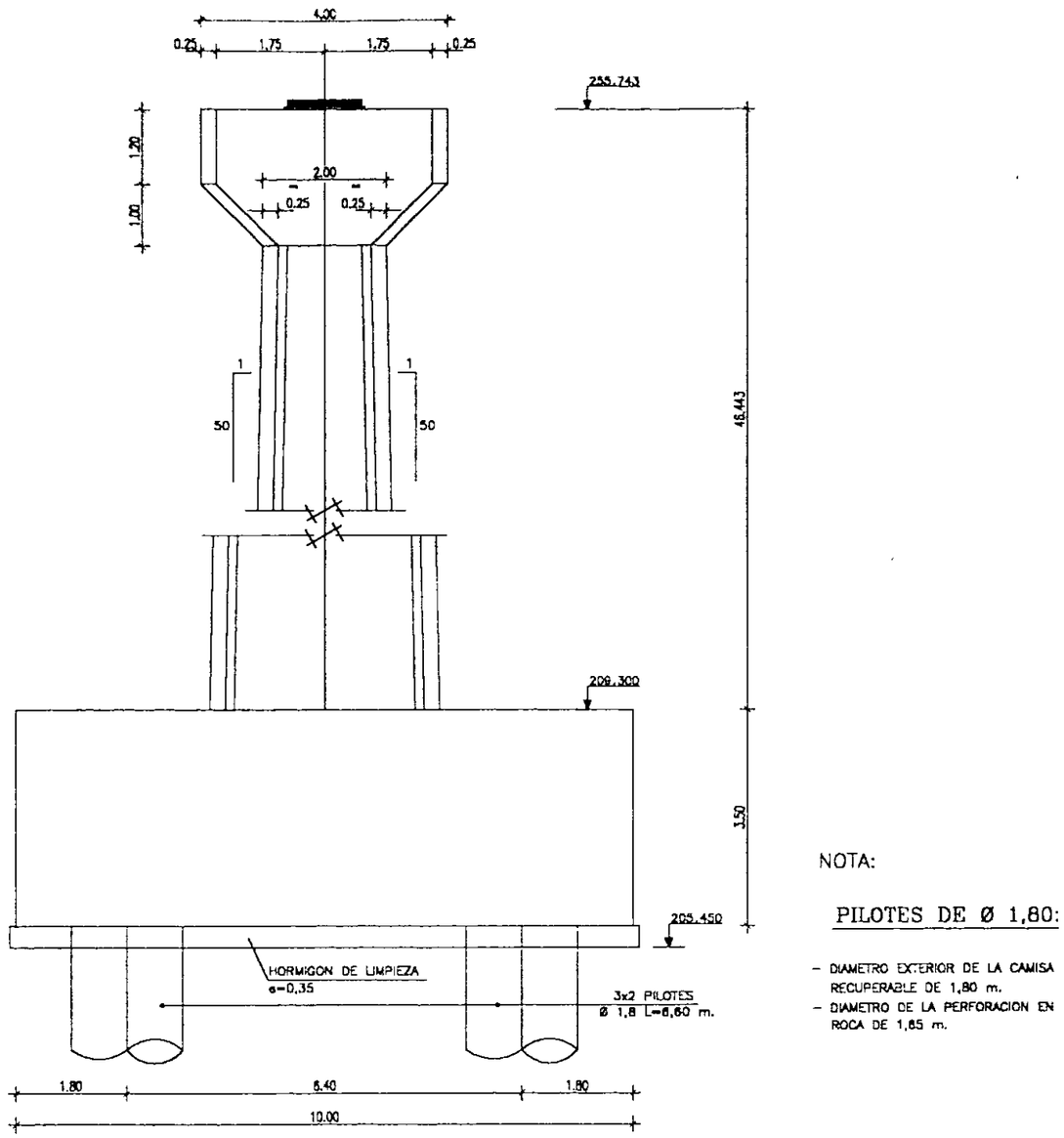
FECHA
NOVIEMBRE 2003

TITULO DEL PLANO
ESTRUCTURAS
PUENTE SOBRE EL RIO FRANCOLI
DEFINICION GEOMETRICA PILA 2

N° DE PLANO
2.9.1
Hoja 6 de 36



ALZADO FRONTAL DE PILA
ESCALA 1:100

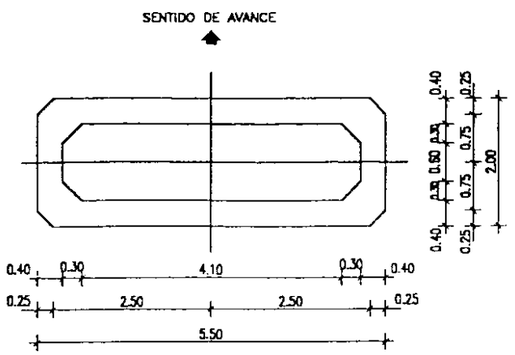


ALZADO LATERAL DE PILA
ESCALA 1:100

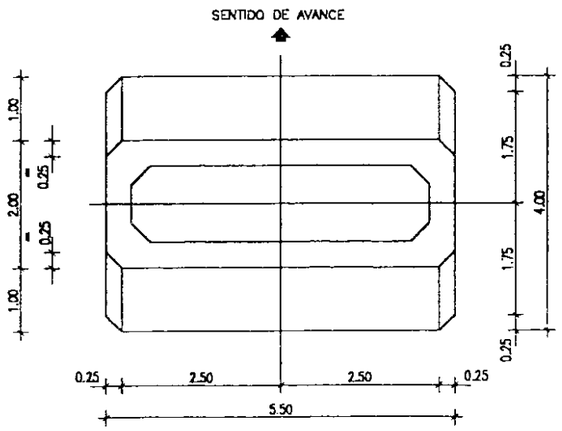
NOTA:

PILOTES DE Ø 1,80:

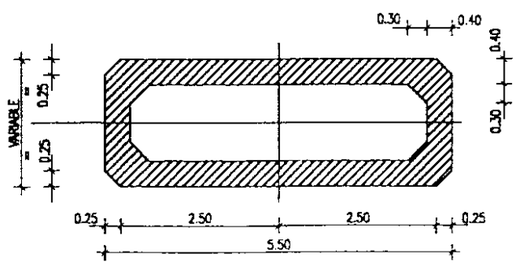
- DIAMETRO EXTERIOR DE LA CAMISA RECUPERABLE DE 1,80 m.
- DIAMETRO DE LA PERFORACION EN ROCA DE 1,65 m.



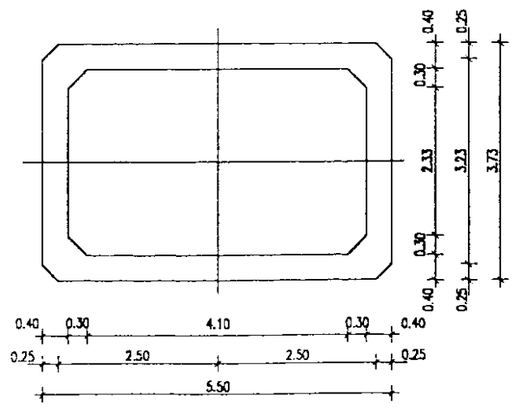
SECCION X–X
ESCALA 1:100



PLANTA CABECERO DE PILA
ESCALA 1:100

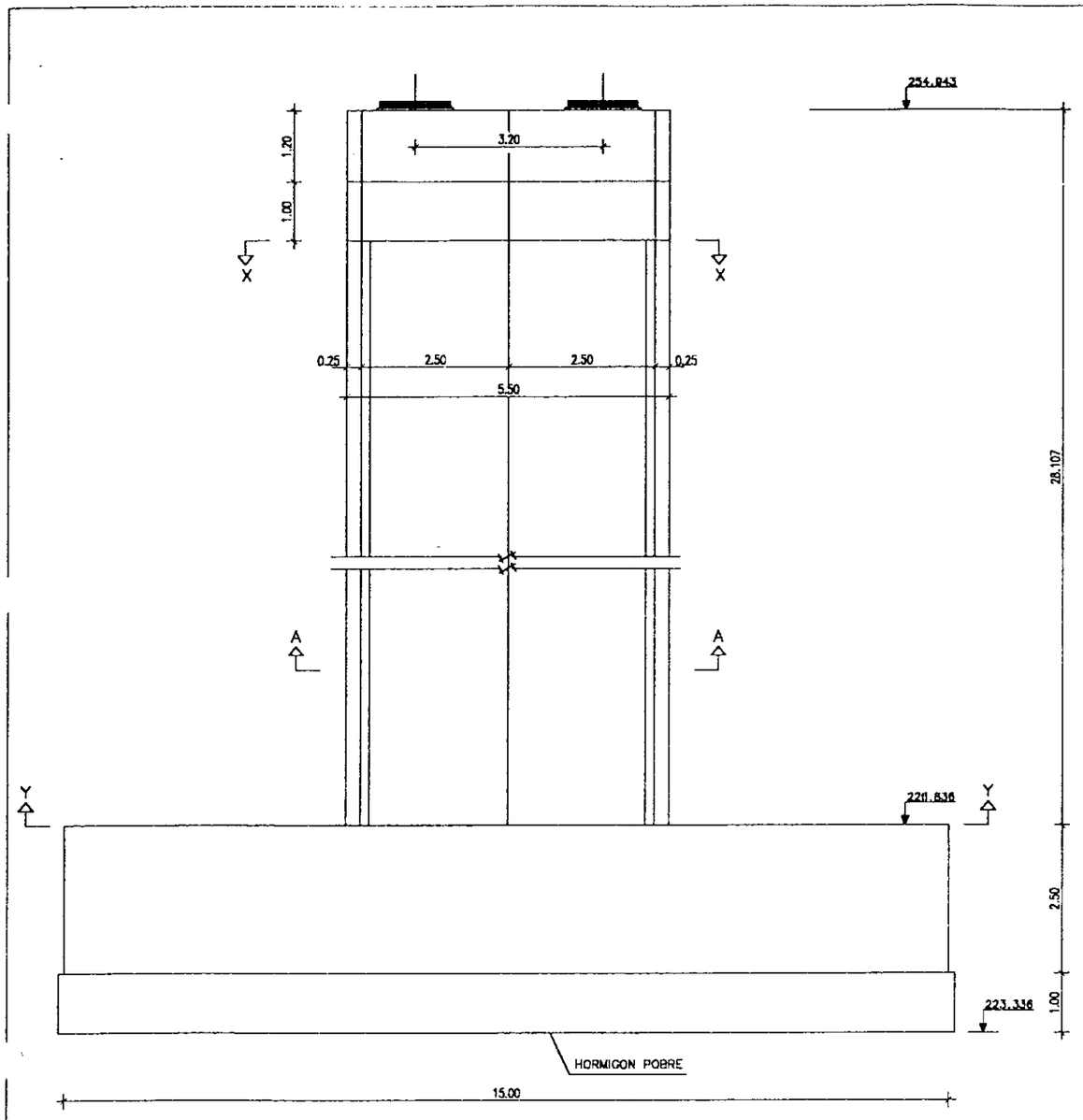


SECCION A–A GENERICA
ESCALA 1:100

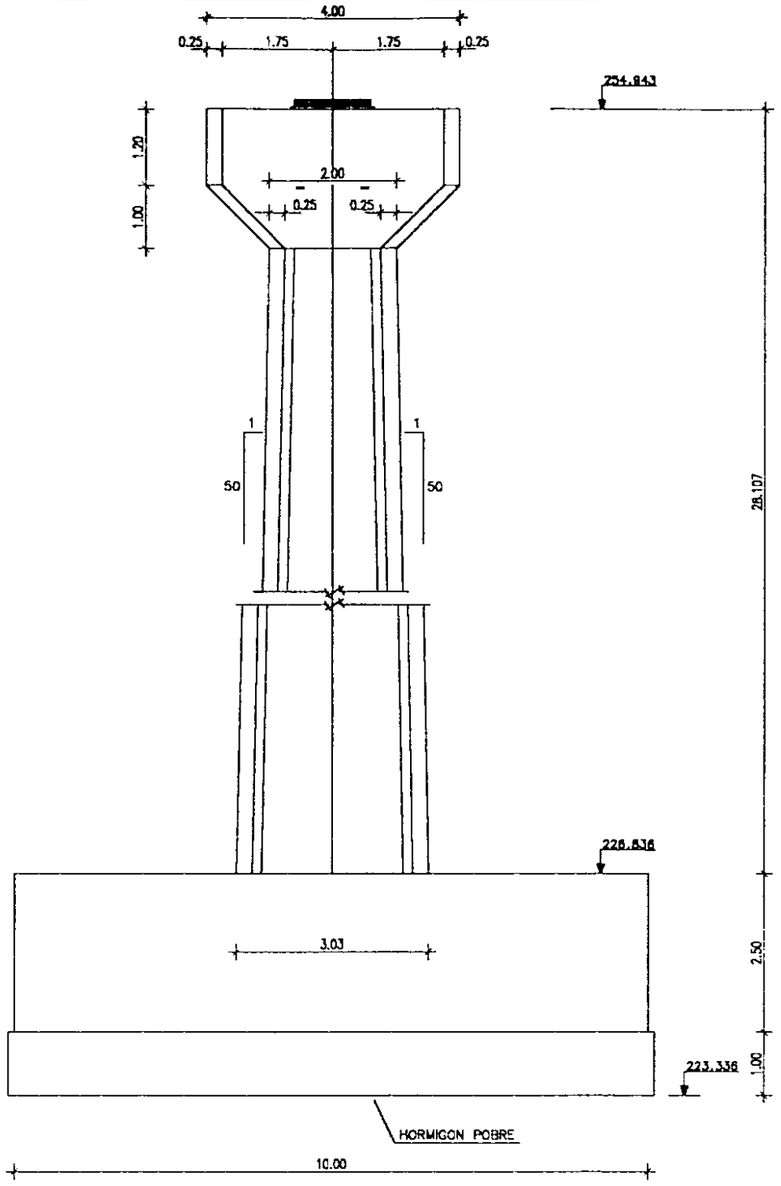


SECCION Y–Y
ESCALA 1:100

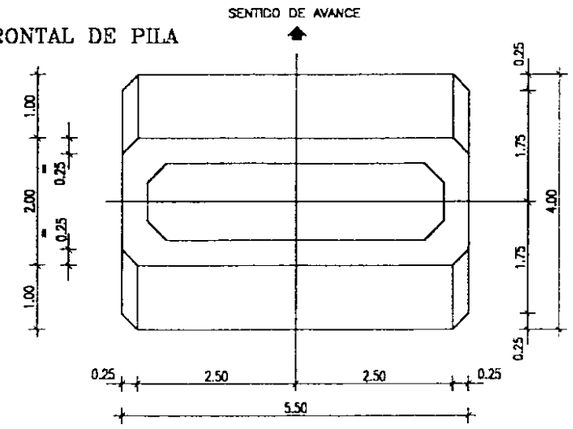
GIF Grupo de Ingeniería Ferroviaria	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA TRAMO: LLEIDA–MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo: D. JAIME GARCIA–GERMAN LOPEZ–BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo: RAUL FERNÁNDEZ OÑARA	CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS) AEPO	ESCALA NORMAL 1:100 Numérica / Gráfica 0 1 2 3m	FECHA NOVIEMBRE 2003	TITULO DEL PLANO ESTRUCTURAS PUENTE SOBRE EL RIO FRANCOLI DEFINICION GEOMETRICA PILA 3	Nº DE PLANO 2.9.1 Hoja 7 de 36



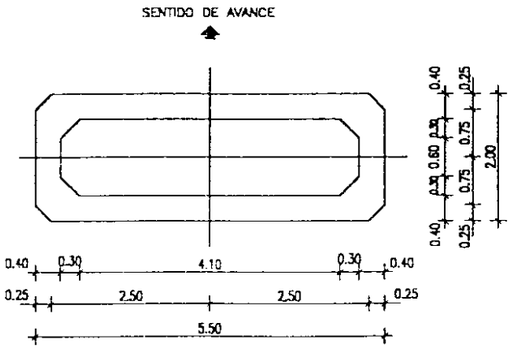
ALZADO FRONTAL DE PILA
ESCALA 1:100



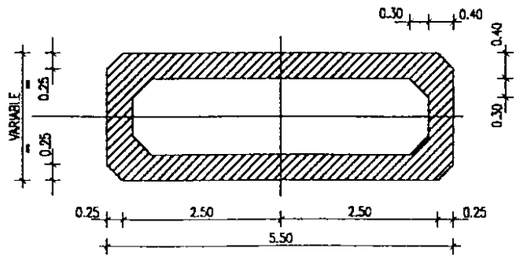
ALZADO LATERAL DE PILA
ESCALA 1:100



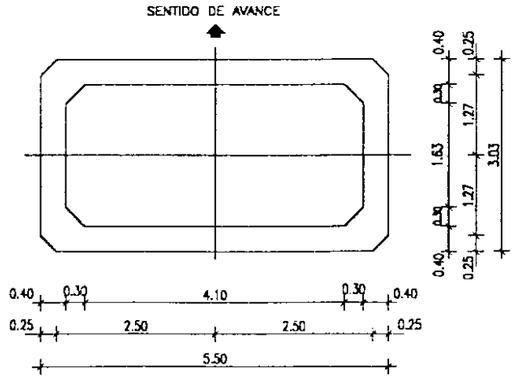
PLANTA CABECERO DE PILA
ESCALA 1:100



SECCION X–X
ESCALA 1:100

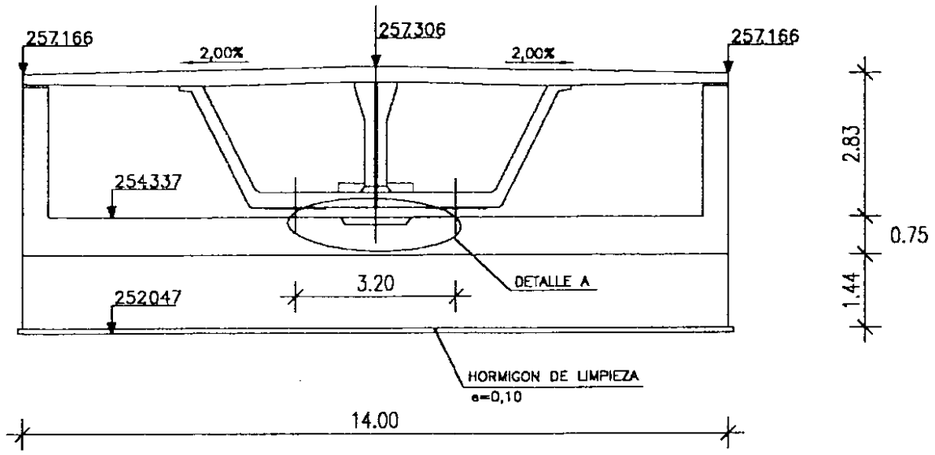


SECCION A–A GENERICA
ESCALA 1:100

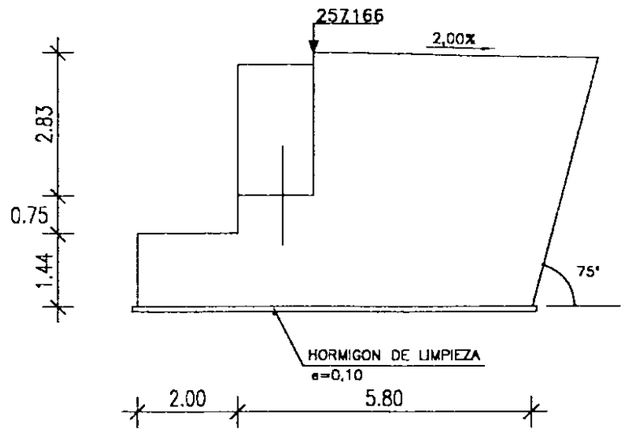


SECCION Y–Y
ESCALA 1:100

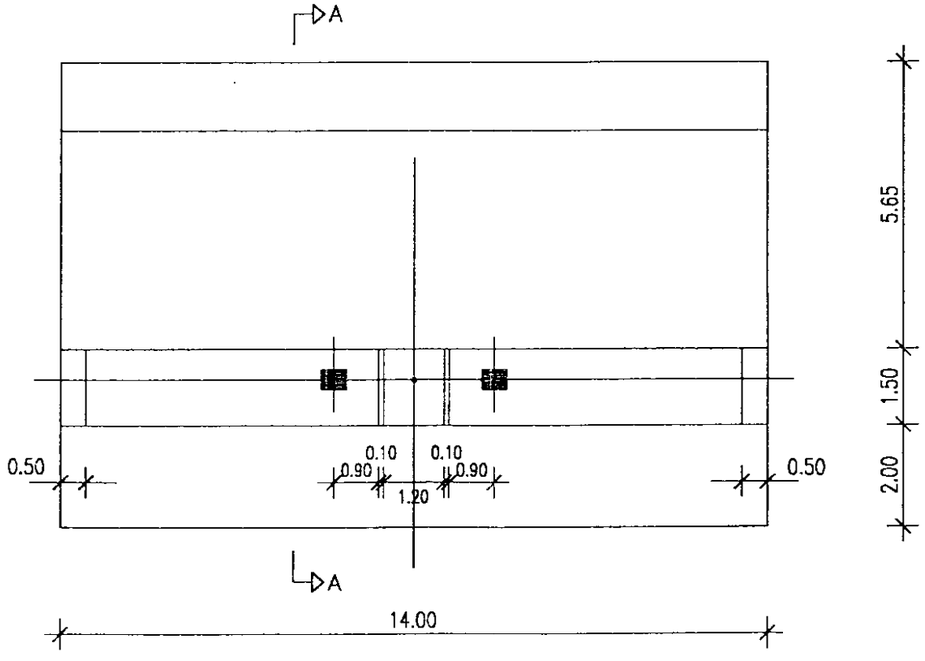
GIF Centro de Administraciones Ferroviarias	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA TRAMO: LLEIDA–MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo: D. JAIME GARCIA-GERMAN LOPEZ-BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo: RAUL FERNANDEZ CABANA	CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS) AEPO	ESCALA NORMAL 1:100 Numérico / Gráfica 0 1 2 3m	FECHA NOVIEMBRE 2003	TITULO DEL PLANO ESTRUCTURAS PUENTE SOBRE EL RIO FRANCOLI DEFINICION GEOMETRICA PILA 4	Nº DE PLANO 4.9.1 Hoja 8 de 36



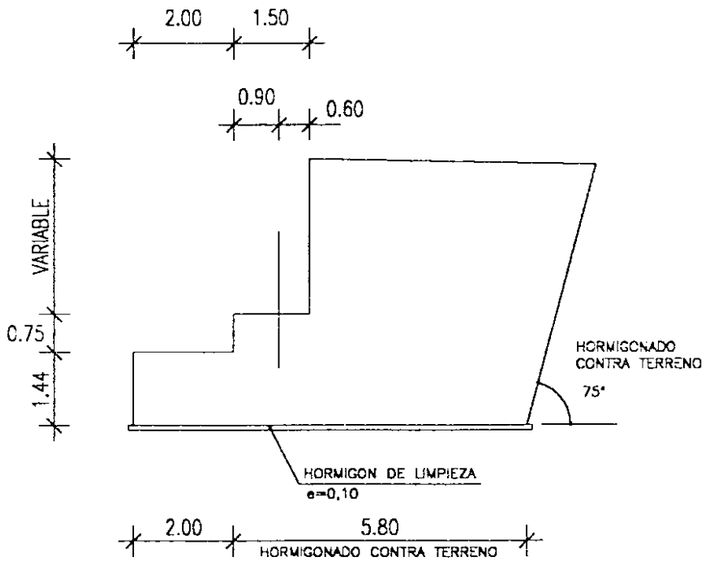
ALZADO FRONTAL
ESCALA 1:125



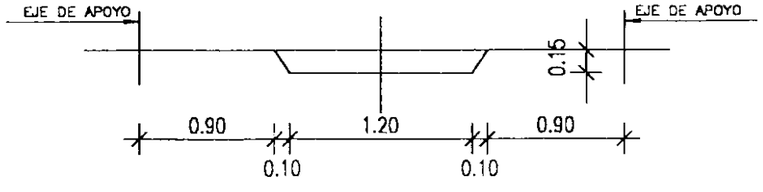
ALZADO LATERAL
ESCALA 1:125



PLANTA
ESCALA 1:125



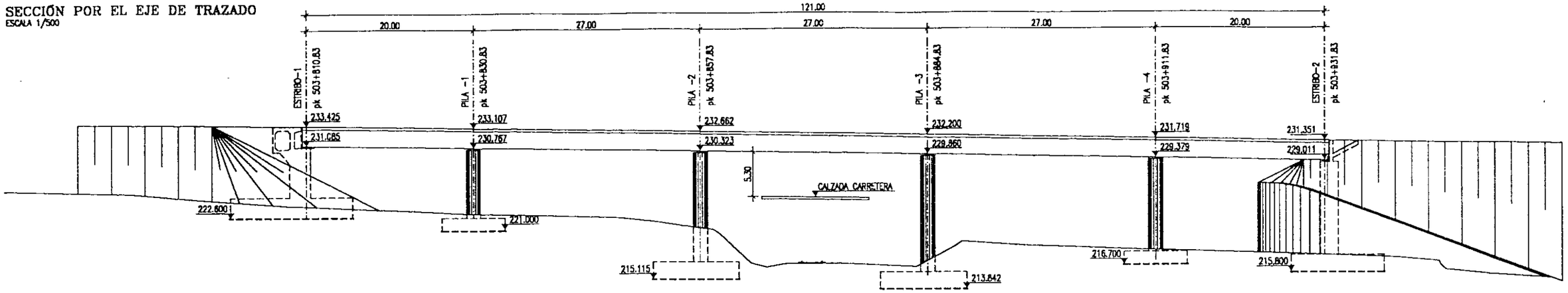
SECCION A–A
ESCALA 1:125



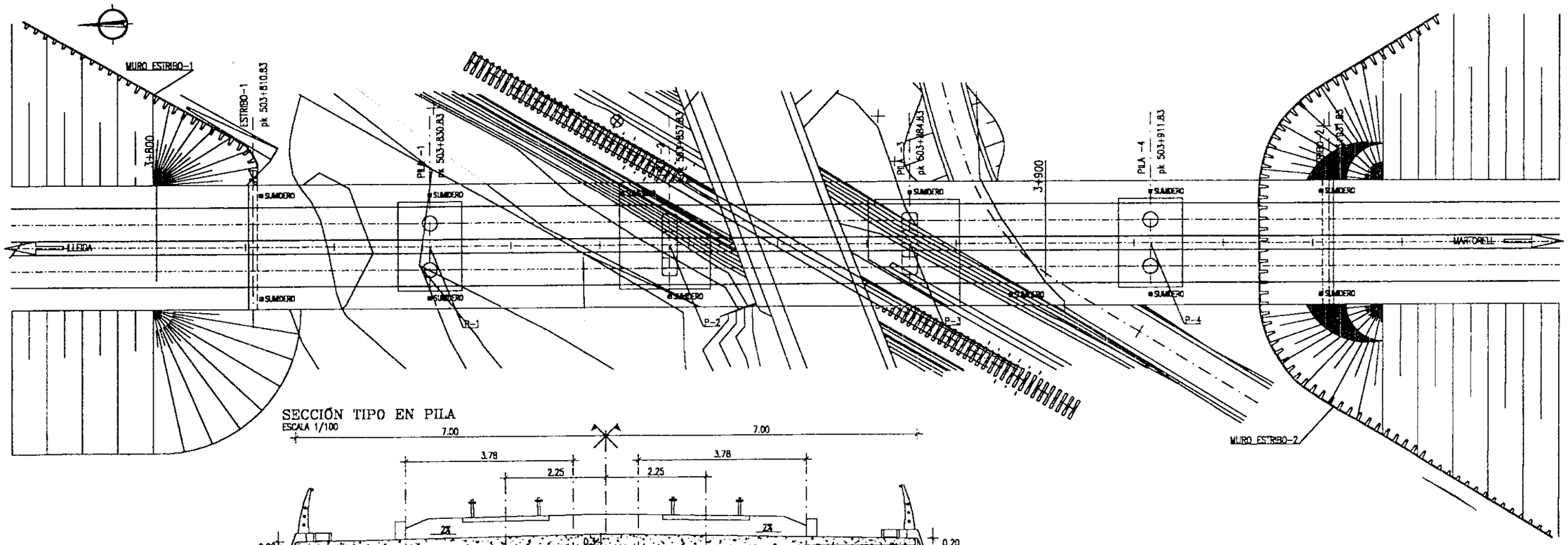
DETALLE A
ESCALA 1:40

GIF Grupo de Ingeniería Ferroviaria	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA TRAMO: LLEIDA–MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo: D. JAIME GARCIA–GERMAN LOPEZ–BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo: RAUL FERNANDEZ CAVARA	CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS) AEPO	ESCALA NORMAL 1:125 1:40 Numérica Gráfica 0 1.25 2.5 3.75 m 0 0.4 0.8 1.2 m	FECHA NOVIEMBRE 2003	TITULO DEL PLANO ESTRUCTURAS PUENTE SOBRE EL RIO FRANCOLI DEFINICIÓN GEOMÉTRICA ESTRIBO 2	Nº DE PLANO 2.9.1 Hoja 9 de 36

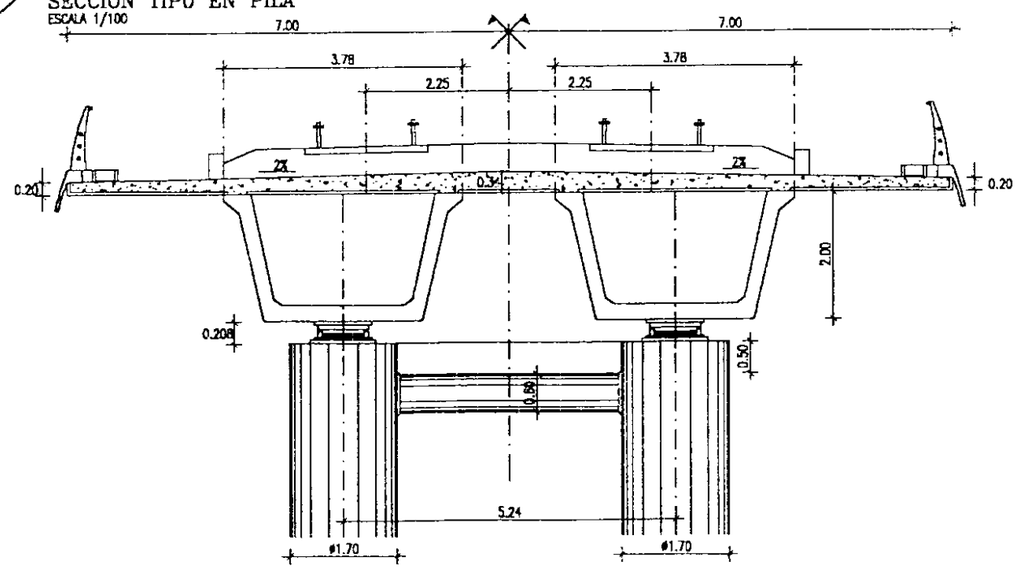
SECCIÓN POR EL EJE DE TRAZADO
ESCALA 1/500



PLANTA
ESCALA 1/500



SECCIÓN TIPO EN PILA
ESCALA 1/100



CARACTERISTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	γ
TABLERO	HA-30/B/20/IIa	NORMAL	1.50
ALZADOS	HA-30/B/20/IIa	NORMAL	1.50
CIMENTACIONES	HA-25/B/20/IIa	NORMAL	1.50
NIVELACIÓN	HM-15	NORMAL	1.50

ACEROS PARA ARMAR CORRUGADOS			
ELEMENTO	TIPO	CONTROL	γ
CIMENTACIONES, ALZADOS Y TABLERO	B 500 S	NORMAL	1.15

ACERO PARA PRETENSAR			
ELEMENTO	TIPO	CONTROL	γ
TABLERO	Y 1860 S7	NORMAL	1.15

GIF Gestor de Infraestructuras Ferroviarias

PROYECTO CONSTRUIDO
LINEA DE ALTA VELOCIDAD
MADRID-ZARAGOZA-BARCELONA-FRONTERA FRANCESA
TRAMO: LLEIDA-MARTORELL. SUBTRAMO V. PLATAFORMA

EL DIRECTOR DEL PROYECTO CONSTRUIDO
Fdo: D. JAIME GARCIA-GERMAN LOPEZ-BELMONTE

EL AUTOR DEL PROYECTO CONSTRUIDO
Fdo: RAUL FERNANDEZ CAMARA

CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS)
AEPO

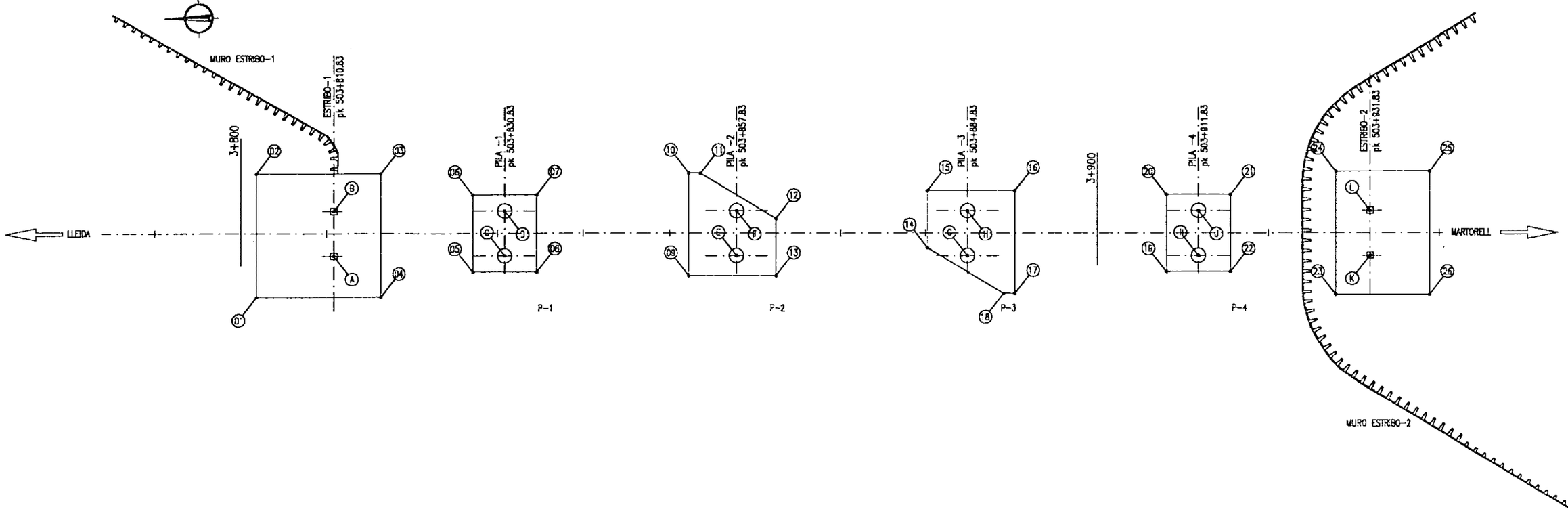
ESCALA NORMAL
1:500
1:100
Numérica
Gráfica
0 5 10 15m
0 1 2 3m

FECHA
NOVIEMBRE 2003

TÍTULO DEL PLANO
ESTRUCTURAS
ESTRUCTURA 1
PLANTA, ALZADO Y SECCION

Nº DE PLANO
2.9.2
Hoja 1 de 32

PLANTA
ESCALA 1/500



CUADRO DE COORDENADAS		
PUNTO	X	Y
A	348181.2624	4572318.9921
B	348186.5008	4572320.1241
C	348181.7655	4572299.9881
D	348187.0048	4572300.1201
E	348182.4466	4572272.9966
F	348187.6848	4572273.1287
G	348183.1264	4572246.0155
H	348188.3647	4572246.1476
I	348183.8061	4572219.0344
J	348189.0450	4572219.1458
K	348184.3102	4572199.0304
L	348189.5485	4572199.1625

CUADRO DE COORDENADAS					
PUNTO	X	Y	PUNTO	X	Y
1	348176.2573	4572328.8688	12	348186.9051	4572263.5179
2	348190.6527	4572329.2316	13	348180.2079	4572263.3491
3	348191.0179	4572314.7362	14	348183.9037	4572253.6767
4	348176.6225	4572314.3734	15	348190.6021	4572253.8455
5	348179.7923	4572303.6999	16	348190.8590	4572240.6487
6	348188.7895	4572303.9265	17	348178.8628	4572240.3464
7	348188.9784	4572296.4290	18	348178.8285	4572241.7058
8	348179.9812	4572296.2023	19	348181.8326	4572222.7256
9	348179.9310	4572278.5459	20	348190.8297	4572222.9523
10	348191.9472	4572278.8482	21	348191.0186	4572215.4547
11	348191.9575	4572277.4439	22	348182.0215	4572215.2280
			23	348179.8312	4572202.9143
			24	348194.0261	4572203.2669
			25	348194.3044	4572192.2803
			26	348179.9077	4572191.9172

CARACTERISTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	γ
TABLERO	HA-30/B/20/IIa	NORMAL	1.50
ALZADOS	HA-30/B/20/IIa	NORMAL	1.50
CIMENTACIONES	HA-25/B/20/IIa	NORMAL	1.50
NIVELACIÓN	HM-15	NORMAL	1.50

ACEROS PARA ARMAR CORRUGADOS			
ELEMENTO	TIPO	CONTROL	γ
CIMENTACIONES, ALZADOS Y TABLERO	B 500 S	NORMAL	1.15

ACERO PARA PRETENSAR			
ELEMENTO	TIPO	CONTROL	γ
TABLERO	Y 1860 S7	NORMAL	1.15

GIF

PROYECTO CONSTRUIDO
LINEA DE ALTA VELOCIDAD
MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA
TRAMO: LLEIDA–MARTORELL. SUBTRAMO V. PLATAFORMA

EL DIRECTOR DEL PROYECTO CONSTRUIDO
Fdo: D. JAIME GARCIA-GERMAN LOPEZ-BELMONTE

EL AUTOR DEL PROYECTO CONSTRUIDO
Fdo: RAÚL FERNÁNDEZ CÁMARA

CONSULTOR (ASISTENCIA AL CONTROL DE OBRAS)
AEPO

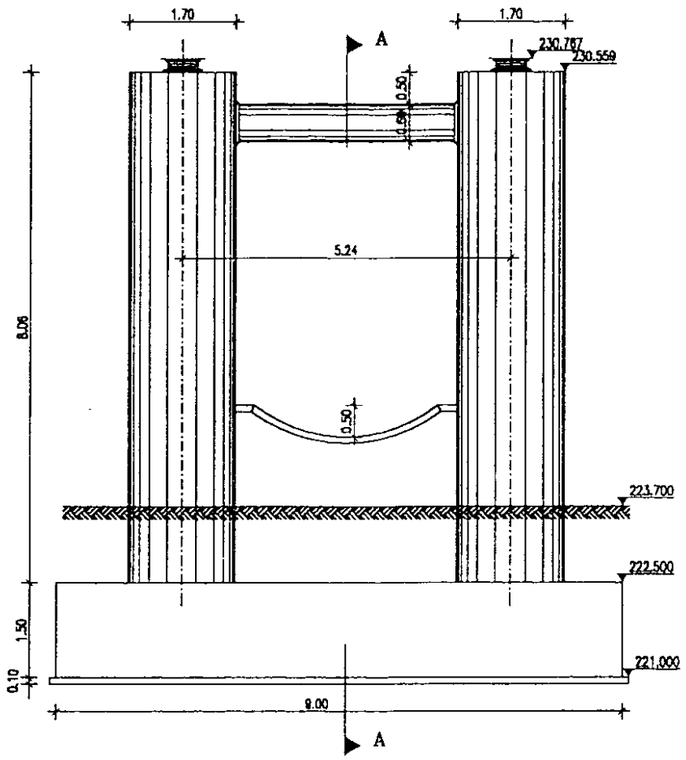
ESCALA NORMAL
1:500
Numérica | Gráfica
0 5 10 15m

FECHA
NOVIEMBRE 2003

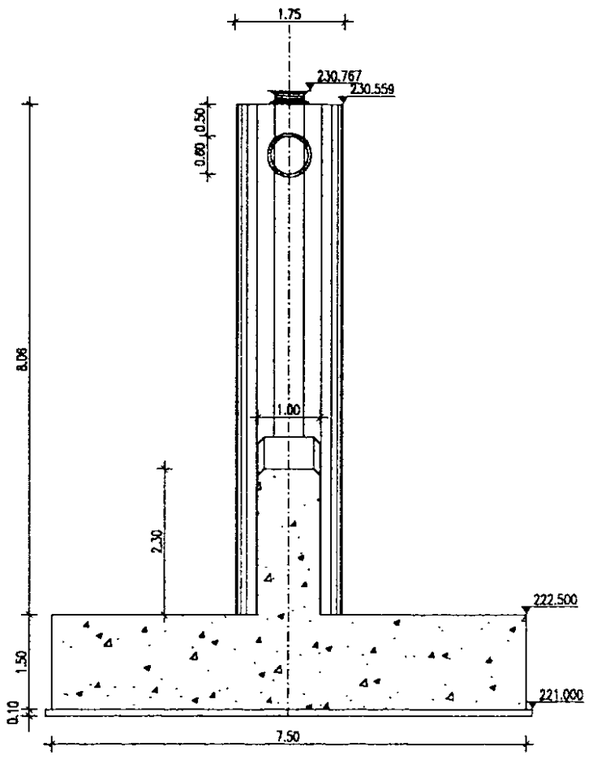
TÍTULO DEL PLANO
ESTRUCTURAS
ESTRUCTURA 1
REPLANTEO DE CIMENTACIONES

Nº DE PLANO
2.9.2
Hoja 2 de 32

ALZADO
ESCALA 1/100



SECCION A-A
ESCALA 1/100



CARACTERISTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	γ
ALZADOS	HA-30/B/20/IIa	NORMAL	1.50
CIMENTACION	HA-25/B/20/IIa	NORMAL	1.50
NIVELACION	HM-15	NORMAL	1.50

EJECUCION DE LA OBRA

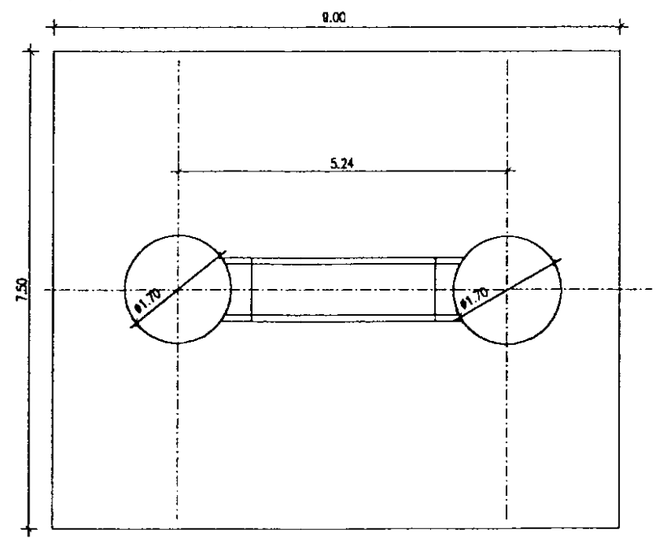
ELEMENTOS IN SITU CONTROL NORMAL Y CONTROL INTENSO
COEFICIENTES DE MAYORACION DE LAS ACCIONES SEGUN EHE.

ACEROS PARA ARMAR CORRUGADOS			
ELEMENTO	TIPO	CONTROL	γ
ALZADOS Y CIMENTACIONES	B 500 S	NORMAL	1.15

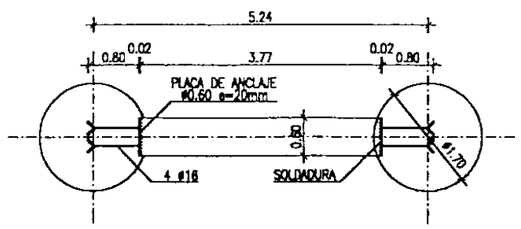
RECUBRIMIENTO NOMINAL DE LAS ARMADURAS

ALZADOS: 40mm
CIMENTACIONES: 30mm

PLANTA
ESCALA 1/100

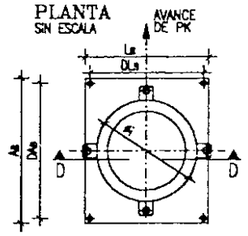


DETALLE ANCLAJE TUBO
ESCALA 1/100

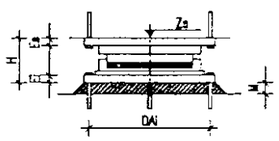


POR EL CALCULO DE LA CIMENTACIONES SE HA ADOPTADO UNA TENSION ADMISIBLE DE 350 KN/m2

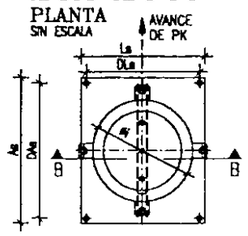
APOYO TIPO PL
PLANTA
SIN ESCALA



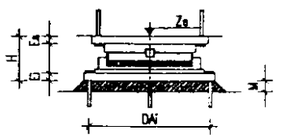
SECCIÓN D-D
COTAS



APOYO TIPO PU
PLANTA
SIN ESCALA

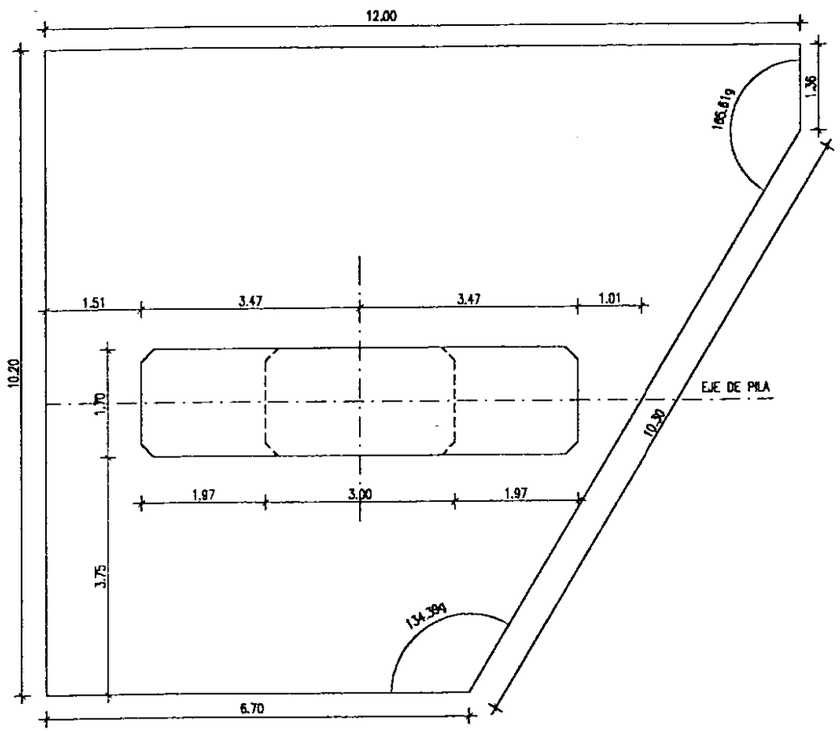


SECCIÓN B-B
COTAS

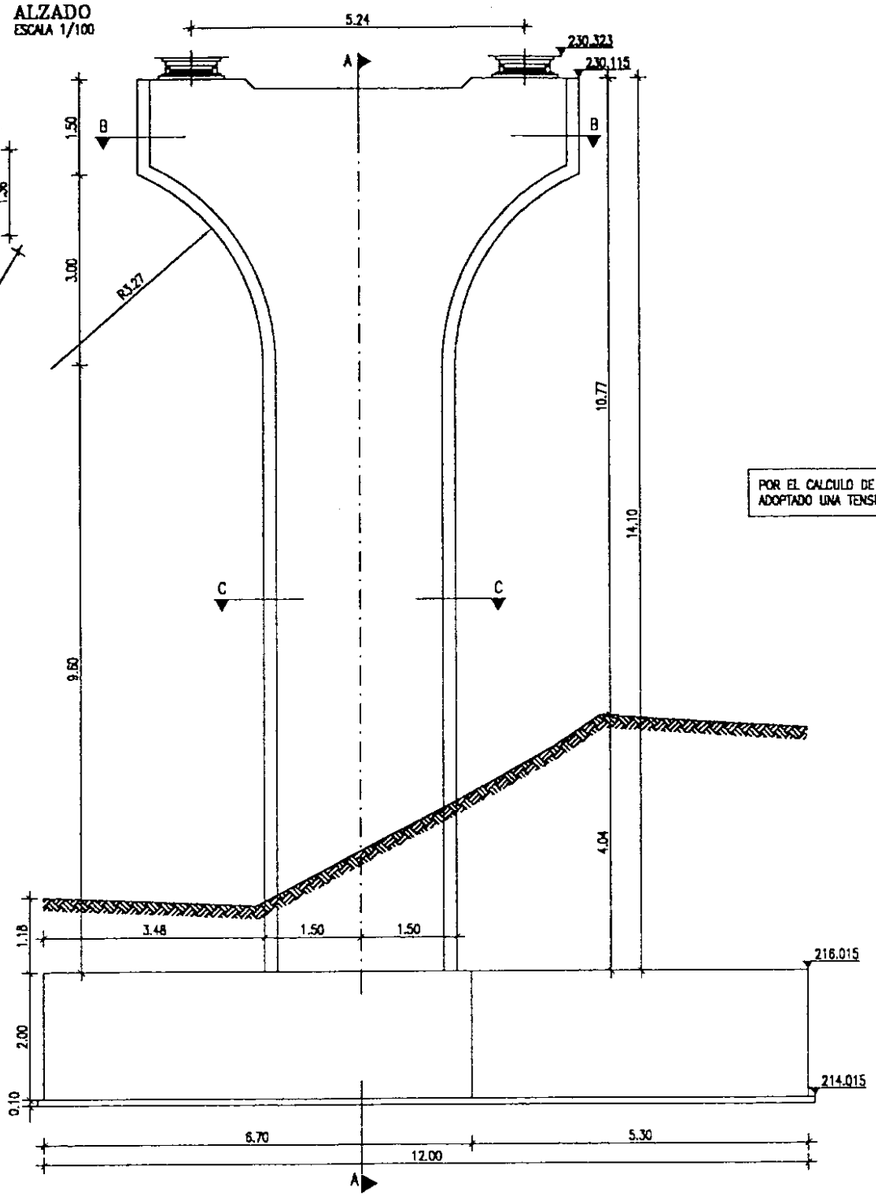


GIF	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID-ZARAGOZA-BARCELONA-FRONTERA FRANCESA TRAMO: LLEIDA-MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo: D. JAIME GARCIA-GERMAN LOPEZ-BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo: RAUL FERNANDEZ CAMARA	CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS) AEPO	ESCALA NORMAL 1:100 Numérica / Gráfica 0 1 2 3m	FECHA NOVIEMBRE 2003	TITULO DEL PLANO ESTRUCTURAS ESTRUCTURA 1 PILA 1 GEOMETRIA	N° DE PLANO 2.9.2 Hoja 3 de 32

PLANTA
ESCALA 1/100

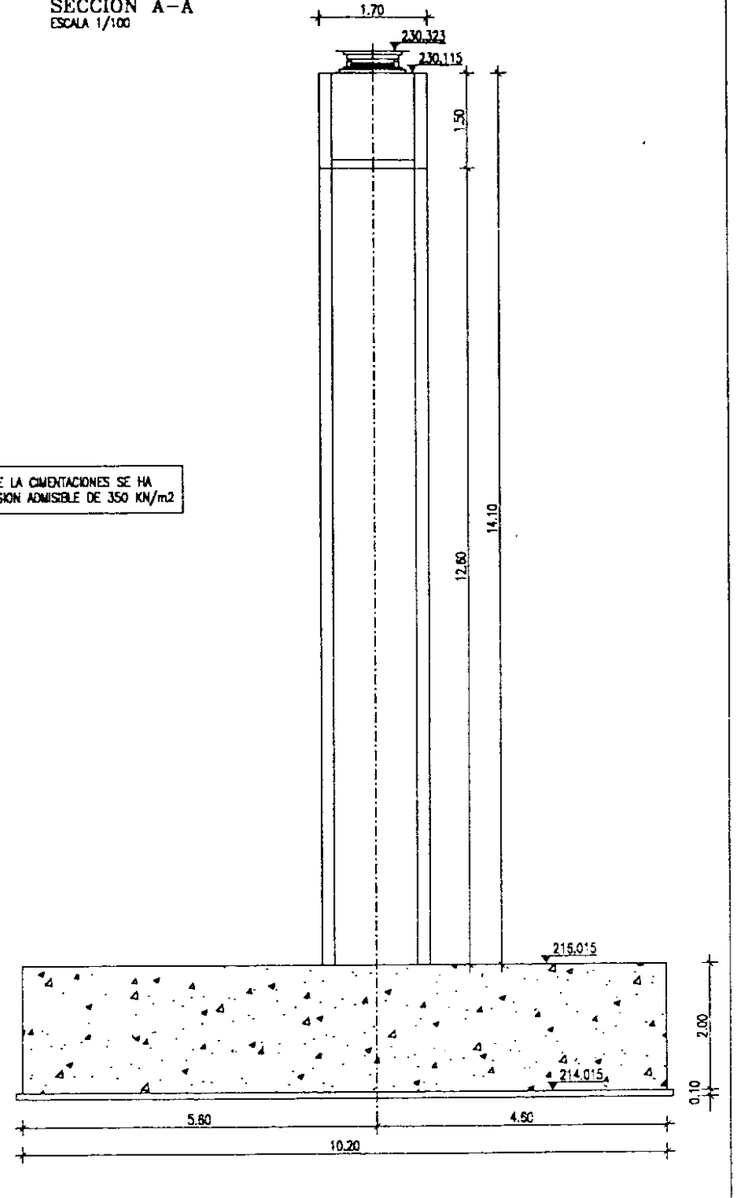


ALZADO
ESCALA 1/100

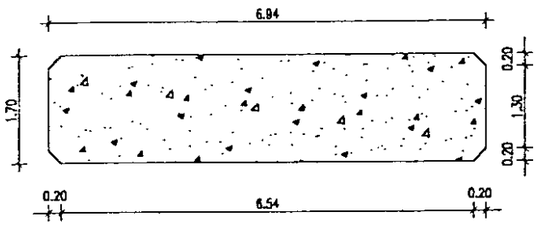


POR EL CALCULO DE LA CIMENTACIONES SE HA ADOPTADO UNA TENSION ADMISIBLE DE 350 KN/m2

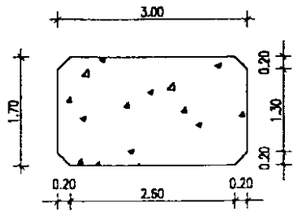
SECCION A–A
ESCALA 1/100



SECCION B–B
ESCALA 1/100



SECCION C–C
ESCALA 1/100



CARACTERISTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	γ
ALZADOS	HA–30/B/20/IIa	NORMAL	1.50
CIMENTACION	HA–25/B/20/IIa	NORMAL	1.50
NIVELACION	HM–15	NORMAL	1.50

ACEROS PARA ARMAR CORRUGADOS			
ELEMENTO	TIPO	CONTROL	γ
ALZADOS Y CIMENTACIONES	B 500 S	NORMAL	1.15

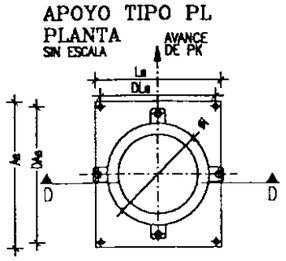
EJECUCION DE LA OBRA

ELEMENTOS IN SITU CONTROL NORMAL Y CONTROL INTENSO
COEFICIENTES DE MAYORACION DE LAS ACCIONES SEGUN EHE.

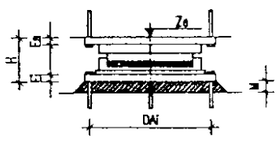
RECUBRIMIENTO NOMINAL DE LAS ARMADURAS

ALZADOS: 40mm
CIMENTACIONES: 30mm

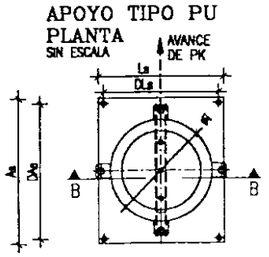
APOYO TIPO PL
PLANTA
SIN ESCALA



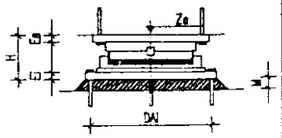
SECCIÓN D–D
COTAS



APOYO TIPO PU
PLANTA
SIN ESCALA

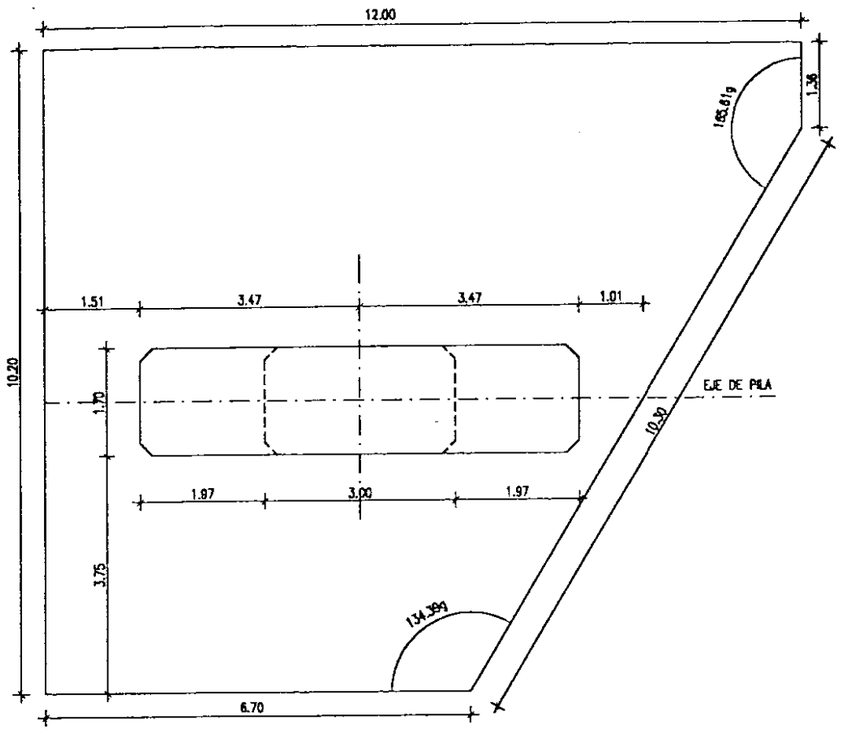


SECCIÓN B–B
COTAS

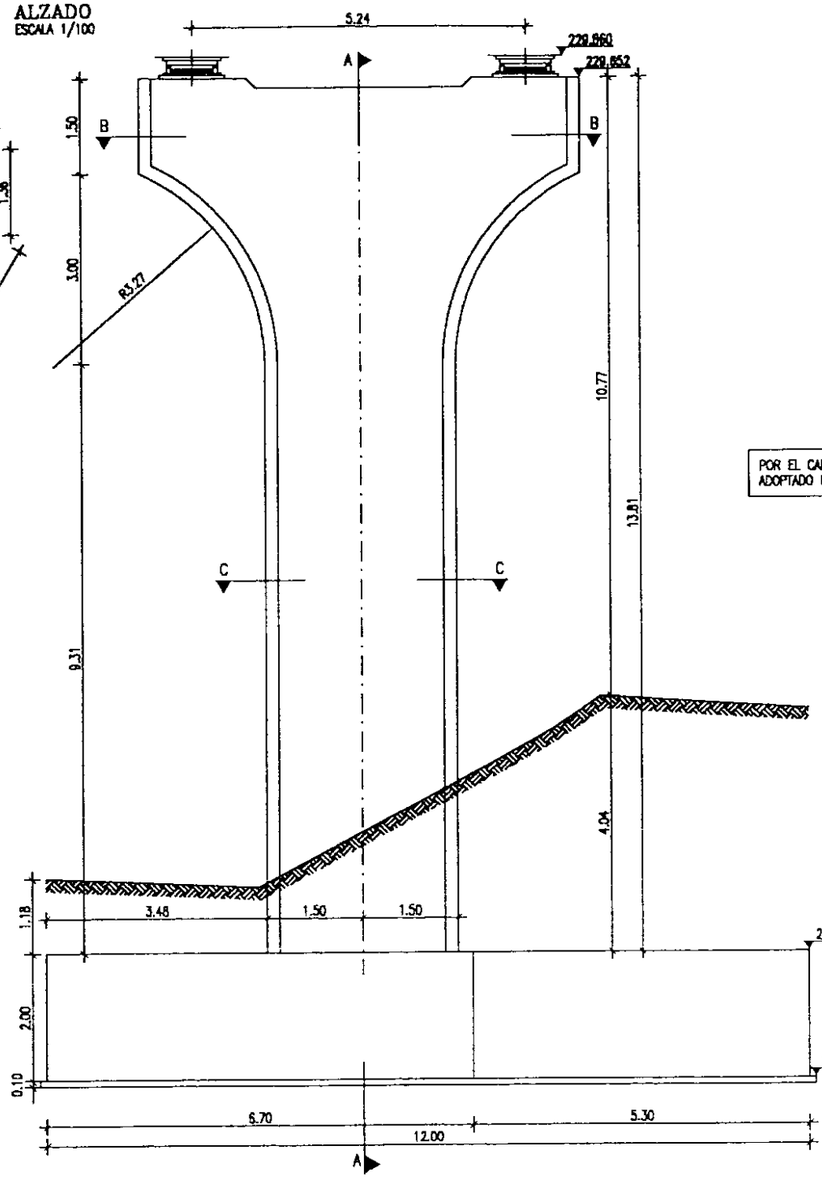


GIF	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA TRAMO: LLEIDA–MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo. D. JAIME GARCIA–GERMAN LOPEZ–BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo. RAUL FERNANDEZ CAMARA	CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS) AEPO	ESCALA NORMAL 1:100 Numérica / Gráfica 0 1 2 3m	FECHA NOVIEMBRE 2003	TITULO DEL PLANO ESTRUCTURAS ESTRUCTURA 1 PILA 2 GEOMETRIA	Nº DE PLANO 2.9.2 Hoja 5 de 32

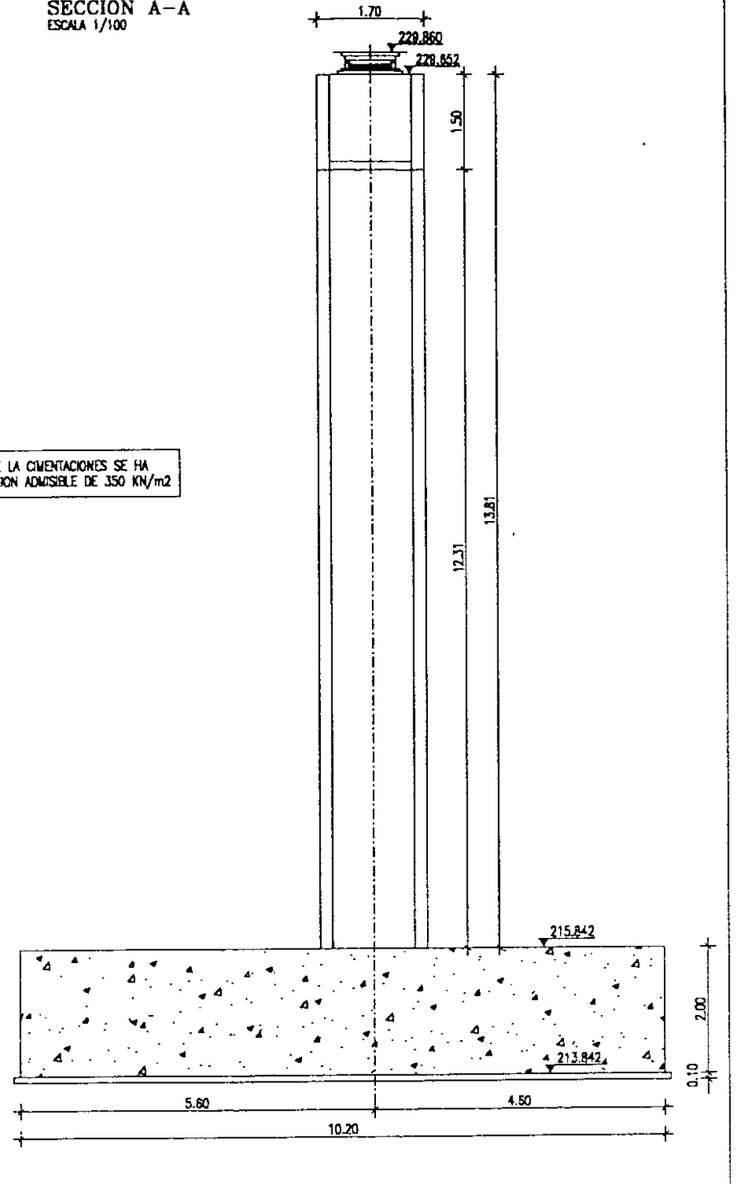
PLANTA
ESCALA 1/100



ALZADO
ESCALA 1/100

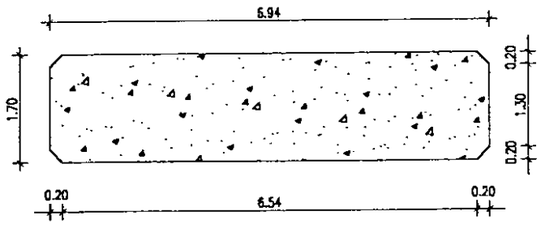


SECCION A–A
ESCALA 1/100

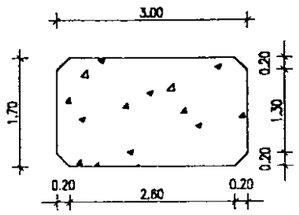


POR EL CALCULO DE LA CIMENTACIONES SE HA ADOPTADO UNA TENSION ADMISIBLE DE 350 KN/m2

SECCION B–B
ESCALA 1/100



SECCION C–C
ESCALA 1/100



CARACTERISTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	γ
ALZADOS	HA-30/B/20/IIa	NORMAL	1.50
CIMENTACION	HA-25/B/20/IIa	NORMAL	1.50
NIVELACION	HM-15	NORMAL	1.50

ACEROS PARA ARMAR CORRUGADOS			
ELEMENTO	TIPO	CONTROL	γ
ALZADOS Y CIMENTACIONES	B 500 S	NORMAL	1.15

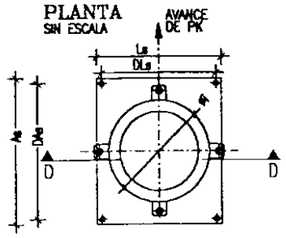
EJECUCION DE LA OBRA

ELEMENTOS IN SITU CONTROL NORMAL Y CONTROL INTENSO
COEFICIENTES DE MAYORACION DE LAS ACCIONES SEGUN EHE.

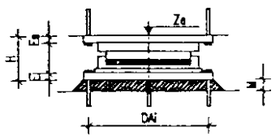
RECUBRIMIENTO NOMINAL DE LAS ARMADURAS

ALZADOS: 40mm
CIMENTACIONES: 30mm

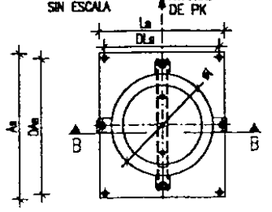
APOYO TIPO PL
PLANTA
SIN ESCALA



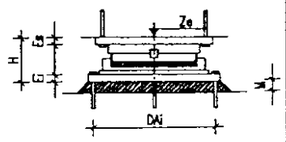
SECCIÓN D–D
COTAS



APOYO TIPO PU
PLANTA
SIN ESCALA



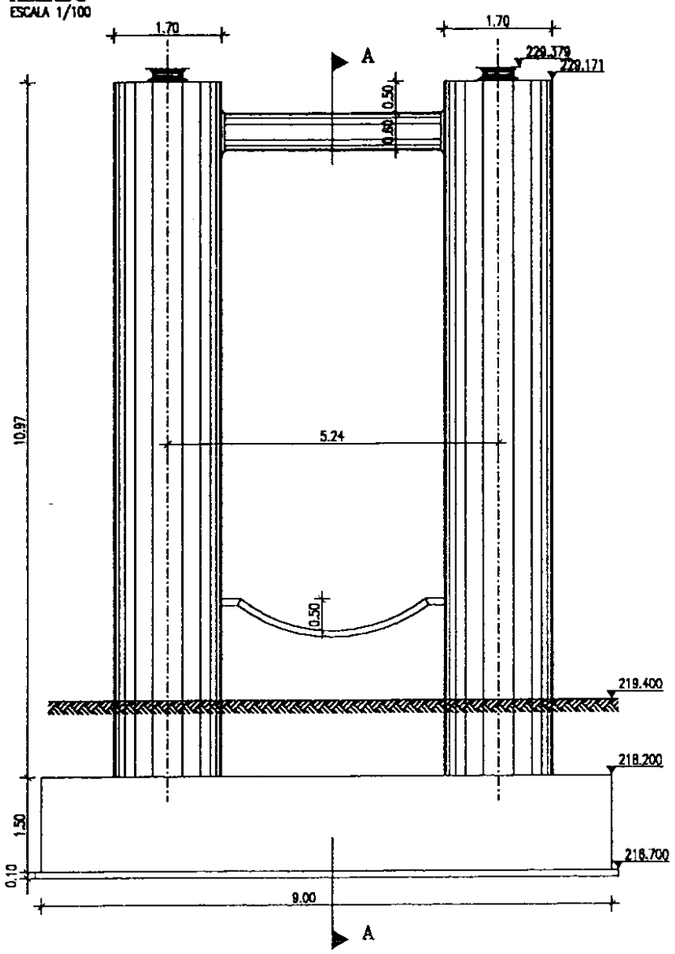
SECCIÓN B–B
COTAS



FDO: RAFAEL RODRIGUEZ GUTIERREZ

GIF Grupo de Ingeniería Ferroviaria	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA TRAMO: LLEIDA–MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo: D. JAIME GARCIA–GERMAN LOPEZ–BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo: RAÚL FERNÁNDEZ CÁMARA	CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS) AEPO	ESCALA NORMAL 1:100 Numérica / Gráfica 0 1 2 3m	FECHA NOVIEMBRE 2003	TITULO DEL PLANO ESTRUCTURAS ESTRUCTURA 1 PILA 3 GEOMETRIA	Nº DE PLANO 2.9.2 Hoja 7 de 32

ALZADO
ESCALA 1/100



CARACTERISTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	γ
ALZADOS	HA-30/B/20/IIa	NORMAL	1.50
CIMENTACION	HA-25/B/20/IIa	NORMAL	1.50
NIVELACION	HM-15	NORMAL	1.50

EJECUCION DE LA OBRA

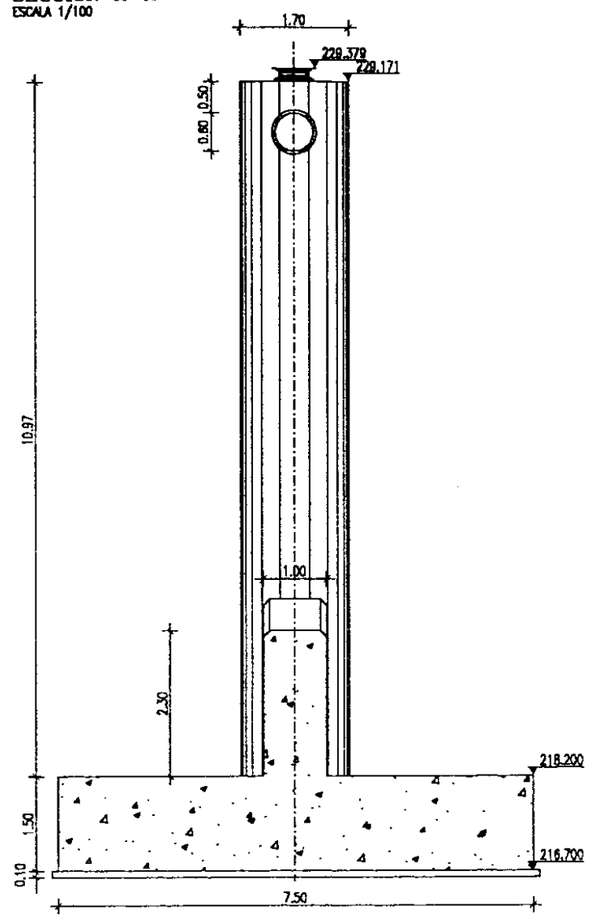
ELEMENTOS IN SITU CONTROL NORMAL Y CONTROL INTENSO
COEFICIENTES DE MAYORACION DE LAS ACCIONES SEGUN EHE.

ACEROS PARA ARMAR CORRUGADOS			
ELEMENTO	TIPO	CONTROL	γ
ALZADOS Y CIMENTACIONES	B 500 S	NORMAL	1.15

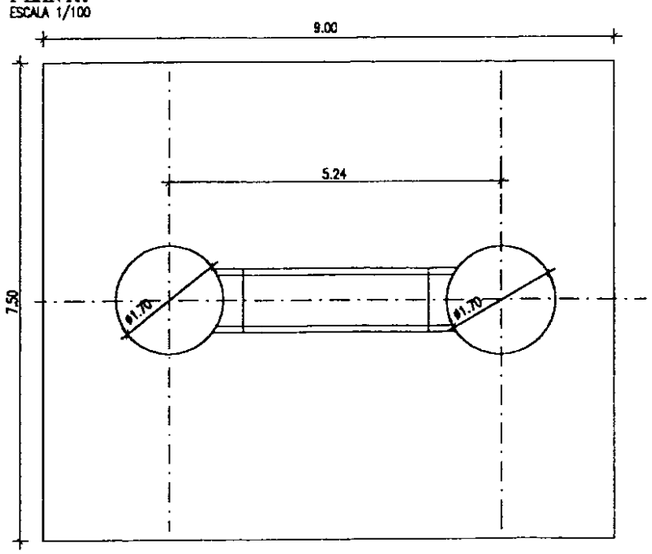
RECUBRIMIENTO NOMINAL DE LAS ARMADURAS

ALZADOS: 40mm
CIMENTACIONES: 30mm

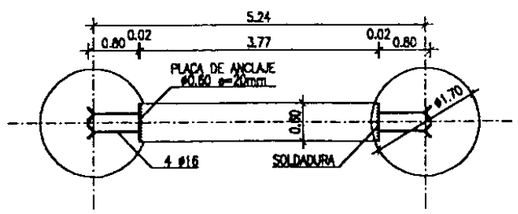
SECCION A-A
ESCALA 1/100



PLANTA
ESCALA 1/100

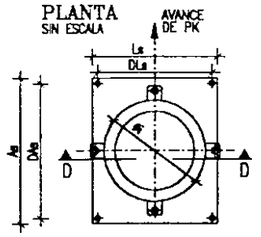


DETALLE ANCLAJE TUBO
ESCALA 1/100

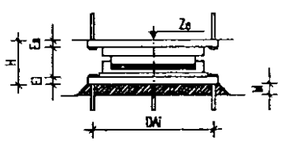


POR EL CALCULO DE LA CIMENTACIONES SE HA ADOPTADO UNA TENSION ADMISIBLE DE 350 KN/m2

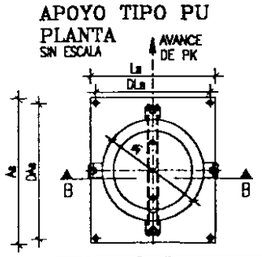
APOYO TIPO PL
PLANTA
SIN ESCALA



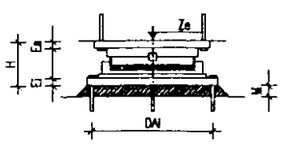
SECCIÓN D-D
COTAS



APOYO TIPO PU
PLANTA
SIN ESCALA

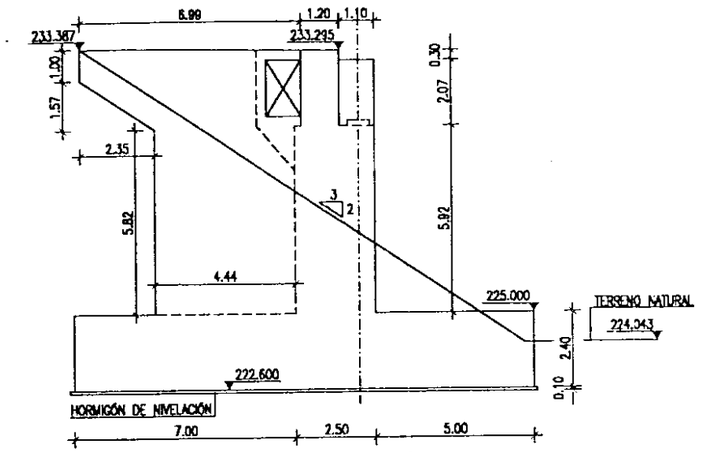


SECCIÓN B-B
COTAS

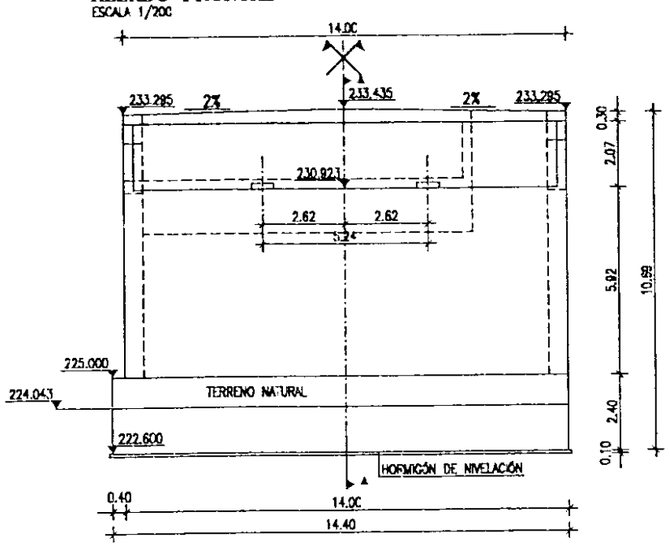


GIF	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID-ZARAGOZA-BARCELONA-FRONTERA FRANCESA TRAMO: LLEIDA-MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo: D. JAIME GARCIA-GERMAN LOPEZ-BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo: RAÚL FERNÁNDEZ CÁMARA	CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS) AEPO	ESCALA NORMAL 1:100 Numérica / Gráfica 0 1 2 3m	FECHA NOVIEMBRE 2003	TITULO DEL PLANO ESTRUCTURAS ESTRUCTURA 1 PILA 4. GEOMETRIA	Nº DE PLANO 2.9.2 Hoja 9 de 32

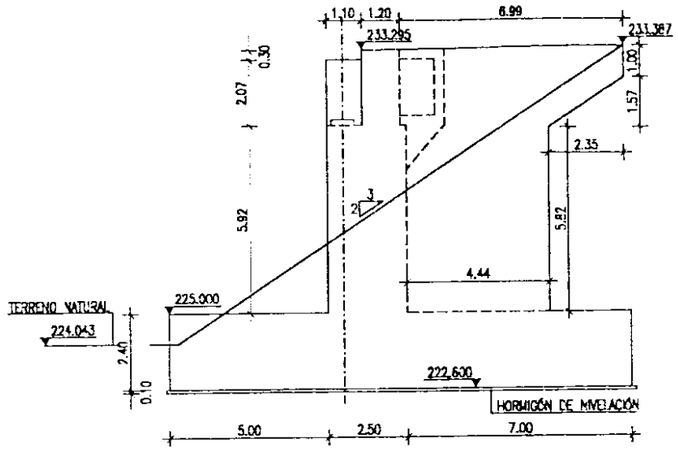
ALETA DERECHA
ESCALA 1/200



ALZADO FRONTAL
ESCALA 1/200



ALETA IZQUIERDA
ESCALA 1/200



APARATO DE APOYO
SIN ESCALA



	PL-300	PU-300
H	102	122

APOYO TIPO POT PL-300 O PU-300
VER DETALLE EN PLANO DE REPLANTEO DE APOYOS

CARACTERISTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	γ
TABLERO	HA-30/B/20/IIa	NORMAL	1.50
ALZADOS	HA-30/B/20/IIa	NORMAL	1.50
CIMENTACIONES	HA-25/B/20/IIa	NORMAL	1.50
NIVELACIÓN	HM-15	NORMAL	1.50

EJECUCION DE LA OBRA

TODOS LOS ELEMENTOS CONTROL INTENSO
COEFICIENTES DE MAYORACION DE LAS ACCIONES SEGUN EHE.

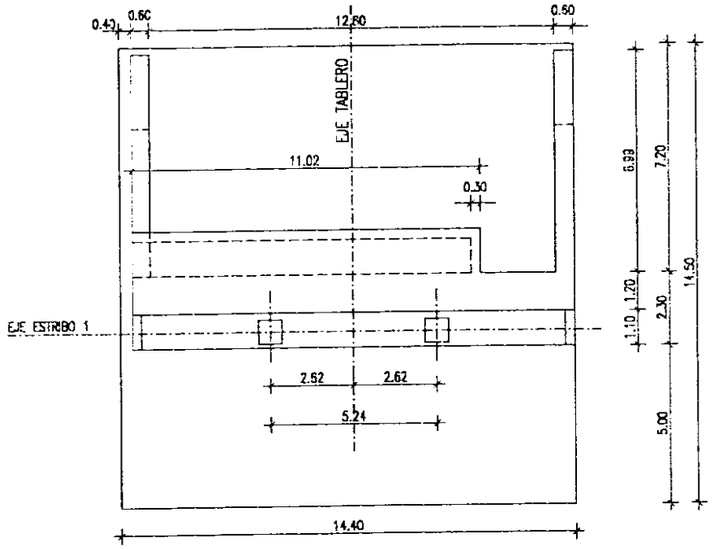
ACEROS PARA ARMAR CORRUGADOS			
ELEMENTO	TIPO	CONTROL	γ
CIMENTACIONES, ALZADOS Y TABLERO	B 500 S	NORMAL	1.15

ACERO PARA PRETENSAR			
ELEMENTO	TIPO	CONTROL	γ
TABLERO	Y 1860 S7 15.2	NORMAL	1.15

RECUBRIMIENTO NOMINAL DE LAS ARMADURAS

ALZADOS : 40 mm
ENCEPADOS Y ZAPATAS : 30 mm

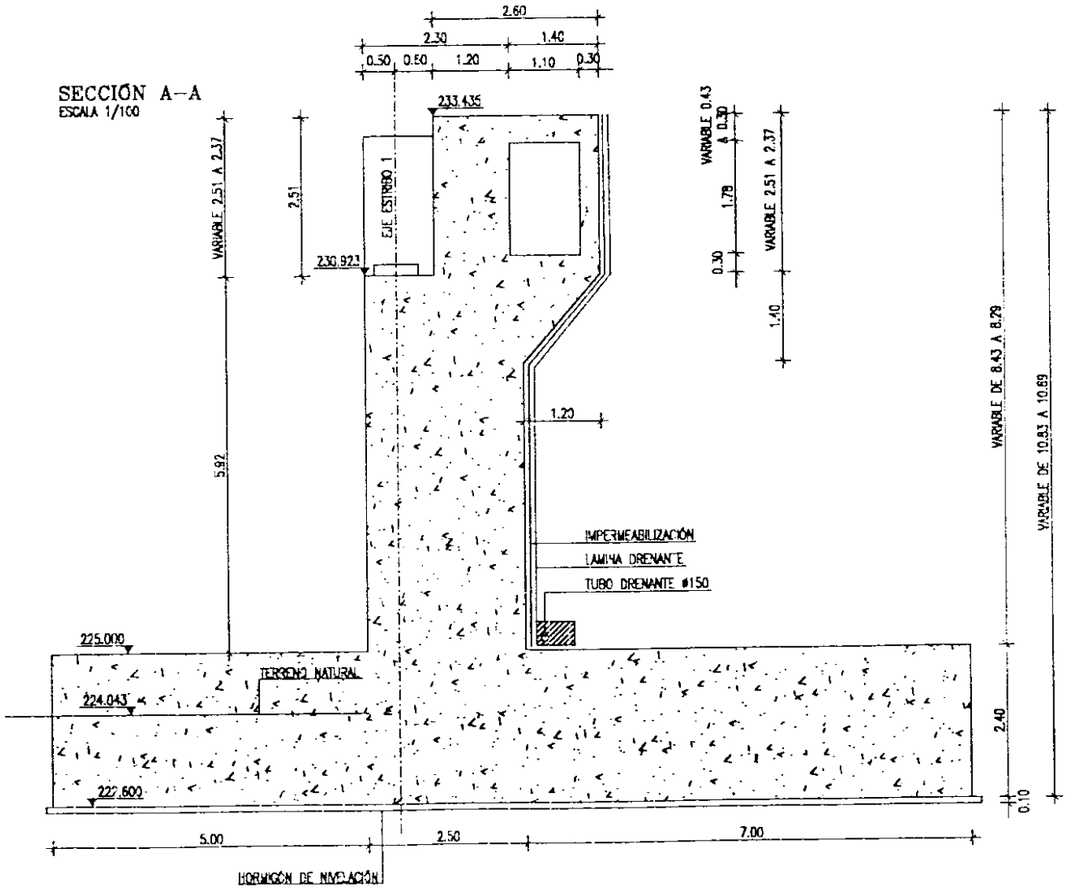
PLANTA
ESCALA 1/200



LA TENSIÓN ADMISIBLE ADOPTADA EN EL TERRENO ES DE 350 KN/m2

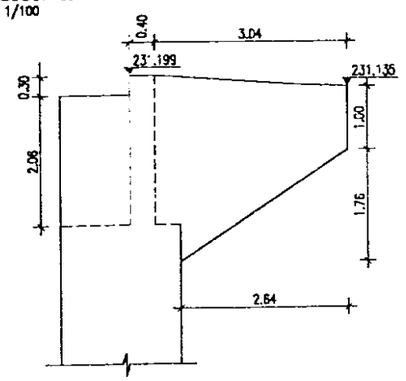
EL RELLENO DE HORMIGÓN DE NIVELACIÓN TENDRA EL ESPESOR NECESARIO PARA GARANTIZAR DICHA TENSIÓN ADMISIBLE

SECCIÓN A-A
ESCALA 1/100

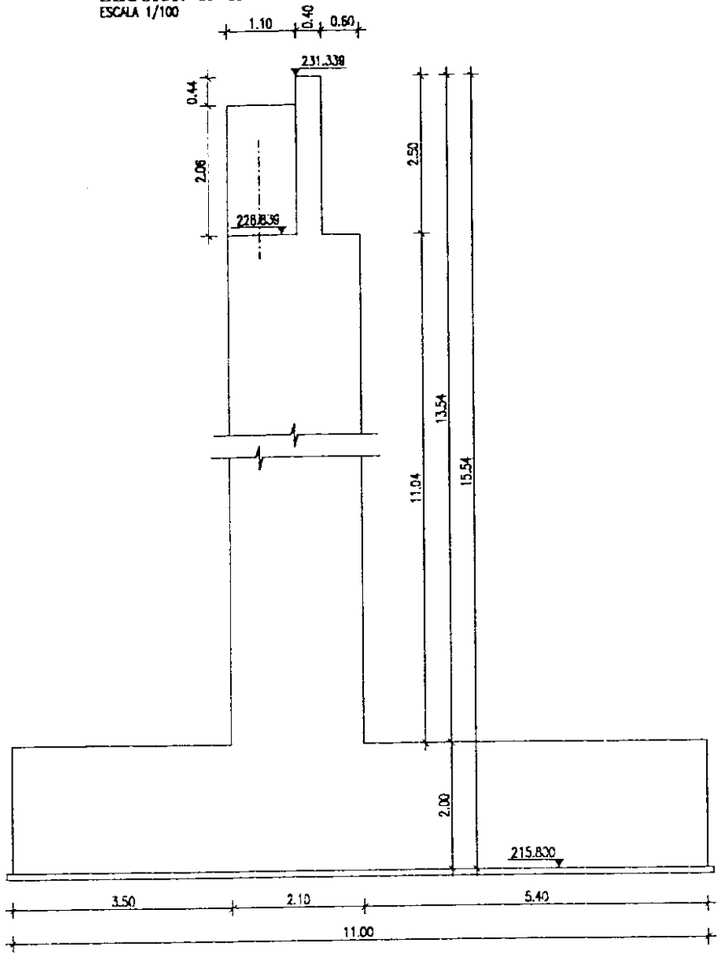


GIF	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID-ZARAGOZA-BARCELONA-FRONTERA FRANCESA TRAMO: LLEIDA-MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo: D. JAIME GARCIA-GERMAN LOPEZ-BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo: RAÚL FERNÁNDEZ CÁMARA	CONSULTOR (ASISTENCIA AL CONTROL DE OBRAS) AEPO	ESCALA NORMAL 1:200 1:100 Numérica Gráfica 0 2 4 6m 0 1 2 3m	FECHA NOVIEMBRE 2003	TITULO DEL PLANO ESTRUCTURAS ESTRUCTURA 1 ESTRIBO 1 GEOMETRIA	Nº DE PLANO 2.9.2 Hoja 11 de 32

SECCIÓN A–A
ESCALA 1/100

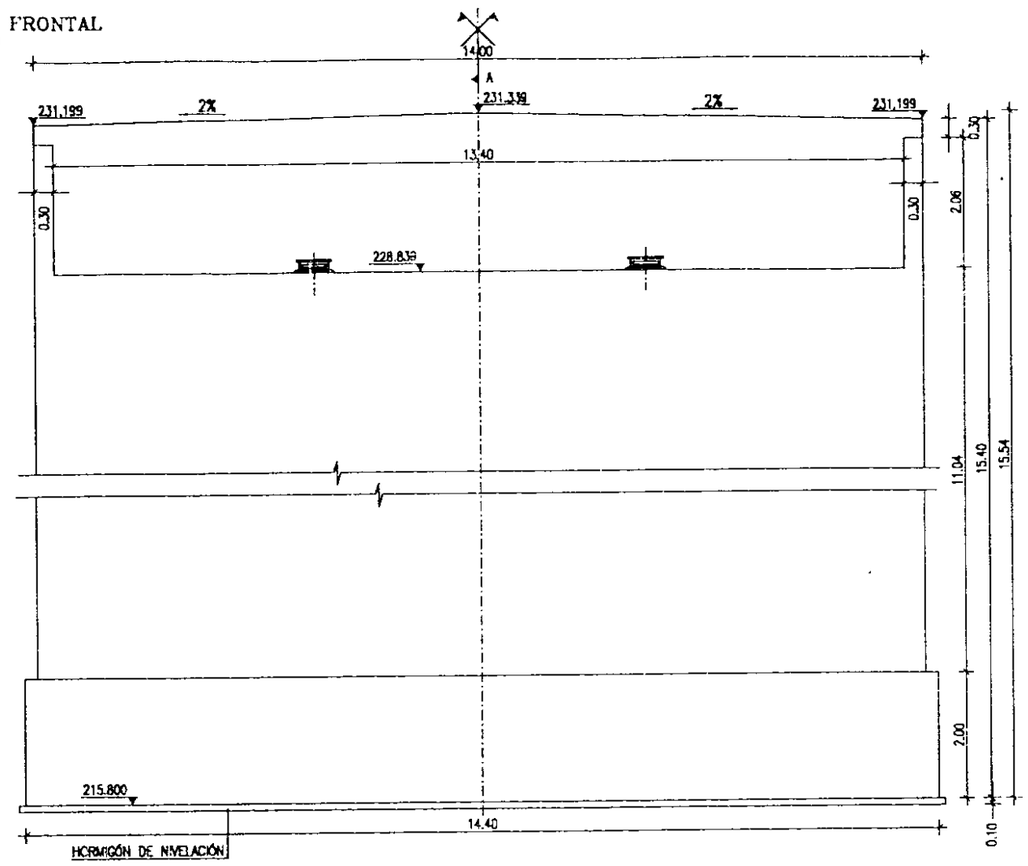


SECCIÓN A–A
ESCALA 1/100

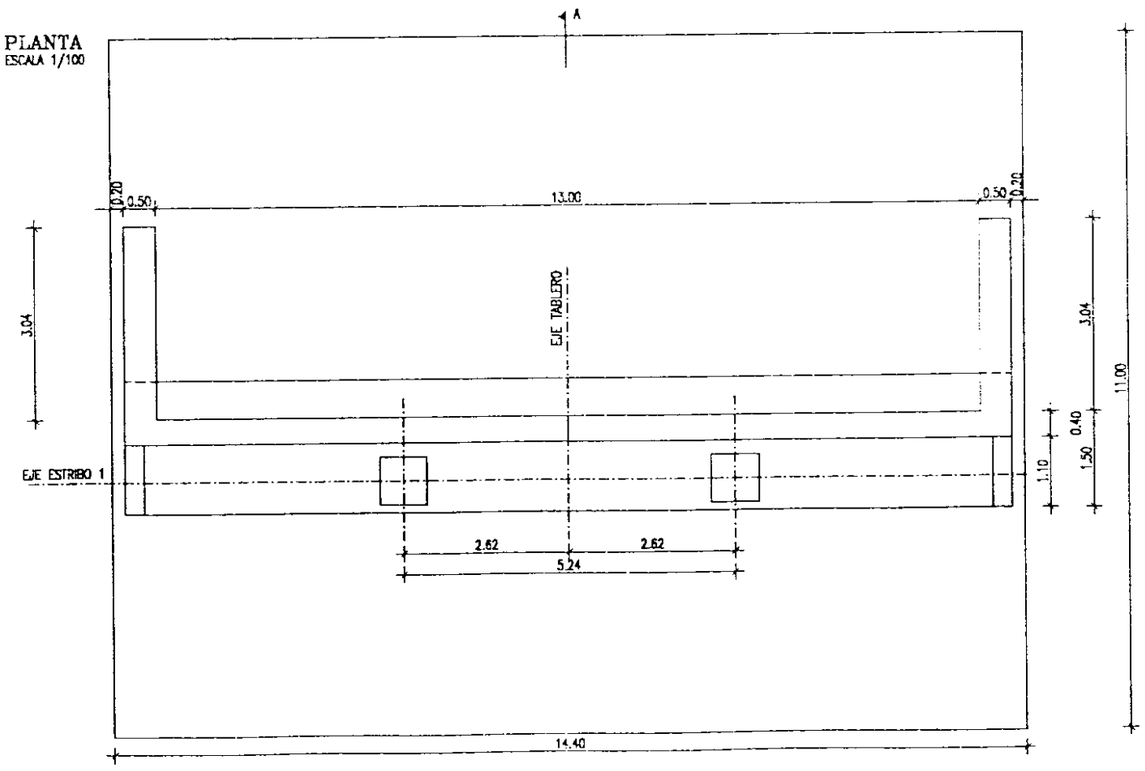


PARA EL CÁLCULO DE ZAPATA SE HA ADOPTADO UNA TENSIÓN ADMISIBLE DE 350KN/m2

ALZADO FRONTAL
ESCALA 1/100



PLANTA
ESCALA 1/100



CARACTERISTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	γ
ALZADOS	HA-30/B/20/IIa	NORMAL	1.50
CIMENTACIONES	HA-25/B/20/IIa	NORMAL	1.50
NIVELACIÓN	HM-15	NORMAL	1.50

ACEROS PARA ARMAR CORRUGADOS			
ELEMENTO	TIPO	CONTROL	γ
CIMENTACIONES, ALZADOS Y TABLERO	B 500 S	NORMAL	1.15

ACERO PARA PRETENSAR			
ELEMENTO	TIPO	CONTROL	γ
TABLERO	Y 186C S7	NORMAL	1.15

EJECUCION DE LA OBRA

TODOS LOS ELEMENTOS CONTROL INTENSO
COEFICIENTES DE MAYORACION DE LAS ACCIONES SEGUN EHE.

RECUBRIMIENTO NOMINAL DE LAS ARMADURAS

ALZADOS : 40 mm
ENCEPADOS Y ZAPATAS : 30 mm

GIF Grupo de Ingeniería Ferroviaria

PROYECTO CONSTRUIDO
LINEA DE ALTA VELOCIDAD
MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA
TRAMO: LLEIDA–MARTORELL. SUBTRAMO V. PLATAFORMA

EL DIRECTOR DEL PROYECTO CONSTRUIDO
Fdo: D. JAIME GARCIA-GERMAN LOPEZ-BELMONTE

EL AUTOR DEL PROYECTO CONSTRUIDO
Fdo: RAÚL FERNÁNDEZ DÁMARA

CONSULTOR (ASISTENCIA AL CONTROL DE OBRAS)
AEPO

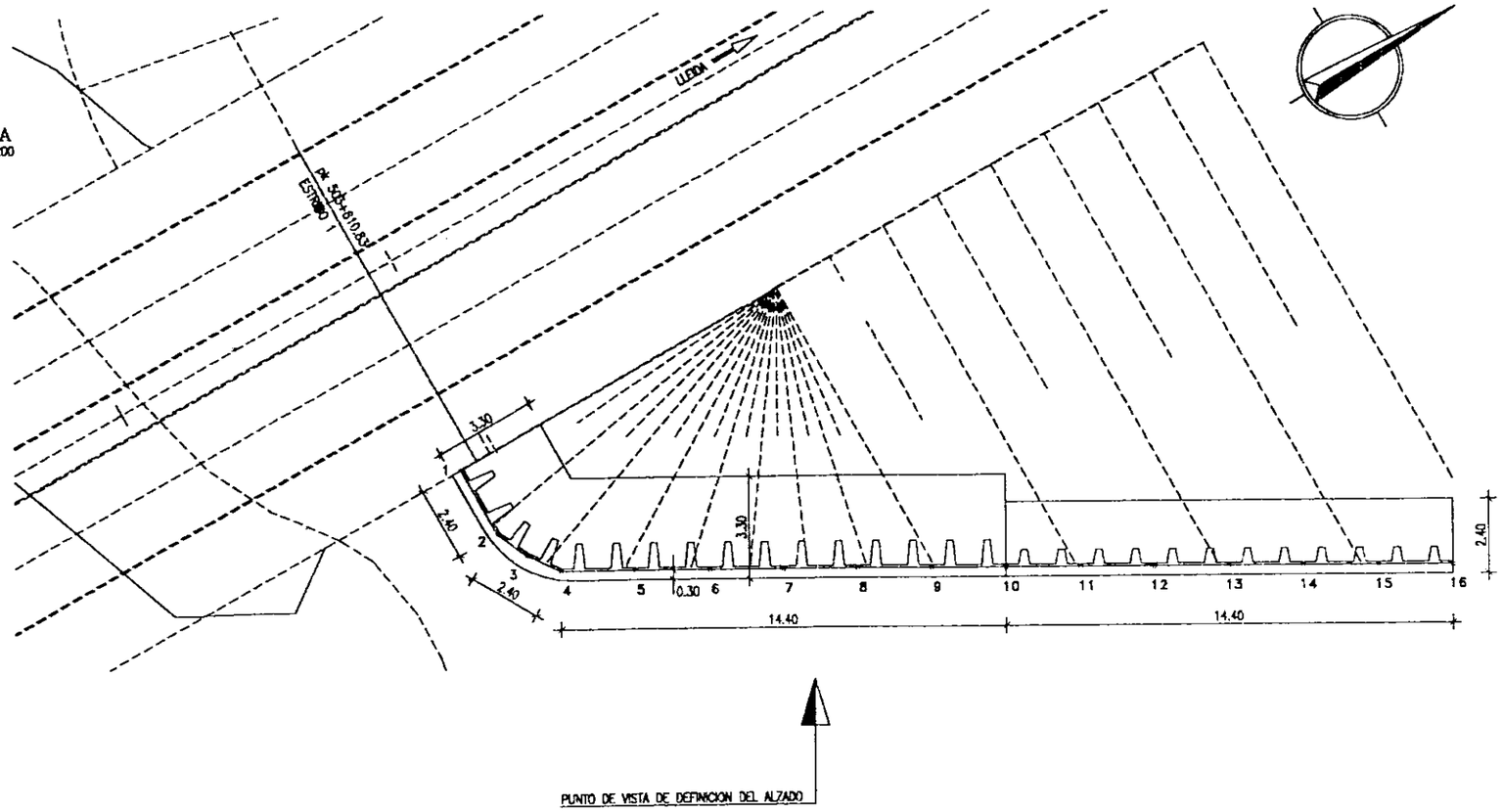
ESCALA NORMAL
1:100
1:25
Numérica
Gráfica
0 1 2 3m
0 0.25 0.5 0.75m

FECHA
NOVIEMBRE 2003

TITULO DEL PLANO
ESTRUCTURAS
ESTRUCTURA 1
ESTRIBO 2 GEOMETRIA

Nº DE PLANO
2.9.2
Hoja 13 de 32

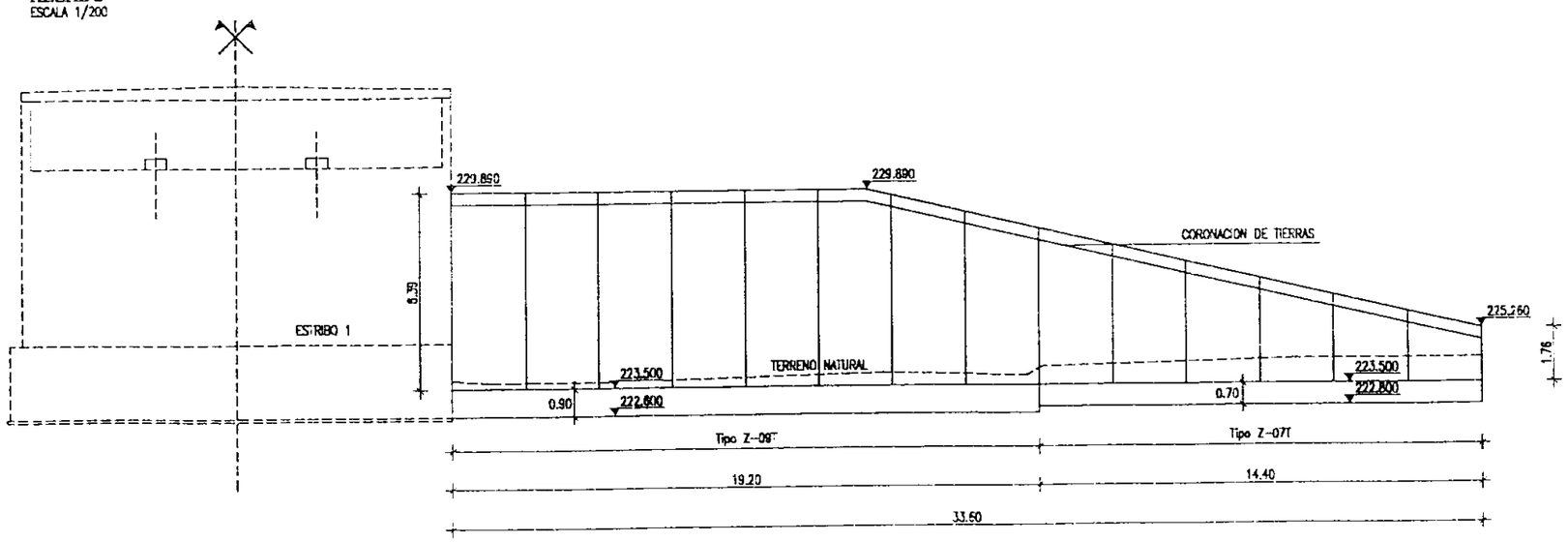
PLANTA
ESCALA 1/200



CUADRO REPLANTEO

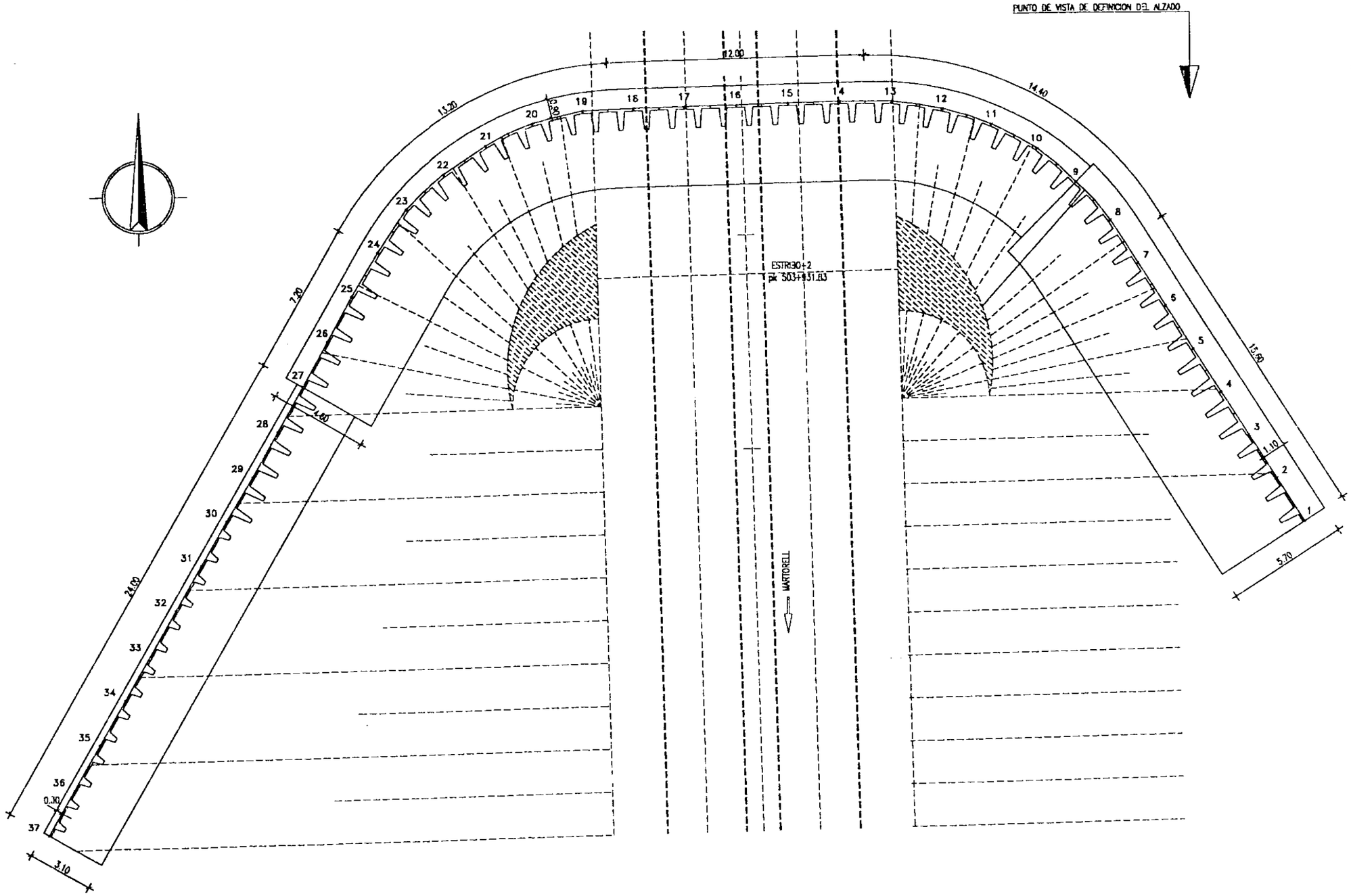
Nº PUNTOS	COORDENADAS X	COORDENADAS Y
1	348190.892	4572319.735
2	348193.291	4572319.784
3	348194.358	4572320.333
4	348195.320	4572321.067
5	348196.442	4572323.188
6	348197.565	4572325.309
7	348198.688	4572327.431
8	348199.810	4572329.552
9	348200.933	4572331.673
10	348202.056	4572333.794
11	348203.178	4572335.916
12	348204.301	4572338.037
13	348205.424	4572340.158
14	348206.546	4572342.279
15	348207.669	4572344.400
16	348208.792	4572346.522

ALZADO
ESCALA 1/200



GIF	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA TRAMO: LLEIDA–MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo.: D. JAIME GARCIA–GERMAN LOPEZ–BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo.: RAUL FERNANDEZ CAMARA	CONSULTOR (ASISTENCIA AL CONTROL DE OBRAS) ABPO	ESCALA NORMAL 1:200 Numérica / Gráfica 0 2 4 6m	FECHA NOVIEMBRE 2003	TITULO DEL PLANO ESTRUCTURAS ESTRUCTURA 1 MURO ESTRIBO 1 PLANTA Y ALZADO	Nº DE PLANO 2.9.2 Hoja 15 de 32

PLANTA
ESCALA 1/200



CUADRO REPLANTEO

Nº PUNTOS	COORDENADAS X	COORDENADAS Y
1	348212.891	4572187.148
2	348211.598	4572189.169
3	348210.305	4572191.191
4	348209.011	4572193.213
5	348207.718	4572195.235
6	348206.425	4572197.256
7	348205.131	4572199.278
8	348203.827	4572201.292
9	348202.275	4572203.116
10	348200.418	4572204.634
11	348198.319	4572205.790
12	348196.045	4572206.548
13	348193.672	4572206.884
14	348191.273	4572206.859
15	348188.873	4572206.799
16	348186.474	4572206.739
17	348184.075	4572206.678
18	348181.676	4572206.618
19	348179.282	4572206.471
20	348176.949	4572205.924
21	348174.752	4572204.964
22	348172.765	4572203.624
23	348171.053	4572201.948
24	348169.671	4572199.989
25	348168.481	4572197.905
26	348167.291	4572195.821
27	348166.101	4572193.736
28	348164.911	4572191.652
29	348163.722	4572189.568
30	348162.532	4572187.484
31	348161.342	4572185.399
32	348160.152	4572183.315
33	348158.962	4572181.231
34	348157.772	4572179.147
35	348156.582	4572177.062
36	348155.392	4572174.978
37	348154.203	4572172.894

GIF

PROYECTO CONSTRUIDO
LINEA DE ALTA VELOCIDAD
MADRID--ZARAGOZA--BARCELONA--FRONTERA FRANCESA
TRAMO: LLEIDA--MARTORELL SUBTRAMO V. PLATAFORMA

EL DIRECTOR DEL PROYECTO CONSTRUIDO
Fdo.
D. JAIME GARCIA-GERMAN LOPEZ-BELMONTE

EL AUTOR DEL PROYECTO CONSTRUIDO
Fdo.
RAÚL FERNÁNDEZ CÁMARA

CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS)
AEPO

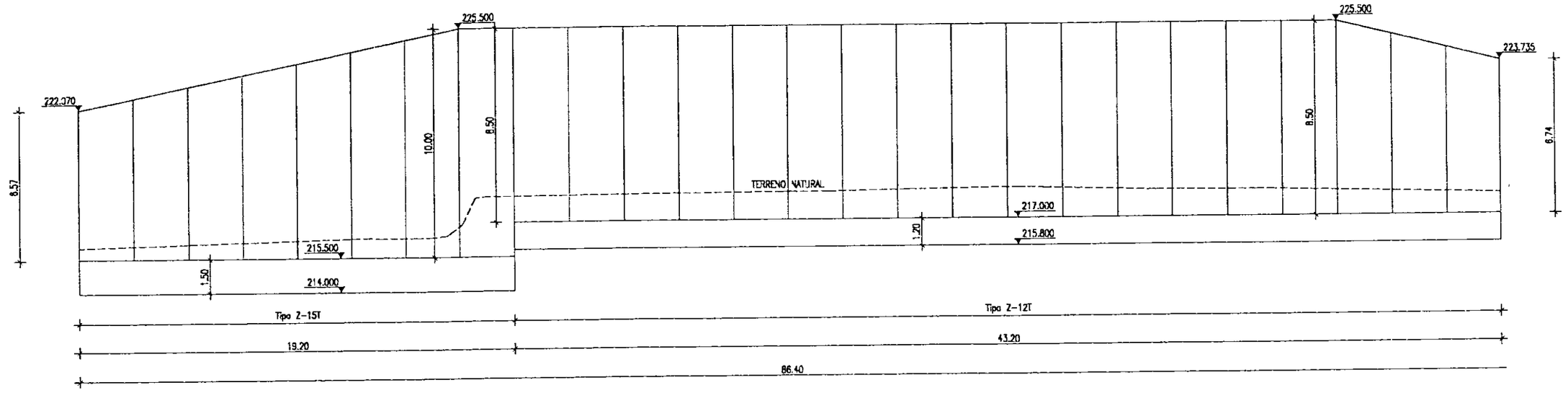
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Numérica
Gráfica
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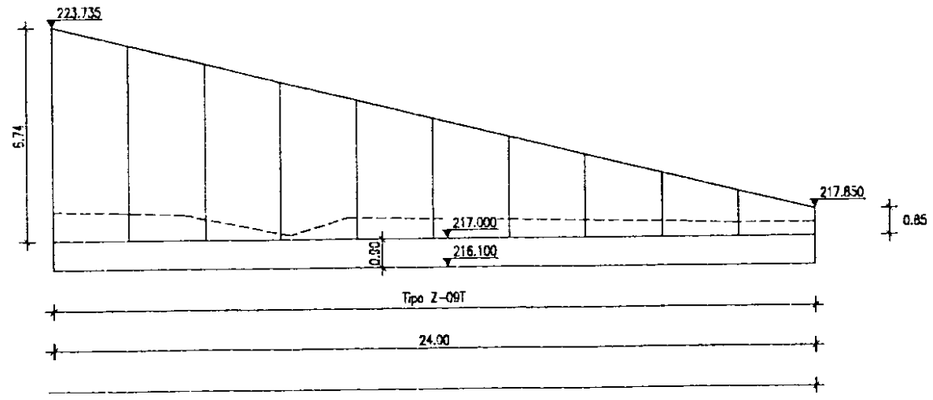
FECHA
NOVIEMBRE 2003

TÍTULO DEL PLANO
ESTRUCTURAS
ESTRUCTURA 1
MURO ESTRIBO 2 PLANTA

Nº DE PLANO
2.9.2
Hoja 16 de 32

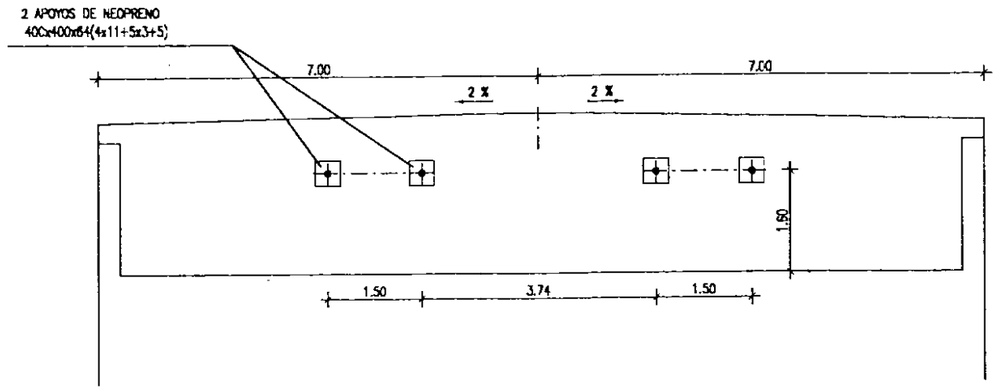
ALZADO
ESCALA 1/200



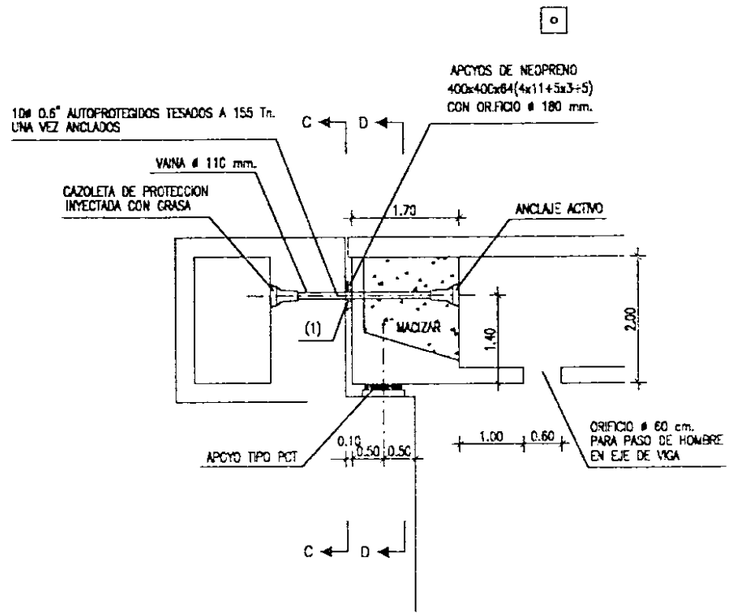


GIF	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA TRAMO: LLEIDA–MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo: D. JAIME GARCIA-GERMAN LOPEZ-BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo: RAÚL FERNÁNDEZ CÁMARA	CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS) AEPO	ESCALA NORMAL 1:200 Numérica | Gráfica 0 2 4 6m	FECHA NOVIEMBRE 2003	TITULO DEL PLANO ESTRUCTURAS ESTRUCTURA 1 MURO ESTRIBO 2 ALZADO	Nº DE PLANO 2.9.2 Hoja 17 de 32

SECCION C-C
ESCALA 1\100

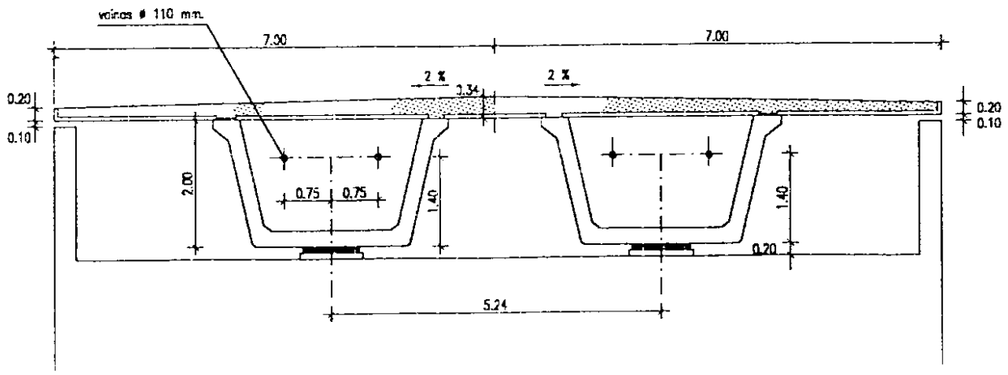


DETALLE ANCLAJE EN ESTRIBO - 1
ESCALA 1\50

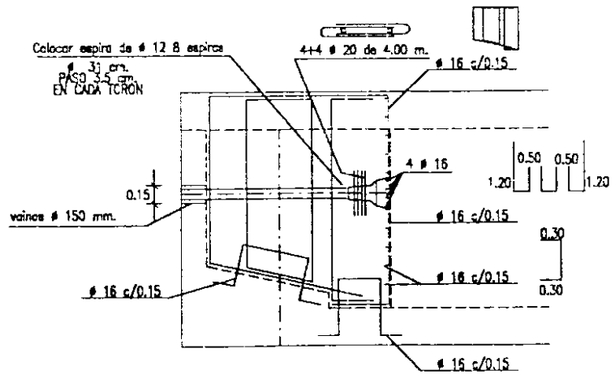


(1) - RELLENO CON MATERIAL TIPO GROUT
DE REGULARIZACION DE APOYOS

SECCION D-D
ESCALA 1\100

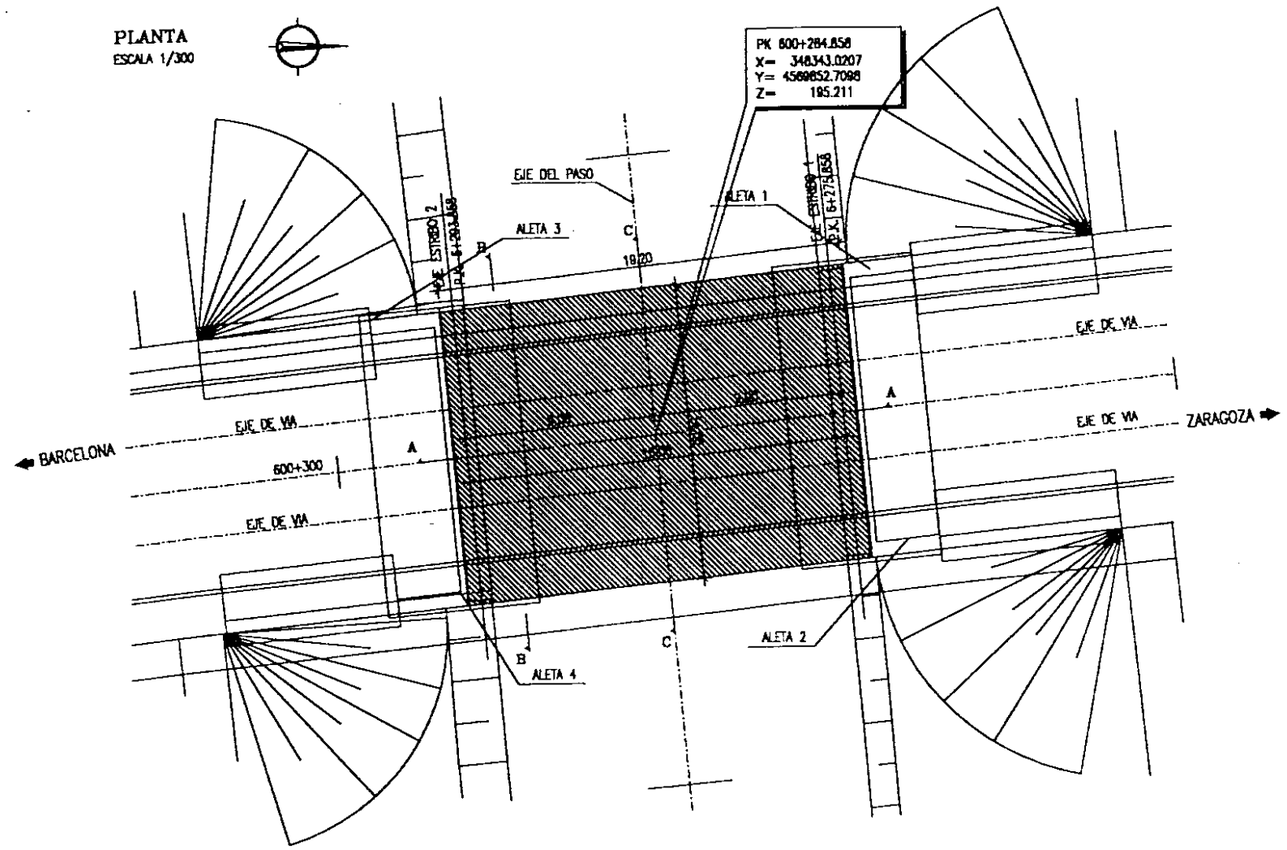


DIAFRAGMA VIGAS ESTRIBO-1
ESCALA 1\100

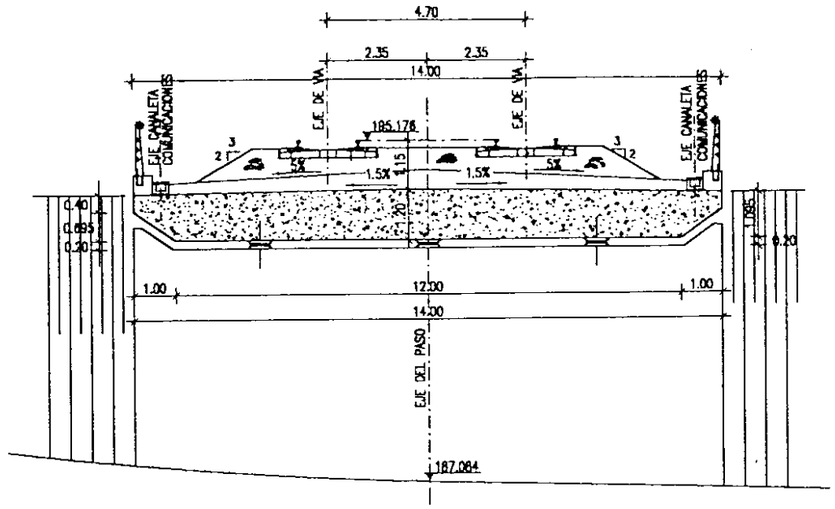


GIF	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID-ZARAGOZA-BARCELONA-FRONTERA FRANCESA TRAMO: LLEIDA-MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo: D. JAIME GARCIA-GERMAN LOPEZ-BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo: RAÚL FERNÁNDEZ CÁMARA	CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS) AEPO	ESCALA NORMAL 1:100 1:50 Numérica Gráfica	FECHA NOVIEMBRE 2003	TITULO DEL PLANO ESTRUCTURAS ESTRUCTURA 1 ANCLAJE EN ESTRIBO 1	Nº DE PLANO 2.9.2 Hoja 26 de 32

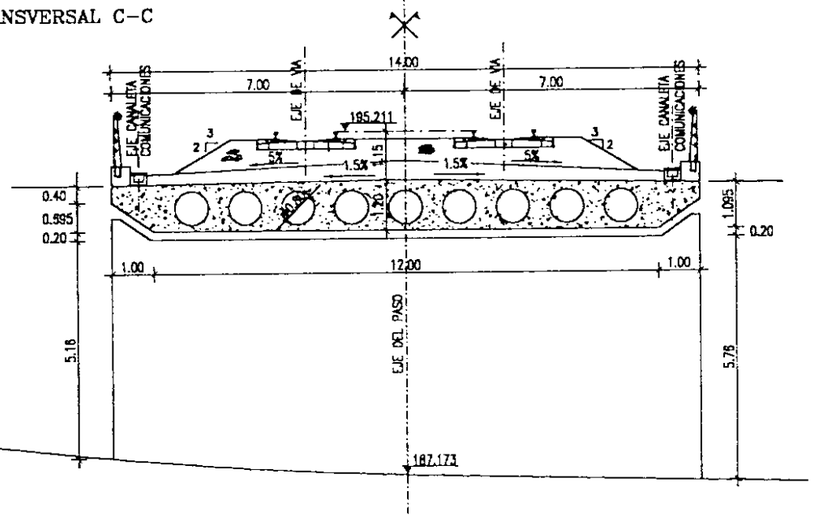
PLANTA
ESCALA 1/300



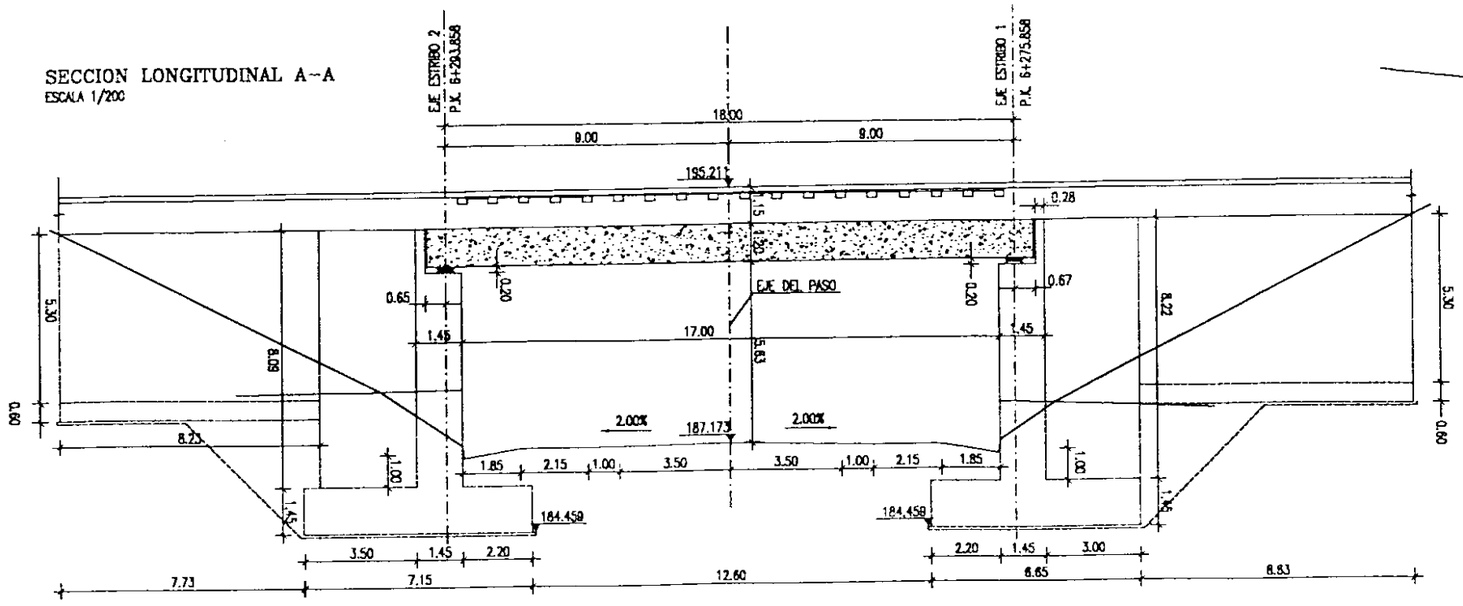
SECCIÓN TRANSVERSAL B-B
ESCALA 1/150



SECCIÓN TRANSVERSAL C-C
ESCALA 1/150



SECCION LONGITUDINAL A-A
ESCALA 1/200



CARACTERISTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	γ
TABLERO	HP-40/B/20/IIa	NORMAL	1.50
ALZADOS	HA-25/B/20/IIa	NORMAL	1.50
CIMENTACIONES	HA-25/B/20/IIa+SR	NORMAL	1.50
NIVELACIÓN	HM-15	NORMAL	1.50

ACEROS			
ACEROS	TIPO	CONTROL	γ
ACERO PARA ARMAR CORRUGADO	B 500 S	NORMAL	1.15
ACERO PARA TESAR	Y 1860 S7	NORMAL	1.15

EJECUCIÓN DE LA OBRA

ELEMENTOS IN SITU CONTROL NORMAL.
COEFICIENTES DE MAYORACIÓN DE LAS ACCIONES SEGÚN EHE.

GIF

PROYECTO CONSTRUIDO
LINEA DE ALTA VELOCIDAD
MADRID-ZARAGOZA-BARCELONA-FRONTERA FRANCESA
TRAMO: LLEIDA-MARTORELL. SUBTRAMO V. PLATAFORMA

EL DIRECTOR DEL PROYECTO CONSTRUIDO
Fdo: D. JAIME GARCIA-GERMAN LOPEZ-BELMONTE

EL AUTOR DEL PROYECTO CONSTRUIDO
Fdo: RAÚL FERNÁNDEZ CÁMARA

CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS)
AEPO

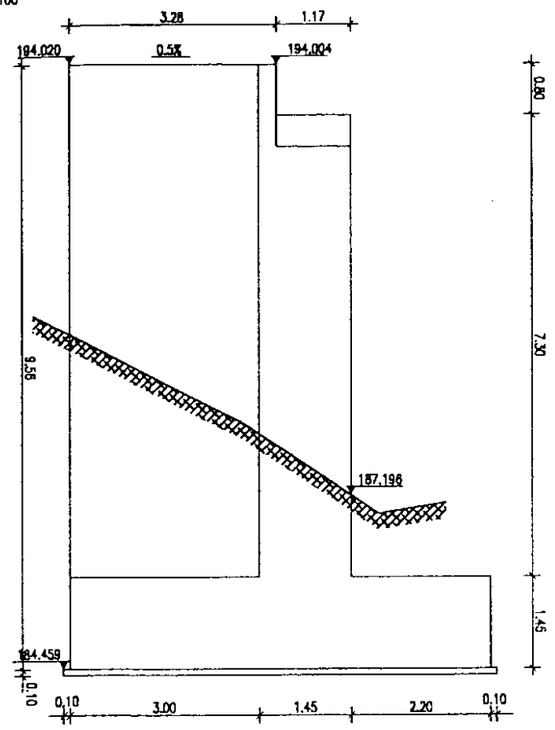
ESCALA NORMAL
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FECHA
NOVIEMBRE 2003

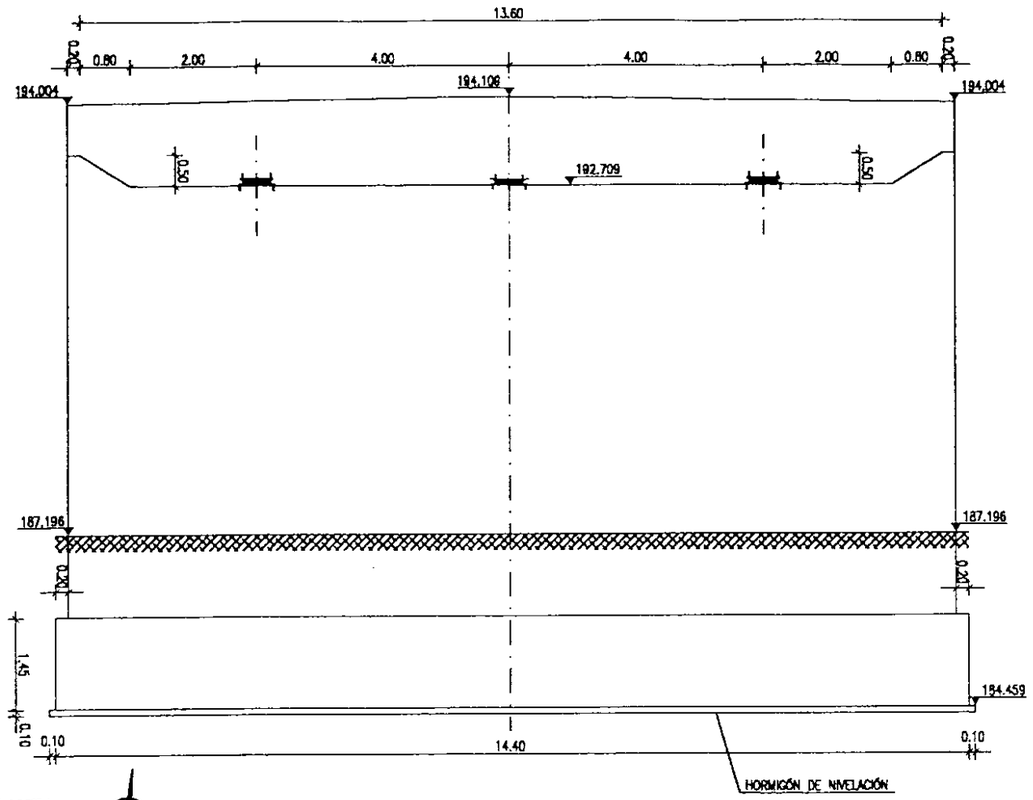
TÍTULO DEL PLANO
ESTRUCTURA 2
PLANTA, ALZADO Y SECCION

Nº DE PLANO
2.9.3
Hoja 1 de 17

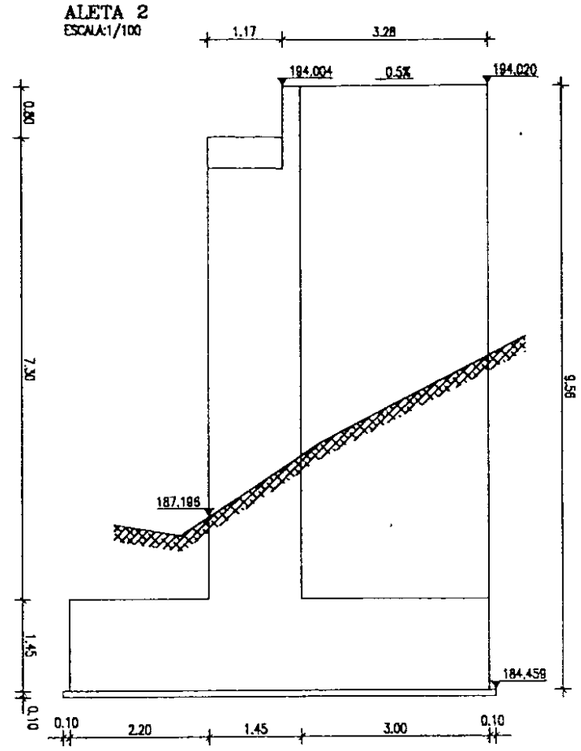
ALETA 1
ESCALA:1/100



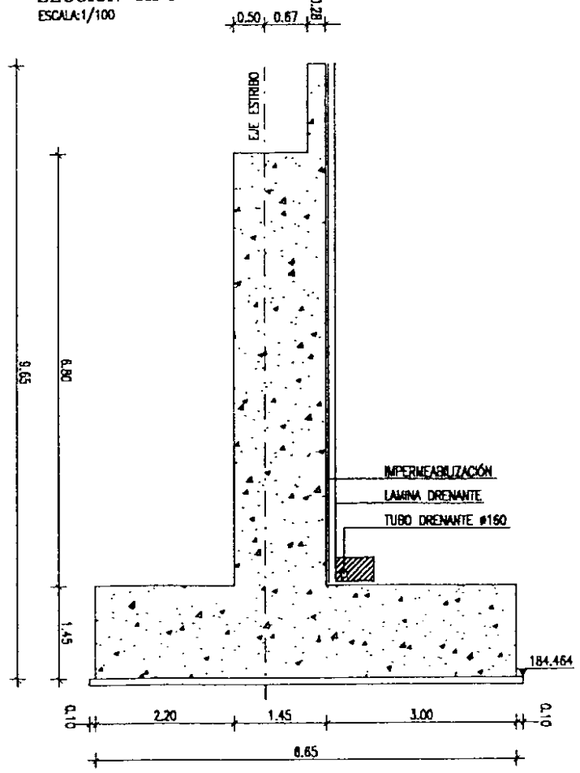
ALZADO
ESCALA:1/100



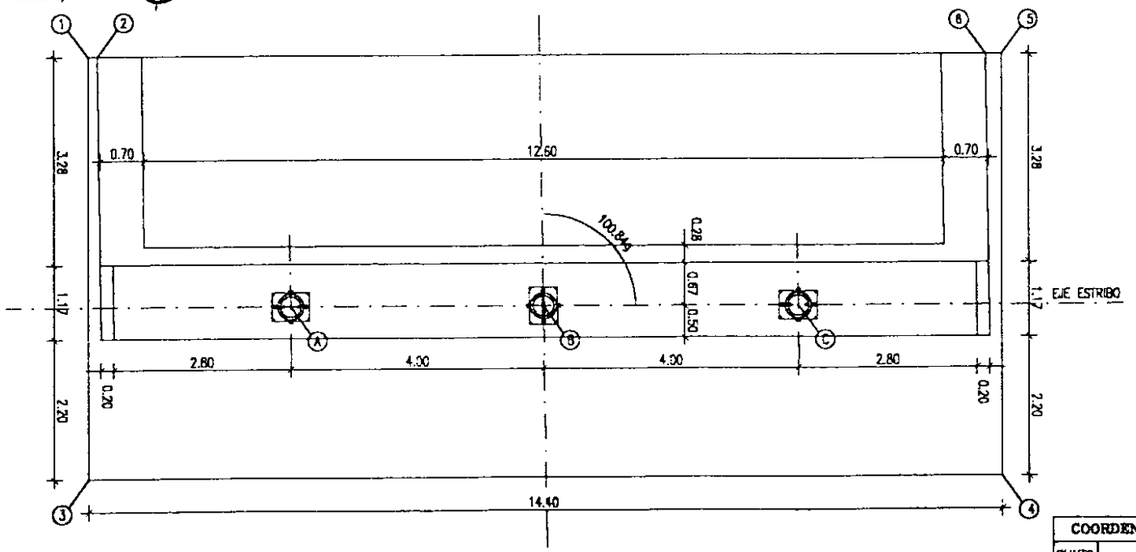
ALETA 2
ESCALA:1/100



SECCIÓN TIPO
ESCALA:1/100



PLANTA
ESCALA:1/100



COORDENADAS DE REPLANTEO			
PUNTO	X	Y	TIPO
1	348334.5307	4569864.9247	
2	348334.6777	4569864.9384	
3	348335.1478	4569858.3034	
4	348349.4864	4569859.6397	
5	348348.8693	4569866.2610	
6	348348.6190	4569866.2377	

APOYO TIPO POT PL-300 O PU-300
VER DETALLE EN PLANO 2.9.3 HOJA 16

COORDENADAS DE REPLANTEO			
PUNTO	X	Y	TIPO
A	348338.0837	4569861.2887	P.L.
B	348342.0668	4569861.6569	P.U.
C	348346.0499	4569862.0310	P.L.

CARACTERÍSTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	γ
TABLERO	HP-40/B/20/IIa	NORMAL	1.50
ALZADOS	HA-25/B/20/IIa	NORMAL	1.50
CIMENTACIONES	HA-25/B/20/IIa+SR	NORMAL	1.50
NIVELACIÓN	HM-15	NORMAL	1.50

ACEROS			
ACEROS	TIPO	CONTROL	γ
ACERO PARA ARMAR CORRUGADO	B 500 S	NORMAL	1.15
ACERO PARA TESAR	Y 1860 S7	NORMAL	1.15

EJECUCIÓN DE LA OBRA

ELEMENTOS IN SITU CONTROL NORMAL.
COEFICIENTES DE MAYORACIÓN DE LAS ACCIONES SEGÚN EHE.

LOS ESTRIBOS HAN SIDO CALCULADOS PARA UNA $\bar{\sigma}_{adm.} = 350\ KN/m^2$.

GIF Grupo de Ingeniería Ferroviaria

PROYECTO CONSTRUIDO
LINEA DE ALTA VELOCIDAD
MADRID-ZARAGOZA-BARCELONA-FRONTERA FRANCESA
TRAMO: LLEIDA-MARTORELL. SUBTRAMO V. PLATAFORMA

EL DIRECTOR DEL PROYECTO CONSTRUIDO
Fdo.: D. JAIME GARCIA-GERMAN LOPEZ-BELMONTE

EL AUTOR DEL PROYECTO CONSTRUIDO
Fdo.: RAÚL FERNÁNDEZ CÁMARA

CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS)
AEPO

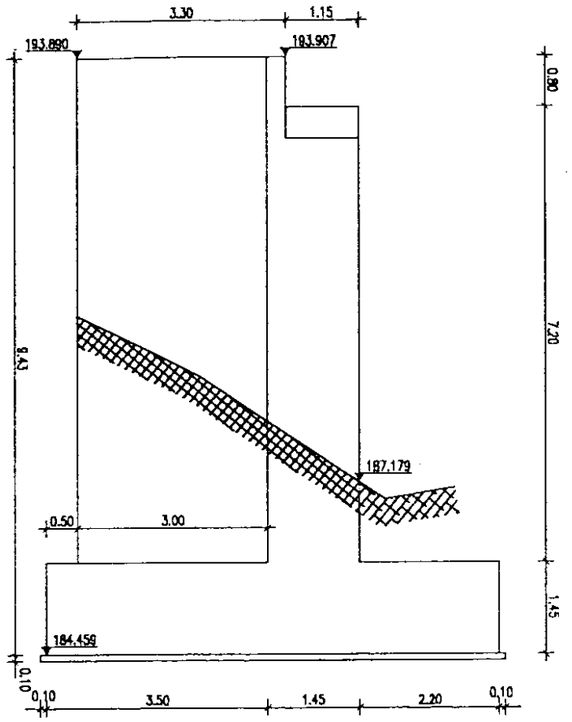
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Numérica | Gráfica

FECHA
NOVIEMBRE 2003

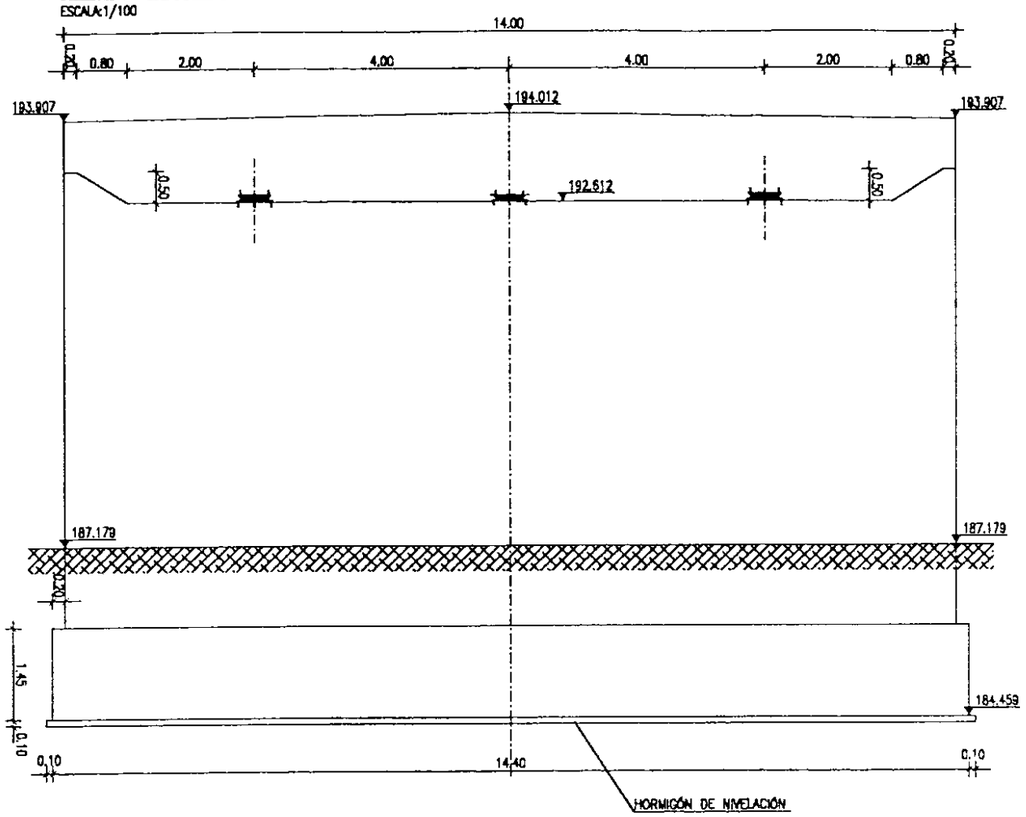
TÍTULO DEL PLANO
ESTRUCTURA 2
ESTRIBO 1. GEOMETRIA

Nº DE PLANO
2.9.3
Hoja 2 de 17

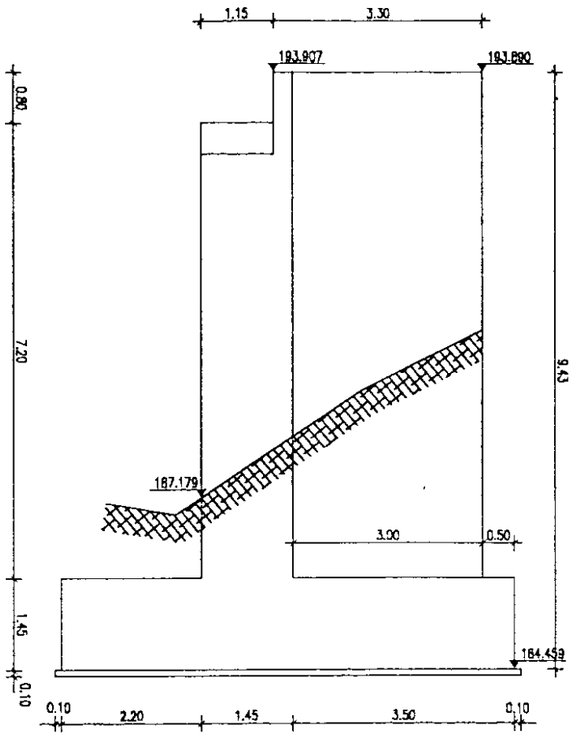
ALETA 4
ESCALA:1/100



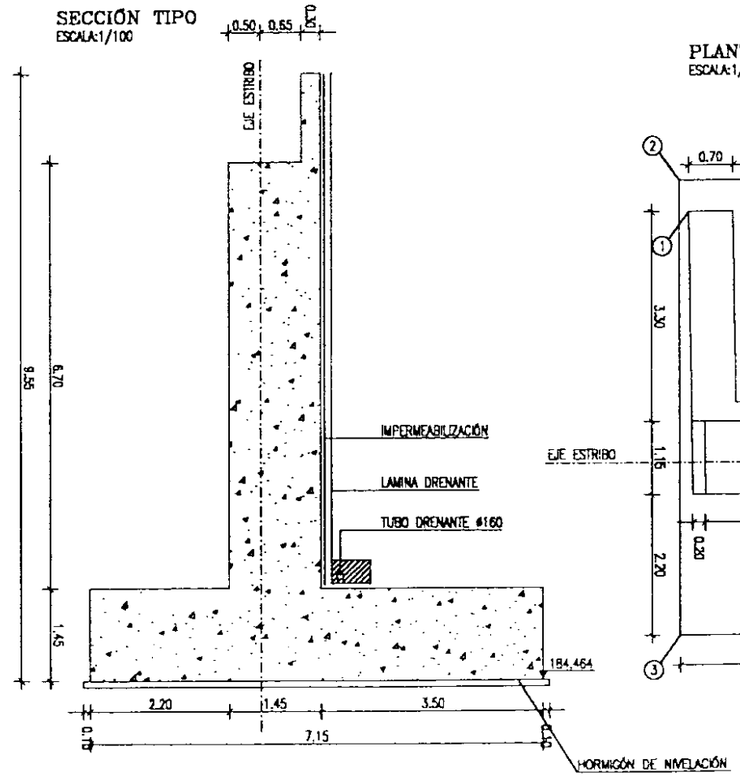
ALZADO ESTRIBO 2
ESCALA:1/100



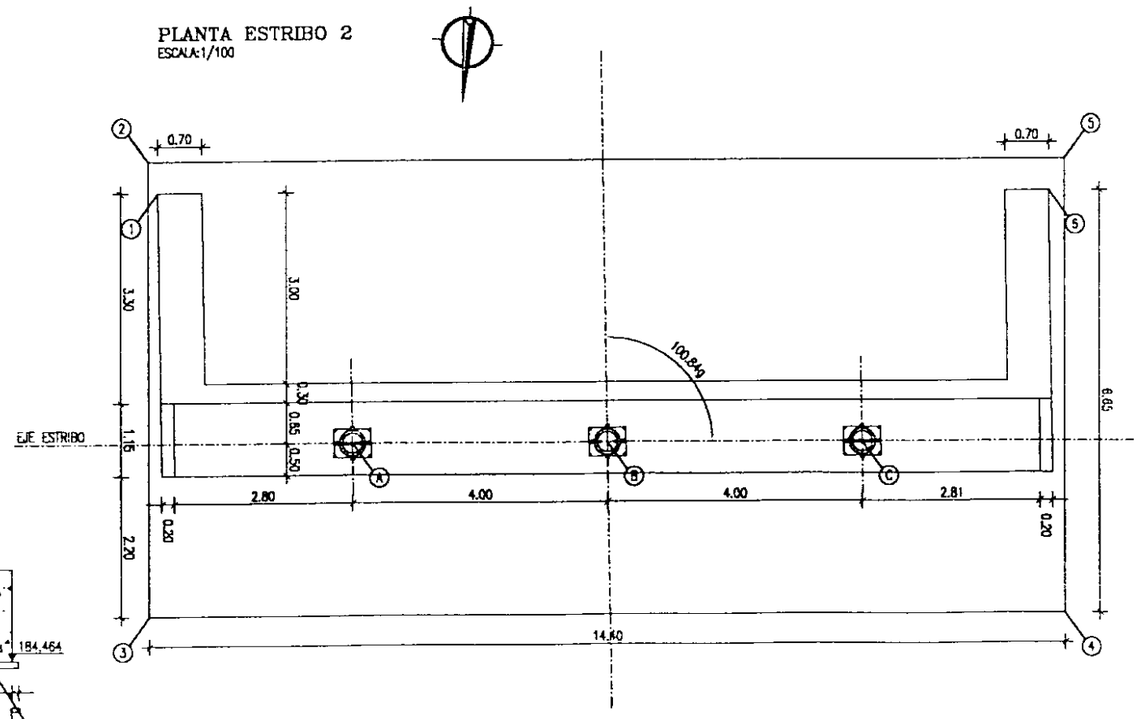
ALETA 3
ESCALA:1/100



SECCIÓN TIPO
ESCALA:1/100



PLANTA ESTRIBO 2
ESCALA:1/100



APOYO TIPO POT PL-300 O PU-300
VER DETALLE EN PLANO 2.9.3 HOJA 16

REPLANTEO APOYOS			
PUNTO	X	Y	TIPO
A	348347.9576	4569844.1308	P.U. (→)
B	348343.9745	4569843.7597	P.F. ( )
C	348339.9913	4569843.3886	P.U. (→)

REPLANTEO ESTRIBO 2		
PUNTO	X	Y
1	348351.3635	4569840.4812
2	348351.5587	4569839.9993
3	348350.8933	4569847.1185
4	348338.5542	4569845.7820
5	348337.2176	4569838.6628
6	348337.4225	4569839.1841

CARACTERÍSTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	γ
TABLERO	HP-40/B/20/IIa	NORMAL	1.50
ALZADOS	HA-25/B/20/IIa	NORMAL	1.50
CIMENTACIONES	HA-25/B/20/IIa+SR	NORMAL	1.50
NIVELACIÓN	HM-15	NORMAL	1.50

ACEROS			
ACEROS	TIPO	CONTROL	γ
ACERO PARA ARMAR CORRUGADO	B 500 S	NORMAL	1.15
ACERO PARA TESAR	Y 1860 S7	NORMAL	1.15

EJECUCIÓN DE LA OBRA

ELEMENTOS IN SITU CONTROL NORMAL
COEFICIENTES DE MAYORACIÓN DE LAS ACCIONES SEGÚN EHE.

LOS ESTRIBOS HAN SIDO CALCULADOS PARA UNA $\sigma_{adm.} = 350\ KN/m^2$.

GIF Grupo de Ingeniería Ferroviaria

PROYECTO CONSTRUIDO
LINEA DE ALTA VELOCIDAD
MADRID-ZARAGOZA-BARCELONA-FRONTERA FRANCESA
TRAMO: LLEIDA-MARTORELL. SUBTRAMO V. PLATAFORMA

EL DIRECTOR DEL PROYECTO CONSTRUIDO
Fdo: D. JAIME GARCIA-BERMAN LOPEZ-BELMONTE

EL AUTOR DEL PROYECTO CONSTRUIDO
Fdo: RAÚL FERNÁNDEZ CÁMARA

CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS)
AEPO

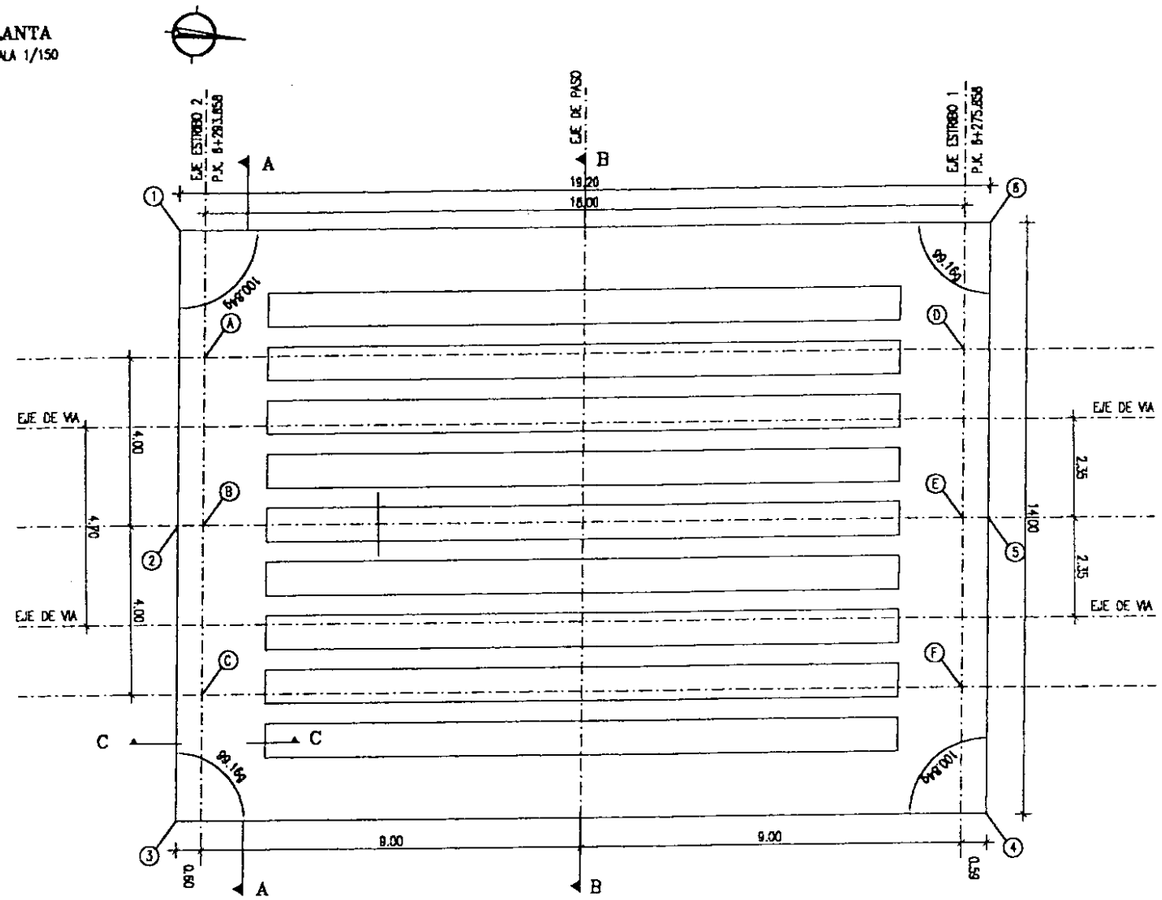
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Numérica | Gráfica
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FECHA
NOVIEMBRE 2003

TÍTULO DEL PLANO
ESTRUCTURA 2
ESTRIBO 2, GEOMETRIA

Nº DE PLANO
2.9.3
Hoja 3 de 17

PLANTA
ESCALA 1/150



CUADRO DE COORDENADAS		
PUNTO	X	Y
1	348337.0673	4569842.5154
2	348344.0373	4569843.1652
3	348351.0081	4569843.8149
4	348348.9742	4569862.9010
5	348342.0038	4569862.2513
6	348335.0334	4569861.6015

COORDENADAS APOYOS		
PUNTO	X	Y
A	348339.9914	4569843.3685
B	348343.9745	4569843.7597
C	348347.9576	4569844.1309
D	348338.0837	4569861.2887
E	348342.0668	4569861.8599
F	348346.0499	4569862.0311

APOYO TIPO POT PL-300 O PU-300
VER DETALLE EN PLANO 2.9.3 HOJA 16

CARACTERÍSTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

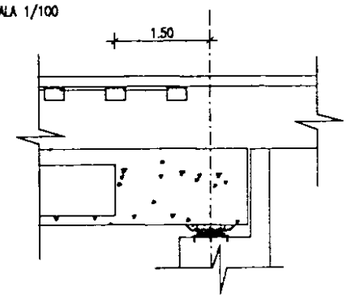
HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	γ
TABLERO	HP-40/B/20/IIa	NORMAL	1.50
ALZADOS	HA-25/B/20/IIa	NORMAL	1.50
CIMENTACIONES	HA-25/B/20/IIa+SR	NORMAL	1.50
NIVELACIÓN	HM-15	NORMAL	1.50

ACEROS			
ACEROS	TIPO	CONTROL	γ
ACERO PARA ARMAR CORRUGADO	B 500 S	NORMAL	1.15
ACERO PARA TESAR	Y 1860 S7	NORMAL	1.15

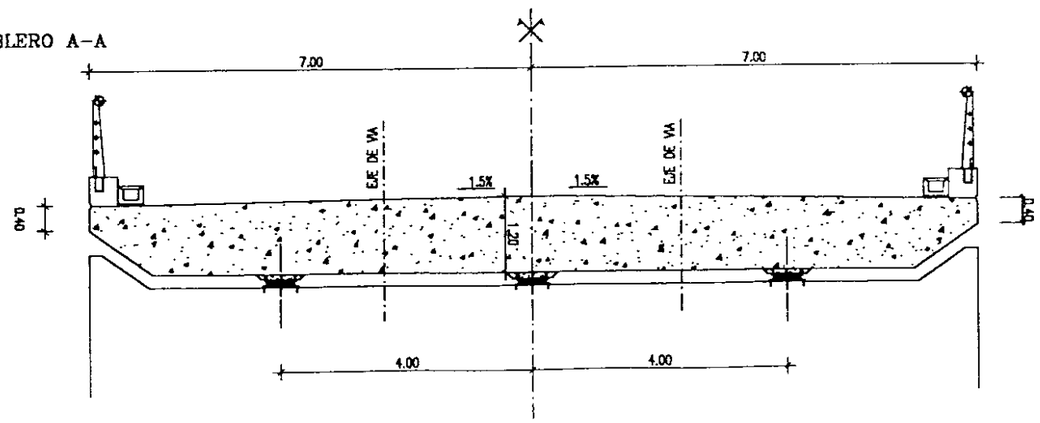
EJECUCIÓN DE LA OBRA

ELEMENTOS IN SITU CONTROL NORMAL
COEFICIENTES DE MAYORACIÓN DE LAS ACCIONES SEGÚN EHE

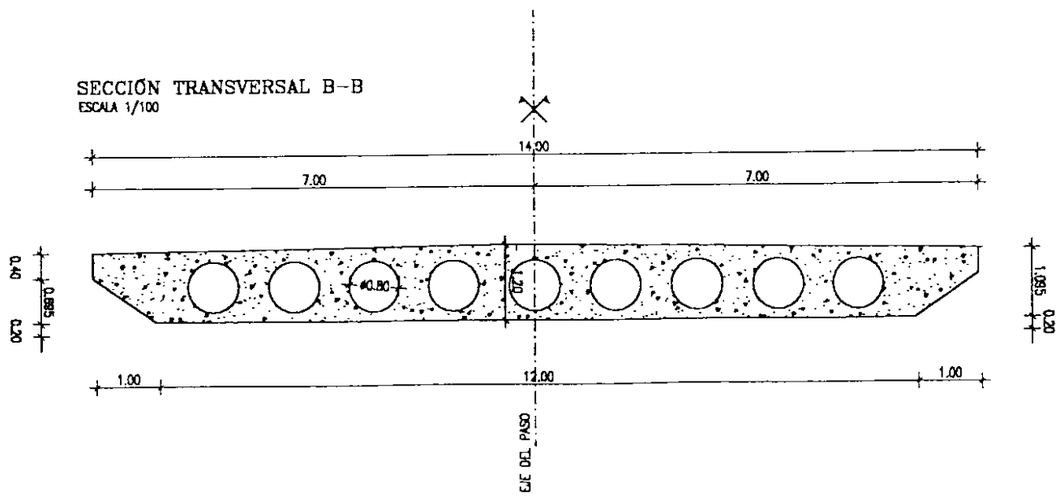
SECCIÓN C-C
ESCALA 1/100



SECCIÓN TABLERO A-A
ESCALA 1/100

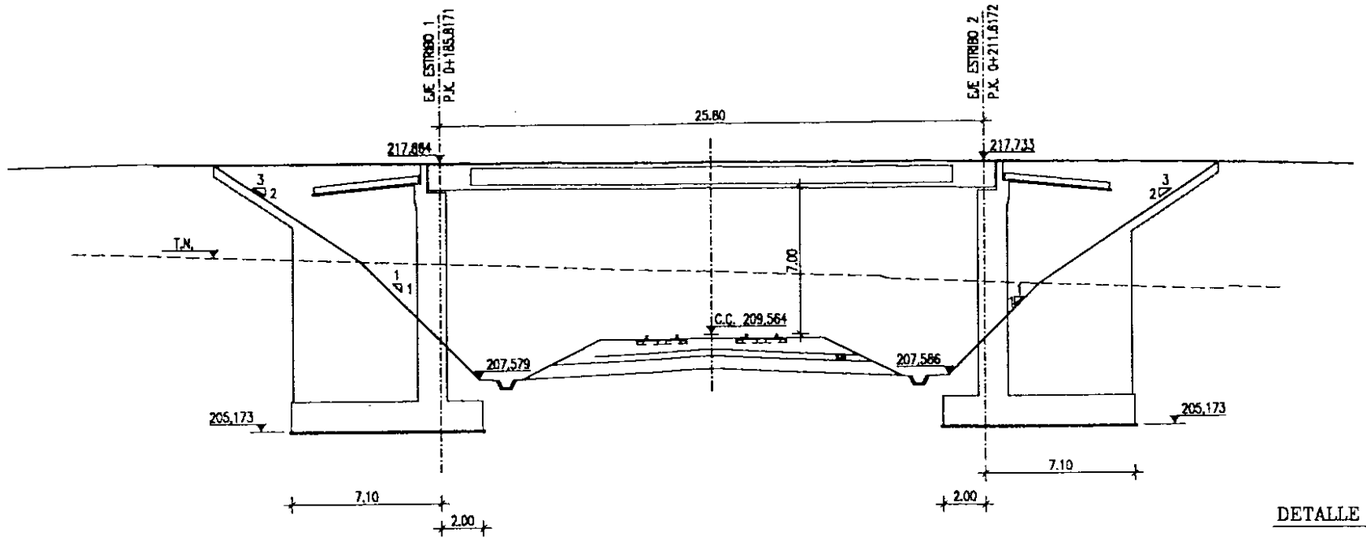


SECCIÓN TRANSVERSAL B-B
ESCALA 1/100

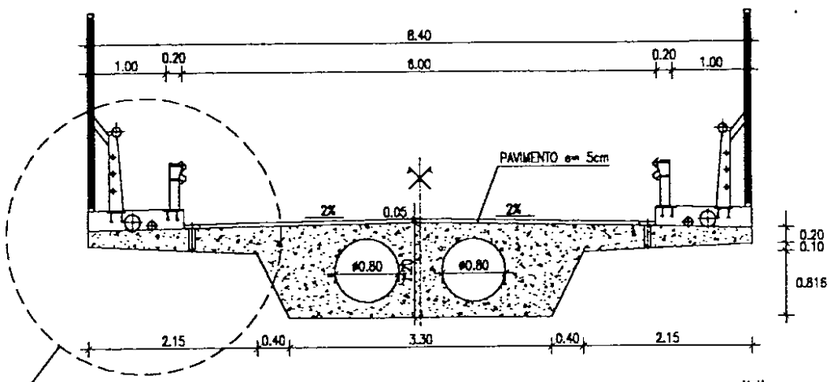


GIF Grupo de Ingeniería Ferroviaria	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID-ZARAGOZA-BARCELONA-FRONTERA FRANCESA TRAMO: LLEIDA-MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo: D. JAIME GARCIA-GERMAN LOPEZ-BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo: RAÚL FERNÁNDEZ CÁMARA	CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS) AEPO	ESCALA NORMAL 1:100 1:150 Numérica / Gráfica 0 1 2 3m 0 1.5 3 4.5m	FECHA NOVIEMBRE 2003	TÍTULO DEL PLANO ESTRUCTURA 2 TABLERO, GEOMETRIA	Nº DE PLANO 2.9.3 Hoja 8 de 17

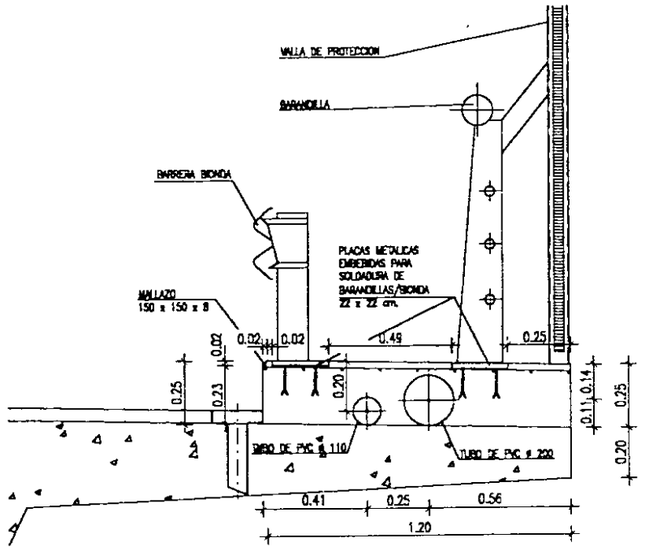
SECCIÓN LONGITUDINAL POR EL EJE DE TRAZADO
ESCALA 1:300



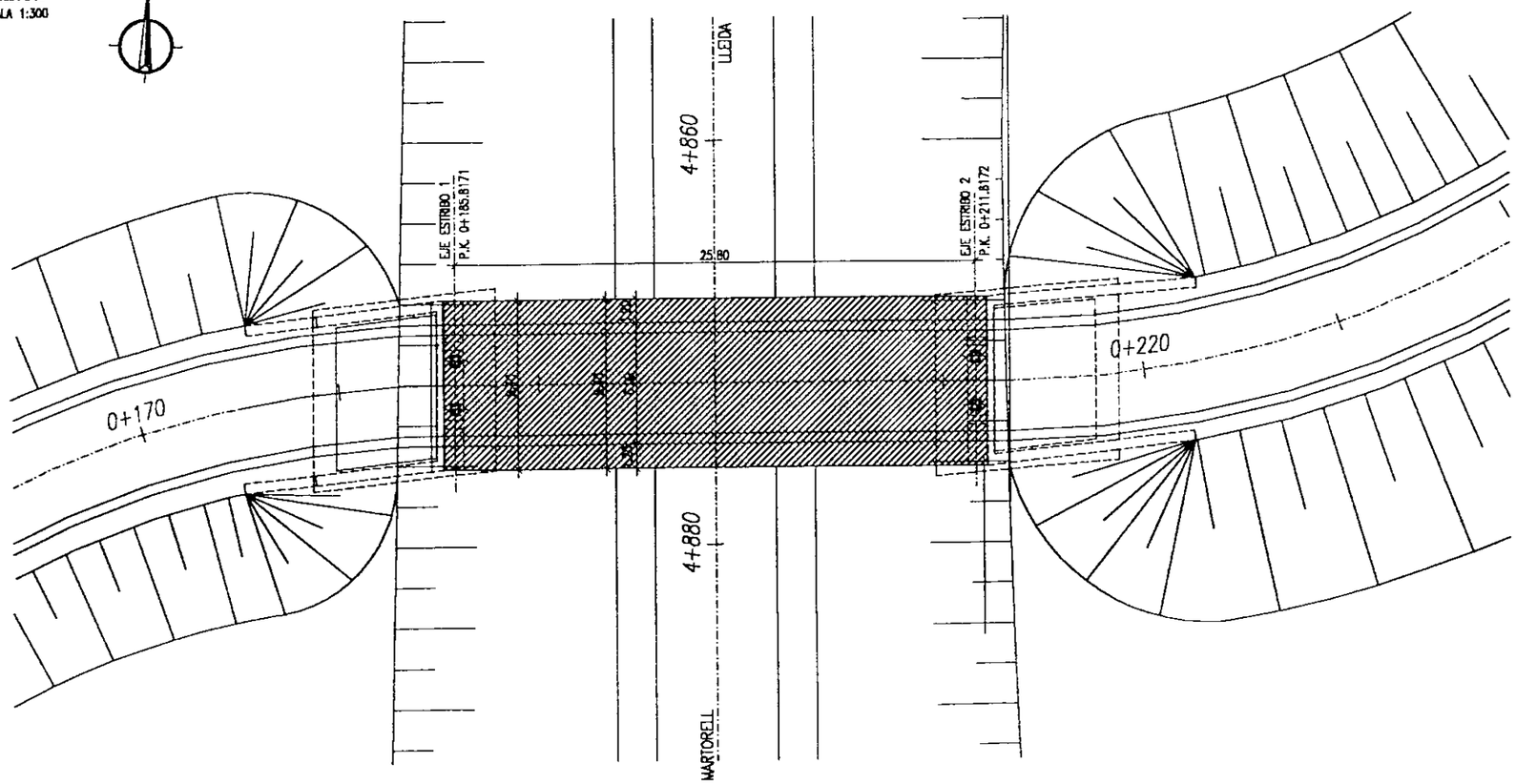
SECCIÓN TRANSVERSAL
ESCALA 1:80



DETALLE A



PLANTA
ESCALA 1:300



DETALLE A
ESCALA 1:20

CARACTERÍSTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	γ
TABLERO	HP-40/B/20/IIa	NORMAL	1.50
ALZADOS	HA-25/B/20/IIa	NORMAL	1.50
CIMENTACIONES	HA-25/B/20/IIa+SR	NORMAL	1.50
NIVELACIÓN	HM-15	NORMAL	1.50

ACEROS			
ACEROS	TIPO	CONTROL	γ
ACERO PARA ARMAR CORRUGADO	B 500 S	NORMAL	1.15
ACERO PARA TESAR	Y 1860 S7	NORMAL	1.15

EJECUCIÓN DE LA OBRA

ELEMENTOS IN SITU CONTROL INTENSO.
COEFICIENTES DE MAYORACIÓN DE LAS ACCIONES SEGÚN EHE.

GIF

PROYECTO CONSTRUIDO
LINEA DE ALTA VELOCIDAD
MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA
TRAMO: LLEIDA–MARTORELL. SUBTRAMO V. PLATAFORMA

EL DIRECTOR DEL PROYECTO CONSTRUIDO
Fdo: D. JAIME BARROS–GERMAN LOPEZ–BELMONTE

EL AUTOR DEL PROYECTO CONSTRUIDO
Fdo: RAÚL FERNÁNDEZ CÁMARA

CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS)
AEPO

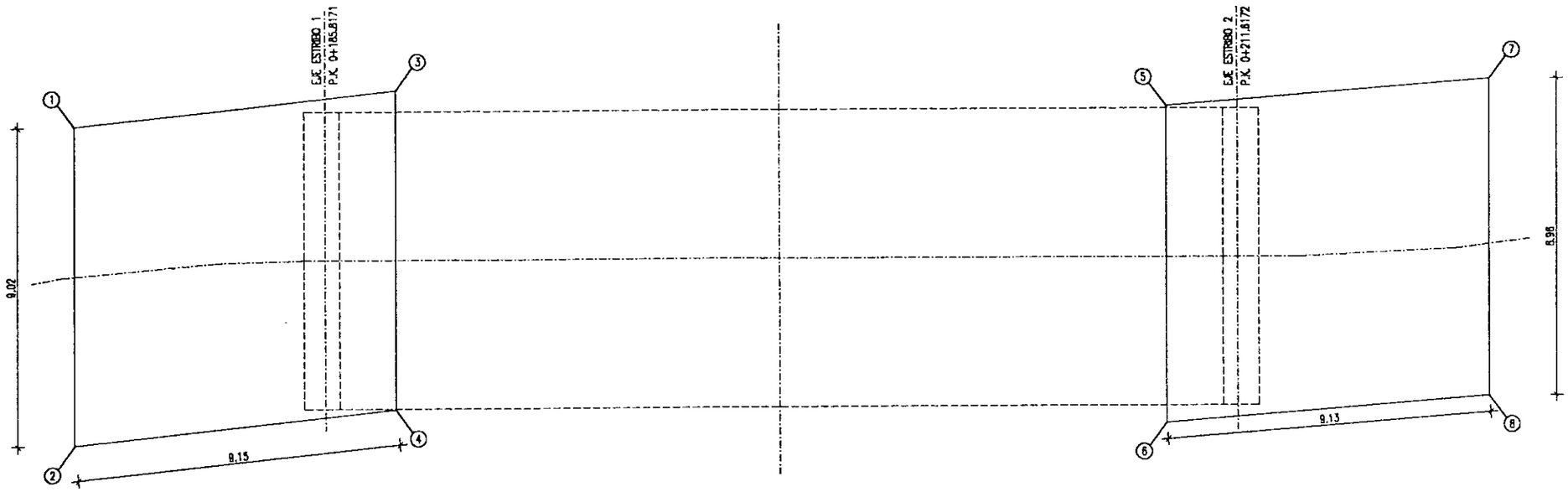
ESCALA NORMAL
1:300
1:80
Numérica | Gráfica
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0 0.8 1.6 2.4m

FECHA
NOVIEMBRE 2003

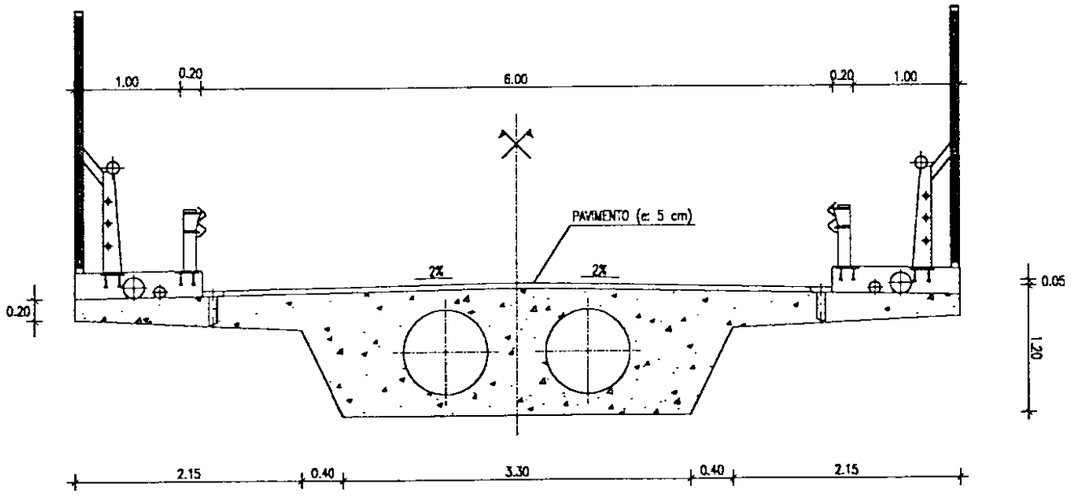
TÍTULO DEL PLANO
PASO SUPERIOR 504.9
PLANTA, ALZADO Y SECCION

Nº DE PLANO
2.9.4
Hoja 1 de 10

PLANTA
ESCALA 1:150



SECCIÓN TIPO
ESCALA 1:60



COORDENADAS CIMENTACIONES		
PUNTO	X	Y
1	348192.7810	4571262.2135
2	348193.1890	4571253.2029
3	348201.8275	4571263.6073
4	348202.2352	4571254.5964
5	348223.6295	4571264.0530
6	348224.0344	4571255.1027
7	348232.6874	4571265.1871
8	348233.0930	4571256.2373

CARACTERÍSTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	γ
TABLERO	HP-40/B/20/IIa	NORMAL	1.50
ALZADOS	HA-25/B/20/IIa	NORMAL	1.50
CIMENTACIONES	HA-25/B/20/IIa+SR	NORMAL	1.50
NIVELACIÓN	HM-15	NORMAL	1.50

ACEROS			
ACEROS	TIPO	CONTROL	γ
ACERO PARA ARMAR CORRUGADO	B 500 S	NORMAL	1.15
ACERO PARA TESAR	Y 1860 S7	NORMAL	1.15

EJECUCIÓN DE LA OBRA

ELEMENTOS IN SITU CONTROL INTENSO.
COEFICIENTES DE MAYORACIÓN DE LAS ACCIONES SEGÚN EHE.

GIF Gestor de Infraestructuras Ferroviarias

PROYECTO CONSTRUIDO
LINEA DE ALTA VELOCIDAD
MADRID-ZARAGOZA-BARCELONA-FRONTERA FRANCESA
TRAMO: LLEIDA-MARTORELL. SUBTRAMO V. PLATAFORMA

EL DIRECTOR DEL PROYECTO CONSTRUIDO
Fdo: D. JAIME GARCIA-GERMAN LOPEZ-BELMONTE

EL AUTOR DEL PROYECTO CONSTRUIDO
Fdo: RAÚL FERNÁNDEZ CÁMARA

CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS)
AEPO

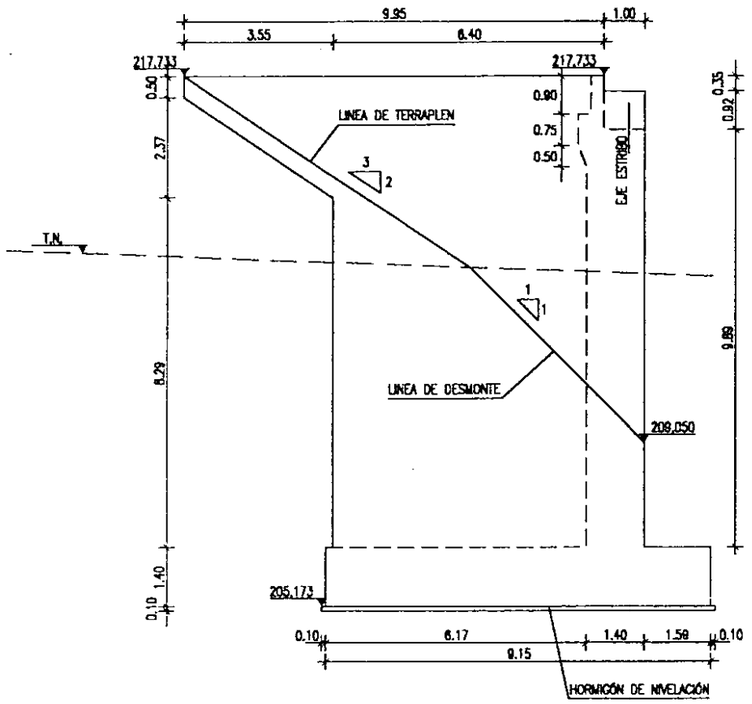
ESCALA NORMAL
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1:60
Numérica
Gráfica
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0 0.6 1.2 1.8m

FECHA
NOVIEMBRE 2003

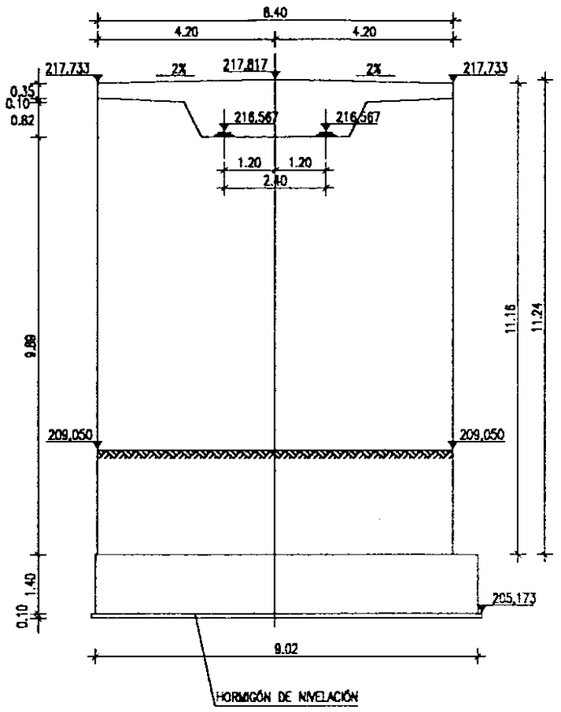
TÍTULO DEL PLANO
PASO SUPERIOR 504.9
REPLANTEO DE CIMENTACIONES

Nº DE PLANO
2.9.4
Hoja 2 de 10

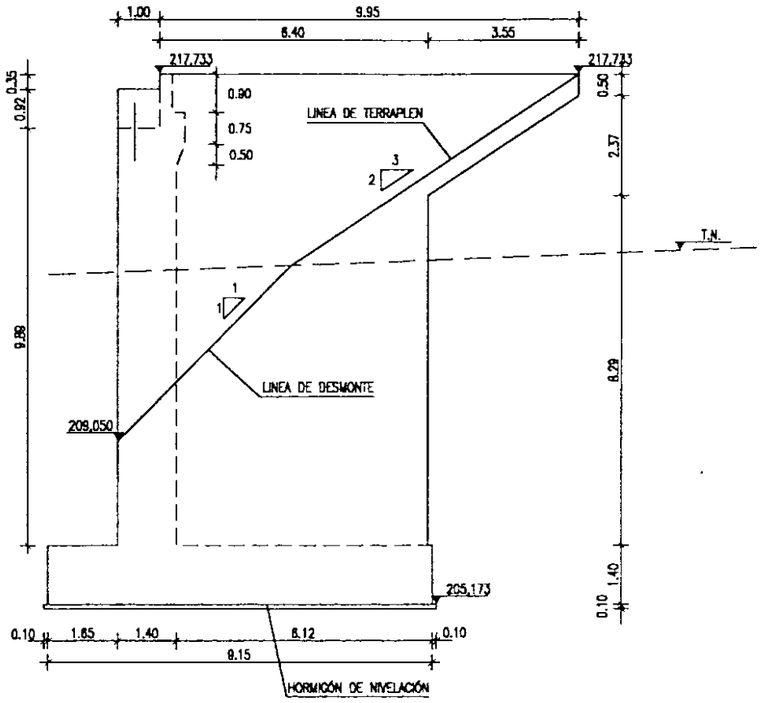
ALETA 2
ESCALA 1:150



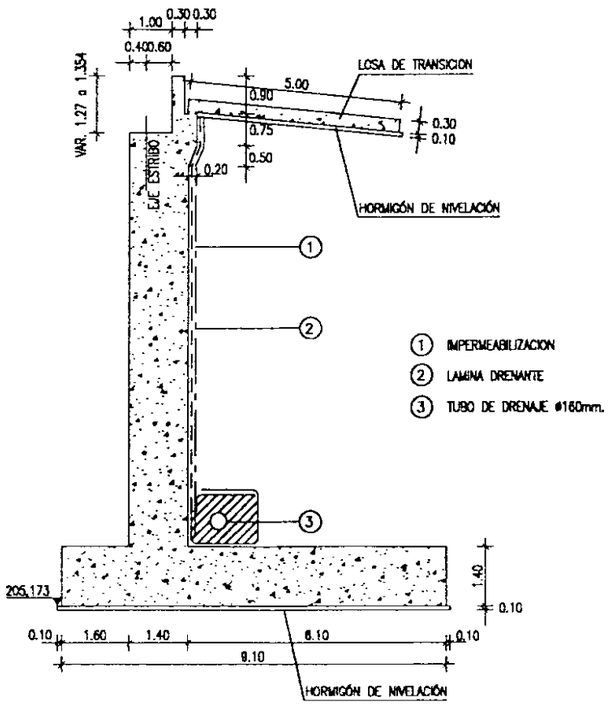
ALZADO
ESCALA 1:150



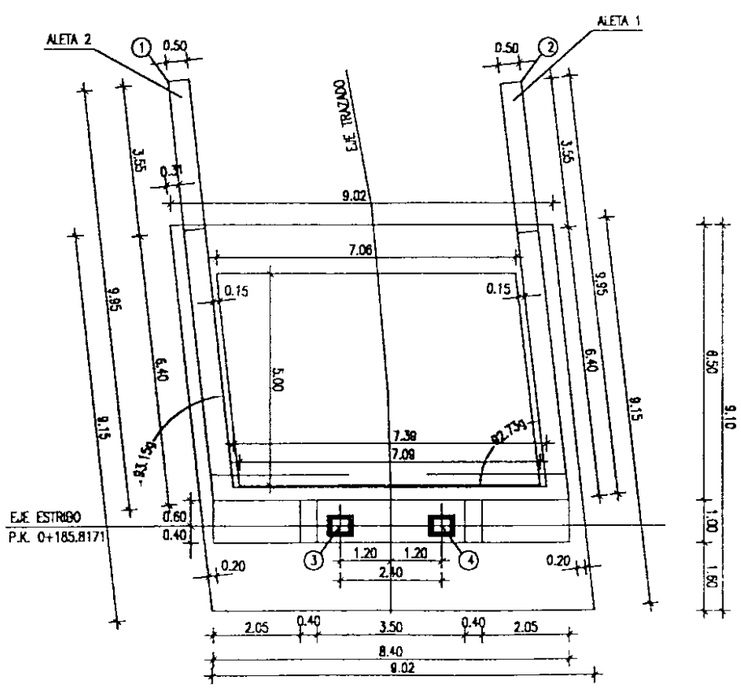
ALETA 1
ESCALA 1:150



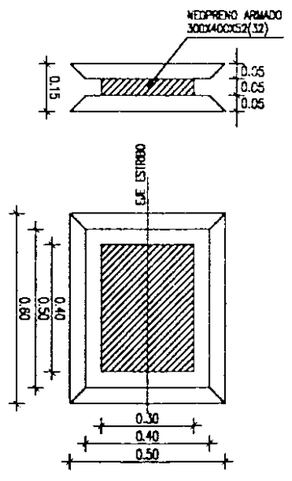
SECCION TIPO
ESCALA 1:150



PLANTA
ESCALA 1:150



DETALLE APARATO DE APOYO
ESCALA 1:20



CUADRO DE COORDENADAS		
PUNTO	X	Y
1	348189.803	4571252.992
2	348189.433	4571261.318
3	348200.101	4571257.531
4	348199.993	4571259.929

CARACTERÍSTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	γ
TABLERO	HP-40/B/20/IIa	NORMAL	1.50
ALZADOS	HA-25/B/20/IIa	NORMAL	1.50
CIMENTACIONES	HA-25/B/20/IIa+SR	NORMAL	1.50
NIVELACIÓN	HM-15	NORMAL	1.50

ACEROS			
ACEROS	TIPO	CONTROL	γ
ACERO PARA ARMAR CORRUGADO	B 500 S	NORMAL	1.15
ACERO PARA TESAR	Y 1860 S7	NORMAL	1.15

EJECUCIÓN DE LA OBRA

ELEMENTOS IN SITU CONTROL INTENSO.
COEFICIENTES DE MAYORACIÓN DE LAS ACCIONES SEGÚN EHE.

GIF

PROYECTO CONSTRUIDO
LINEA DE ALTA VELOCIDAD
MADRID-ZARAGOZA-BARCELONA-FRONTERA FRANCESA
TRAMO: LLEIDA-MARTORELL. SUBTRAMO V. PLATAFORMA

EL DIRECTOR DEL PROYECTO CONSTRUIDO
Fdo. D. JAIME GARCIA-GERMAN LOPEZ-BELMONTE

EL AUTOR DEL PROYECTO CONSTRUIDO
Fdo. RAUL FERNANDEZ CAMARA

CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS)
AEPO

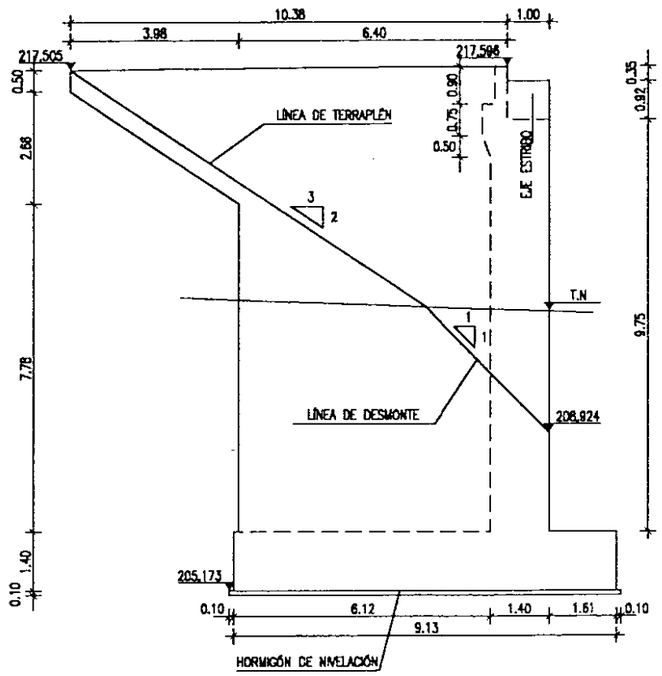
ESCALA NORMAL
1:150
1:20
Numérica
0 1.5 3 4.5m
0 0.2 0.4 0.6m
Gráfica

FECHA
NOVIEMBRE 2003

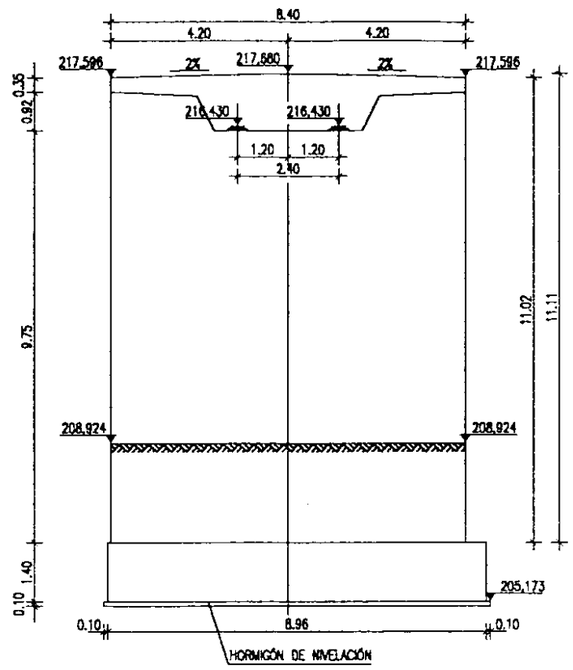
TÍTULO DEL PLANO
PASO SUPERIOR 504.9
ESTRIBO 1. GEOMETRIA

Nº DE PLANO
2.9.4
Hoja 3 de 10

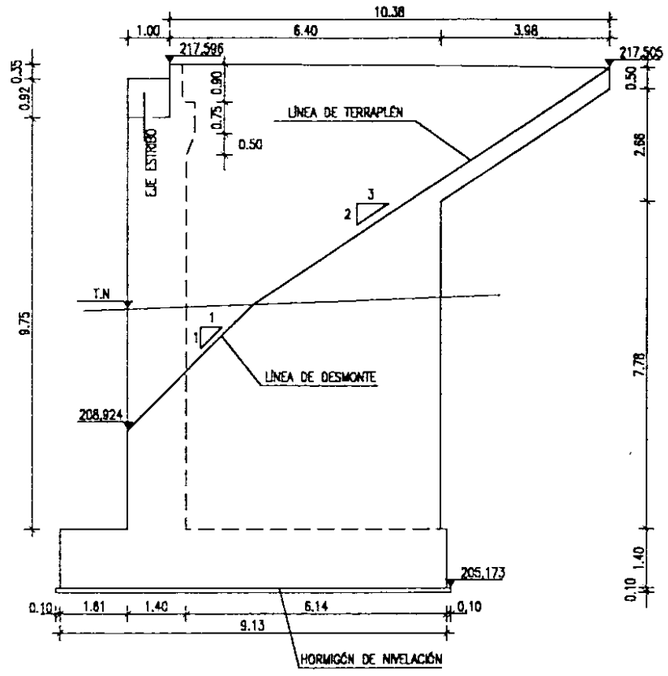
ALETA 3
ESCALA 1:150



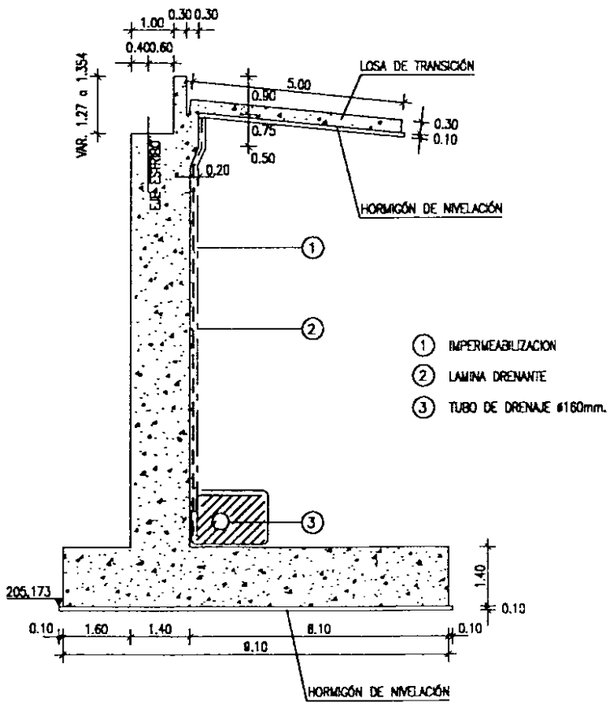
ALZADO
ESCALA 1:150



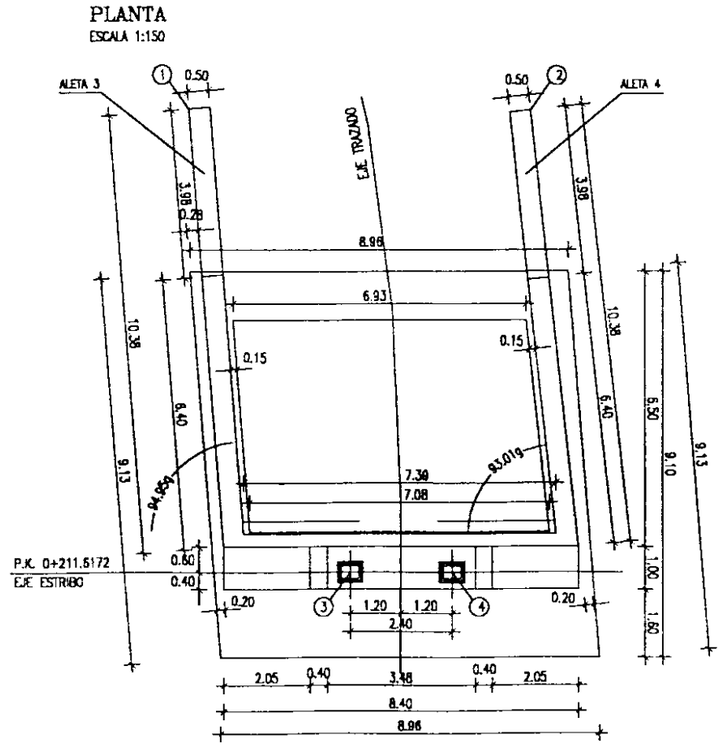
ALETA 4
ESCALA 1:150



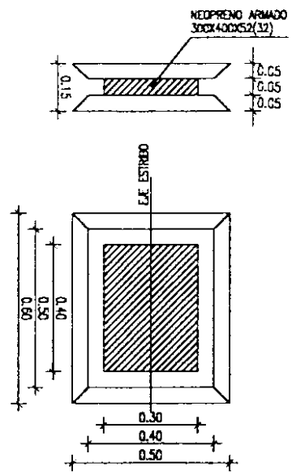
SECCION TIPO
ESCALA 1:150



PLANTA
ESCALA 1:150



DETALLE APARATO DE APOYO
ESCALA 1:20



CARACTERÍSTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	γ
TABLERO	HP-40/B/20/IIa	NORMAL	1.50
ALZADOS	HA-25/B/20/IIa	NORMAL	1.50
CIMENTACIONES	HA-25/B/20/IIa+SR	NORMAL	1.50
NIVELACIÓN	HM-15	NORMAL	1.50

ACEROS			
ACEROS	TIPO	CONTROL	γ
ACERO PARA ARMAR CORRUGADO	B 500 S	NORMAL	1.15
ACERO PARA TESAR	Y 1860 S7	NORMAL	1.15

EJECUCIÓN DE LA OBRA

ELEMENTOS IN SITU CONTROL INTENSO.
COEFICIENTES DE MAYORACIÓN DE LAS ACCIONES SEGÚN EHE.

CUADRO DE COORDENADAS		
PUNTO	X	Y
1	348236.530	4571265.387
2	348236.865	4571257.309
3	348225.768	4571261.074
4	348225.874	4571258.676

GIF Gestor de Infraestructuras Ferroviarias

PROYECTO CONSTRUIDO
LINEA DE ALTA VELOCIDAD
MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA
TRAMO: LLEIDA–MARTORELL. SUBTRAMO V. PLATAFORMA

EL DIRECTOR DEL PROYECTO CONSTRUIDO
Fdo: D. JAIME GARCIA-GERMAN LOPEZ-BELMONTE

EL AUTOR DEL PROYECTO CONSTRUIDO
Fdo: RAÚL FERNÁNDEZ CÁMARA

CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS)
AEPO

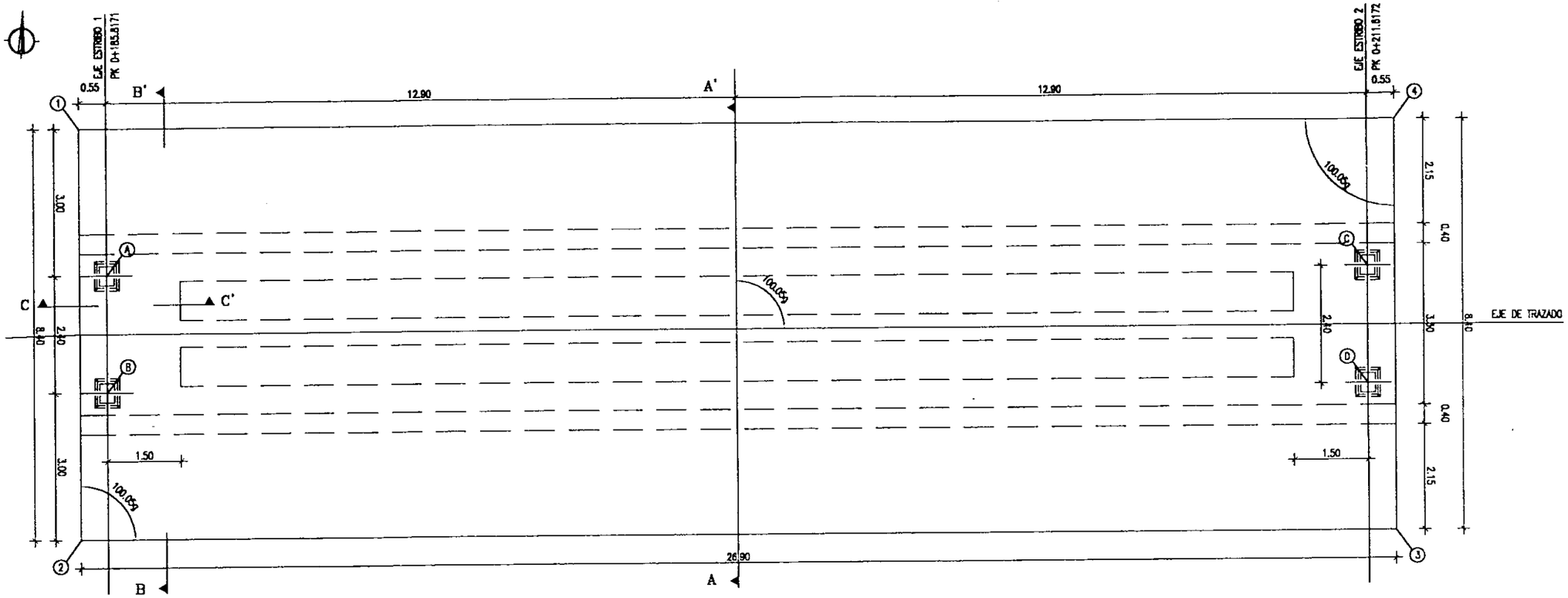
ESCALA NORMAL
1:150
1:20
Numérica
Gráfica
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0 0.2 0.4 0.6m

FECHA
NOVIEMBRE 2003

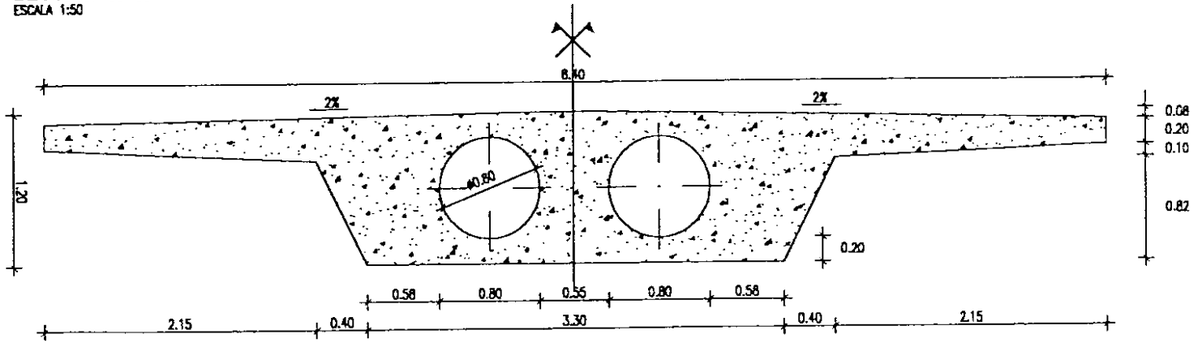
TÍTULO DEL PLANO
PASO SUPERIOR 504.9
ESTRIBO 2. GEOMETRIA

Nº DE PLANO
2.9.4
Hoja 4 de 10

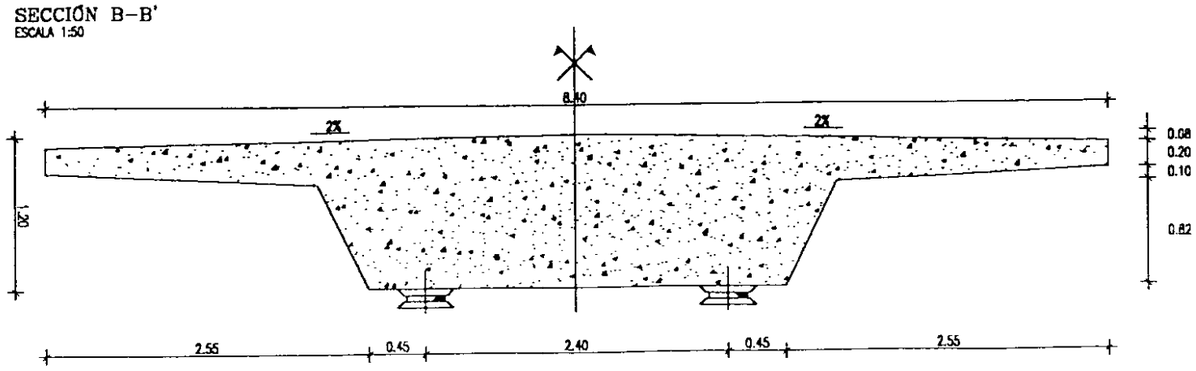
PLANTA
ESCALA 1:100



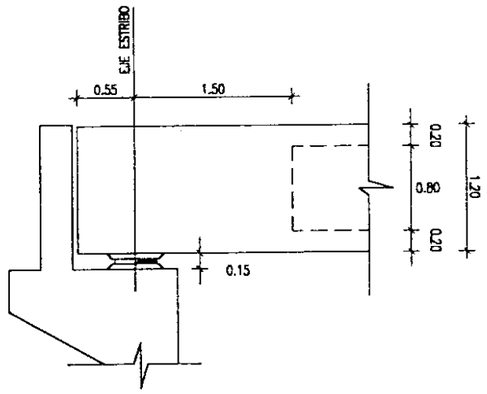
SECCIÓN A–A'
ESCALA 1:50



SECCIÓN B–B'
ESCALA 1:50



SECCIÓN C–C'
ESCALA 1:60



COORDENADAS TABLERO		
PUNTO	X	Y
1	348199.3067	4571262.9013
2	348199.6865	4571254.5099
3	348226.5800	4571255.7037
4	348226.1802	4571264.0951

COORDENADAS APOYOS		
PUNTO	X	Y
A	348199.9918	4571258.9288
B	348200.1003	4571257.5313
C	348225.7664	4571261.0737
D	348225.8749	4571258.6762

CARACTERÍSTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	γ
TABLERO	HP-40/B/20/IIa	NORMAL	1.50
ALZADOS	HA-25/B/20/IIa	NORMAL	1.50
CIMENTACIONES	HA-25/B/20/IIa+SR	NORMAL	1.50
NIVELACIÓN	HM-15	NORMAL	1.50

ACEROS			
ACEROS	TIPO	CONTROL	γ
ACERO PARA ARMAR CORRUGADO	B 500 S	NORMAL	1.15
ACERO PARA TESAR	Y 1660 S7	NORMAL	1.15

EJECUCIÓN DE LA OBRA

ELEMENTOS IN SITU CONTROL INTENSO.
COEFICIENTES DE MAYORACIÓN DE LAS ACCIONES SEGÚN EHE.

GIF Grupo de Ingeniería Ferroviaria

PROYECTO CONSTRUIDO
LINEA DE ALTA VELOCIDAD
MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA
TRAMO: LLEIDA–MARTORELL. SUBTRAMO V. PLATAFORMA

EL DIRECTOR DEL PROYECTO CONSTRUIDO
Fdo: D. JAIME GARCIA–GERMAN LOPEZ–BELMONTE

EL AUTOR DEL PROYECTO CONSTRUIDO
Fdo: RAÚL FERNÁNDEZ CÁMARA

CONSULTOR (ASISTENCIA AL CONTROL DE OBRAS)
AEPO

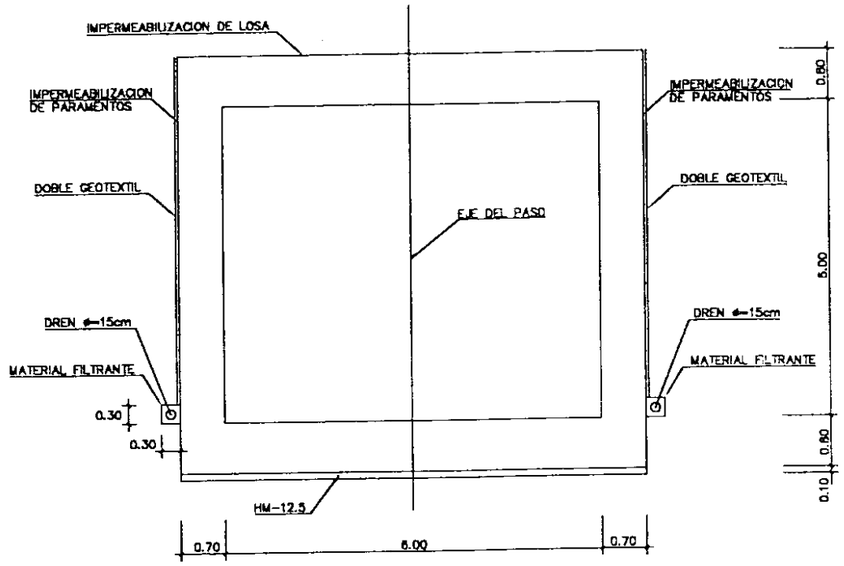
ESCALA NORMAL
1:100
1:60
1:50
Numérica | Gráfica

FECHA
NOVIEMBRE 2003

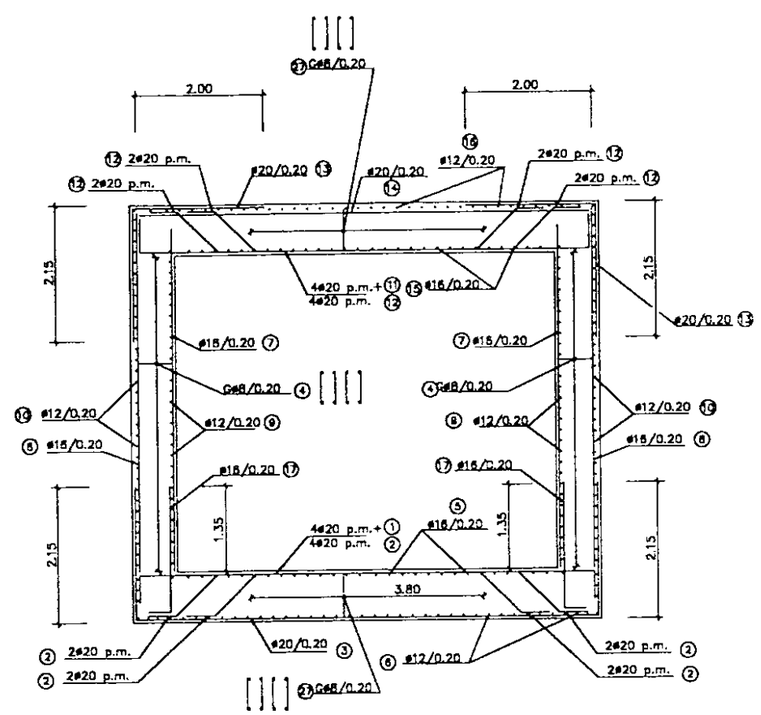
TÍTULO DEL PLANO
PASO SUPERIOR 504.9
TABLERO. GEOMETRIA

Nº DE PLANO
2.9.4
Hoja 6 de 10

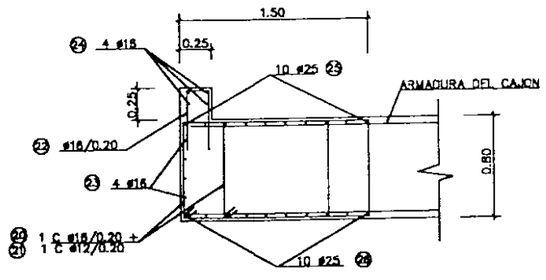
DEFINICION GEOMETRICA
ESCALA 1:100



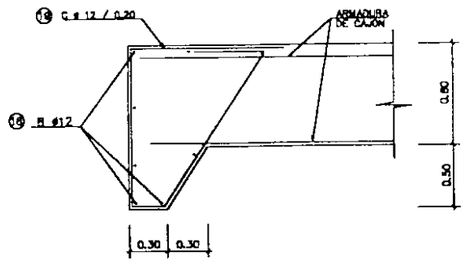
ARMADURAS
ESCALA 1:100



IMPOSTA
ESCALA 1:50



TACON
ESCALA 1:50



CARACTERÍSTICAS DE LOS MATERIALES

MATERIAL	ELEMENTO	TIPO	NIVEL DE CONTROL	γ
HORMIGÓN	NIVELACIÓN	HM-12.5	NORMAL	——
	CIMIENTOS	HA-25/P/20/IIa	NORMAL	1.50
	ALZADOS	HA-25/P/20/IIa	NORMAL	1.50
ACERO	TODOS	B 500 S	NORMAL	1.15
EJECUCIÓN	TODOS	——	INTENSO	SEGÚN EHE

NOTAS :

LA CAPACIDAD PORTANTE DEL TERRENO A LA COTA DE CIMENTACIÓN SERÁ DE 3,5 Kp/cm2 COMO MÍNIMO, REFERIDA A LA TENSIÓN COBARICÉNTRICA.

BAJO LAS ZAPATAS SE COLOCARA UNA CAPA DE HORMIGÓN DE NIVELACIÓN DE 10 cm DE ESPESOR COMO MÍNIMO.

LA SALIDA DEL DRENAJE DEL TRASDÓS DE HASTIALES Y ALETAS SE DEFINIRÁ EN LA PROPIA OBRA.

LOS RECUBRIMIENTOS SERÁN DE 4 cm EN CIMIENTOS Y 3 cm EN ALZADOS.

LOS EMPALMES DE ARMADURAS SE REALIZARAN DE ACUERDO CON LA EHE.

GIF

PROYECTO CONSTRUIDO
LINEA DE ALTA VELOCIDAD
MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA
TRAMO: LLEIDA–MARTORELL. SUBTRAMO V. PLATAFORMA

EL DIRECTOR DEL PROYECTO CONSTRUIDO
Fdo: D. JAIME GARCIA-GERMAN LOPEZ-BELMONTE

EL AUTOR DEL PROYECTO CONSTRUIDO
Fdo: RAUL FERNANDEZ CAMARA

CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS)
AEPO

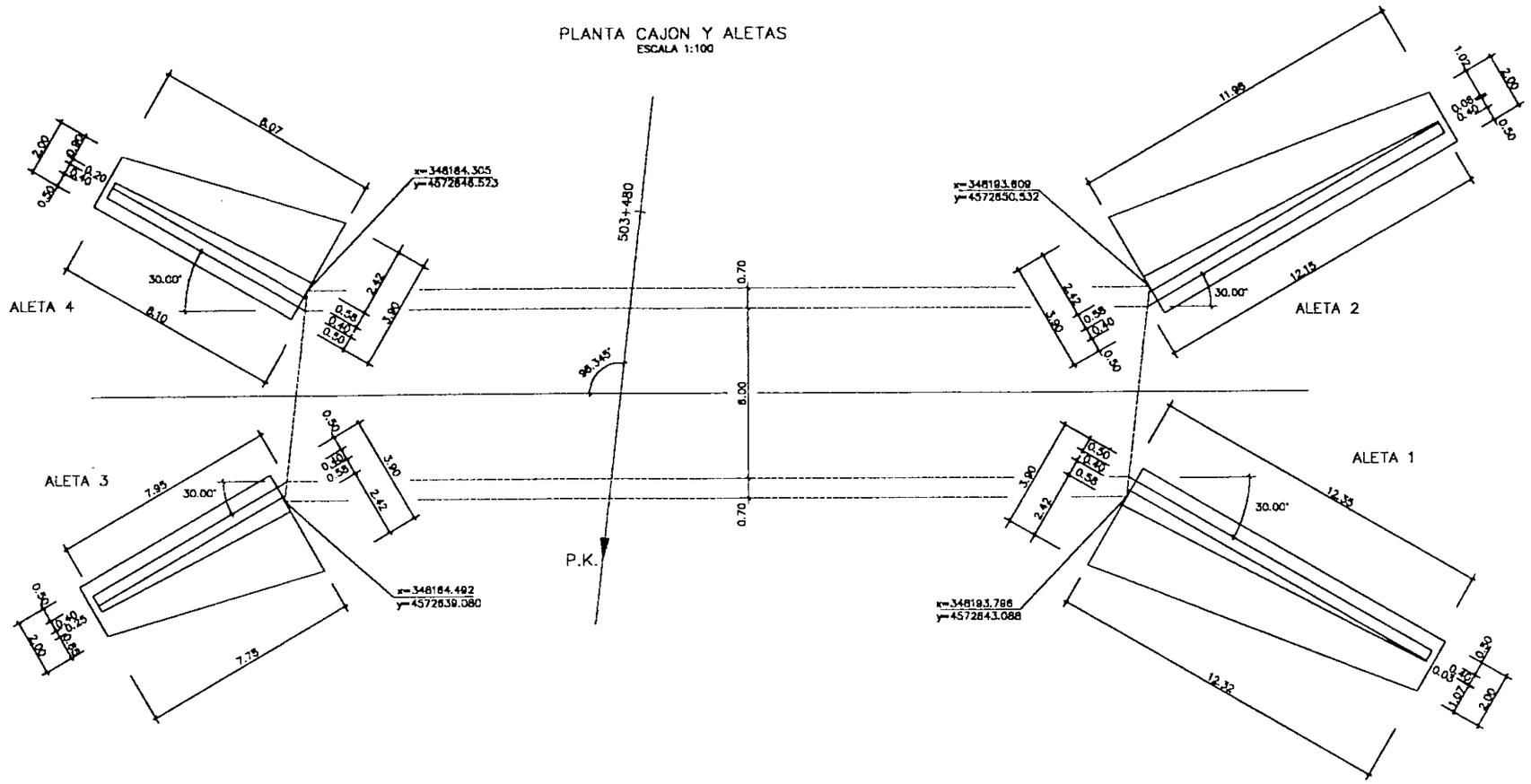
ESCALA NORMAL
1:100
1:50
Numérica
Gráfica
0 1 2 3m
0 0.5 1 1.5m

FECHA
NOVIEMBRE 2003

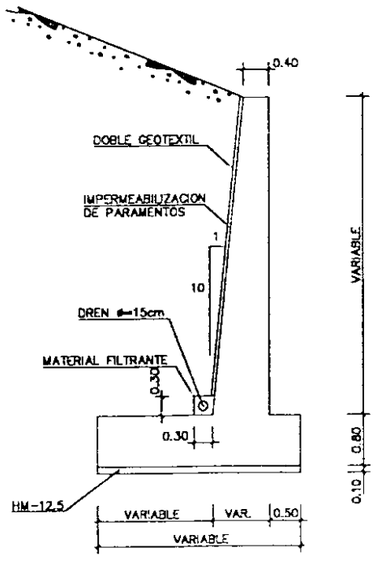
TÍTULO DEL PLANO
ESTRUCTURAS
PASO INFERIOR 503.5
CAJON. DEFINICION Y ARMADURAS

Nº DE PLANO
2.9.5
Hoja 2 de 5

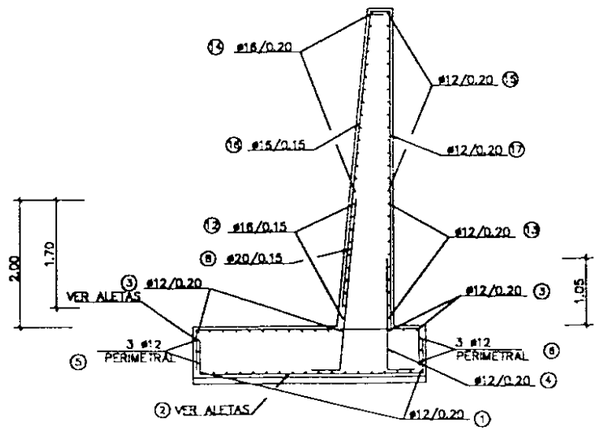
PLANTA CAJON Y ALETAS
ESCALA 1:100



SECCION TIPO ALETAS
(DEFINICION GEOMETRICA)
ESCALA 1:50



SECCION TIPO ARMADURAS
ESCALA 1:50



CARACTERÍSTICAS DE LOS MATERIALES

MATERIAL	ELEMENTO	TIPO	NIVEL DE CONTROL	γ
HORMIGÓN	NIVELACIÓN	HM-12.5	NORMAL	——
	CIMIENTOS	HA-25/P/20/IIa	NORMAL	1.50
	ALZADOS	HA-25/P/20/IIa	NORMAL	1.50
ACERO	TODOS	B 500 S	NORMAL	1.15
EJECUCIÓN	TODOS	——	INTENSO	SEGÓN EHE

NOTAS :

LA CAPACIDAD PORTANTE DEL TERRENO A LA COTA DE CIMENTACIÓN SERÁ DE 3,5 Kp/cm2 COMO MÍNIMO, REFERIDA A LA TENSIÓN COBARICÉNTRICA.

BAJO LAS ZAPATAS SE COLOCARA UNA CAPA DE HORMIGÓN DE NIVELACIÓN DE 10 cm DE ESPESOR COMO MÍNIMO.

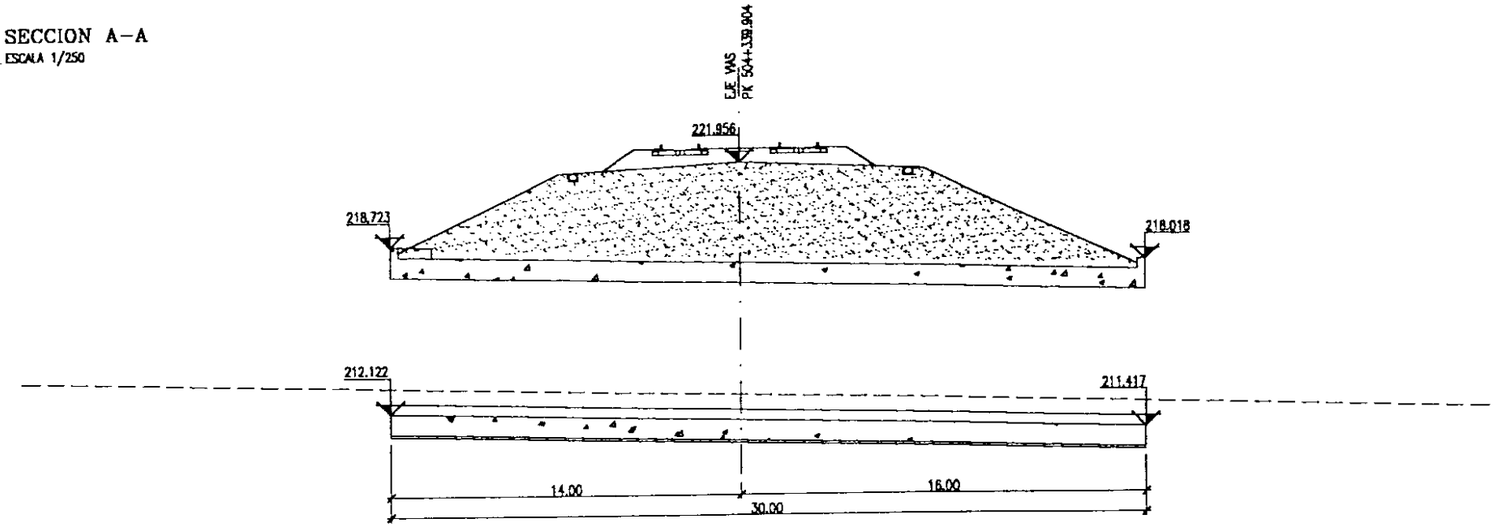
LA SALIDA DEL DRENAJE DEL TRASDÓS DE HASTIALES Y ALETAS SE DEFINIRÁ EN LA PROPIA OBRA.

LOS RECUBRIMIENTOS SERÁN DE 4 cm EN CIMIENTOS Y 3 cm EN ALZADOS.

LOS EMPALMES DE ARMADURAS SE REALIZARAN DE ACUERDO CON LA EHE.

GIF	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA TRAMO: LLEIDA–MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo: EL JAIME GARCIA–GERMAN LOPEZ–BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo: RAÚL FERNÁNDEZ CÁMARA	CONSULTOR (ASISTENCIA AL CONTROL DE OBRAS) AEPO	ESCALA NORMAL 1:100 1:200 Numérica 0 1 2 3m 0 2 4 8m Gráfica	FECHA NOVIEMBRE 2003	TÍTULO DEL PLANO ESTRUCTURAS PASO INFERIOR 503.5 ALETAS. DEFINICION Y ARMADURAS	Nº DE PLANO 2.9.5 Hoja 3 de 5

SECCION A–A
ESCALA 1/250



CARACTERISTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	γ
NIVELACION	HM–15	NORMAL	1.50
ALZADOS	HA–25/B/20/IIa	NORMAL	1.50
CIMENTACIONES	HA–25/B/20/IIa+SR	NORMAL	1.50

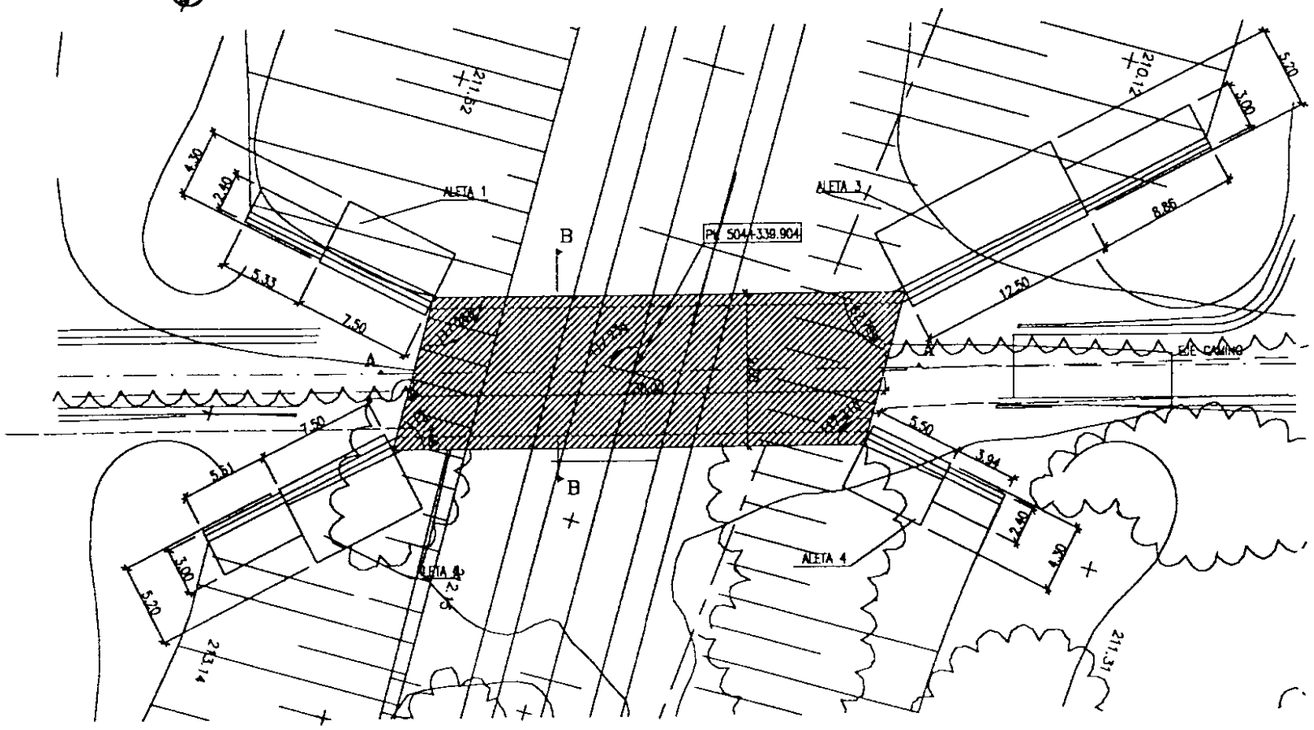
ACEROS			
ACEROS	TIPO	CONTROL	γ
ACERO PARA ARMAR CORRUGADO	B 500S	NORMAL	1.15

EJECUCION DE LA OBRA

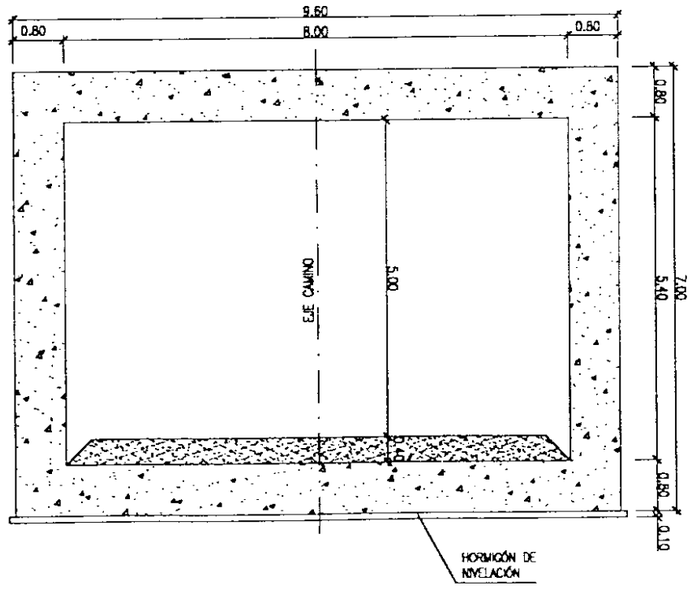
ELEMENTOS IN SITU CONTROL NORMAL.
COEFICIENTES DE MAYORACION DE LAS ACCIONES SEGUN EHE.

NOTA: PARA EL CALCULO SE HA ADOPTADO UNA TENSIÓN ADMISIBLE σ_{adm}= 3.5 Kp/cm2

PLANTA
ESCALA 1/400

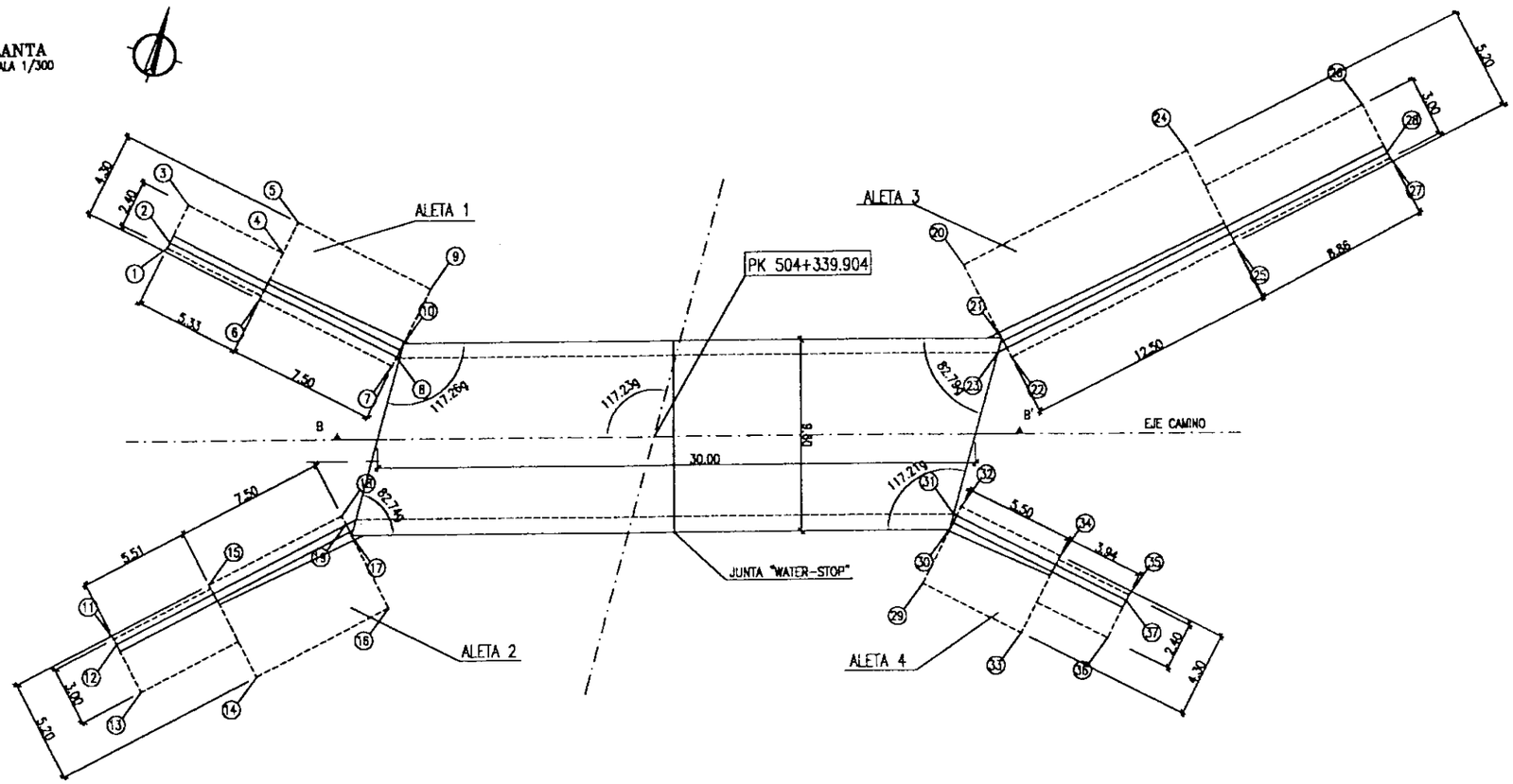


SECCION TRANSVERSAL
ESCALA 1/100



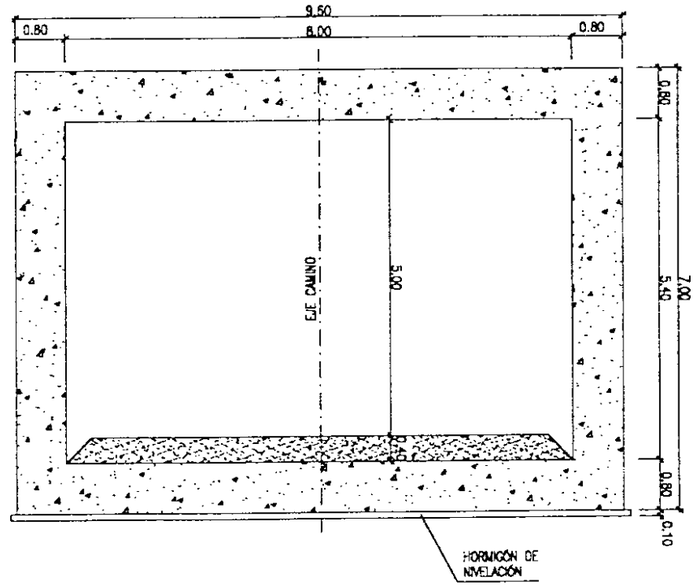
GIF	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA TRAMO: LLEIDA–MARTORELL SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo: D. JAIME GARCIA–GERMAN LOPEZ–BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo: RAUL FERNANDEZ CAMARA	CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS) AEPO	ESCALA NORMAL 1:400 1:250 1:100 Numérica Gráfica 0 4 8 16m 0 2.5 5 7.5m 0 1 2 3m	FECHA NOVIEMBRE 2003	TITULO DEL PLANO ESTRUCTURAS PASO INFERIOR 504.3 PLANO GENERAL	Nº DE PLANO 2.9.6 Hoja 1 de 8

PLANTA
ESCALA 1/300



CUADRO DE COORDENADAS					
PUNTO	X	Y	PUNTO	X	Y
1	348170.877	4571793.264	19	348183.482	4571782.527
2	348170.929	4571793.559	20	348209.518	4571803.782
3	348171.286	4571795.627	21	348212.388	4571800.805
4	348176.546	4571794.697	22	348213.127	4571800.039
5	348176.843	4571796.370	23	348212.408	4571800.040
6	348176.082	4571792.136	24	348218.516	4571812.458
7	348183.477	4571790.828	25	348222.126	4571808.715
8	348183.565	4571791.320	26	348226.279	4571817.164
9	348184.228	4571795.062	27	348228.362	4571815.005
10	348183.685	4571792.058	28	348228.153	4571815.221
11	348173.942	4571773.722	29	348212.119	4571787.906
12	348174.150	4571773.506	30	348212.843	4571790.846
13	348175.843	4571771.750	31	348212.621	4571791.676
14	348181.381	4571773.949	32	348212.872	4571792.140
15	348177.772	4571777.693	33	348217.537	4571786.946
16	348186.780	4571779.155	34	348218.287	4571791.180
17	348183.943	4571782.098	35	348222.134	4571790.295
18	348183.171	4571782.898	36	348221.716	4571787.932
			37	348222.082	4571790.000

SECCION TRANSVERSAL
ESCALA 1/100



CARACTERISTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	γ
NIVELACION	HM-15	NORMAL	1.50
ALZADOS	HA-25/B/20/IIa	NORMAL	1.50
CIMENTACIONES	HA-25/B/20/IIa+SR	NORMAL	1.50

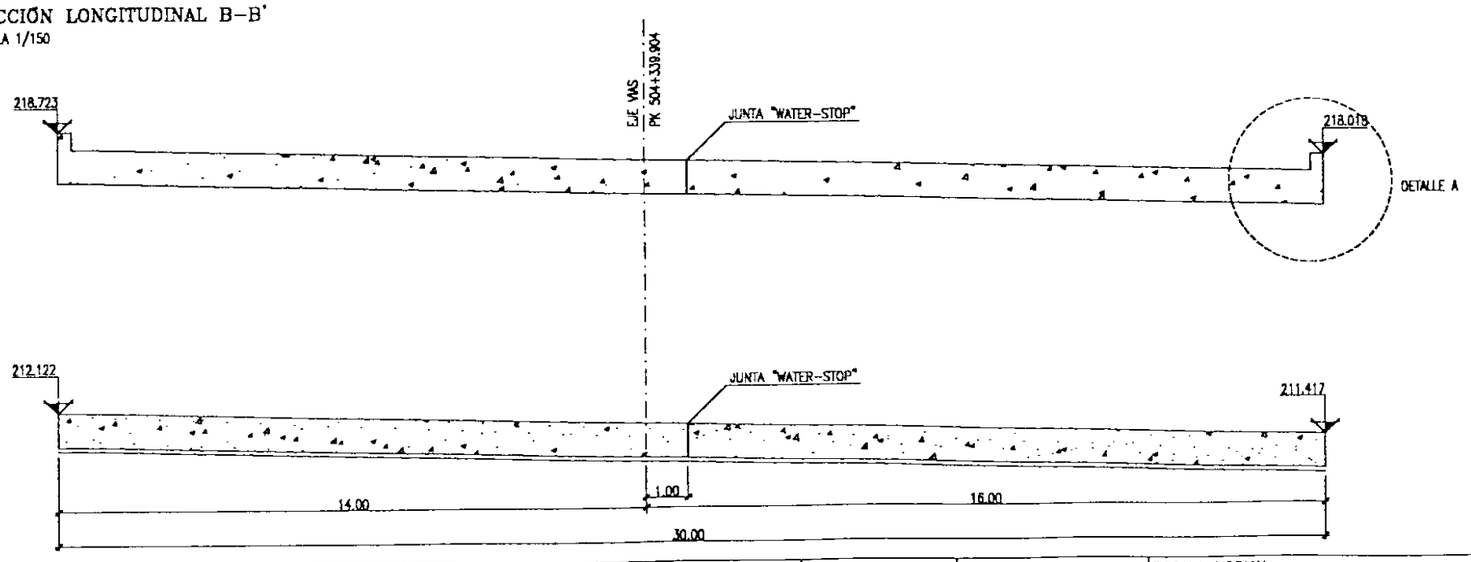
ACEROS			
ACEROS	TIPO	CONTROL	γ
ACERO PARA ARMAR CORRUGADO	B 500S	NORMAL	1.15

EJECUCION DE LA OBRA

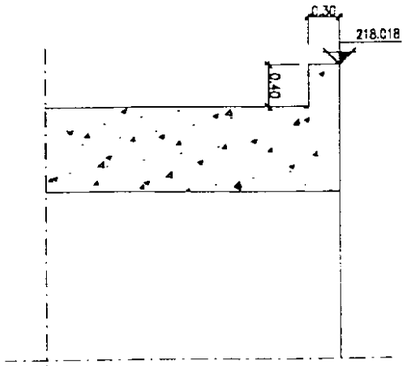
ELEMENTOS IN SITU CONTROL NORMAL.
COEFICIENTES DE MAYORACION DE LAS ACCIONES SEGUN EHE.

NOTA: PARA EL CALCULO SE HA ADOPTADO UNA TENSIÓN ADMISIBLE σ_{adm}= 3.5 Kp/cm2

SECCIÓN LONGITUDINAL B–B'
ESCALA 1/150

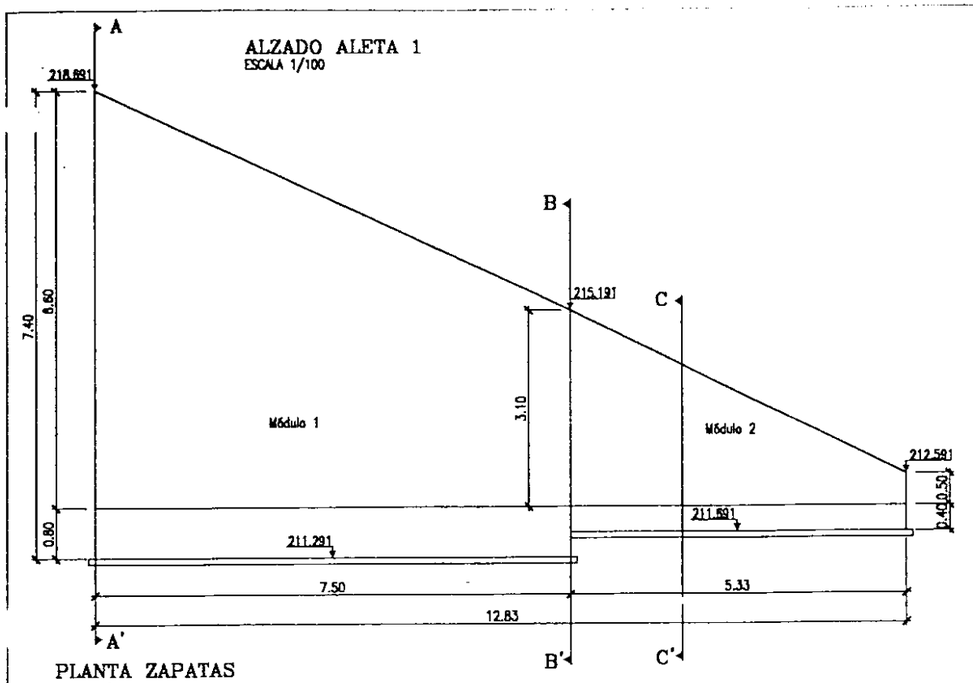


DETALLE A
ESCALA 1/60

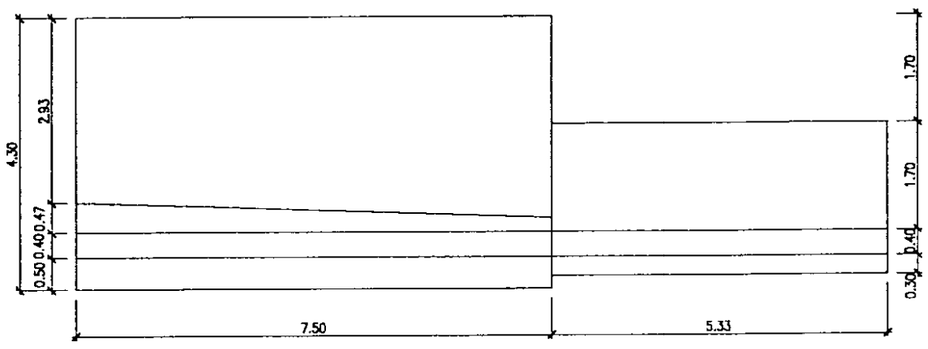


GIF	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA TRAMO: LLEIDA–MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo: D. JAIME GARCIA-GERMAN LOPEZ-BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo: RAÚL FERNÁNDEZ CÁMARA	CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS) AEPO	ESCALA NORMAL 1:300 1:150 1:100 1:60 Numérica Gráfica 0 3 6 9m 0 1.5 3 4.5m 0 1 2 3m 0 0.6 1.2 1.8m	FECHA NOVIEMBRE 2003	TÍTULO DEL PLANO ESTRUCTURAS PASO INFERIOR 504.3 CAJON. DEFINICIÓN GEOMETRICA Y REPL.	Nº DE PLANO 2.9.6 Hoja 2 de 8

ALZADO ALETA 1
ESCALA 1/100



PLANTA ZAPATAS
ESCALA:1/100



CARACTERISTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	γ
NIVELACION	HM-15	NORMAL	1.50
ALZADOS	HA-25/B/20/IIa	NORMAL	1.50
CIMENTACIONES	HA-25/B/20/IIa+SR	NORMAL	1.50

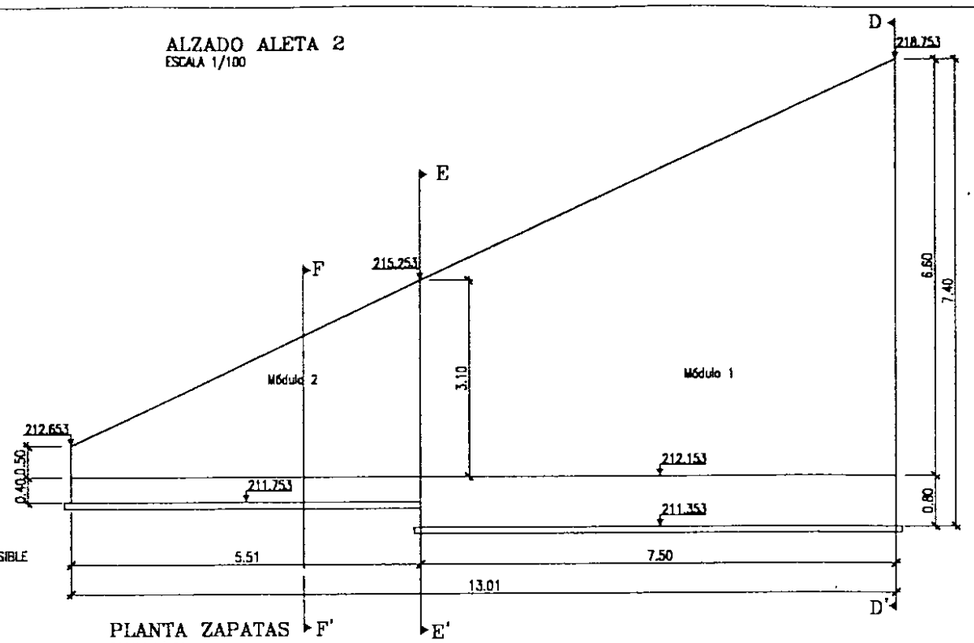
ACEROS			
ACEROS	TIPO	CONTROL	γ
ACERO PARA ARMAR CORRUGADO	B 500S	NORMAL	1.15

EJECUCION DE LA OBRA

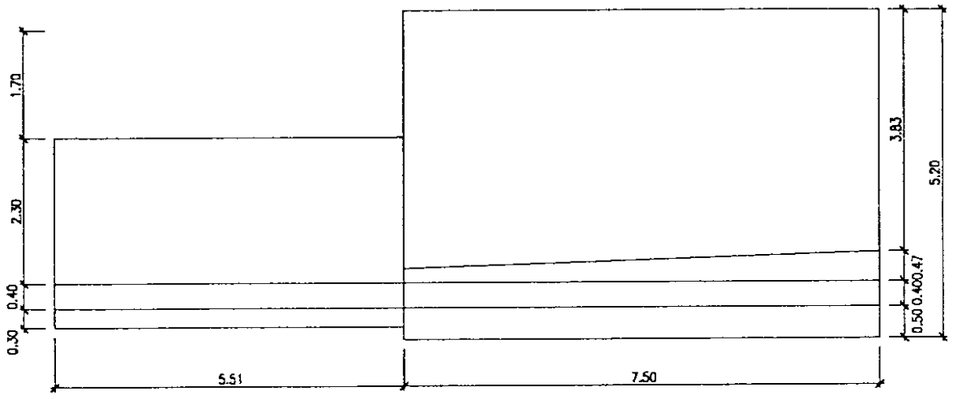
ELEMENTOS IN SITU CONTROL NORMAL.
COEFICIENTES DE MAYORACION DE LAS ACCIONES SEGUN EHE.

NOTA: PARA EL CÁLCULO SE HA ADOPTADO UNA TENSIÓN ADMISIBLE
σ_{adm}= 3.5 Kp/cm2

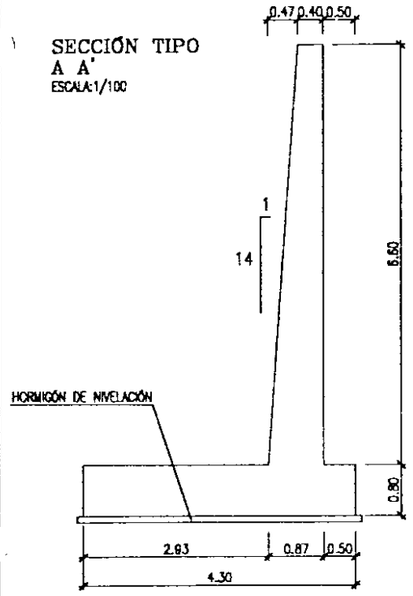
ALZADO ALETA 2
ESCALA 1/100



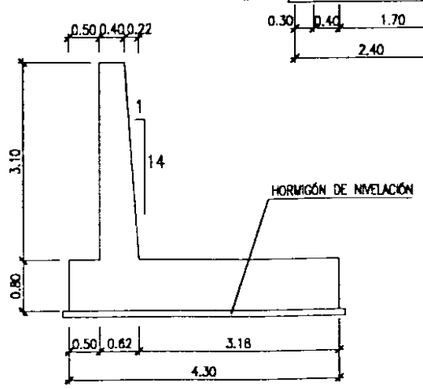
PLANTA ZAPATAS
ESCALA:1/100



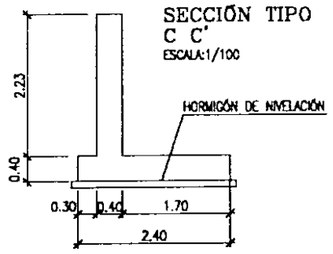
SECCIÓN TIPO A A'
ESCALA:1/100



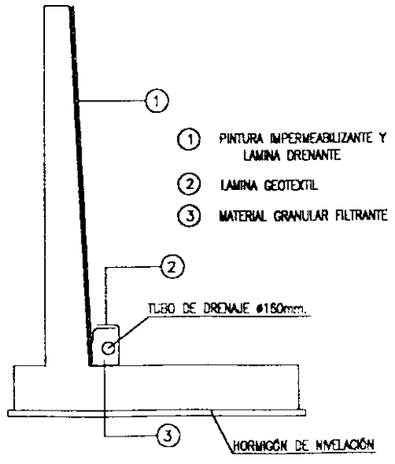
SECCIÓN TIPO B B'
ESCALA:1/100



SECCIÓN TIPO C C'
ESCALA:1/100

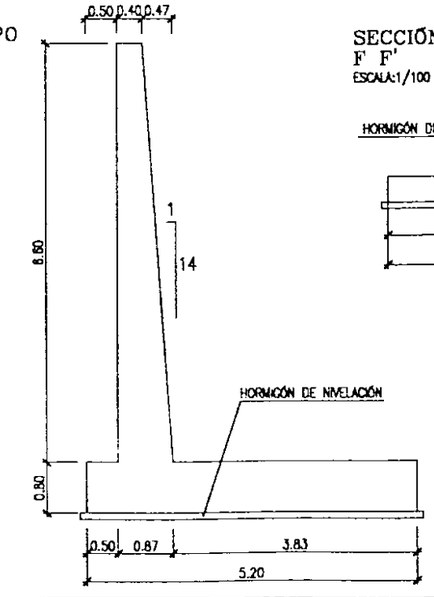


SECCIÓN TIPO

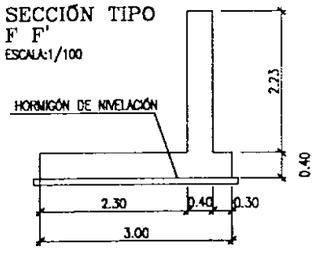


① PINTURA IMPERMEABILIZANTE Y LAMINA DRENANTE
② LAMINA GEOTEXTIL
③ MATERIAL GRANULAR FILTRANTE

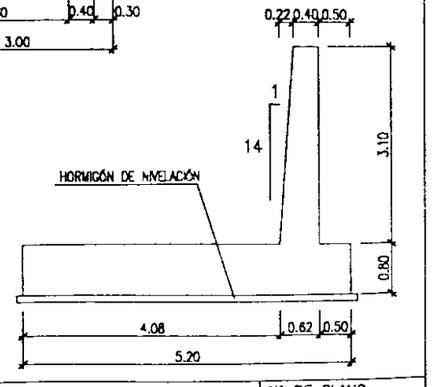
SECCIÓN TIPO D D'
ESCALA:1/100



SECCIÓN TIPO F F'
ESCALA:1/100

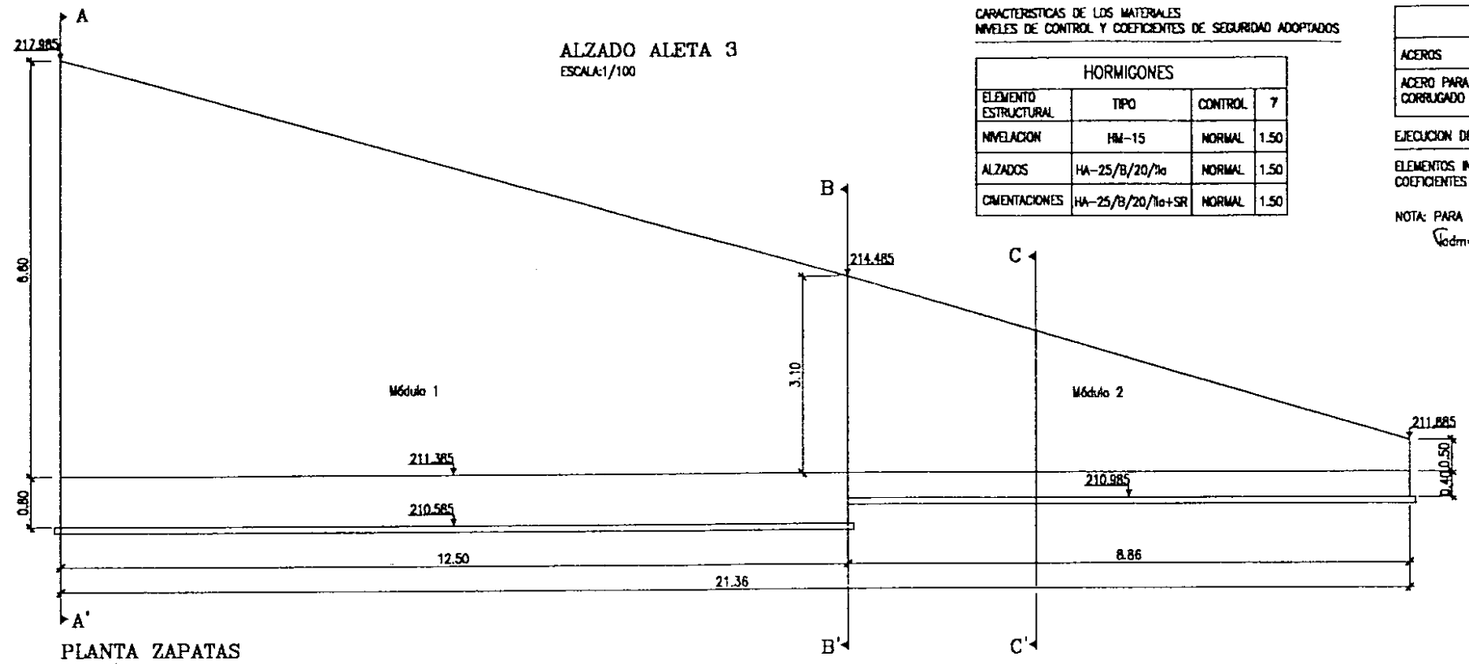


SECCIÓN TIPO E E'
ESCALA:1/100



GIF	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA TRAMO: LLEIDA–MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo: D. JAIME GARCIA–BERMEJO LOPEZ–BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo: RAUL FERNANDEZ CAMARA	CONSULTOR (ASISTENCIA AL CONTROL DE OBRA) AEPO	ESCALA NORMAL 1:100 Numérica / Gráfica 0 1 2 3m	FECHA NOVIEMBRE 2003	TÍTULO DEL PLANO ESTRUCTURAS PASO INFERIOR 504.3 ALETAS 1 Y 2. DEFINICION GEOMETRICA	Nº DE PLANO 2.9.6 Hoja 3 de 8

ALZADO ALETA 3
ESCALA:1/100



CARACTERISTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	7
NIVELACION	HM-15	NORMAL	1.50
ALZADOS	HA-25/B/20/IIa	NORMAL	1.50
CIMENTACIONES	HA-25/B/20/IIa+SR	NORMAL	1.50

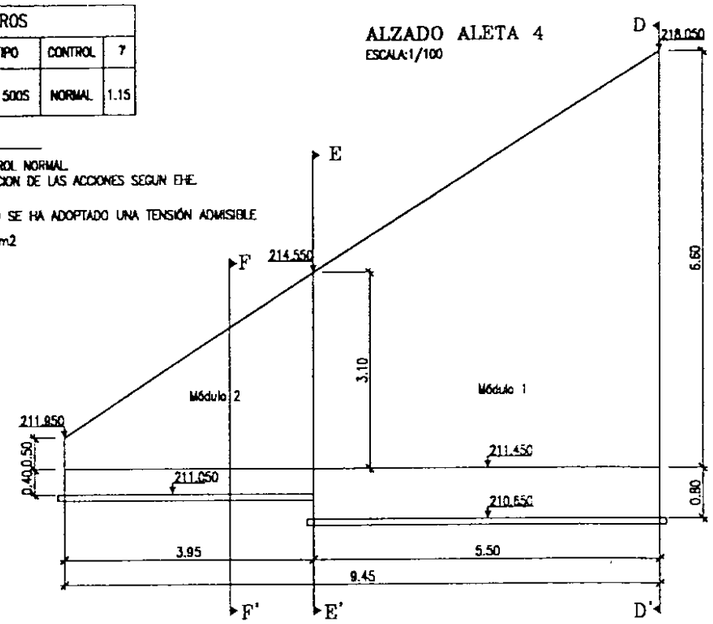
ACEROS			
ACEROS	TIPO	CONTROL	7
ACERO PARA ARMAR CORRUGADO	B 500S	NORMAL	1.15

EJECUCION DE LA OBRA

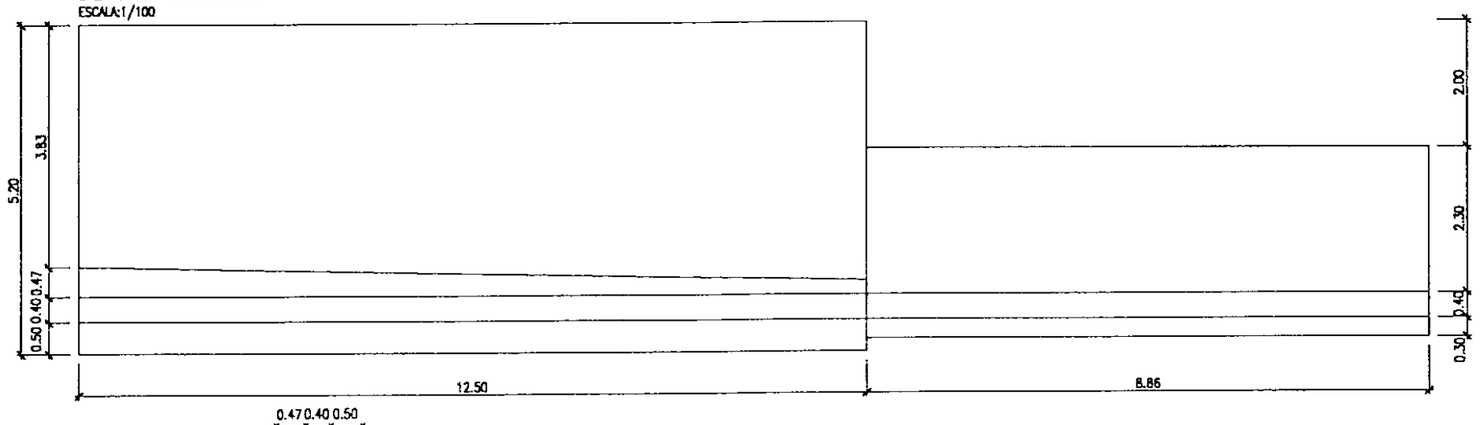
ELEMENTOS IN SITU CONTROL NORMAL
COEFICIENTES DE MAYORACION DE LAS ACCIONES SEGUN EHE

NOTA: PARA EL CÁLCULO SE HA ADOPTADO UNA TENSIÓN ADMISIBLE
σ_{adm}= 3.5 Kp/cm2

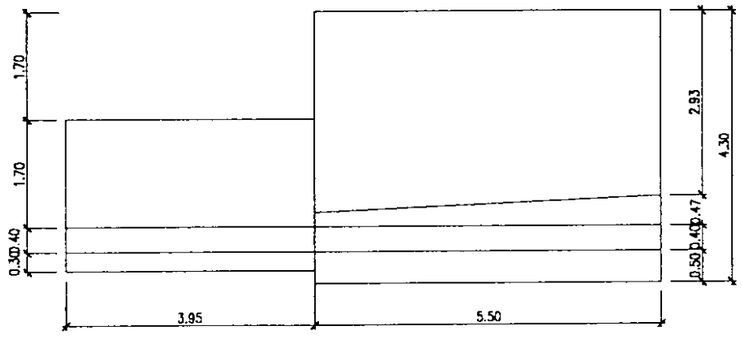
ALZADO ALETA 4
ESCALA:1/100



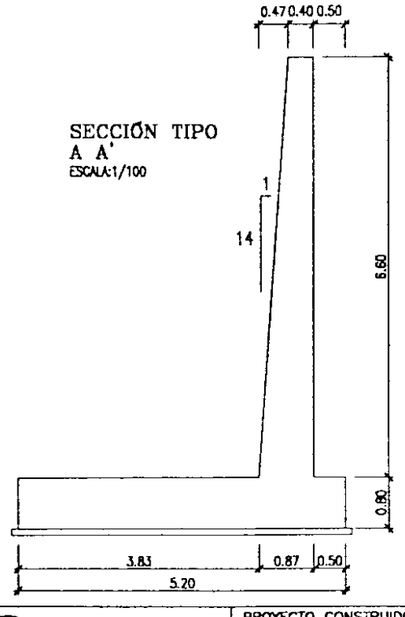
PLANTA ZAPATAS
ESCALA:1/100



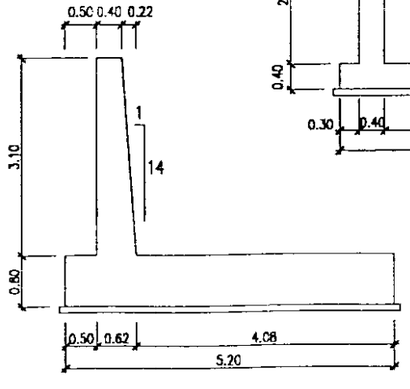
PLANTA ZAPATAS
ESCALA:1/100



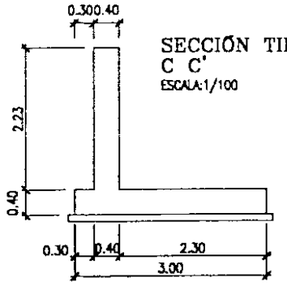
SECCIÓN TIPO A A'
ESCALA:1/100



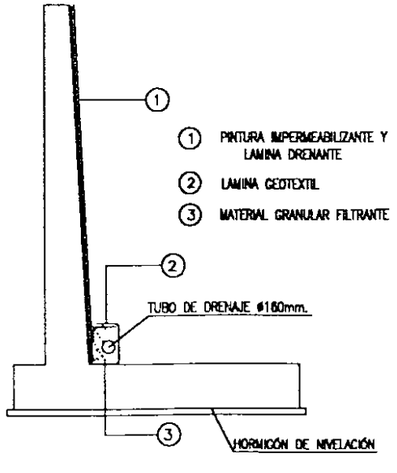
SECCIÓN TIPO B B'
ESCALA:1/100



SECCIÓN TIPO C C'
ESCALA:1/100

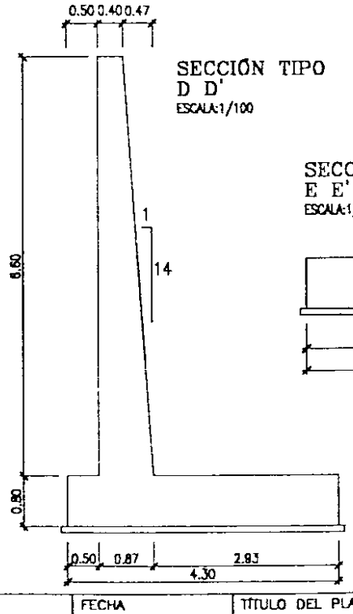


SECCIÓN TIPO

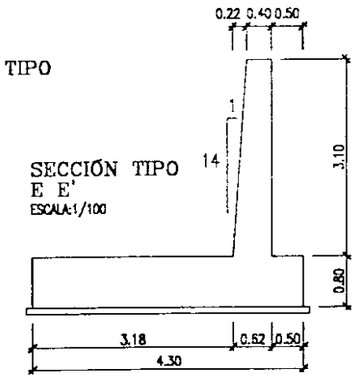


① PINTURA IMPERMEABILIZANTE Y LAMINA DRENANTE
② LAMINA GEOTEXTIL
③ MATERIAL GRANULAR FILTRANTE

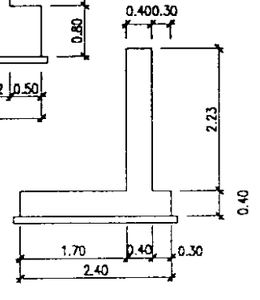
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ESCALA:1/100



SECCIÓN TIPO E E'
ESCALA:1/100

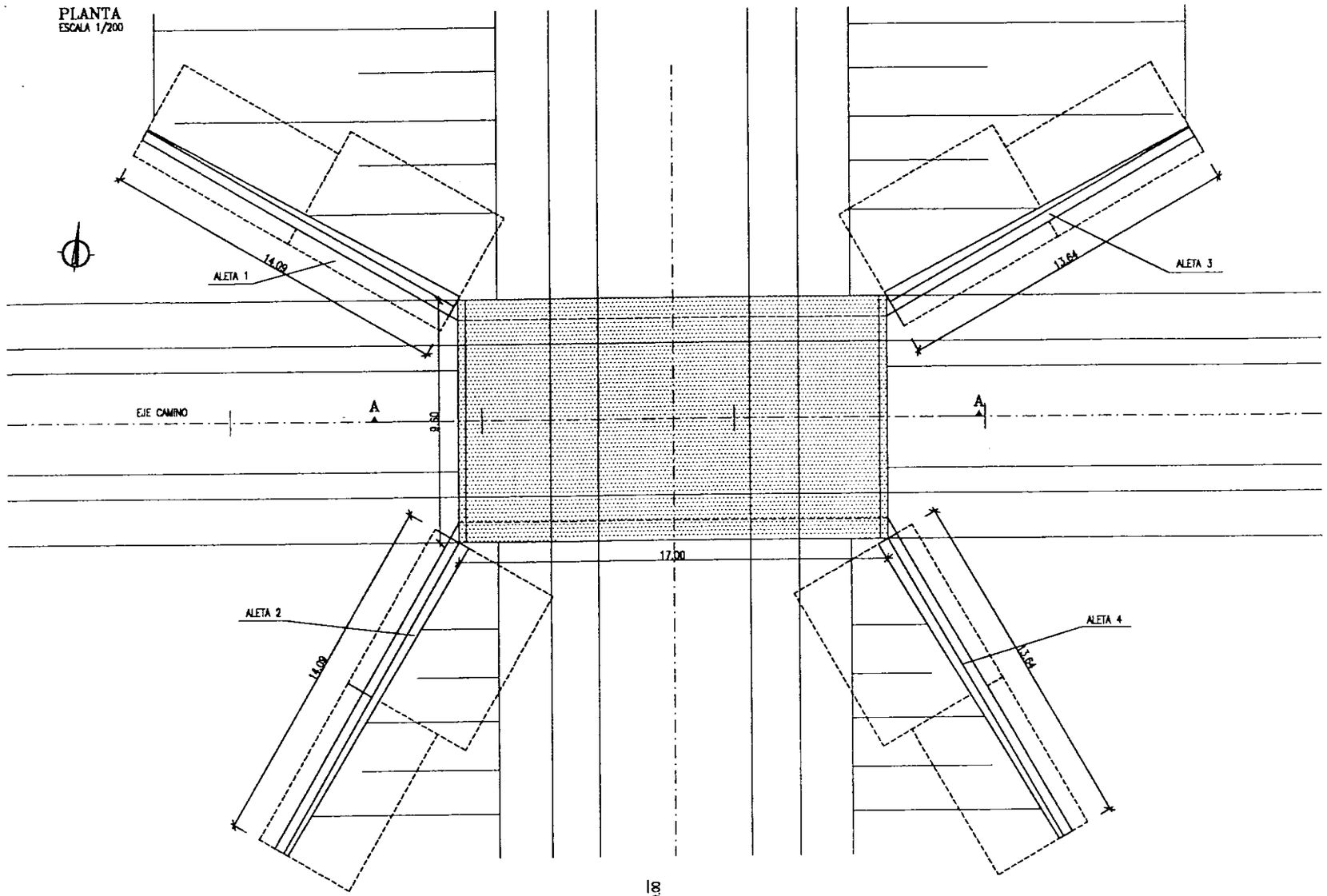


SECCIÓN TIPO F F'
ESCALA:1/100



GIF	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA TRAMO: LLEIDA–MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo: D. JAIME GARCIA–GERMAN LOPEZ–BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo: RAÚL FERNÁNDEZ CÁMARA	CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS) AEPO	ESCALA NORMAL 1:100 Numérica / Gráfica 0 1 2 3m	FECHA NOVIEMBRE 2003	TÍTULO DEL PLANO ESTRUCTURAS PASO INFERIOR 504.3 ALETAS 3 Y 4. DEFINICION GEOMETRICA	Nº DE PLANO 2.9.6 Hoja 4 de 8

PLANTA
ESCALA 1/200



CARACTERISTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	γ
NIVELACION	HM-15	NORMAL	1.50
ALZADOS	HA-25/B/20/IIa	NORMAL	1.50
CIMENTACIONES	HA-25/B/20/IIa+SR	NORMAL	1.50

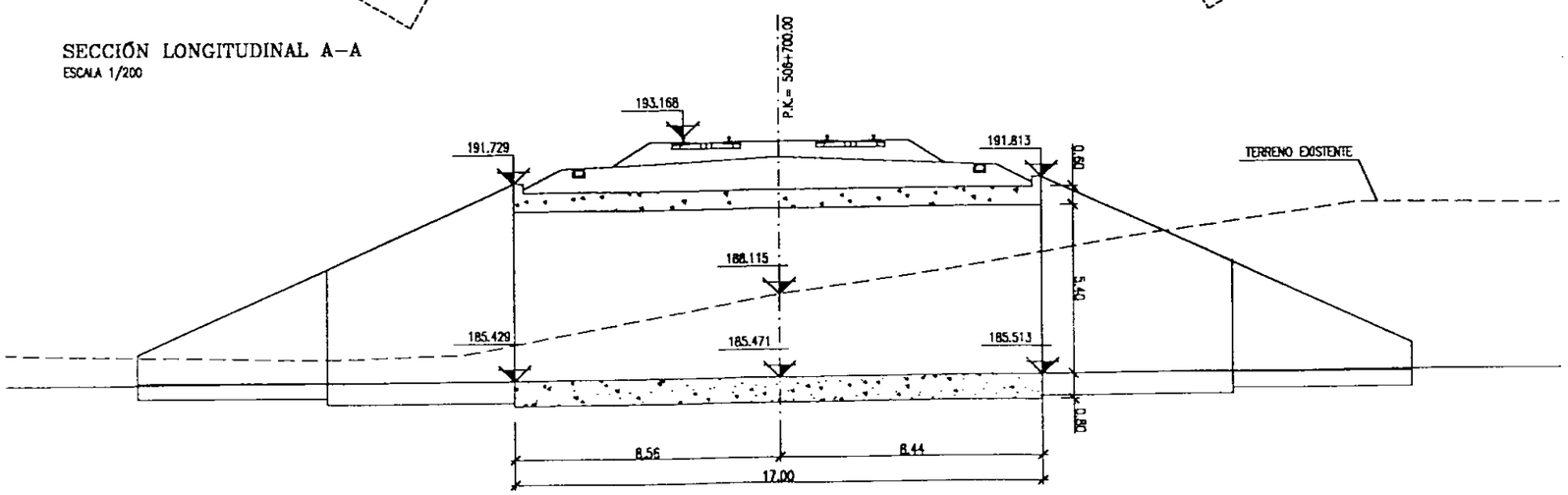
ACEROS			
ACEROS	TIPO	CONTROL	γ
ACERO PARA ARMAR CORRUGADO	B 500S	NORMAL	1.15

EJECUCION DE LA OBRA

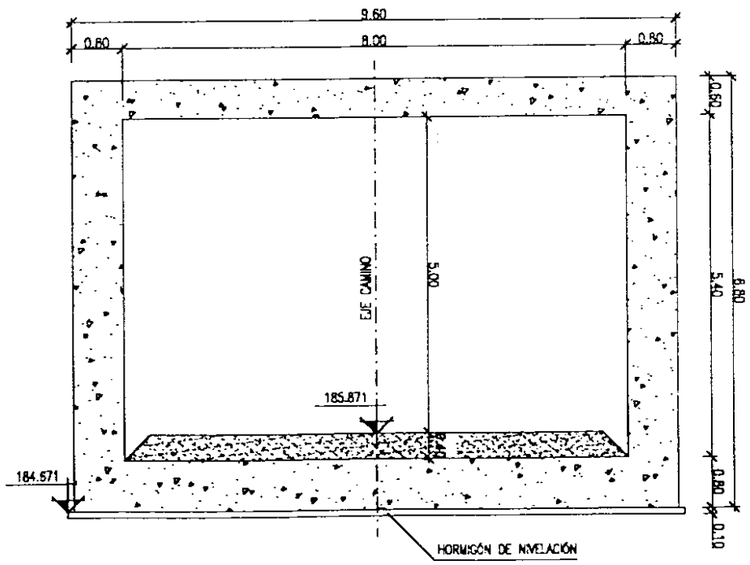
ELEMENTOS IN SITU CONTROL NORMAL
COEFICIENTES DE MAYORACION DE LAS ACCIONES SEGUN EHE.

NOTA: PARA EL CÁLCULO SE HA ADOPTADO UNA TENSIÓN ADMISIBLE σ_{adm}= 3.5 Kp/cm2

SECCIÓN LONGITUDINAL A-A
ESCALA 1/200

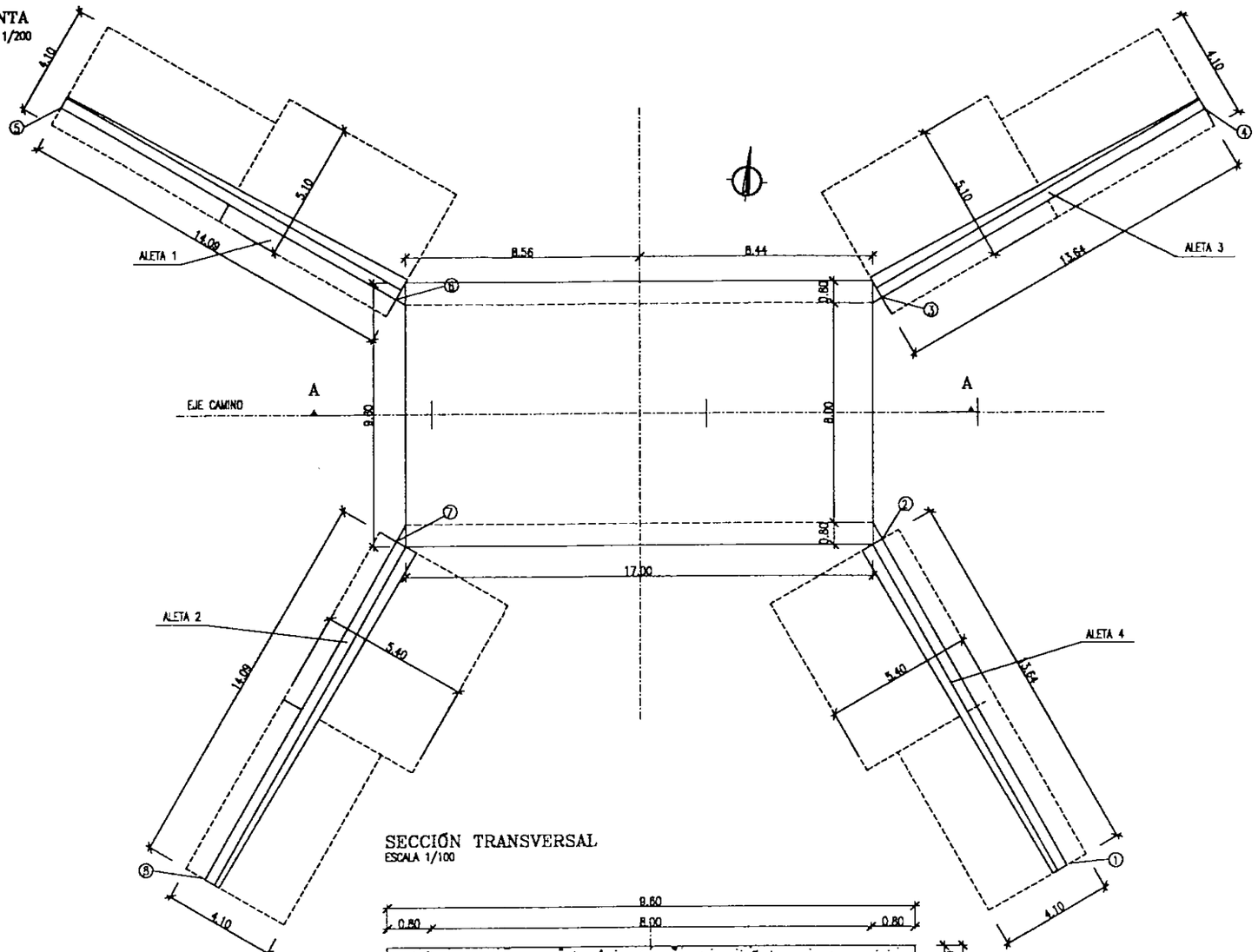


SECCIÓN TRANSVERSAL
ESCALA 1/100

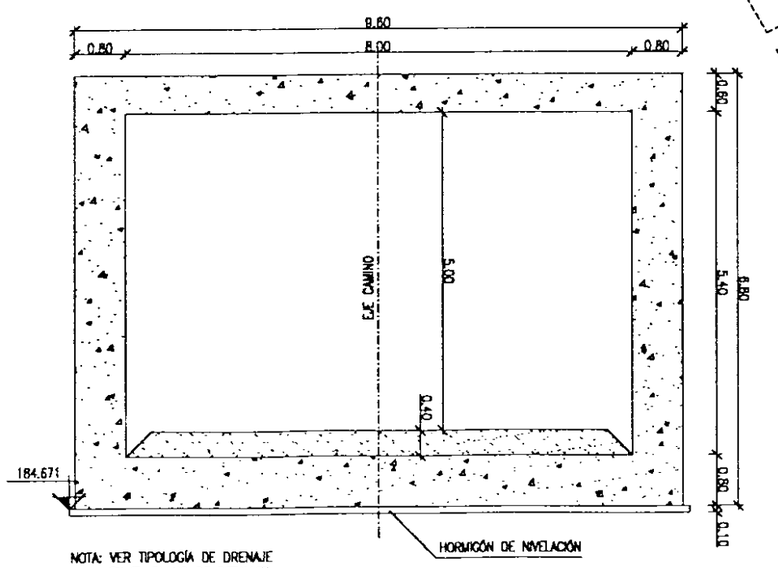


GIF	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID-ZARAGOZA-BARCELONA-FRONTERA FRANCESA TRAMO: LLEIDA-MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo: D. JAIME GARCIA-OSMAN LOPEZ-BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo: RAÚL FERNÁNDEZ CÁMARA	CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS) AEPO	ESCALA NORMAL 1:200 1:100 Numérica Gráfica 0 2 4 6m 0 1 2 3m	FECHA NOVIEMBRE 2003	TITULO DEL PLANO ESTRUCTURAS PASO INFERIOR 506.7 PLANO GENERAL	Nº DE PLANO 2.9.7 Hoja 1 de 9

PLANTA
ESCALA 1/200

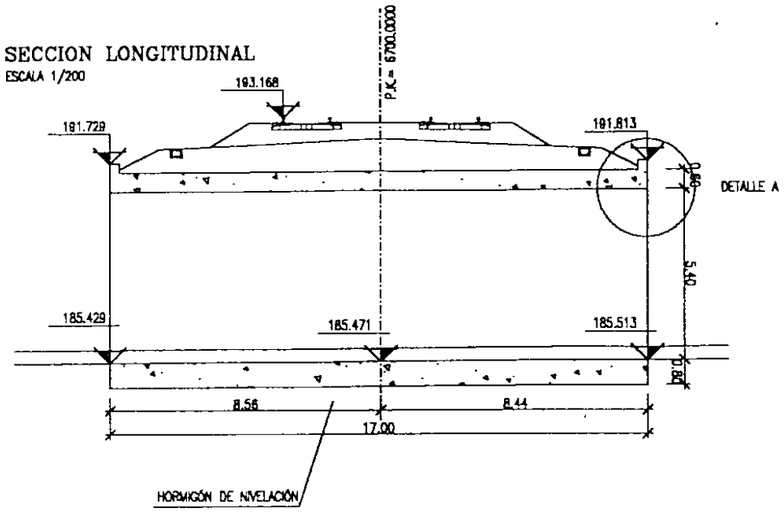


SECCIÓN TRANSVERSAL
ESCALA 1/100

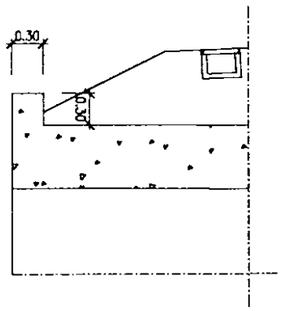


NOTA: VER TIPOLOGÍA DE DRENAJE EN EL PLANO DE DETALLES

SECCION LONGITUDINAL
ESCALA 1/200



DETALLE A
SIN ESCALA



CUADRO DE COORDENADAS		
PUNTO	X	Y
1	348404.264	4569425.238
2	348395.230	4569436.261
3	348385.287	4569445.011
4	348408.322	4569453.043
5	348364.822	4569448.848
6	348377.703	4569443.136
7	348378.536	4569434.385
8	348372.924	4569421.505

CARACTERISTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	γ
NIVELACION	HM-15	NORMAL	1.50
ALZADOS	HA-25/B/20/IIa	NORMAL	1.50
CIMENTACIONES	HA-25/B/20/IIa+SR	NORMAL	1.50

ACEROS			
ACEROS	TIPO	CONTROL	γ
ACERO PARA ARMAR CORRUGADO	B 500S	NORMAL	1.15

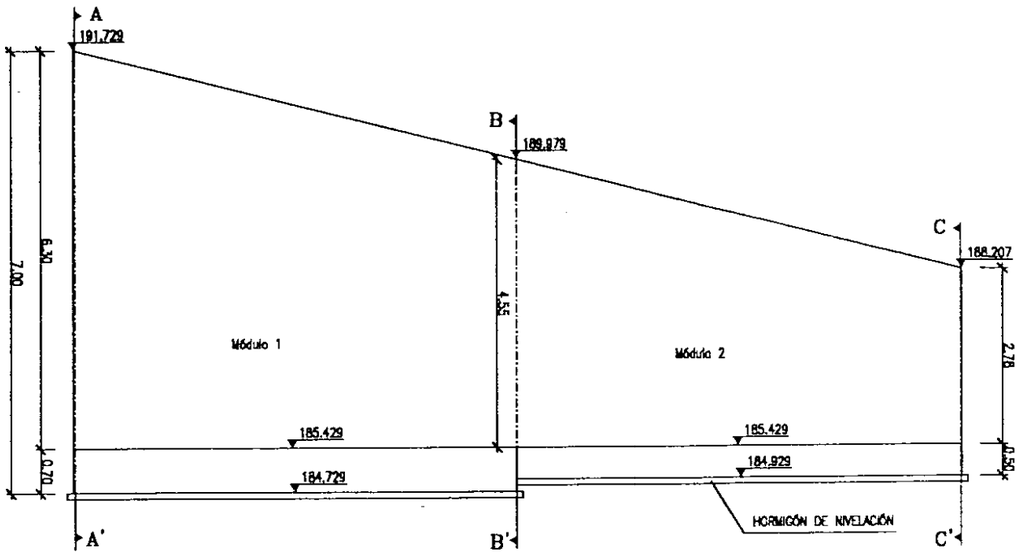
EJECUCION DE LA OBRA

ELEMENTOS IN SITU CONTROL NORMAL
COEFICIENTES DE MAYORACION DE LAS ACCIONES SEGUN EHE.

NOTA: PARA EL CÁLCULO SE HA ADOPTADO UNA TENSIÓN ADMISIBLE $\bar{\sigma}_{adm}$= 3.5 Kp/cm2

GIF	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA TRAMO: LLEIDA–MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo: D. JAIME GARCIA-GERMAN LOPEZ-BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo: RAÚL FERNÁNDEZ CAMARA	CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS) AEPO	ESCALA NORMAL 1:200 1:100 Numérica Gráfica 0 2 4 6m 0 1 2 3m	FECHA NOVIEMBRE 2003	TÍTULO DEL PLANO ESTRUCTURAS PASO INFERIOR 506.7 CAJÓN DEFINICION GEOMETRICA Y REPL.	Nº DE PLANO 2.9.7 Hoja 2 de 9

ALZADO ALETA 2
ESCALA:1/100



CARACTERISTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	γ
NIVELACION	HM-15	NORMAL	1.50
ALZADOS	HA-25/B/20/IIa	NORMAL	1.50
CIMENTACIONES	HA-25/B/20/IIa+SR	NORMAL	1.50

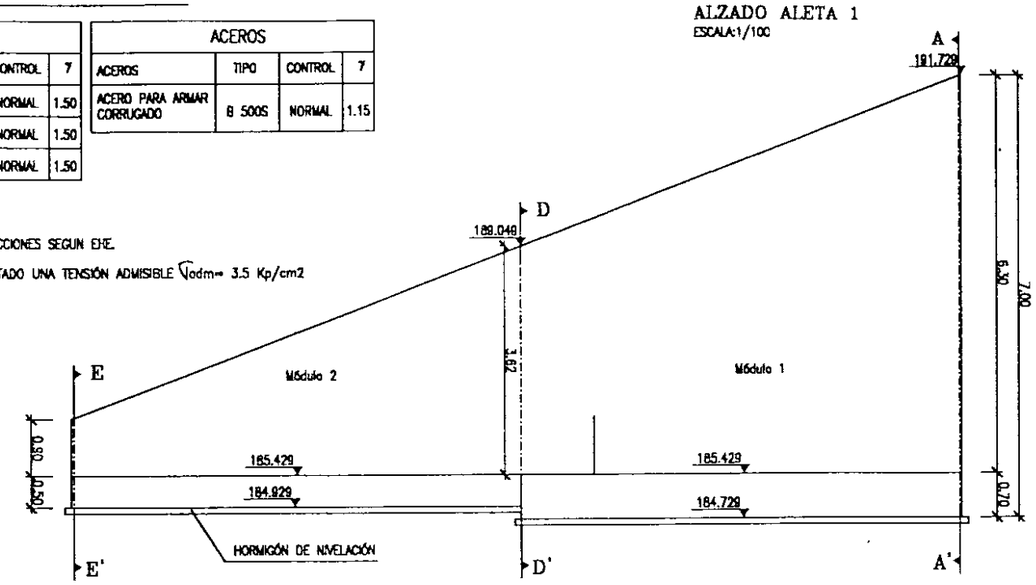
ACEROS			
ACEROS	TIPO	CONTROL	γ
ACERO PARA ARMAR CORRUGADO	B 500S	NORMAL	1.15

EJECUCION DE LA OBRA

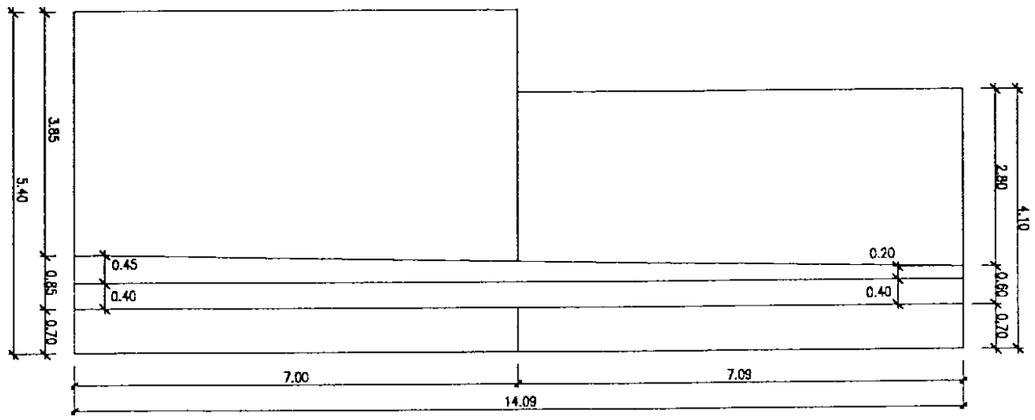
ELEMENTOS IN SITU CONTROL NORMAL
COEFICIENTES DE MAYORACION DE LAS ACCIONES SEGUN EHE

NOTA: PARA EL CÁLCULO SE HA ADOPTADO UNA TENSIÓN ADMISIBLE σ_{adm}= 3.5 Kp/cm2

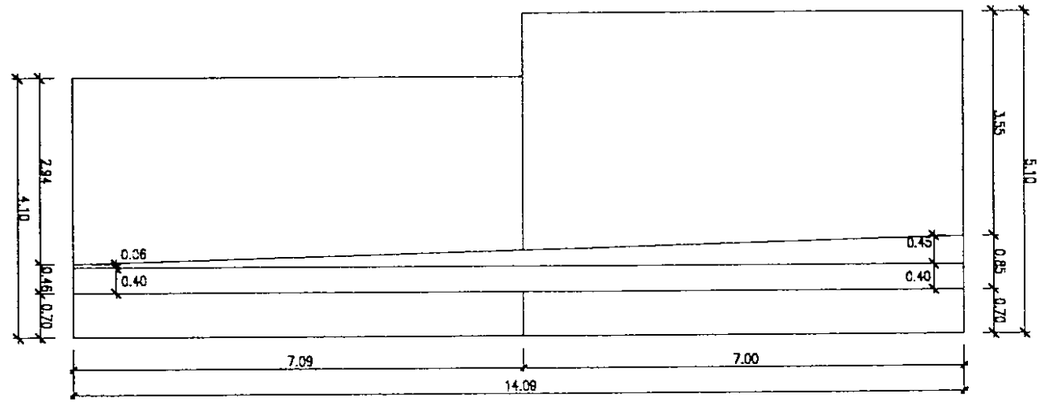
ALZADO ALETA 1
ESCALA:1/100



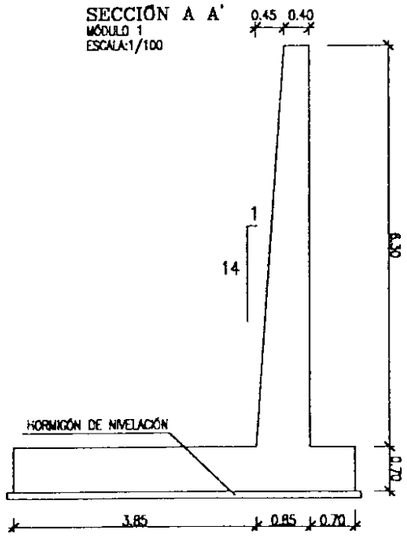
PLANTA ZAPATAS
ESCALA:1/100



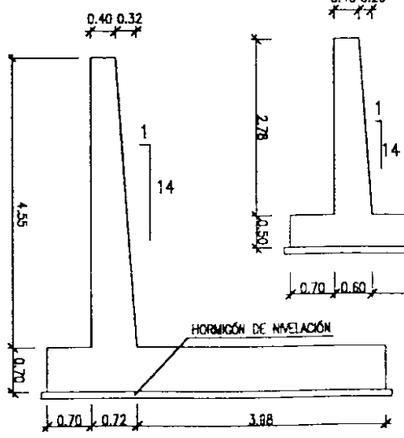
PLANTA ZAPATAS
ESCALA:1/100



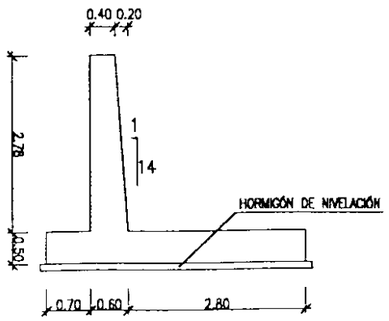
SECCIÓN A A'
MÓDULO 1
ESCALA:1/100



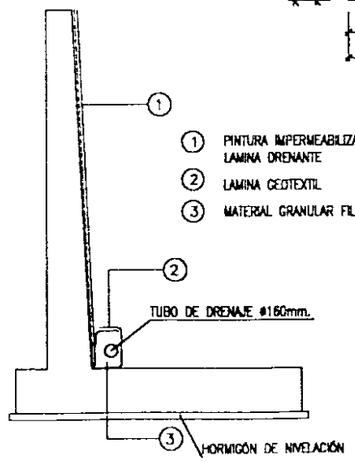
SECCIÓN B B'
MÓDULO 2
ESCALA:1/100



SECCIÓN C C'
MÓDULO 2
ESCALA:1/100

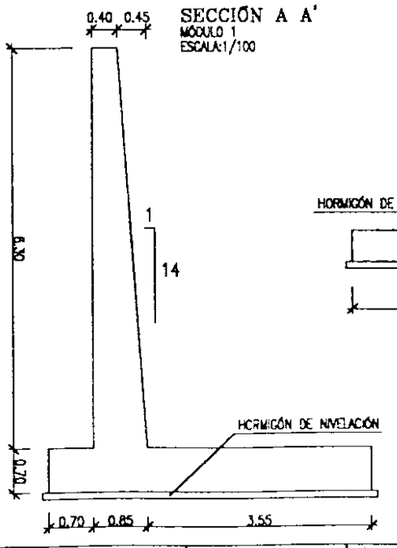


SECCION TIPO
ESCALA 1/100

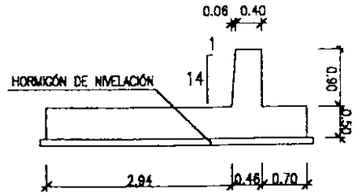


① PINTURA IMPERMEABILIZANTE Y LAMINA DRENANTE
② LAMINA GEOTEXTIL
③ MATERIAL GRANULAR FILTRANTE

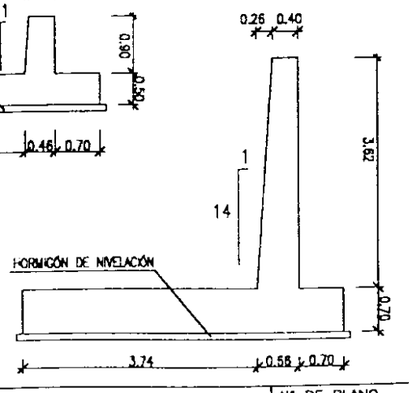
SECCIÓN A A'
MÓDULO 1
ESCALA:1/100



SECCIÓN E E'
MÓDULO 2
ESCALA:1/100



SECCIÓN D D'
MÓDULO 2
ESCALA:1/100



GIF

PROYECTO CONSTRUIDO
LINEA DE ALTA VELOCIDAD
MADRID-ZARAGOZA-BARCELONA-FRONTERA FRANCESA
TRAMO: LLEIDA-MARTORELL. SUBTRAMO V. PLATAFORMA

EL DIRECTOR DEL PROYECTO CONSTRUIDO
Fdo: D. JAIME GARCIA-GERMAN LOPEZ-BELMONTE

EL AUTOR DEL PROYECTO CONSTRUIDO
Fdo: RAÚL FERNÁNDEZ CÁMARA

CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS)
AEPO

ESCALA NORMAL
1:100
Numérica | Gráfica
0 1 2 3m

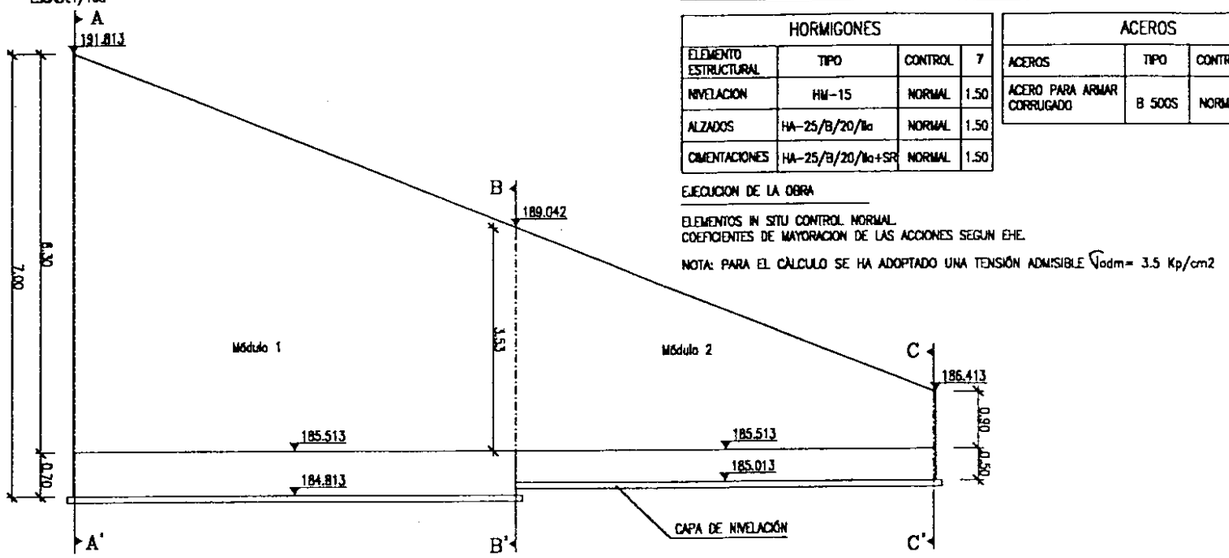
FECHA
NOVIEMBRE 2003

TITULO DEL PLANO
ESTRUCTURAS
PASO INFERIOR 506.7
ALETAS 1 Y 2. DEFINICION GEOMETRICA

Nº DE PLANO
2.9.7
Hoja 3 de 9

ALZADO ALETA 3

ESCALA:1/100



CARACTERISTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	γ
NIVELACION	HM-15	NORMAL	1.50
ALZADOS	HA-25/B/20/IIa	NORMAL	1.50
CIMENTACIONES	HA-25/B/20/IIa+SR	NORMAL	1.50

ACEROS			
ACEROS	TIPO	CONTROL	γ
ACERO PARA ARMAR CORRUGADO	B 500S	NORMAL	1.15

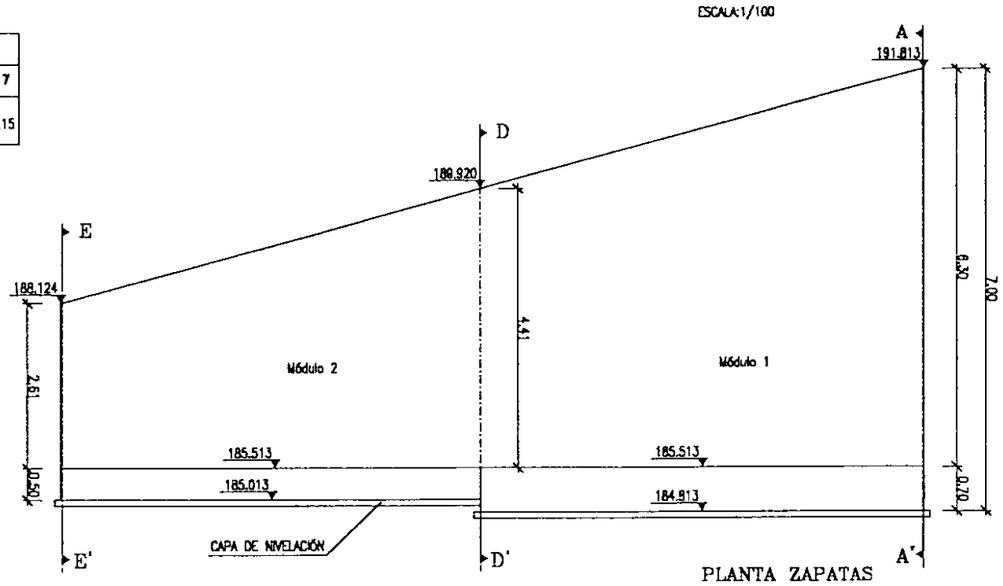
EJECUCION DE LA OBRA

ELEMENTOS IN SITU CONTROL NORMAL.
COEFICIENTES DE MAYORACION DE LAS ACCIONES SEGUN EHE.

NOTA: PARA EL CÁLCULO SE HA ADOPTADO UNA TENSIÓN ADMISIBLE σ_{adm}= 3.5 Kp/cm2

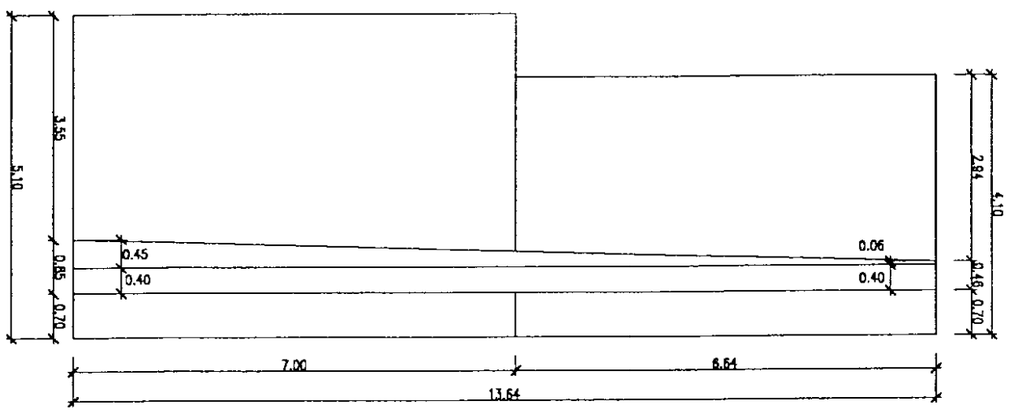
ALZADO ALETA 4

ESCALA:1/100



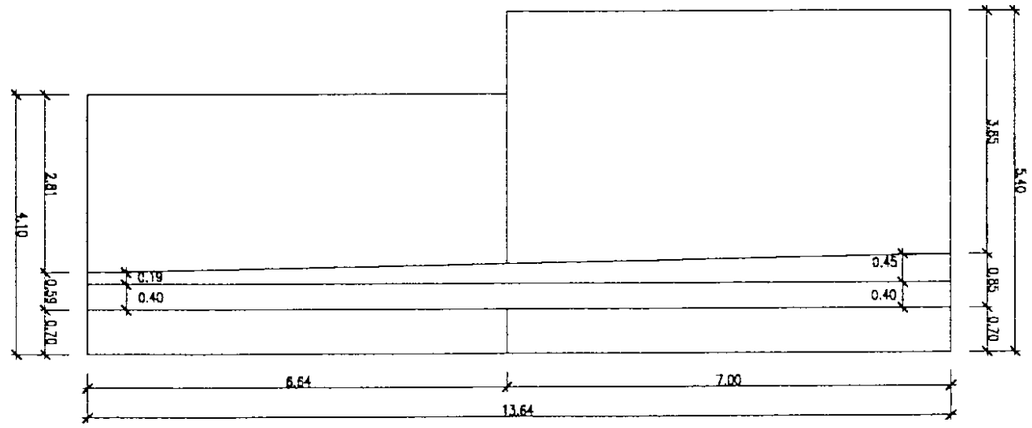
PLANTA ZAPATAS

ESCALA:1/100



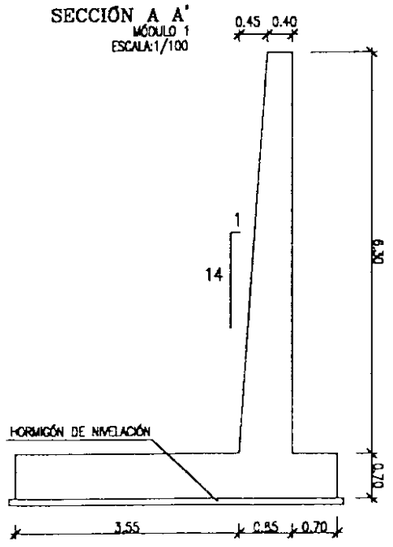
PLANTA ZAPATAS

ESCALA:1/100



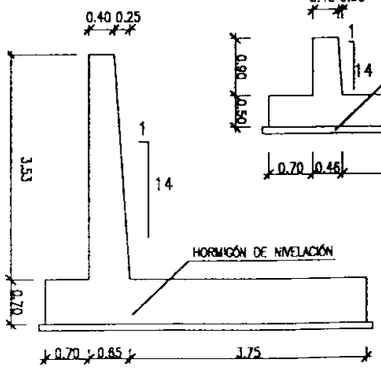
SECCIÓN A A'

MÓDULO 1
ESCALA:1/100



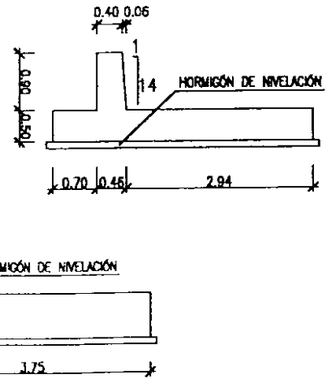
SECCIÓN B B'

MÓDULO 2
ESCALA:1/100



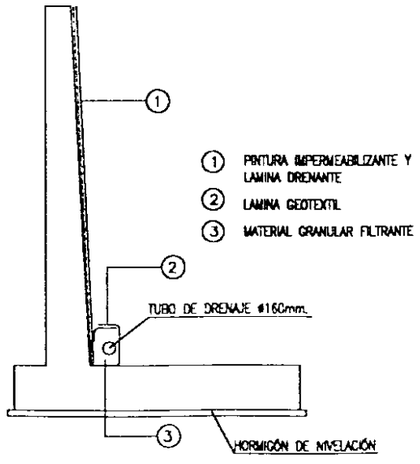
SECCIÓN C C'

MÓDULO 2
ESCALA:1/100



SECCION TIPO

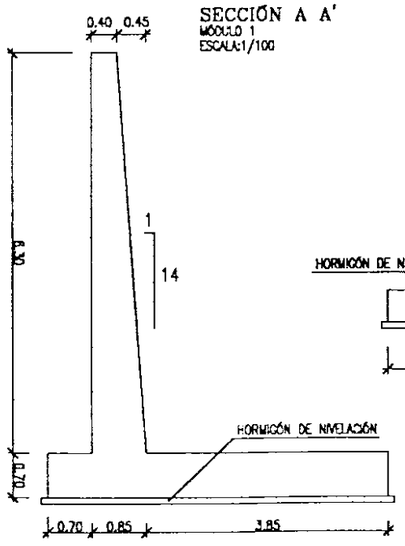
ESCALA 1/100



① PINTURA IMPERMEABILIZANTE Y LAMINA DRENANTE
② LAMINA GEOTEXTIL
③ MATERIAL GRANULAR FILTRANTE

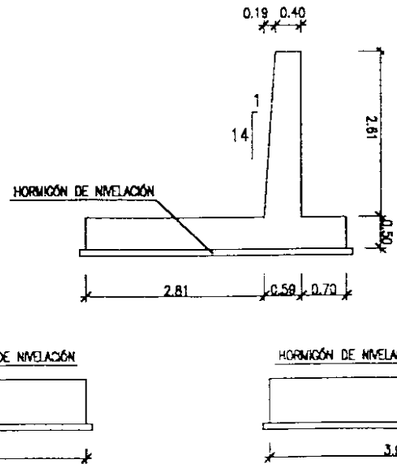
SECCIÓN A A'

MÓDULO 1
ESCALA:1/100



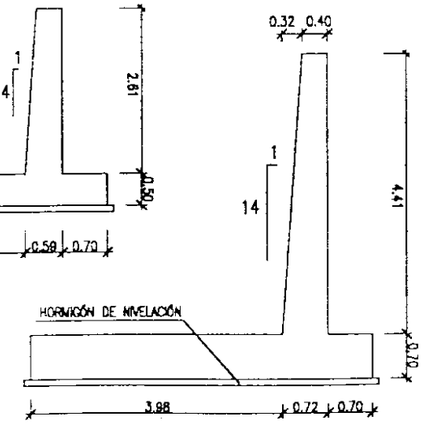
SECCIÓN E E'

MÓDULO 2
ESCALA:1/100



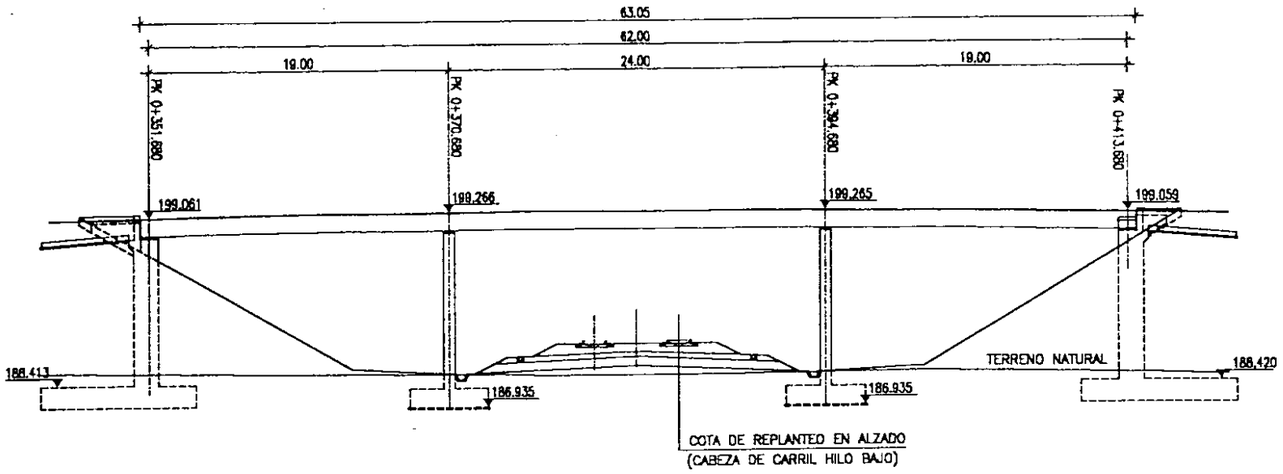
SECCIÓN D D'

MÓDULO 2
ESCALA:1/100

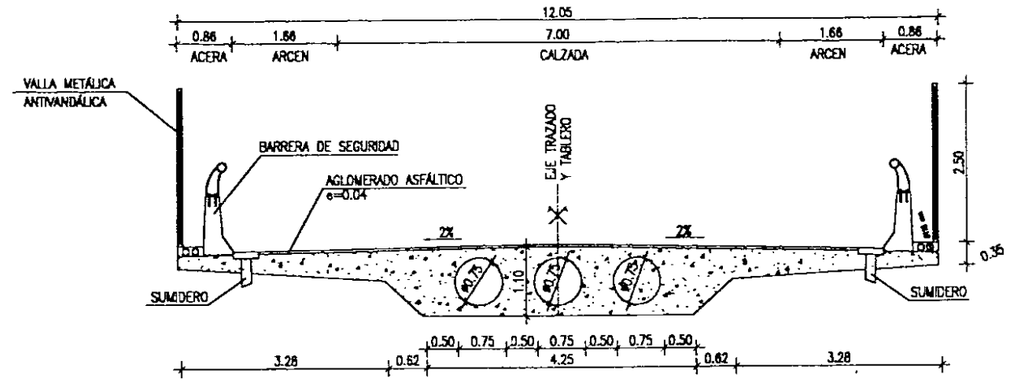


GIF Grupo de Ingeniería Ferroviaria	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA TRAMO: LLEIDA–MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo. D. JAIME GARCIA-GERMAN LOPEZ-BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo. RAÚL FERNÁNDEZ CÁMARA	CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS) AEPO	ESCALA NORMAL 1:100 Numérica / Gráfica 0 1 2 3m	FECHA NOVIEMBRE 2003	TÍTULO DEL PLANO ESTRUCTURAS PASO INFERIOR 506.7 ALETAS 3 Y 4. DEFINICION GEOMETRICA	Nº DE PLANO 2.9.7 Hoja 4 de 9

SECCIÓN LONGITUDINAL
ESCALA 1/400

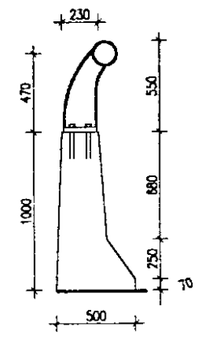


SECCIÓN TRANSVERSAL
ESCALA 1/100



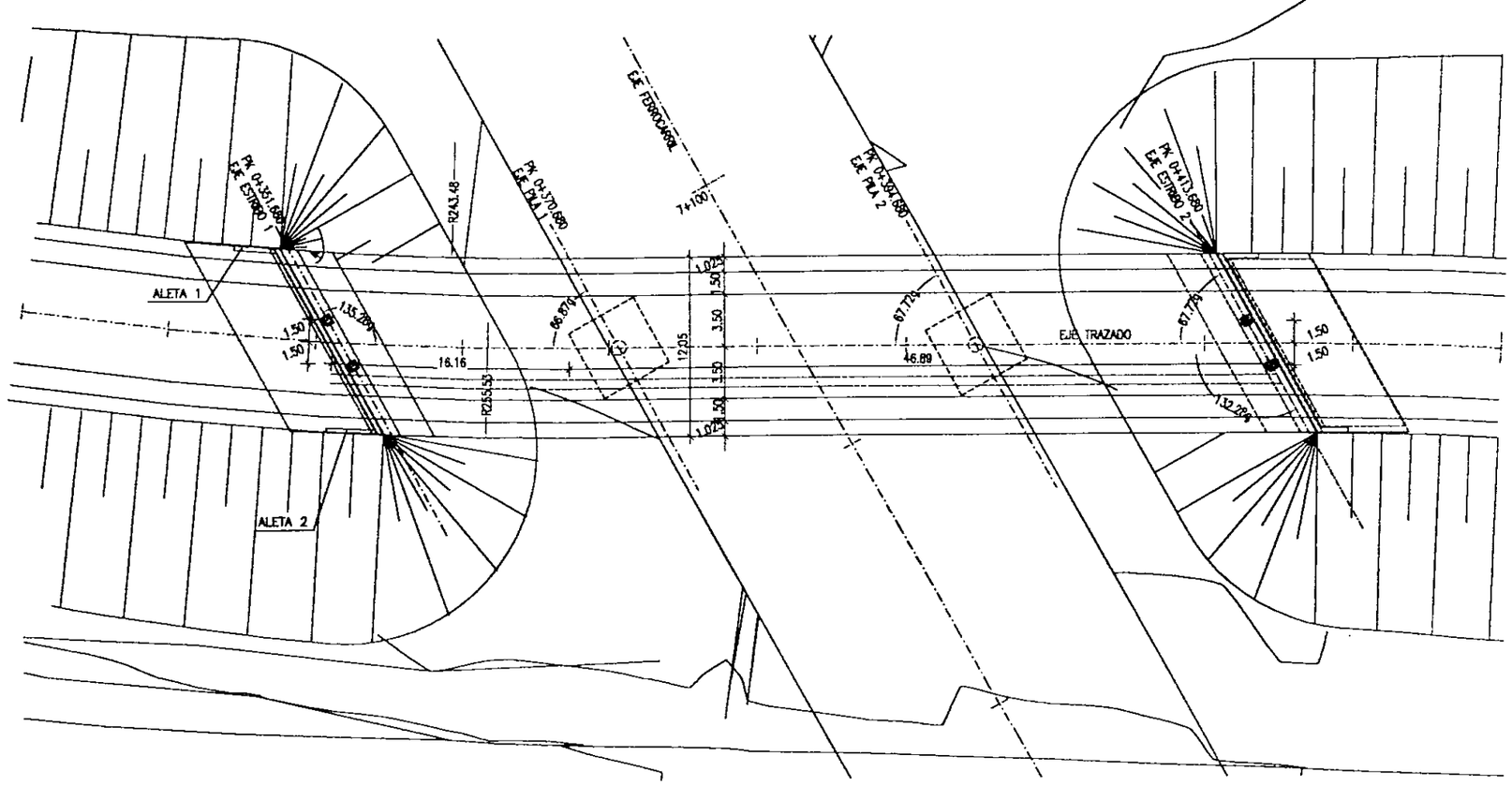
DETALLE DEL PRETIL CON BARANDA

Cotas en mm.



Pretil de hormigón prefabricado con baranda PX6/1-15a

PLANTA
ESCALA 1/400



CARACTERÍSTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	γ
TABLERO	HP-40/B/20/IIa	NORMAL	1.50
ALZADOS	HA-25/B/20/IIa	NORMAL	1.50
CIMENTACIONES	HA-25/B/20/IIa+SR	NORMAL	1.50
NIVELACIÓN	HM-15	NORMAL	1.50

ACEROS			
ACEROS	TIPO	CONTROL	γ
ACERO PARA ARMAR CORRUGADO	B 500 S	NORMAL	1.15
ACERO PARA TESAR	Y 1860 S7	NORMAL	1.15

EJECUCIÓN DE LA OBRA

ELEMENTOS IN SITU CONTROL NORMAL.
COEFICIENTES DE MAYORACIÓN DE LAS ACCIONES SEGÚN EHE.

GIF Grupo de Ingeniería Ferroviaria

PROYECTO CONSTRUIDO
LINEA DE ALTA VELOCIDAD
MADRID-ZARAGOZA-BARCELONA-FRONTERA FRANCESA
TRAMO: LLEIDA-MARTORELL SUBTRAMO V. PLATAFORMA

EL DIRECTOR DEL PROYECTO CONSTRUIDO
Fdo: D. JAIME GARCIA-DEMAN LOPEZ-BELMONTE

EL AUTOR DEL PROYECTO CONSTRUIDO
Fdo: RAÚL FERNÁNDEZ CÁMARA

CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS)
AEPO

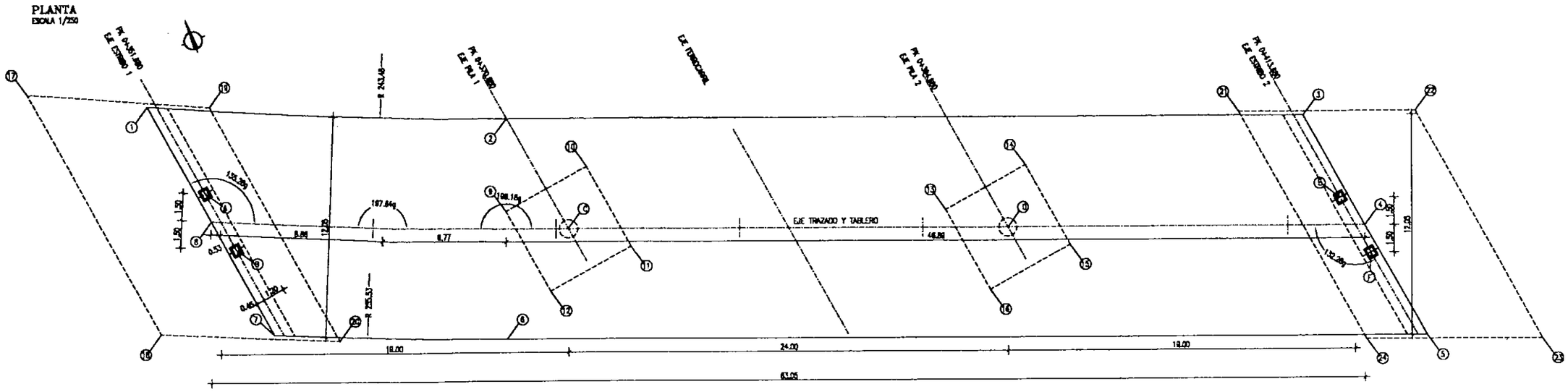
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FECHA
NOVIEMBRE 2003

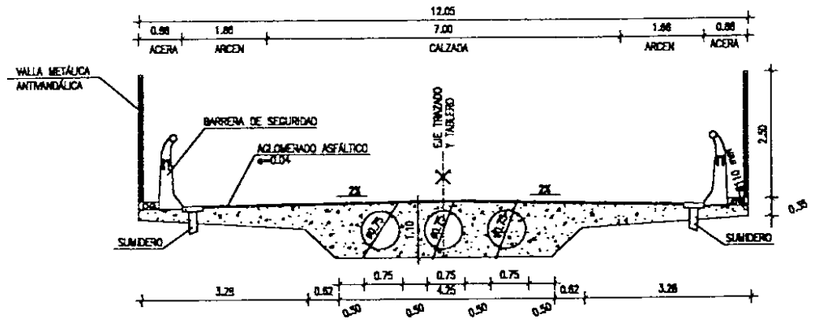
TÍTULO DEL PLANO
PASO SUPERIOR 507.1
PLANTA, ALZADO Y SECCION

Nº DE PLANO
2.9.9
Hoja 1 de 14

PLANTA
ESCALA 1/250



SECCIÓN TRANSVERSAL
ESCALA 1/100



REPLANTEO APOYOS		
PUNTO	X	Y
A	348403.863	4569043.542
B	348404.093	4569040.029
C	348421.248	4569034.509
D	348443.482	4569025.473
E	348460.877	4569020.023
F	348461.291	4569016.816

REPLANTEO TABLERO Y PILAS		
PUNTO	X	Y
1	348402.483	4569048.496
2	348420.385	4569041.363
3	348460.729	4569024.967
4	348461.561	4569018.125
5	348462.393	4569011.284
6	348415.888	4569030.184
7	348404.220	4569035.265
8	348403.355	4569042.348
9	348418.464	4569036.688
10	348423.427	4569037.294
11	348424.033	4569032.331
12	348419.070	4569031.725
13	348440.698	4569027.652
14	348445.661	4569028.258
15	348446.267	4569023.295
16	348441.304	4569022.688
17	348396.660	4569052.636
18	348398.484	4569037.689
19	348405.820	4569048.147
20	348407.388	4569033.580
21	348457.575	4569026.468
22	348466.423	4569022.872
23	348468.143	4569008.735
24	348459.294	4569012.331

CARACTERÍSTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	γ_c
TABLERO	HP-40/B/20/IIa	NORMAL	1.50
ALZADOS	HA-25/B/20/IIa	NORMAL	1.50
CIMENTACIONES	HA-25/B/20/IIa+SR	NORMAL	1.50
NIVELACIÓN	HM-15	NORMAL	1.50

ACEROS			
ACEROS	TIPO	CONTROL	γ_s
ACERO PARA ARMAR CORRUGADO	B 500 S	NORMAL	1.15
ACERO PARA TESAR	Y 1860 S7	NORMAL	1.15

EJECUCIÓN DE LA OBRA

ELEMENTOS IN SITU CONTROL NORMAL.
COEFICIENTES DE MAYORACIÓN DE LAS ACCIONES SEGÚN EHE.

GIF

PROYECTO CONSTRUIDO
LINEA DE ALTA VELOCIDAD
MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA
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Fdo: RAÚL FERNÁNDEZ CÁMARA

CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS)
AEPO

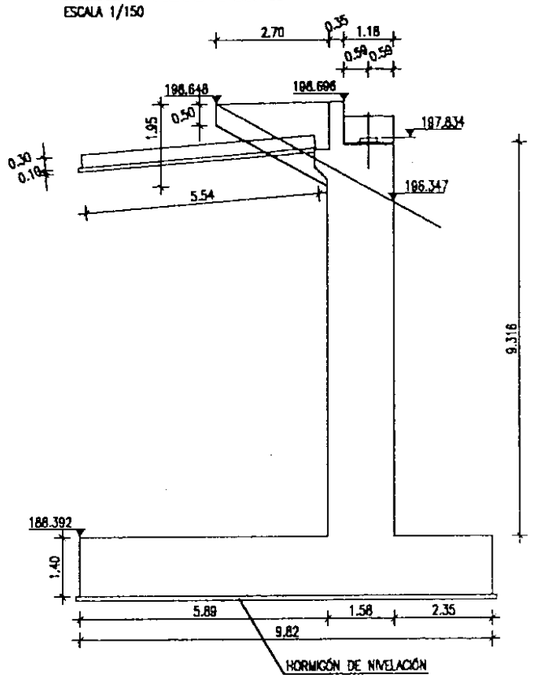
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Gráfica
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FECHA
NOVIEMBRE 2003

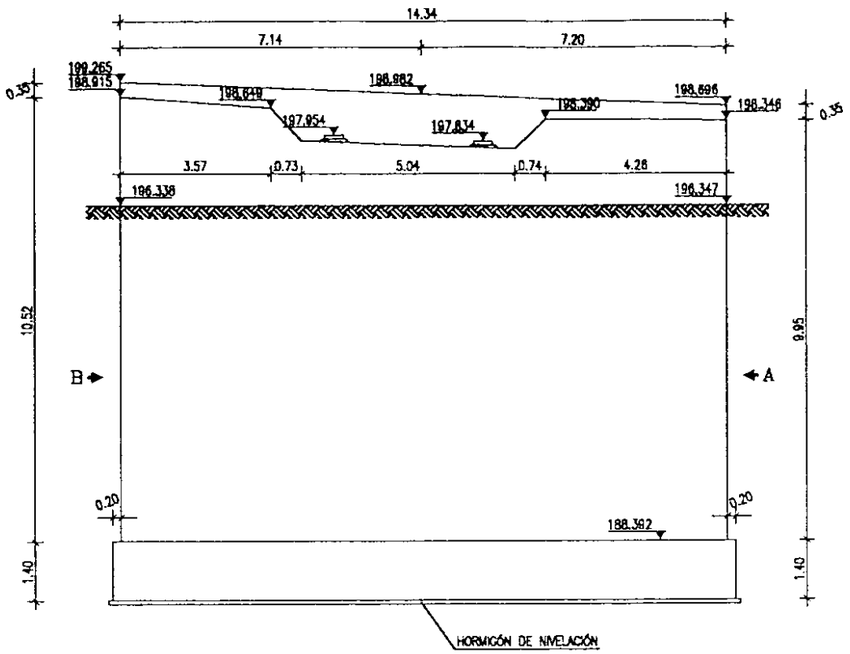
TITULO DEL PLANO
PASO SUPERIOR 507.1
REPLANTEO DE TABLERO Y CIMENT.

Nº DE PLANO
2.9.9
Hoja 2 de 14

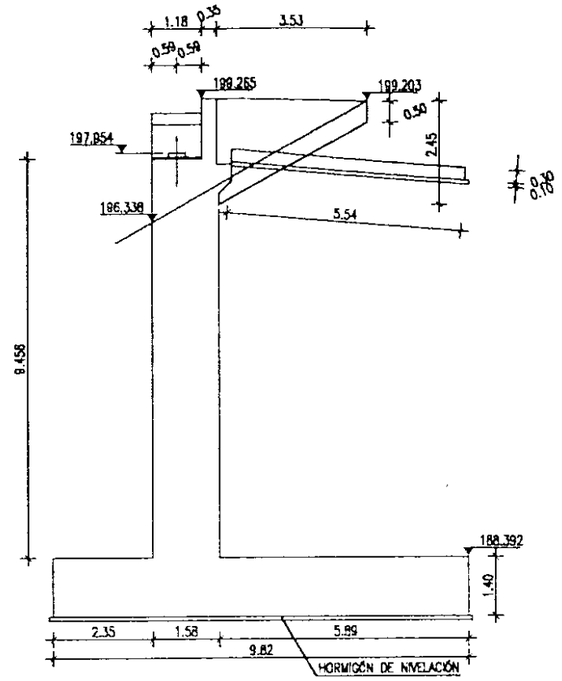
ALZADO VISTO POR A
ESCALA 1/150



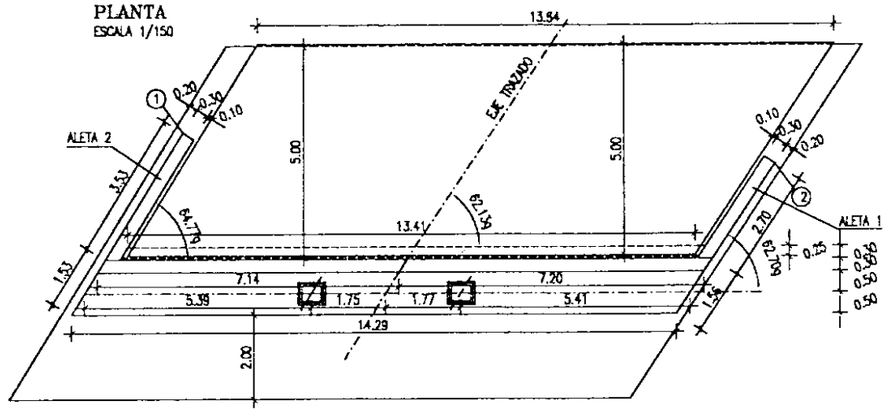
ALZADO
ESCALA 1/150



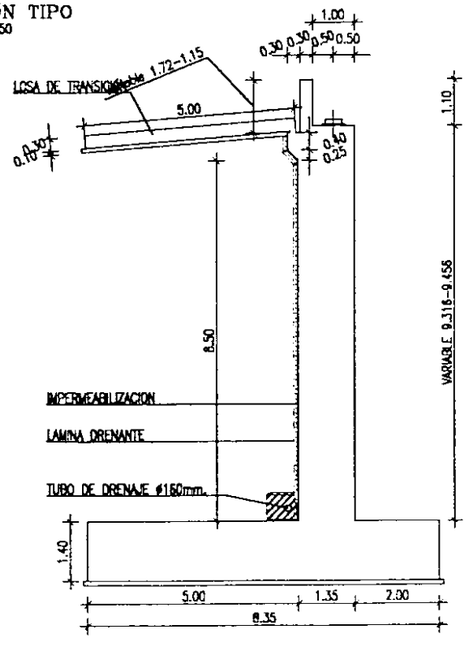
ALZADO VISTO POR B
ESCALA 1/150



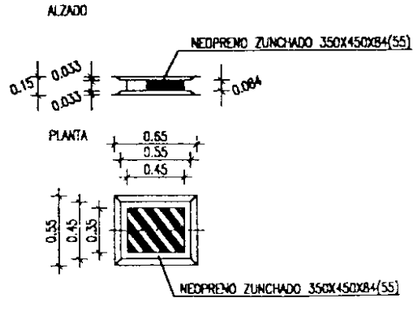
PLANTA
ESCALA 1/150



SECCIÓN TIPO
ESCALA 1/150



DETALLE APARATO DE APOYO
ESCALA:1/50



REPLANTEO ALETAS		
PUNTO	X	Y
1	348400.641	4569036.915
2	348399.694	4569050.893

CARACTERÍSTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	γ
TABLERO	HP-40/B/20/IIa	NORMAL	1.50
ALZADOS	HA-25/B/20/IIa	NORMAL	1.50
CIMENTACIONES	HA-25/B/20/IIa+SR	NORMAL	1.50
NIVELACIÓN	HM-15	NORMAL	1.50

ACEROS			
ACEROS	TIPO	CONTROL	γ
ACERO PARA ARMAR CORRUGADO	B 500 S	NORMAL	1.15
ACERO PARA TESAR	Y 1860 S7	NORMAL	1.15

EJECUCIÓN DE LA OBRA

ELEMENTOS IN SITU CONTROL NORMAL
COEFICIENTES DE MAYORACIÓN DE LAS ACCIONES SEGÚN EHE

GIF Grupo de Ingeniería Ferroviaria

PROYECTO CONSTRUIDO
LINEA DE ALTA VELOCIDAD
MADRID-ZARAGOZA-BARCELONA-FRONTERA FRANCESA
TRAMO: LLEIDA-MARTORELL. SUBTRAMO V. PLATAFORMA

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EL AUTOR DEL PROYECTO CONSTRUIDO
Fdo: RAÚL FERNÁNDEZ CÁMARA

CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS)
AEPO

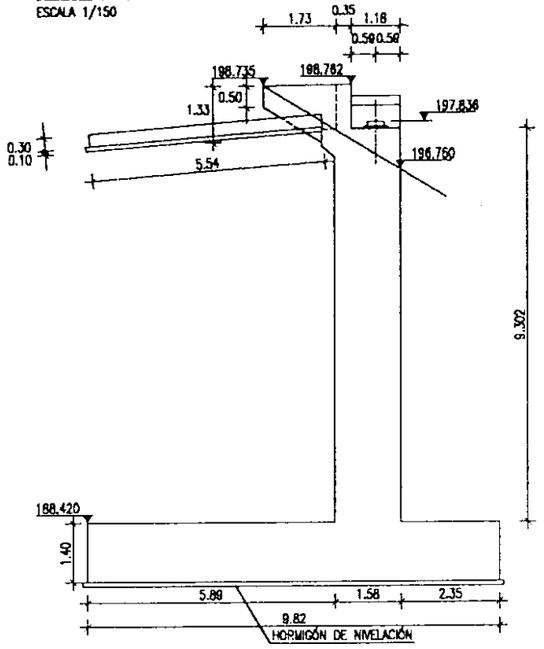
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1:50
Numérica | Gráfica
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0 0.5 1 1.5m

FECHA
NOVIEMBRE 2003

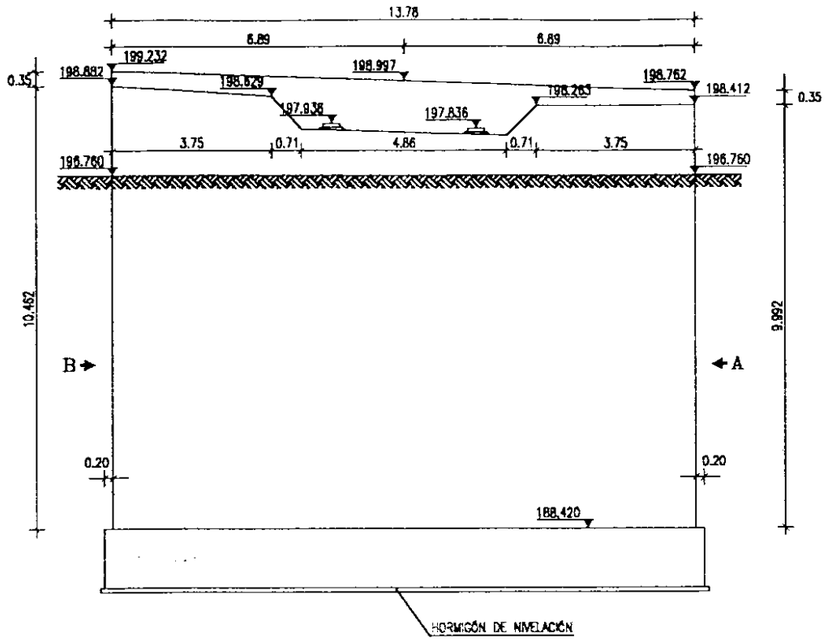
TÍTULO DEL PLANO
PASO SUPERIOR 507.1
ESTRIBO 1. DEFINICION GEOMETRICA

Nº DE PLANO
2.9.9
Hoja 3 de 14

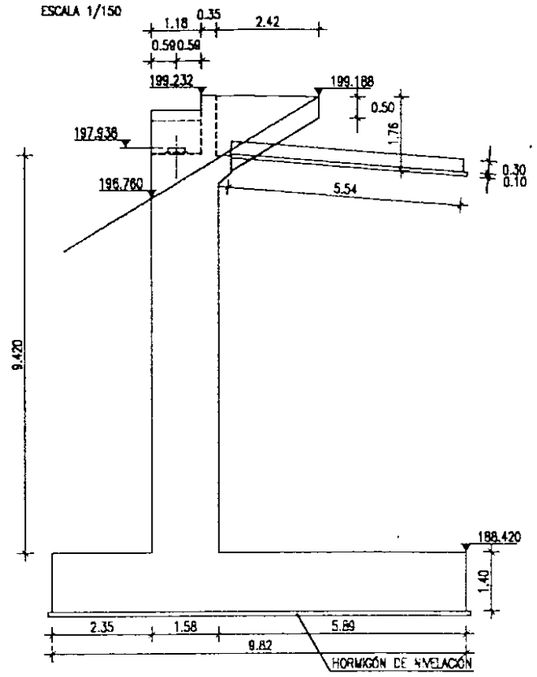
ALZADO VISTO POR A
ESCALA 1/150



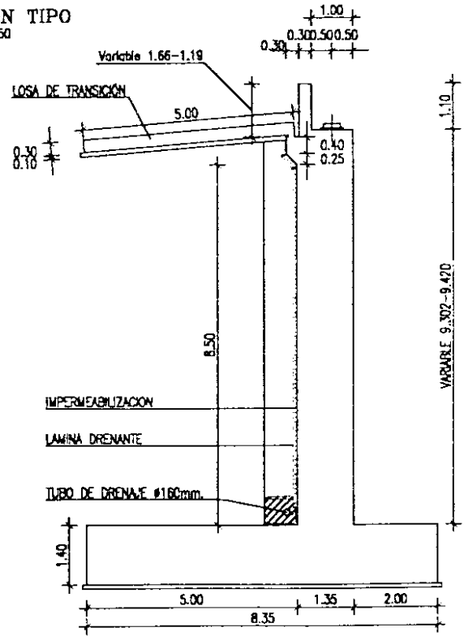
ALZADO
ESCALA 1/150



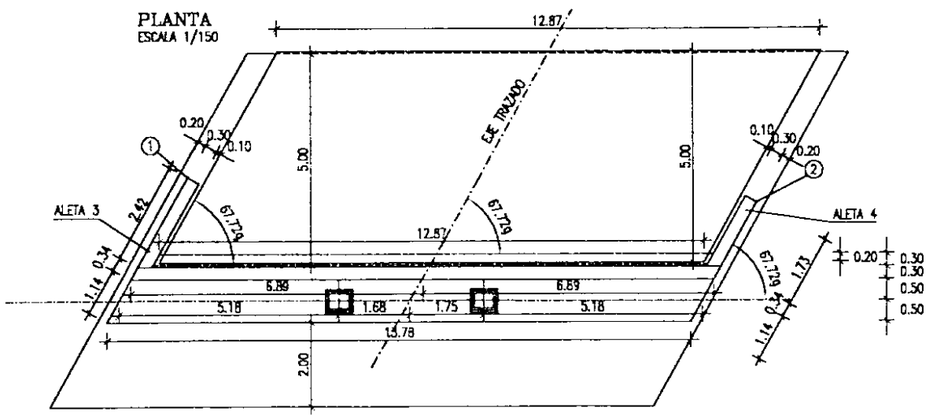
ALZADO VISTO POR B
ESCALA 1/150



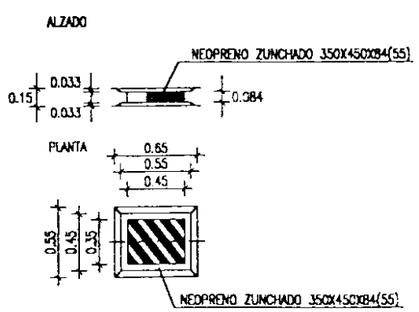
SECCIÓN TIPO
ESCALA 1/150



PLANTA
ESCALA 1/150



DETALLE APARATO DE APOYO
ESCALA:1/50



REPLANTEO ALETAS		
PUNTO	X	Y
1	348463.341	4569023.909
2	348464.366	4569010.488

CARACTERÍSTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	7
TABLERO	HP-40/B/20/IIa	NORMAL	1.50
ALZADOS	HA-25/B/20/IIc	NORMAL	1.50
CIMENTACIONES	HA-25/B/20/IIc+SR	NORMAL	1.50
NIVELACIÓN	HM-15	NORMAL	1.50

ACEROS			
ACEROS	TIPO	CONTROL	7
ACERO PARA ARMAR CORRUGADO	B 500 S	NORMAL	1.15
ACERO PARA TESAR	Y 1860 S7	NORMAL	1.15

EJECUCIÓN DE LA OBRA

ELEMENTOS IN SITU CONTROL NORMAL
COEFICIENTES DE MAYORACIÓN DE LAS ACCIONES SEGÚN EHE.

GIF Grupo de Ingeniería Ferroviaria

PROYECTO CONSTRUIDO
LINEA DE ALTA VELOCIDAD
MADRID-ZARAGOZA-BARCELONA-FRONTERA FRANCESA
TRAMO: LLEIDA-MARTORELL. SUBTRAMO V. PLATAFORMA

EL DIRECTOR DEL PROYECTO CONSTRUIDO
Fdo: EL JAIME GARCIA-GERMAN LOPEZ-BELMONTE

EL AUTOR DEL PROYECTO CONSTRUIDO
Fdo: RAÚL FERNÁNDEZ CÁMARA

CONSULTOR (ASISTENCIA AL CONTROL DE OBRAS)
AEPO

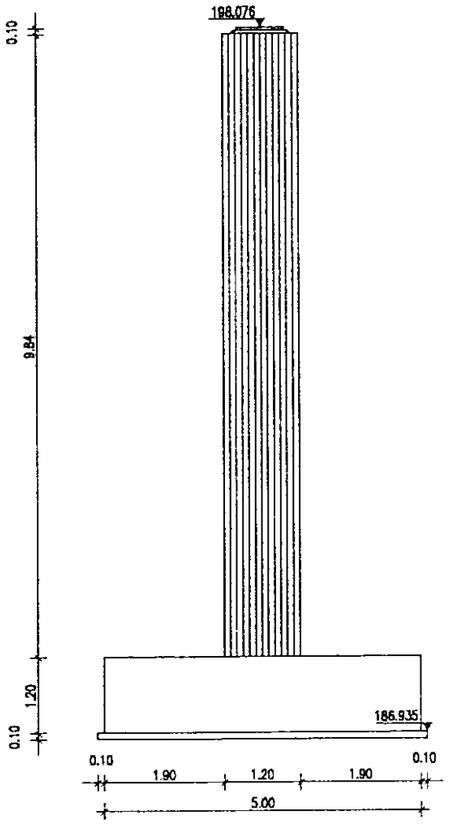
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Gráfica
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FECHA
NOVIEMBRE 2003

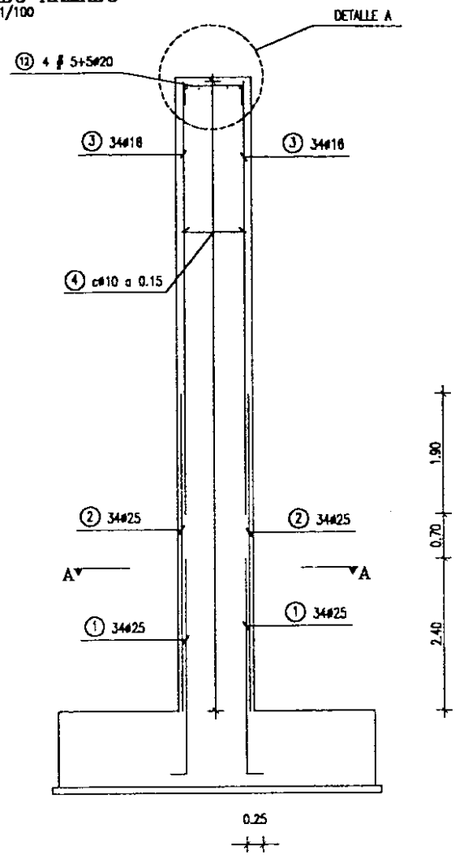
TÍTULO DEL PLANO
PASO SUPERIOR 507.1
ESTRIBO 2, DEFINICION GEOMETRICA

Nº DE PLANO
2.9.9
Hoja 4 de 14

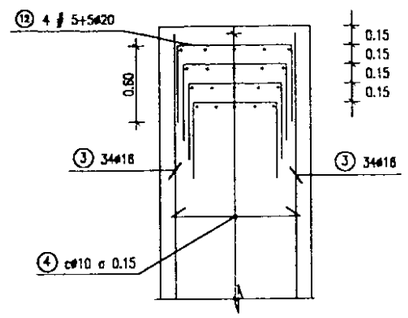
ALZADO
ESCALA 1/100



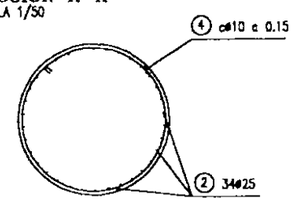
ALZADO ARMADO
ESCALA 1/100



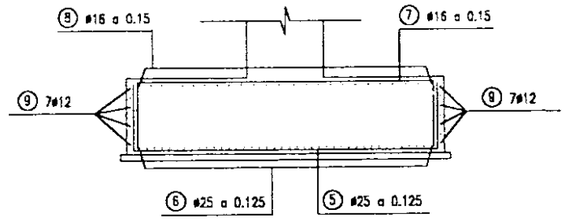
DETALLE A
ESCALA 1/50



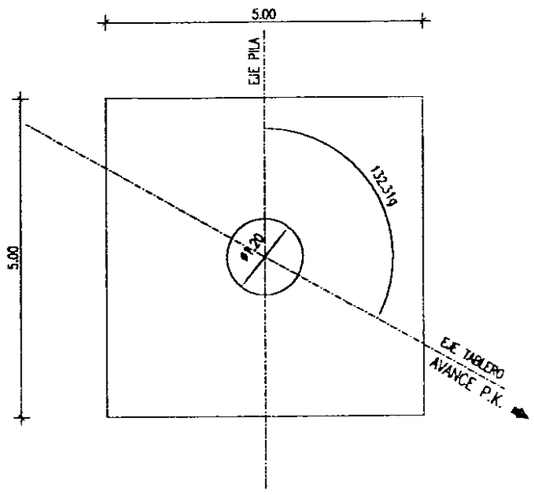
SECCIÓN A–A
ESCALA 1/50



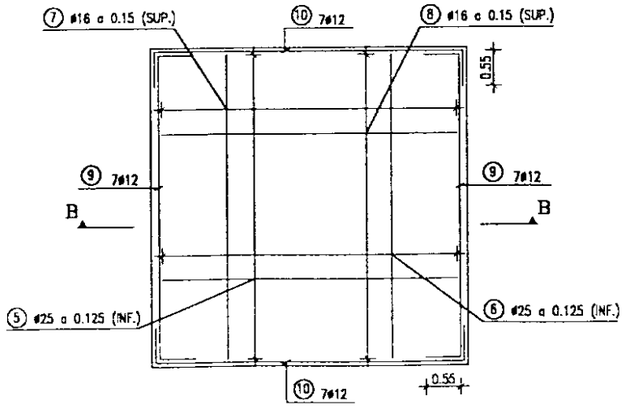
SECCIÓN B–B
ESCALA 1/100



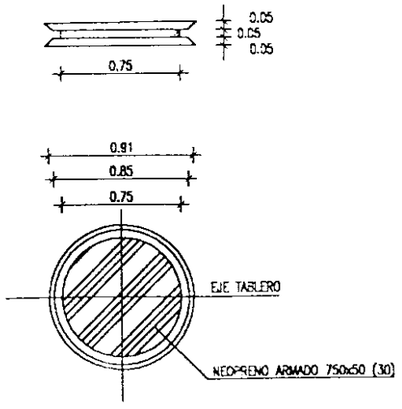
PLANTA
ESCALA 1/100



PLANTA ARMADO
ESCALA 1/100



DETALLE APOYOS
ESCALA 1/40



NOTA: LAS ZAPATAS HAN SIDO CALCULADAS PARA UNA $\bar{\sigma}_{adm.}$ DE= 350KN/m^2.
LA DIRECCIÓN FACULTATIVA DEBERÁ VERIFICAR ESTE VALOR
DURANTE LA CONSTRUCCIÓN DE LA PILA.

CARACTERÍSTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	?
TABLERO	HP–40/B/20/IIa	NORMAL	1.50
ALZADOS	HA–25/B/20/IIa	NORMAL	1.50
CIMENTACIONES	HA–25/B/20/IIa+SR	NORMAL	1.50
NIVELACIÓN	HM–15	NORMAL	1.50

ACEROS			
ACEROS	TIPO	CONTROL	?
ACERO PARA ARMAR CORRUGADO	B 500 S	NORMAL	1.15
ACERO PARA TESAR	Y 1860 S7	NORMAL	1.15

EJECUCIÓN DE LA OBRA

ELEMENTOS IN SITU CONTROL NORMAL.
COEFICIENTES DE MAYORACIÓN DE LAS ACCIONES SEGÚN EHE.

GIF

PROYECTO CONSTRUIDO
LINEA DE ALTA VELOCIDAD
MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA
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AEPO

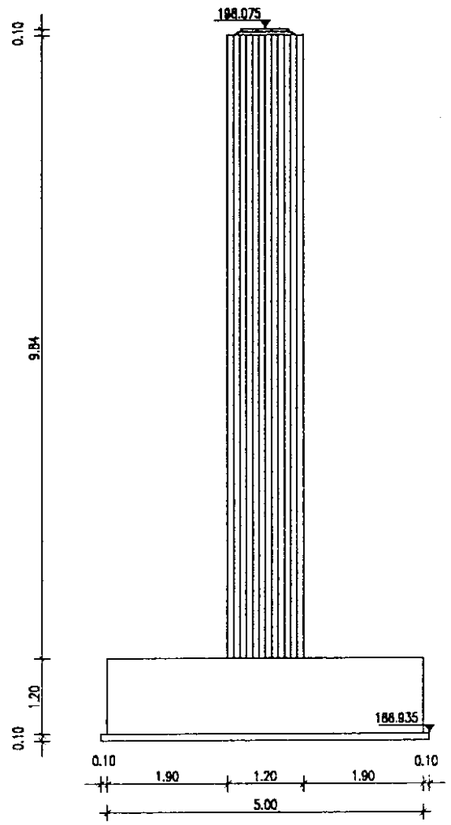
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Gráfica
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FECHA
NOVIEMBRE 2003

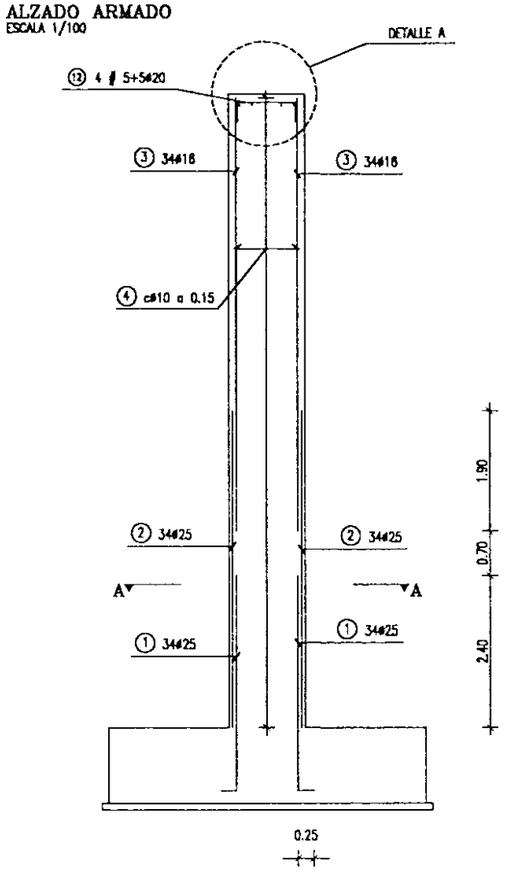
TÍTULO DEL PLANO
PASO SUPERIOR 507.1
PILA 1. DEFINICION GEOMETR. Y ARMAD.

Nº DE PLANO
2.9.9
Hoja 7 de 14

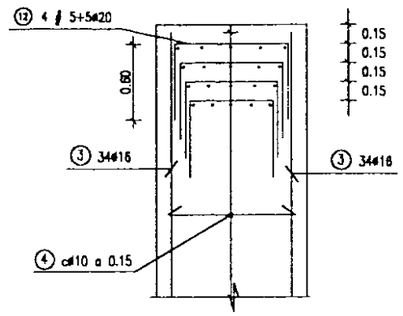
ALZADO
ESCALA 1/100



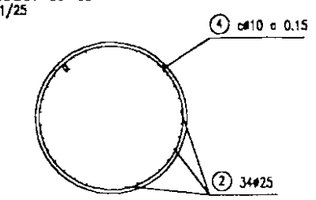
ALZADO ARMADO
ESCALA 1/100



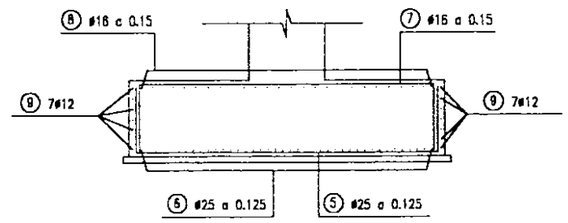
DETALLE A
ESCALA 1/50



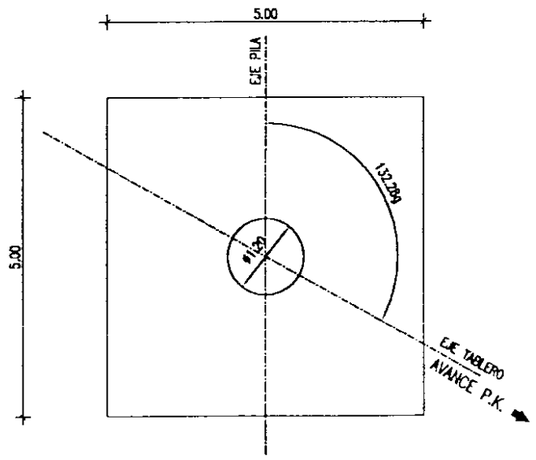
SECCIÓN A–A
ESCALA 1/25



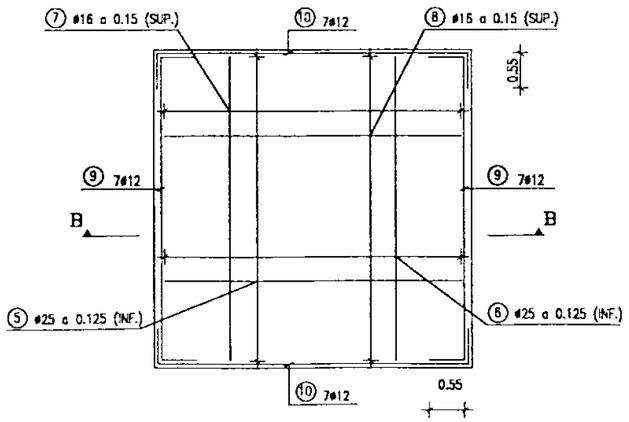
SECCIÓN B–B
ESCALA 1/100



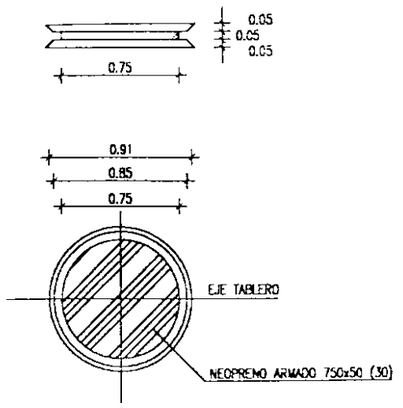
PLANTA
ESCALA 1/100



PLANTA ARMADO
ESCALA 1/100



DETALLE APOYOS
ESCALA 1/40



NOTA: LAS ZAPATAS HAN SIDO CALCULADAS PARA UNA $\bar{\sigma}$adm. DE= 350KN/m². LA DIRECCIÓN FACULTATIVA DEBERÁ VERIFICAR ESTE VALOR DURANTE LA CONSTRUCCIÓN DE LA PILA.

CARACTERÍSTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	γ
TABLERO	HP–40/B/20/IIa	NORMAL	1.50
ALZADOS	HA–25/B/20/IIa	NORMAL	1.50
CIMENTACIONES	HA–25/B/20/IIa+SR	NORMAL	1.50
NIVELACIÓN	HM–15	NORMAL	1.50

ACEROS			
ACEROS	TIPO	CONTROL	γ
ACERO PARA ARMAR CORRUGADO	B 500 S	NORMAL	1.15
ACERO PARA TESAR	Y 1650 S7	NORMAL	1.15

EJECUCIÓN DE LA OBRA

ELEMENTOS IN SITU CONTROL NORMAL
COEFICIENTES DE MAYORACIÓN DE LAS ACCIONES SEGÚN EHE.

GIF Grupo de Ingeniería Ferroviaria

PROYECTO CONSTRUIDO
LINEA DE ALTA VELOCIDAD
MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA
TRAMO: LLEIDA–MARTORELL. SUBTRAMO V. PLATAFORMA

EL DIRECTOR DEL PROYECTO CONSTRUIDO
Fdo.: D. JAIME GARCIA–GERMAN LOPEZ–BELMONTE

EL AUTOR DEL PROYECTO CONSTRUIDO
Fdo.: RAÚL FERNANDEZ CAMARA

CONSULTOR (ASISTENCIA AL CONTROL DE OBRAS)
AEPO

ESCALA NORMAL
1:100
1:40
Numérica | Gráfica
0 1 2 3m
0 0.4 0.8 1.2m

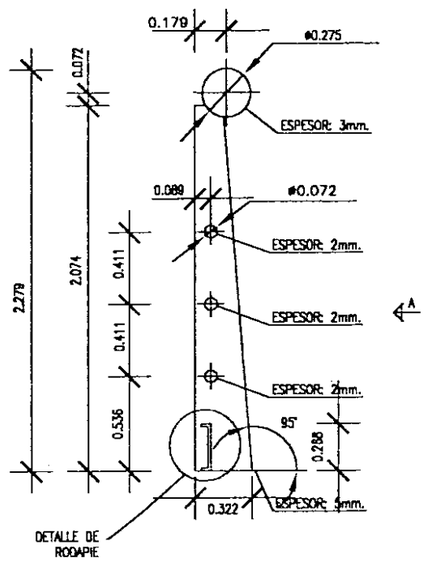
FECHA
NOVIEMBRE 2003

TITULO DEL PLANO
PASO SUPERIOR 507.1
PILA 2, DEFINICION GEOMETR. Y ARMAD.

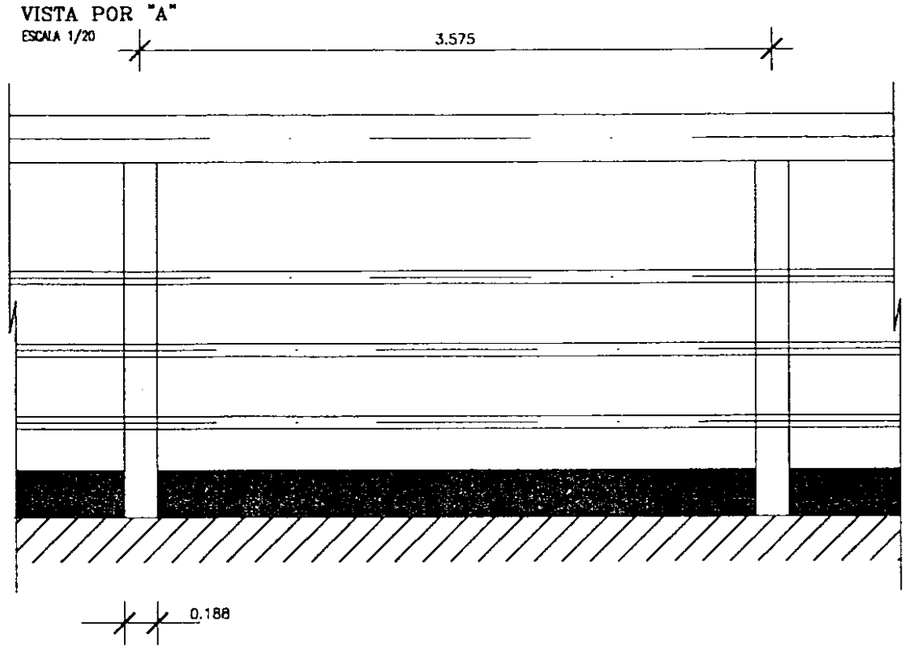
Nº DE PLANO
2.9.9
Hoja 8 de 14

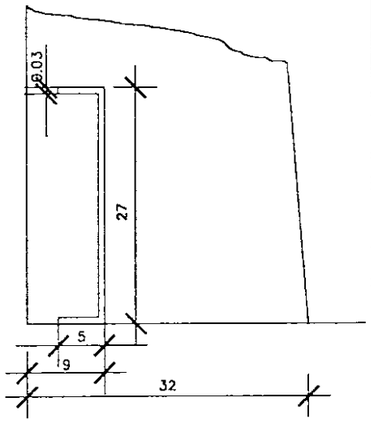
BARANDILLA CON IMPOSTA VIADUCTO, E-1 Y E-2

ALZADO
ESCALA 1/20



VISTA POR "A"
ESCALA 1/20

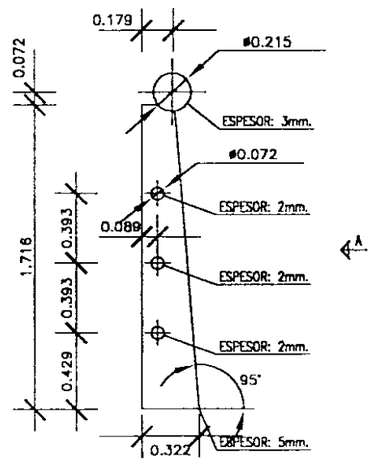




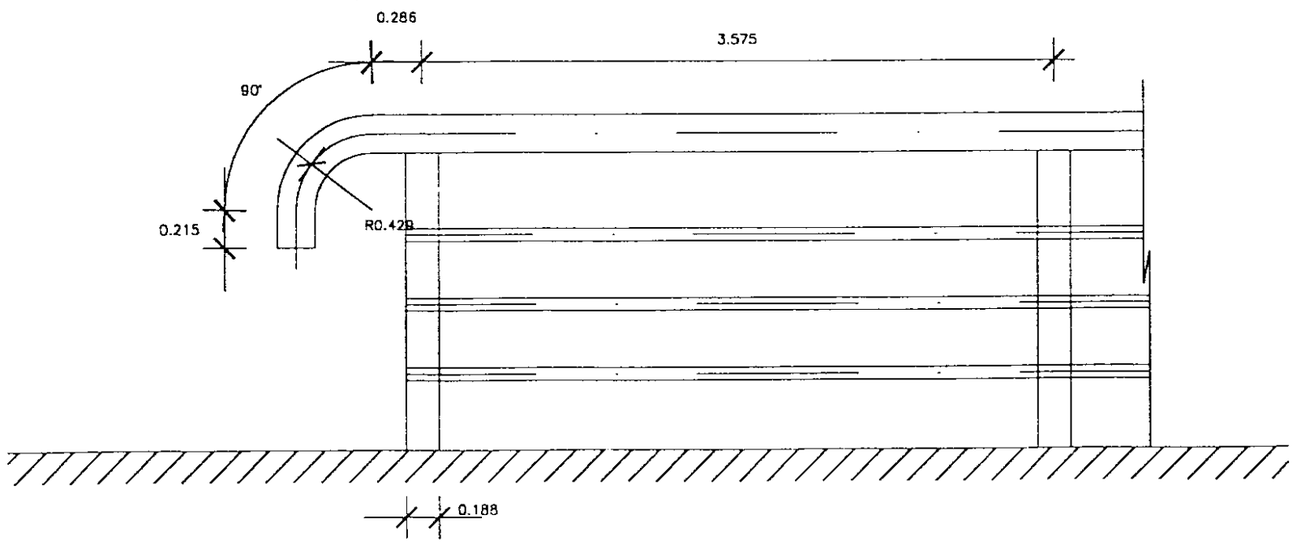
DETALLE DE RODAPIE
ESCALA 1/4
(cotas en mm.)

BARANDILLA PASO SUPERIOR 504+900

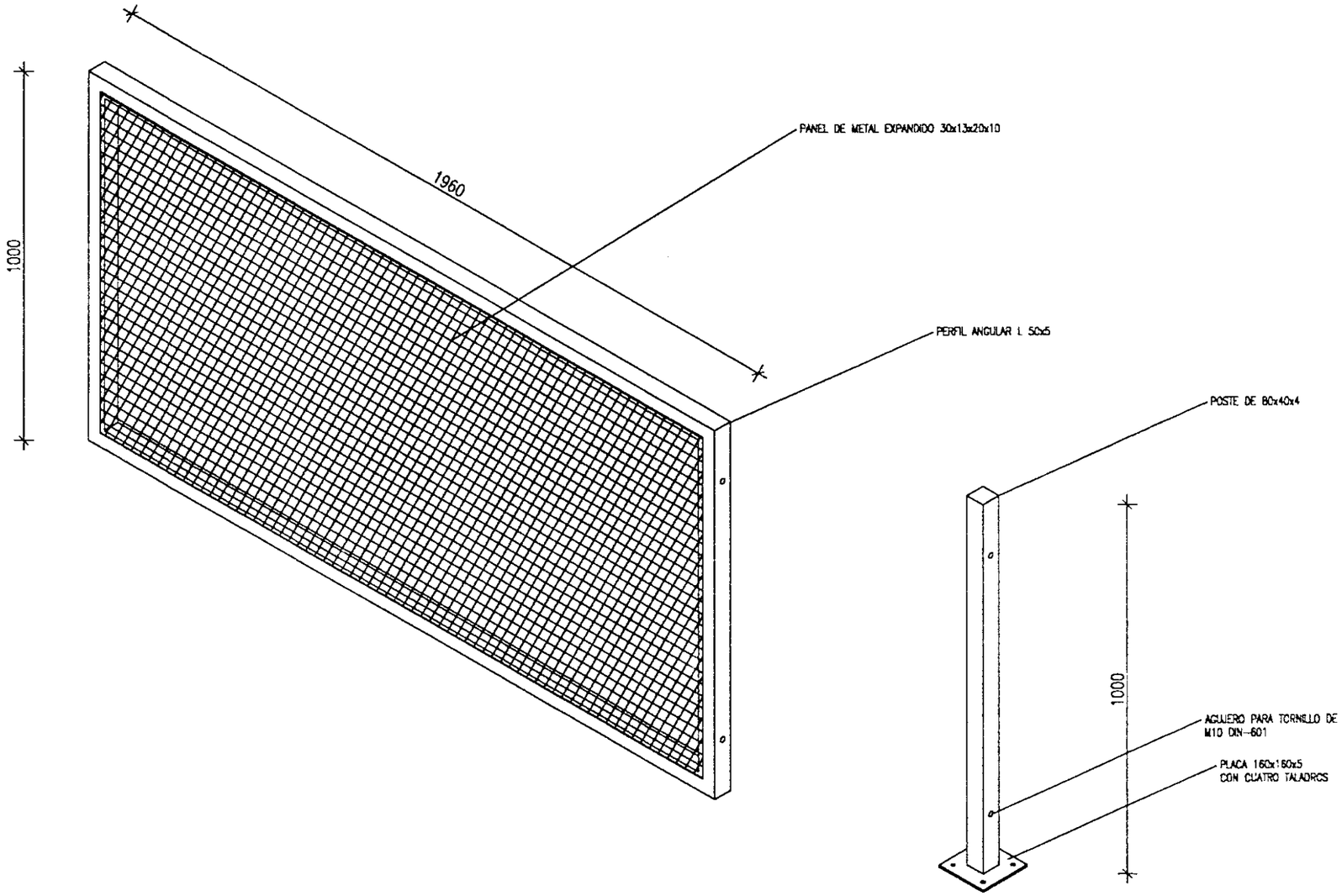
ALZADO
ESCALA 1/20



VISTA POR "A"
ESCALA 1/20



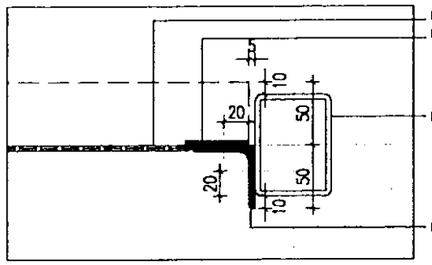
GIF	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID-ZARAGOZA-BARCELONA-FRONTERA FRANCESA TRAMO: LLEIDA-MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo: D. JAIME GARCIA-GERMAN LOPEZ-BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo: RAÚL FERNÁNDEZ CAMARA	CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS) AEPO	ESCALA NORMAL 1:20 1:4 Numérica Gráfica 0 0.20 0.40 0.60m 0 0.04 0.08 0.12m	FECHA NOVIEMBRE 2003	TITULO DEL PLANO ESTRUCTURAS DETALLES TIPOLOGIA DE BARANDILLAS	Nº DE PLANO 2.9.10 Hoja 1 de 7



* MATERIAL GALVANIZADO EN CALIENTE.

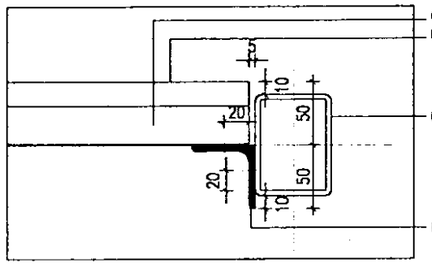
* SE TRATARÁ POSTERIORMENTE CON UNA CAPA DE IMPRIMACIÓN Y UNA MANO DE ESMALTE DE POLIURETANO ASFÁLTICO DE 35-40 MICRAS.

GIF	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID-ZARAGOZA-BARCELONA-FRONTERA FRANCESA TRAMO: LLEIDA-MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo: D. JAIME GARCIA-GERMAN LOPEZ-BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo: RAÚL FERNÁNDEZ CAÑAVA	CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS) AEPO	ESCALA NORMAL SIN ESCALA Numérico | Gráfica	FECHA NOVIEMBRE 2003	TÍTULO DEL PLANO ESTRUCTURAS DETALLES GUARDACUERPOS P.S. 506+700	Nº DE PLANO 2.9.10 Hoja 2 de 7



DETALLE P1: FIJACION DEL PANEL DE MALLA EXPANDIDA AL POSTE EXISTENTE

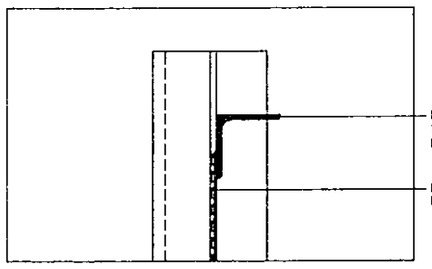
ESCALA A3 1/5 -cotas mm.-



DETALLE P2: FIJACION DE LA CHAPA TIPO PEGASO SOBRE EL BASTIDOR DEL CERRAMIENTO EXISTENTE

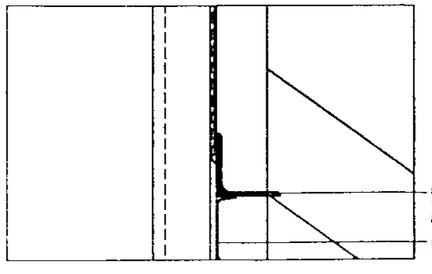
ESCALA A3 1/5

* EN LOS CASOS EN LOS QUE EL APOYO DE LA BARANDILLA EXISTENTE ESTE COMPLETAMENTE PEGADO AL POSTE EXISTENTE, SE PODRA SUSTITUIR POR UN PERFIL L-60.30.5 COLOCADO POR DETRAS DE LA CHAPA TIPO "PEGASO"



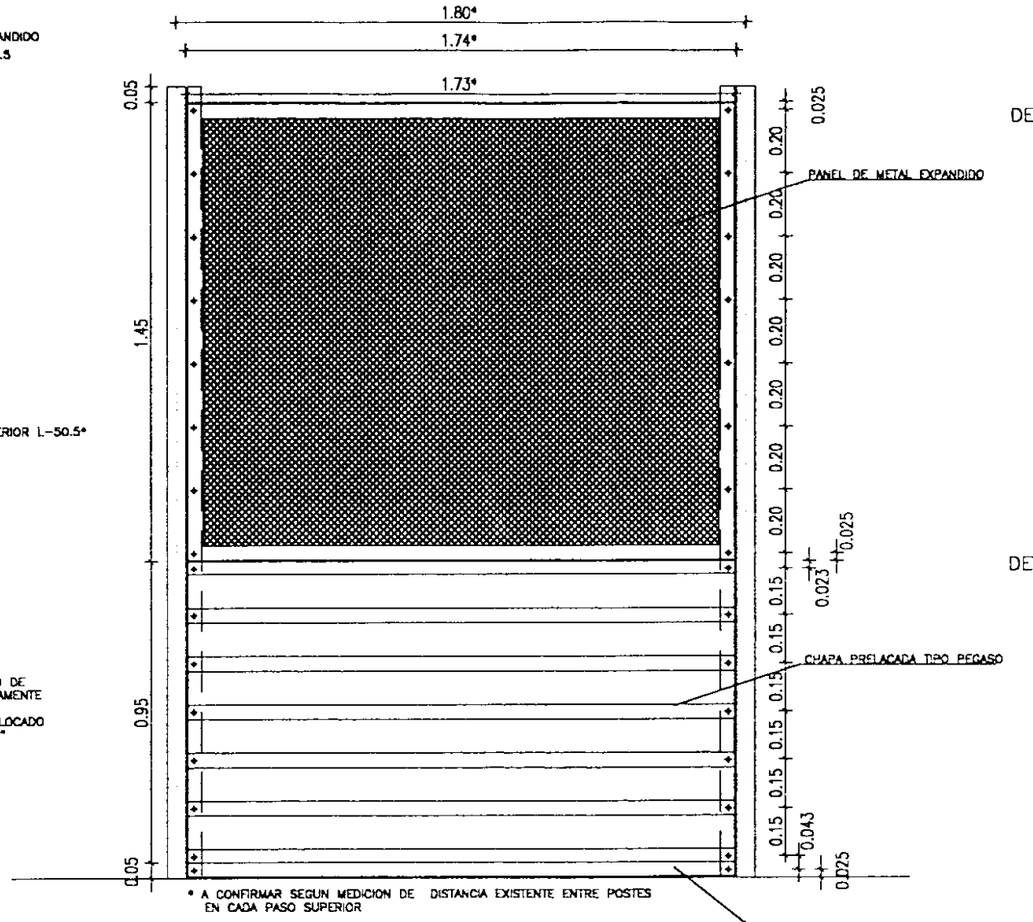
DETALLE S1: PARTE SUPERIOR COLOCADA DEL PANEL DE METAL EXPANDIDO

ESCALA A3 1/5



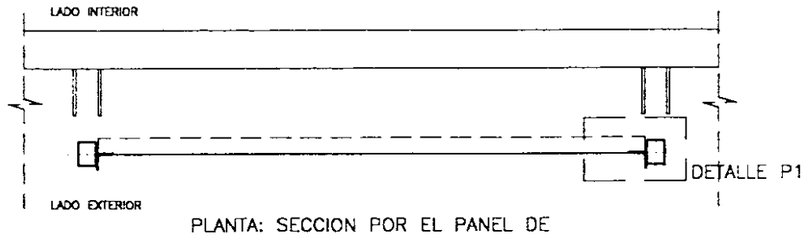
DETALLE S2: ENCUENTRO DEL PANEL DE METAL EXPANDIDO CON LA CHAPA TIPO PEGASO

ESCALA A3 1/5



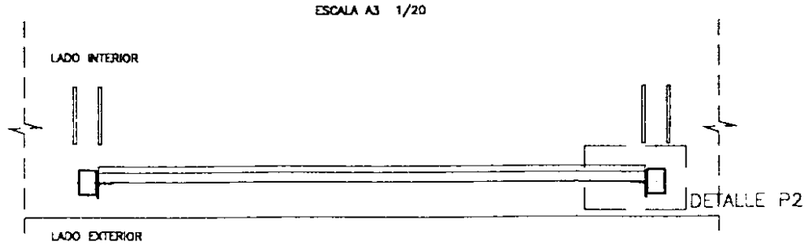
ALZADO INTERIOR DEL MODULO DE CERRAMIENTO

ESCALA A3 1/20



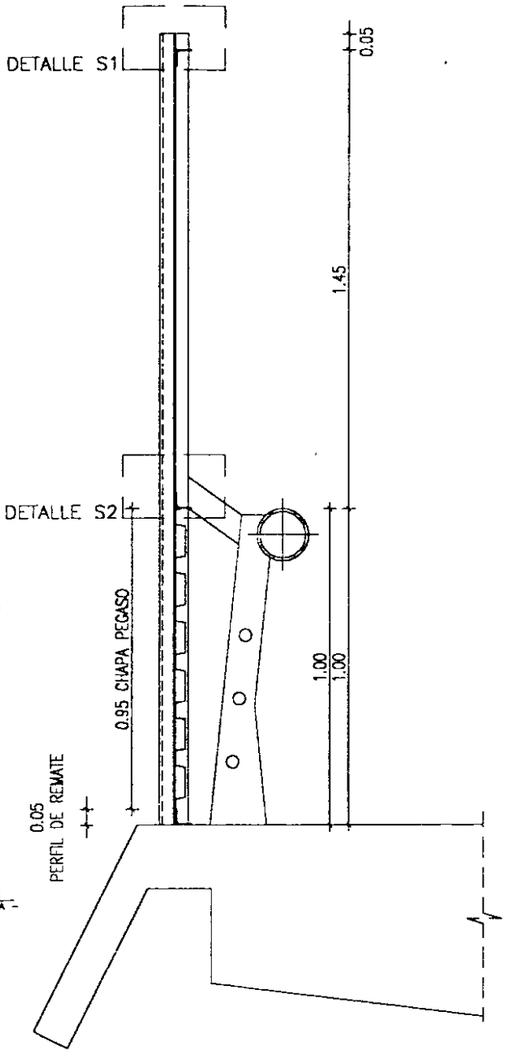
PLANTA: SECCION POR EL PANEL DE MALLA EXPANDIDA

ESCALA A3 1/20



PLANTA: SECCION POR LA CHAPA TIPO PEGASO

ESCALA A3 1/20

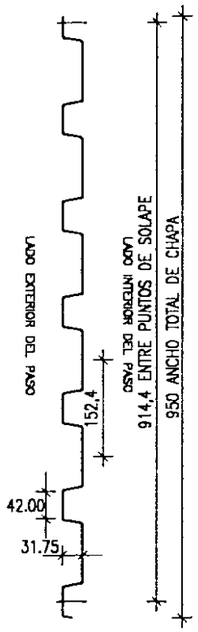


SECCION DEL MODULO DE CERRAMIENTO REMODELADO Y BARANDILLA

ESCALA A3 1/20

GIF	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID-ZARAGOZA-BARCELONA-FRONTERA FRANCESA TRAMO: LLEIDA-MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo: D. JAIME ENRION-GERMAN LOPEZ-BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo: RAUL FERNANDEZ CANAVA	CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS) AEPO	ESCALA NORMAL VARIAS Numérica / Gráfica	FECHA NOVIEMBRE 2003	TITULO DEL PLANO ESTRUCTURAS DETALLES GEOMETRÍA DE PROTECCIONES ANTIVANDÁLICAS	Nº DE PLANO • 2.9.10 Hoja 3 de 7

DEFINICION GEOMETRICA DE LA CHAPA TIPO PEGASO (MODELO DE REFERENCIA: CHAPA PRELACADA PL-32/152 DE ACERALIA) -cotas en mm.-

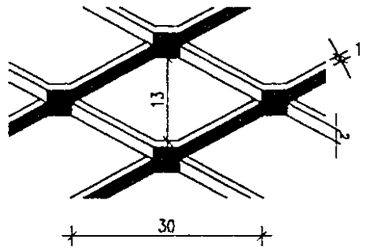


CHAPA PRELACADA POR LAS DOS CARAS SEGUN RAL CORPORATIVO DEL GIF

ESPESOR 1 mm.

PESO: 10,73 Kg./m2

DEFINICION DEL METAL EXPANDIDO



DENOMINACION: METAL EXPANDIDO, CHAPA ESTIRADA O MALLA "DEPLOYE" EN FORMA DE ROMBO

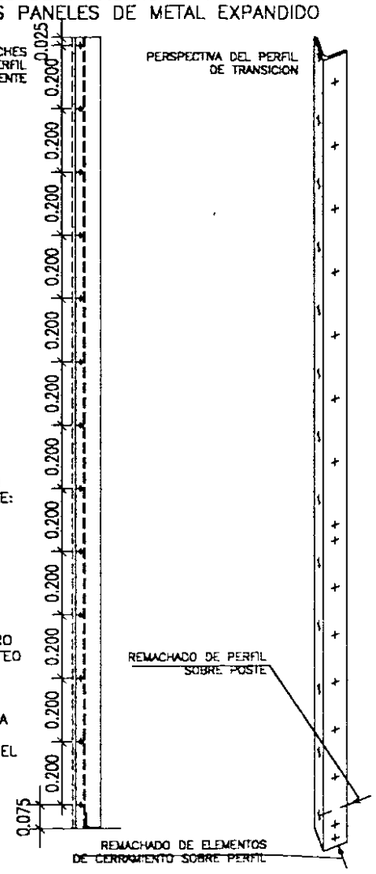
REFERENCIA DEL MODELO: 30.13.20.10

DIMENSIONES:
- DIAGONAL MAYOR: 30 mm.
- DIAGONAL MENOR: 13 mm:
- PASO: 2 mm.
- ESPESOR DE LA CHAPA: 1 mm.

ESPESOR 1 mm.

PESO: 2,40 Kg./m2

PERFILES DE TRANSICION PARA FIJACION DE LOS PANELES DE METAL EXPANDIDO



SE DEFINEN CON UN PERFIL L-50.5 CON TODA LA ALTURA DEL MONTANTE EXISTENTE: 2,50 m.

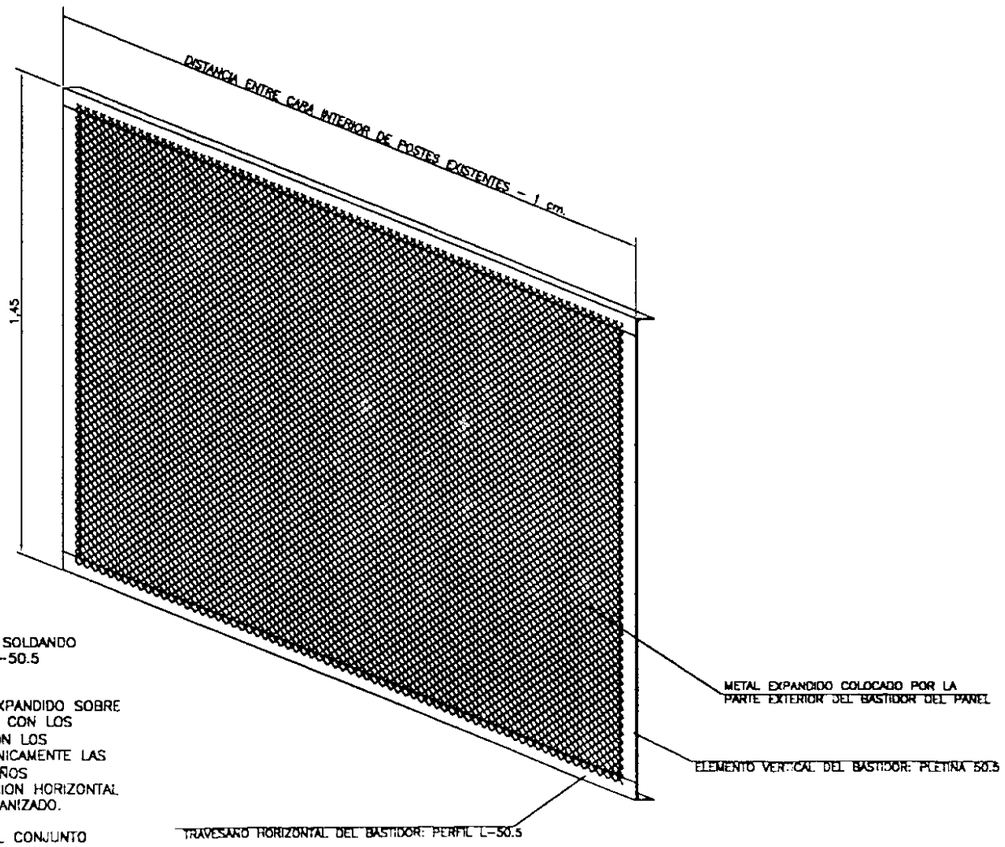
SE GALVANIZARAN EN CALIENTE

SE LACARAN EN TALLER EN COLOR CORPORATIVO DEL GIF

SE FIJARAN EN OBRA A LOS POSTES EXISTENTES MEDIANTE REMACHES DE ACERO LACADOS, DISPUESTOS SEGUN EL REPLANTEO ADJUNTO

UNA VEZ COLOCADOS SE FIJARA SOBRE ELLOS EL PANEL DE METAL EXPANDIDO, LA CHAPA PRELACADA TIPO PEGASO Y EL PERFIL DE REMATE INFERIOR, UTILIZANDO EL MISMO TIPO DE REMACHES SEGUN REPLANTEO DEFINIDO EN EL PLANO 2.1

DEFINICION Y PERSPECTIVA DEL PANEL DE METAL EXPANDIDO



EJECUCION:

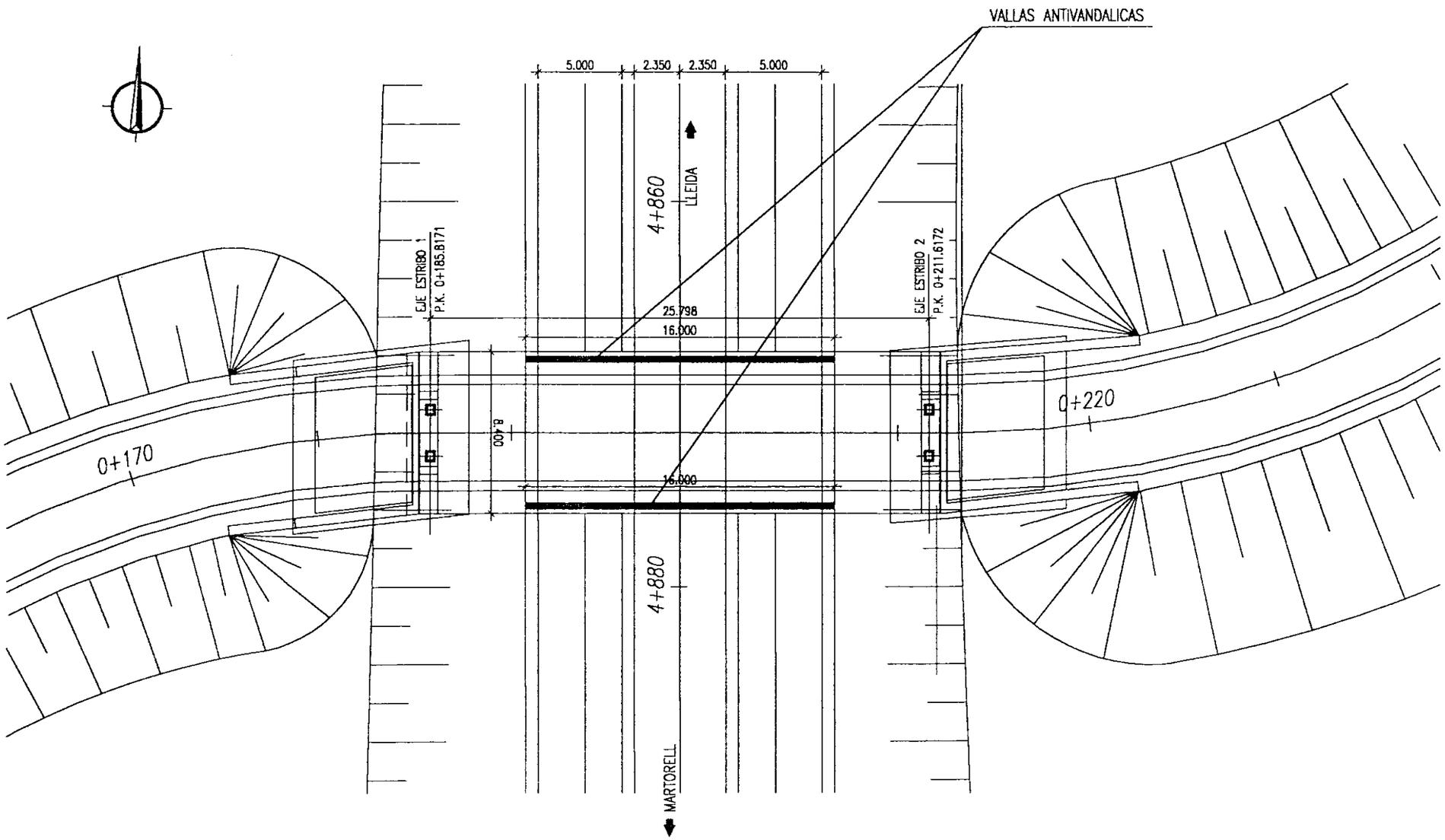
- SE MONTARA EL BASTIDOR EN TALLER SOLDANDO PLETINAS 50.5 VERTICALES Y PERFILES L-50.5 HORIZONTALES.

- SE COLOCARA EN TALLER EL METAL EXPANDIDO SOBRE EL BASTIDOR CON UN SOLAPE DE 2 cm. CON LOS TRAVESAÑOS HOROZONTALES Y 1 cm. CON LOS ELEMENTOS VERTICALES. SE SOLDARAN UNICAMENTE LAS PUNTAS DE CONTACTO CON LOS TRAVESAÑOS HORIZONTALES PARA PERMITIR LA DILATACION HORIZONTAL DEL METAL EXPANDIDO DURANTE EL GALVANIZADO.

- SE GALVANIZARA EN CALIENTE TODO EL CONJUNTO MONTADO MEDIANTE INMERSION EN CUBETA.

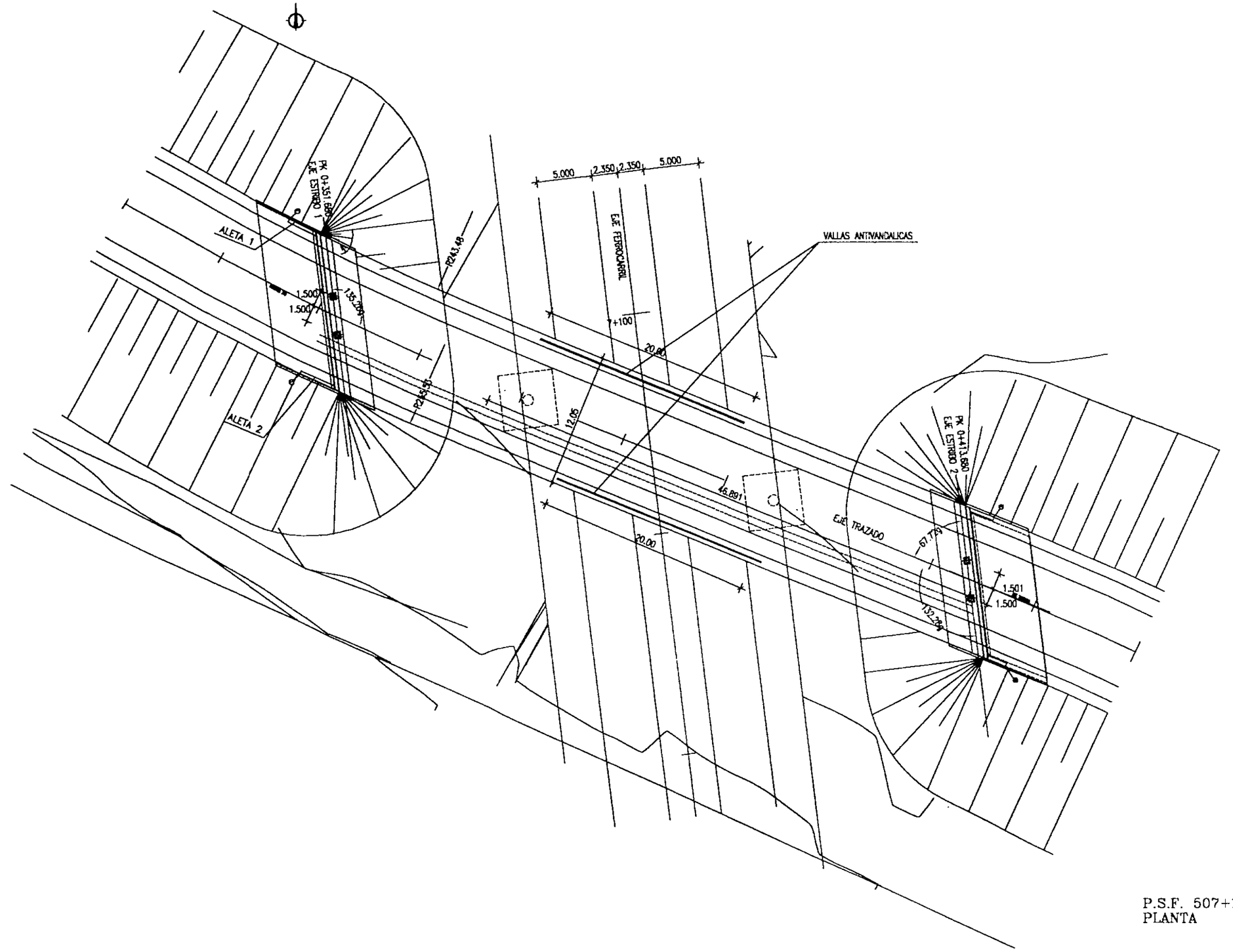
SE LACARA EN TALLER SEGUN COLOR CORPORATIVO DEL GIF

GIF	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID-ZARAGOZA-BARCELONA-FRONTERA FRANCESA TRAMO: LLEIDA-MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo: D. JAIME GARCIA-GERMAN LOPEZ-BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo: RAUL FERNANDEZ CAMARA	CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS) AEPO	ESCALA NORMAL VARIAS Numérico / Gráfica	FECHA NOVIEMBRE 2003	TITULO DEL PLANO ESTRUCTURAS DETALLES MATERIALES DE PROTECCIONES ANTIVANDÁLICAS	Nº DE PLANO 2.9.10 Hoja 4 de 7



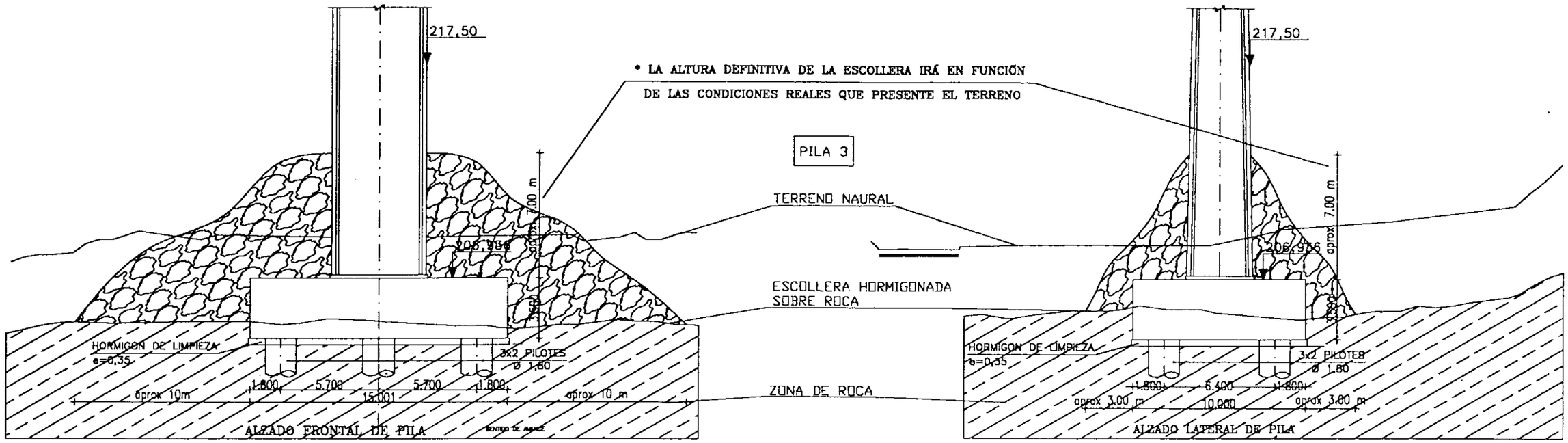
P.S.F. 504+900
PLANTA

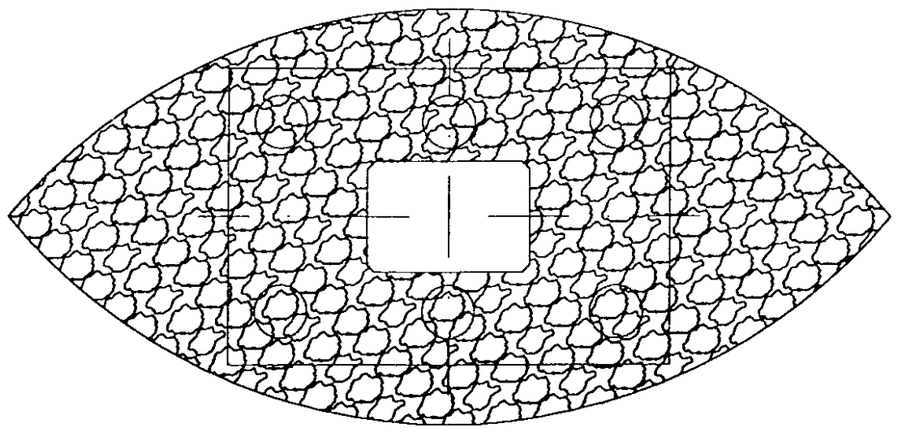
GIF	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA TRAMO: LLEIDA–MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo: D. JAIME GARCIA–GERMAN LOPEZ–BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo: RAUL FERNANDEZ CAMARA	CONSULTOR (ASISTENCIA AL CONTROL DE OBRAS) AEPO	ESCALA NORMAL S/E Numérica Gráfica	FECHA NOVIEMBRE 2003	TITULO DEL PLANO ESTRUCTURAS DETALLES SITUACION PROTECCIONES ANTIVANDÁLICAS	Nº DE PLANO 2.9.10 Hoja 5 de 7



P.S.F. 507+100
PLANTA

GIF	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA TRAMO: LLEIDA–MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo.: D. JAIME GARCIA–GERMAN LOPEZ–BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo.: RAÚL FERNÁNDEZ CÁMARA	CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS) AEPO	ESCALA NORMAL S/E Numérica | Gráfica	FECHA NOVIEMBRE 2003	TÍTULO DEL PLANO ESTRUCTURAS DETALLES SITUACION PROTECCIONES ANTIVANDÁLICAS	Nº DE PLANO 2.9.10 Hoja 6 de 7





PLANTA DE PILA 3

GIF	PROYECTO CONSTRUIDO LINEA DE ALTA VELOCIDAD MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA TRAMO: LLEIDA–MARTORELL. SUBTRAMO V. PLATAFORMA	EL DIRECTOR DEL PROYECTO CONSTRUIDO Fdo: D. JAIME GARCIA–BERMAN LOPEZ–BELMONTE	EL AUTOR DEL PROYECTO CONSTRUIDO Fdo: RAÚL FERNÁNDEZ OÑARA	CONSULTOR: (ASISTENCIA AL CONTROL DE OBRAS) AEPO	ESCALA NORMAL S/E Numérica | Gráfica 0 – – – m	FECHA NOVIEMBRE 2003	TÍTULO DEL PLANO ESTRUCTURAS DETALLES PROTECCIÓN PILA 3 DEL VIADUCTO	Nº DE PLANO 2.9.10 Hoja 7 de 7

4. Cálculos

4. CÁLCULOS.

4.1. VIADUCTO DEL FRANCOLÍ

4.2. ESTRUCTURA E-1

4.3. ESTRUCTURA E-2

4.4. PASO SUPERIOR 504.9

4.5. PASO SUPERIOR 507.1

4.6. PASO INFERIOR 503.5

4.7. PASO INFERIOR 504.3

4.8. PASO INFERIOR 506.7.

4.9. CÁLCULOS ESTRUCTURALES DE LAS ODT´S

4.1. Viaducto del Francoli

UTE ALT CAMP

VIADUCTO SOBRE EL RÍO FRANCOLI

ANEJO DE CÁLCULO DEL TABLERO

ENERO-2003

ÍNDICE

MEMORIA DE CÁLCULO

CÁLCULO DEL TABLERO

Viaducto s/ el Río Francolí. UTE ALT CAMP

MEMORIA DE CÁLCULO

ÍNDICE DE LA MEMORIA

1-NORMATIVA APLICADA

2-DESARROLLO DEL CÁLCULO

2.1-CÁLCULO DEL PESO PROPIO DEL TABLERO. **FASES DE MONTAJE**

2.2-CÁLCULO DE LA ESTRUCTURA SOMETIDA AL RESTO DE CARGAS

2.3-MODELOS DE CÁLCULO EMPLEADOS

3-ACCIONES CONSIDERADAS EN EL CÁLCULO

PESO PROPIO

CARGAS MUERTAS

CARGAS HORIZONTALES DERIVADAS DEL ROZAMIENTO EN APOYOS

SOBRECARGA DE PASEOS

ACCIONES TÉRMICAS

INTERACCIÓN LONGITUDINAL CARRIL-TABLERO

VIENTO

ACCIONES ACCIDENTALES: DESCARRILAMIENTO DE VEHÍCULOS FERROVIARIOS

4-FASES DE MONTAJE. CÁLCULO DE ESFUERZOS DE PESO PROPIO

1-NORMATIVA APLICADA

Para el cálculo se ha empleado la siguiente normativa:

- ***Borrador #G IPF-****Febrero 2000* (Instrucción para puentes de ferrocarril)
- ***Eurocódigo EC-3***
- ***IPF-75*** (Instrucción para puentes de ferrocarril)
- ***IAP-98*** (Instrucción para puentes de carretera)

No se emplea ya la instrucción antigua de la IPF ya que el nuevo borrador incorpora unos coeficientes de clasificación que hacen muy similar el tren de cargas empleado al antiguo tren B; por tanto, el cálculo realizado para el tablero es equivalente al cálculo conjunto de la antigua IPF junto con el Eurocódigo.

2-DESARROLLO DEL CÁLCULO

Para realizar el cálculo del tablero se ha procedido a realizar diversos modelos de cálculo que permitan la obtención de los esfuerzos existentes en la estructura de una forma que refleje lo más aproximadamente posible la realidad.

2.1-CÁLCULO DEL PESO PROPIO DEL TABLERO. **FASES DE MONTAJE**

Para realizar este cálculo se emplea un ***modelo viga continua*** evolutivo según las diferentes fases de montaje de la estructura. Para ello se utilizan unos modelos de barras que representan el tablero existente en cada una de estas fases de ejecución.

Del proceso constructivo se realizará posteriormente un resumen de los esfuerzos que actúan sobre las distintas secciones de la estructura según las fases de montaje.

2.2-CÁLCULO DE LA ESTRUCTURA SOMETIDA AL RESTO DE CARGAS

Se han considerado las cargas especificadas en el borrador de la nueva IPF española (Febrero 2000) complementada con el Eurocódigo EC-3.

- Todas las cargas se han aplicado en un ***modelo de viga continua***, obteniendo los esfuerzos existentes sobre la sección completa.
- Además, para el cálculo de los esfuerzos derivados de cargas muertas y sobrecargas ferroviarias se ha desarrollado un ***modelo de emparrillado plano***, mediante el cual se ha podido obtener el reparto trasnversal de esfuerzos existente en el tablero para poder así proceder a un dimensionamiento mucho más afinado del tablero.

2.3-MODELOS DE CÁLCULO EMPLEADOS

Los modelos empleados para el cálculo del tablero, según se ha podido comprobar en las páginas anteriores, son:

Viaducto s/ el Río Francolí. UTE ALT CAMP *Memoria*

- ***Modelo de viga continua.*** Empleado para la obtención de los esfuerzos derivados de las fases de montaje y como primera aproximación del resto de cargas.
- ***Modelo de emparrillado plano.*** Utilizado para las cargas muertas y las sobrecargas.

De esta forma, al utilizar el modelo del emparrillado plano, se ha podido considerar el efecto que sobre la flexión longitudinal produce el esfuerzo torsor, además del reparto que una sobrecarga centrado produce sobre las diferentes almas debido a la geometría de la viga.

3-ACCIONES CONSIDERADAS EN EL CÁLCULO

Las cargas aplicadas para el cálculo del tablero en los modelos de cálculo empleados son las siguientes:

- ***Cargas permanentes***
  - *Peso propio*.
  - *Cargas muertas*.
  - *Pretensado y esfuerzos hiperestáticos del pretensado*.
  - *Acciones diferidas derivadas de la retracción y fluencia*.
  - *Cargas horizontales* producidas por el *rozamiento* en los apoyos deslizantes.
- ***Sobrecargas***
  - *Sobrecargas de uso*: sobrecarga en paseos y sobrecarga ferroviaria. Dentro de ésta última están incluida las acciones horizontales producidas por el frenado, arranque, fuerza centrífuga y lazo.
  - *Acciones térmicas*: variación uniforme de la temperatura y gradiente térmico.
  - *Interacción longitudinal carril-tablero*.
  - *Viento*
- ***Acciones accidentales***
  - *Descarrilamiento*

PESO PROPIO

El correspondiente a considerar una densidad del hormigón[1] de *2.5* t/m^3. Su aplicación en la estructura se realiza según las fases de montajes descritas.

[1] Realmente para la obtención del peso propio de las vigas en las fases de montaje se ha considerado una densidad de 2.6 t/m^3.

CARGAS MUERTAS

Los tipos de carga a considerar serán los siguientes:

- *Balasto* ($\gamma = 1.8$ t/m^3) ; valor máximo $\Rightarrow p_{máx} = 1.3 \cdot p_0 = 5.91$ t/m
  valor mínimo $\Rightarrow p_{mín} = 0.7 \cdot p_0 = 3.18$ t/m
- *Carriles y traviesas* $\Rightarrow$ 0.64 t/m
- *Conductos + cables* $\Rightarrow$ 0.30 t/m
- *Paseos* (ancho $\approx$ 1,1 m; 0.5 t/m^2) $\Rightarrow$ 0.55 t/m
- *Murete guardabalasto* $\Rightarrow$ 0.25 t/m
- *Barandillas* $\Rightarrow$ 0.05 t/m

$Cp_{máx}$ = 7.65 t/m por vía de circulación

$Cp_{mín}$ = 4.92 t/m por vía de circulación

CARGAS HORIZONTALES DERIVADAS DEL ROZAMIENTO EN APOYOS

Se considerará una fuerza horizontal por el rozamiento producido en los apoyos deslizantes igual a:

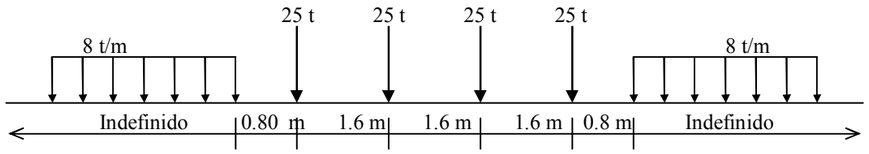
- ***5% de las cargas permanentes*** verticales en caso desfavorable
- ***1% de las cargas permanentes*** verticales en caso favorable

SOBRECARGA DE PASEOS

Su valor es igual a 0.50 t/m^2, aunque al combinarse con la sobrecarga ferroviaria queda reducido a la mitad.

SOBRECARGA FERROVIARIA: TRENES DE CARGA

Se han considerado como sobrecarga de uso ferroviaria los trenes fijados por el borrador de la instrucción I.P.F; en este caso el más desfavorable es el ***Tren UIC***, el cual también figura en el Eurocódigo.



Se considerarán además posibles *ripados de las vías de 30 cm + r/18* = ***0.383 m*** hacia cada lado del eje de las mismas, siendo r la distancia entre apoyos de las ruedas (1.435 + 0.065 = 1.500 m.).

Para estos trenes se tendrá que, por efectos dinámicos, el valor de las cargas verticales podrá oscilar entre ϕ *y (2-*ϕ*)* del valor estático, siendo ϕ:

- **Flexión:** $\phi_2 = \frac{1.44}{\sqrt{L_\phi}} + 0.82 = 1.015$ (Mantenimiento riguroso)
- **Cortante:** $\phi_3 = \frac{0.96}{\sqrt{L_\phi}} + 0.82 = 1.010$

en donde L_ϕ viene definida en el cuadro 2.5 del borrador de la IPF (= 1/3·80·1.3 = 34.67).

Se considerarán los casos de la actuación de la sobrecarga ferroviaria en una vía o en dos, reduciendo el número de hipótesis estudiadas a las más desfavorables según se deduce de los valores obtenidos en el modelo de emparrillado

Cargas horizontales derivadas del frenado y arranque

Se consideran los siguientes valores para las cargas longitudinales:

- *Frenado* = 2 t/m × L (por vía cargada)
- *Arranque* = 3,3 t/m × L' (por vía cargada)

en donde L = longitud de la vía cargada y L' = Mín (L;30 m).

Para el caso en que se considera sobrecarga en una de las vías se aplicará frenado o arranque según sea el valor más desfavorable, mientras que si están cargadas las dos vías en una de ellas se considerará frenado y en la otra arranque.

Cargas horizontales derivadas de la fuerza centrífuga

El valor nominal de la fuerza centrífuga es el siguiente:

$$F_c = \frac{p \cdot V^2}{g \cdot R}$$

en donde V es la velocidad de cálculo, R el radio de la curvatura del trazado de las vías (≈7.250 m en este caso) y p el valor de la carga vertical considerada para la sobrecarga ferroviaria en t/m.

Efecto lazo

Se considerará además, independientemente del número de vías, la actuación de una *carga horizontal de 10 t en sentido transversal*, aplicada en el sitio más desfavorable a la altura superior del carril.

Coeficientes que afectan a las sobrecargas ferroviarias

Aparte de los coeficientes de impacto ya definidos, los valores de las cargas anteriores se van a ver afectados otros coeficientes que aún no han sido especificados. Éstos son:

- *Coeficiente de clasificación* α: Su valor depende del ancho de la vía del tren (RENFE, Internacional ó Métrica); en este caso α = 1,21 por ser vía RENFE.

- *Coeficiente reductor f*: Su valor depende de la velocidad y del ancho de la longitud de la vía cargada:

$$f = \left[1 - \frac{V - 120}{1000} \cdot \left(\frac{814}{V} + 1{,}75\right) \cdot \left(1 - \sqrt{2{,}88 / L_f}\right)\right] \geq f^*$$

en donde:

V = Velocidad de proyecto (km/h)

f^* = Valor obtenido para v = 280 km/h

L_f = Longitud en metros de la vía cargada en la situación más desfavorable para el caso estudiado (2,88 m.≤ L_f ≤ 150 m., siendo f = f^* = 1si L < 2,88 m).

Reglas de aplicación

Se realizarán dos cálculos paralelos, uno para velocidad de 120 km/h y otro para la velocidad de proyecto (350 km/h), escogiendo en cada caso la situación más desfavorable.

- **Cargas verticales**; Se emplearán las definidas por el tren de cargas anteriores, situadas en el sitio más desfavorable para el caso estudiado, en una o dos vías, afectadas por los coeficientes α, f y ϕ^*:

$$\alpha \cdot f \cdot \phi^* \cdot P_{v,k}$$

en donde $\phi^* = \phi$ *ó* $(2-\phi)$ según sea el caso.

- **Cargas horizontales**; Se estudiarán los siguientes casos:
  1) *Frenado y/o Arranque + Lazo*, estando el valor del frenado y/o arranque afectado por los coeficientes α y f.
  2) *Fuerza centrífuga + Lazo,* estando el valor de la fuerza centrífuga afectada por los coeficientes α y f.
  3) *Frenado y/o Arranque + Fuerza centrífuga + Lazo:* Estando los valores de la fuerza centrífuga y del frenado y/o arranque afectados por los coeficientes α y f, se estudiarán los casos:

     3.1) *Frenado y/o Arranque + 50% Fuerza centrífuga + Lazo*

     3.2) 50 % *Frenado y/o Arranque + Fuerza centrífuga + Lazo*

ACCIONES TÉRMICAS

Se consideran dos tipos de acciones térmicas:

Gradiente térmico

Para determinar su valor se hace uso del epígrafe *2.3.12.1.2.1* del borrador IPF, según el cual:

$$\Delta T_{SI} = (K_1 \cdot K_2 \cdot K_3) \cdot \Delta T_{ref} \approx 5^o$$

en donde:

$K_1 \approx 0{,}90$ (canto del tablero = 2.70)

$K_2 \approx 0{,}91$ (relación entre ancho de losa superior e inferior ≈ 1,2)

$K_3 \approx 0{,}60$

$\Delta T_{ref} \approx 10^o$

Variación uniforme de la temperatura

Para determinar su valor se hace uso del epígrafe *2.3.12.1.1* del borrador IPF, según el cual:

$$\Delta T = K \cdot z^a \cdot h^b \cdot s^c \approx 31^o$$

en donde:

K = 29,13

a = 0,301

b = -0,148

c = 0

z = 2 (zona II)

h = 2,70

s = 1

Esta acción es equivalente a introducir en el hormigón una deformación longitudinal impuesta de $\varepsilon \approx 0{,}3$ *mm/m*

INTERACCIÓN LONGITUDINAL CARRIL-TABLERO

Para la obtención del valor de esta acción se emplea la fórmula del EC-3, en donde F_l = ***0.8·L$_t$*** (t por vía de circulación cargada, siendo L_t la longitud del tablero) = ***72 t/vía*** (máxima)

VIENTO

ENTORNO TIPO II

VELOCIDAD DE REFERENCIA 28 m/s

$\rho = 0.225$ T/m^2

ACCIONES ACCIDENTALES: DESCARRILAMIENTO DE VEHÍCULOS FERROVIARIOS

Se estudiarán las dos situaciones de proyecto prescritas por la instrucción:

- ***Situación de proyecto I***: Corresponde al descarrilamiento de la locomotora o de los vagones con carga pesada dentro de un área de ancho igual a 1,5 veces el ancho de la vía a cada lado del eje de la misma (2,15 m^2). Las cargas equivalentes a aplicar son dos cargas lineales de $\alpha \cdot 5 = 6.05$ t/m separadas entre sí el ancho de la vía (1,435 m), paralelas a la vía y en una longitud de 6,40 m. En esta situación se debe evitar el colapso total de la estructura siendo tolerable el daño local.
- ***Situación de proyecto II:*** Corresponde al descarrilamiento de la locomotora o de los vagones con carga pesada dentro de un área de ancho igual a 1,5 veces el ancho de la vía a cada lado del eje de la misma (2,15 m^2) o en el borde del tablero, según sea la posición más desfavorable. La carga equivalente a aplicar es una carga lineal de $\alpha \cdot 8 = 9.68$ t/m, paralela a la vía y en una longitud de 20 m.

En cuanto a las *acciones accidentales derivadas del sismo* no corresponde estudiarlas dado que la aceleracíon de cálculo $a_c \leq 0{,}06g$ ($a_b/g = 0{,}04$ en la provincia de Tarragona).

4-FASES DE MONTAJE. CÁLCULO DE ESFUERZOS DE PESO PROPIO

Para la ejecución del tablero se han dispuesto las siguientes fases de ejecución, una vez hechas las pilas y estribos:

1) **MONTAJE DE VIGAS**; Se montan en primer lugar las vigas laterales y las vigas martillo, situadas sobre gatos de arena y sujetas a las pilas mediante barras verticales tipo MACALLOY. Las acciones a las que dan lugar son las derivadas del peso propio de las mismas, considerando una densidad para el hormigón de 2.6 t/m^3 y el área correspondiente de la sección.

2) **MONTAJE DE PLACAS DE ENCOFRADO;** El paso siguiente será el montaje en todo el tablero de las prelosas. La carga introducida corresponde al peso propio de las mismas ($\approx 0{,}20$ t/m^2).

3) **EJECUCIÓN DE LOS EMPALMES.**

4) **HORMIGONADO DE LA LOSA CENTRAL SOBRE PILAS;** Se hormigonará en primera fase la losa sobre una longitud de 13 m a cada lado de las pilas. El peso propio introducido será el que se obtiene de considerar la sección de la losa con una densidad de 2.5 t/m^3. Realizado este hormigonado se retirarán las barras de MACALLOY de anclaje

5) **HORMIGONADO DE LA LOSA CENTRAL EN EL RESTO DEL TABLERO;** posteriormente se hormigonará el resto de la losa central en la zonas que no existía aún.

6) **HORMIGONADO DE LA LOSA DE VUELOS EN EL RESTO DEL TABLERO;** por último se hormigonará la parte de la losa correspondiente a los vuelos del tablero.

7) RETIRADA DE LOS GATOS DE ARENA

CÁLCULO DEL TABLERO

ÍNDICE DEL CÁLCULO DEL TABLERO

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CÁLCULO DE REACCIONES.

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***LISTADO DE RESULTADOS DE LOS MODELOS DE CÁLCULO*(RESTO DE CARGAS EXTERIORES).**

OBTENCIÓN DE ESFUERZOS

Para el cálculo de los esfuerzos se han empleado principalmente dos modelos de cálculo distintos: en primer lugar, uno evolutivo por medio del cual se han ido obteniendo los esfuerzos de peso propio según las fases de montaje; para el resto de las cargas exteriores se ha hecho uso de otro pórtico, ya con la sección completa, en el que se han aplicado el resto de las cargas exteriores.

Cálculo de coeficientes de excentricidad

Se ha realizado además otro modelo de emparrilado plano con el que poder obtener el desigual reparto que el tablero realiza entre las almas de las vigas tanto de las cargas excéntricas como de las centradas, correspondientes ambas a las posibles acciones que actúan sobre el mismo. Se han aplicado así diversas hipótesis de cargas unitarias con las que obtener los coeficientes de excentricidad empleados:

$$Cexc = \frac{n \times Esf\ \text{máx}}{\sum_{i=1}^{n} Esfi}$$

Tipo de Carga	*Cexc. Momento*	*Cexc. Cortante*
Cargas muertas	1.10	1.10
Sobrecarga Ferroviaria 1 vía ripada	2.00	2.60
Sobrecarga Ferroviaria 2 vías ripadas	1.10	1.25
Sobrecarga en Paseos	1.50	1.80

Los valores que figuran en las envolventes de esfuerzos presentadas llevan ya incluidos los distintos coeficientes empleados: *excentricidad, impacto y coeficiente de clasificación*[2].

[2] Puesto que desde el punto de vista de armado del tablero es más desfavorable no considerar el coeficiente reductor f, los esfuerzos presentados corresponden a una velocidad de 120 km/h

ENVOLVENTE DE ESFUERZOS

Flectores máximos en vano 1 de 32 m

		VALORES CARACTERISTICOS DE LOS ESFUERZOS						
Tipo de cargas		***0.00***	***2.67***	***5.33***	***8.00***	***10.67***	***16.00***	***21.33***	***24.00***	***26.67***	***29.33***	***32.00***
Fase 1:Montaje de vigas		0.0	197.8	514.3	633.0	712.1	633.0	395.6	0.0	-425.9	-767.8	-956.1
Montaje de prelosas		0.0	56.0	145.6	179.2	201.6	179.2	112.0	0.0	-119.7	-215.0	-267.3
Losa fase 1 sobre pilas		0.0	8.4	25.1	33.6	50.4	67.2	81.7	43.0	-39.5	-119.9	-219.2
Losa fase 1; resto		0.0	75.2	188.7	227.0	229.5	158.2	15.3	-148.5	-277.4	-363.3	-358.8
Losa fase 2		0.0	47.1	122.2	150.3	168.3	148.2	90.1	-6.2	-108.8	-190.3	-244.6
ΣPp		**0.0**	**384.5**	**995.9**	**1223.0**	**1361.9**	**1185.8**	**694.6**	**-111.6**	**-971.3**	**-1656.3**	**-2046.0**
Balasto máx.		0.0	291.5	583.0	706.5	830.0	740.0	314.0	-67.0	-448.0	-997.0	-1546.0
Balasto min.		0.0	157.0	314.0	380.0	446.0	398.0	169.0	72.5	-24.0	-428.0	-832.0
Resto Carga muerta		0.0	86.0	172.0	208.0	244.0	218.0	93.0	-19.5	-132.0	-293.5	-455.0
Retracción y fluencia		0.0	40.5	80.9	121.4	161.9	242.8	323.8	364.2	404.7	445.2	485.6
Sobrecarga uniforme +	1	0.0	17.0	34.0	42.5	51.0	54.0	40.0	25.5	11.0	5.5	0.0
Sobrecarga uniforme -	1	0.0	-4.0	-8.0	-12.0	-16.0	-24.0	-32.0	-36.0	-40.0	-61.0	-82.0
Tren +	1	0.0	292.5	585.0	702.0	819.0	825.0	604.0	382.0	160.0	173.5	187.0
Tren -	1	0.0	-72.0	-144.0	-216.0	-288.0	-431.0	-575.0	-647.0	-719.0	-975.0	-1231.0
Gradiente Térmico	2	0.0	55.7	111.4	167.1	222.8	334.2	445.6	501.3	557.0	612.7	668.4

	ENVOLVENTE CON COEFICIENTES DE EXCENTRICIDAD										
Mk+	0	1711.7	3650.3	4477.9	5217.3	5126.7	3603.6	1729.2	-198.7	-1540.9	-2587.8
Mk-	0	451.3	1129.4	1268.1	1318.7	662.8	-618.8	-1855.5	-3145.5	-5175.8	-6910.7
Md+	0	2393.98	5094.25	6221.59	7229.9	7032.15	4804.86	2395.59	436.368	-737.74	-1616.6
Md-	0	350.987	928.858	967.335	917.646	62.5623	-1419.6	-2982.3	-5176.5	-8241.2	-10907

Flectores máximos en vano 2 de 40 m

		VALORES CARACTERÍSTICOS DE LOS ESFUERZOS												
Tipo de cargas		***0.00***	***3.00***	***3.33***	***6.67***	***8.00***	***11.33***	***20.00***	***28.67***	***32.00***	***33.33***	***34.50***	***36.67***	***40.00***
Fase 1:Montaje de vigas		-956.1	-767.8	-591.1	-130.4	0.0	395.6	712.1	395.6	0.0	-130.4	-272.4	-591.1	-956.1
Montaje de prelosas		-267.3	-215.0	-165.8	-36.8	0.0	112.0	201.6	112.0	0.0	-36.8	-76.7	-165.8	-267.3
Losa fase 1 sobre pilas		-219.2	-166.9	-119.6	-8.5	18.4	74.1	77.2	75.8	20.9	-5.8	-37.5	-116.3	-215.4
Losa fase 1; resto		-358.8	-277.5	-243.7	-142.3	-108.5	20.3	164.7	18.0	-111.9	-146.0	-180.1	-248.3	-316.5
Losa fase 2		-244.6	-200.2	-158.4	-48.7	-17.4	77.9	154.2	-78.2	-16.9	-48.2	-82.1	-157.8	-243.9
ΣPp		**-2046.0**	**-1627.3**	**-1278.6**	**-366.6**	**-107.4**	**680.0**	**1309.9**	**523.2**	**-107.9**	**-367.1**	**-648.8**	**-1279.2**	**-1999.2**
Balasto máx.		-1546.0	-957.8	-892.5	-239.0	152.0	543.0	800.0	530.0	133.0	-264.0	-495.0	-924.0	-1584.0
Balasto mín.		-832.0	-515.6	-480.5	-129.0	81.5	292.0	430.0	285.0	71.5	-142.0	-266.3	-497.0	-852.0
Resto Carga muerta		-455.0	-281.7	-262.5	-70.0	45.0	160.0	235.0	156.0	39.0	-78.0	-145.9	-272.0	-466.0
Retracción y fluencia		485.6	485.7	485.7	485.7	485.7	485.7	485.8	485.8	485.9	485.9	485.9	485.9	485.9
Sobrecarga uniforme +	1	0.0	7.2	8.0	16.0	33.0	50.0	63.0	51.0	34.0	17.0	14.0	8.5	0.0
Sobrecarga uniforme -	1	-82.0	-57.2	-54.5	-27.0	-23.5	-20.0	-13.0	-5.0	-13.5	-22.0	-34.4	-57.5	-93.0
Tren +	1	187.0	213.6	216.5	246.0	572.5	899.0	1207.0	913.0	592.0	271.0	248.1	205.5	140.0
Tren -	1	-1230.0	-861.4	-820.5	-411.0	-356.0	-301.0	-243.0	-386.0	-457.0	-528.0	-677.6	-955.5	-1383.0
Gradiente Térmico	2	684.4	671.8	670.4	656.4	650.8	636.8	600.4	564.0	550.0	544.4	539.5	530.4	516.4

	ENVOLVENTE CON COEFICIENTES DE EXCENTRICIDAD												
Mk+	-2571.8	-1245.5	-796.0	1124.2	2842.2	5079.8	6890.3	4871.0	2767.7	1044.6	362.9	-1010.6	-2873.6
Mk-	-6908.0	-4917.7	-4394.6	-1736.5	-965.4	333.9	1365.3	-42.2	-1241.4	-2068.8	-2984.7	-4793.1	-7325.3
Md+	-1602.2	-532.41	-111.39	1523.94	3651.1	6776.81	9365.01	6533.46	3604.2	1503.25	906.217	-309.92	-1930.9
Md-	-10903	-7657.6	-6889.3	-2680.3	-1501.5	-87.741	1027.26	-567.39	-1906.6	-3192.9	-4651.4	-7505	-11558

Flectores máximos en vano 3 de 40 m

		VALORES CARACTERÍSTICOS DE LOS ESFUERZOS												
Tipo de cargas		***0.00***	***3.33***	***5.50***	***6.67***	***8.00***	***11.33***	***20.00***	***28.67***	***32.00***	***33.33***	***34.50***	***36.67***	***40.00***
Fase 1:Montaje de vigas		-956.1	-767.8	-425.9	-130.4	0.0	395.6	712.1	395.6	0.0	-130.4	-272.4	-591.1	-956.1
Montaje de prelosas		-267.3	-215.0	-119.7	-36.8	0.0	112.0	201.6	112.0	0.0	-36.8	-76.7	-165.8	-267.3
Losa fase 1 sobre pilas		-216.7	-164.4	-75.3	-6.5	20.3	75.6	77.8	75.6	20.3	-6.5	-38.3	-117.3	-216.7
Losa fase 1; resto		-315.6	-280.6	-212.7	-144.8	-110.8	18.5	164.1	18.5	-110.8	-144.8	-178.7	-246.7	-314.6
Losa fase 2		-244.2	-199.7	-118.8	-48.3	-17.0	78.2	154.4	78.2	-17.0	-48.3	-82.2	-157.9	-244.2
ΣPp		**-1999.7**	**-1627.5**	**-952.4**	**-366.7**	**-107.5**	**680.0**	**1309.9**	**680.0**	**-107.5**	**-366.7**	**-648.4**	**-1278.8**	**-1998.7**
Balasto máx.		-1584.0	-926.5	-499.1	-269.0	126.0	521.0	785.0	524.0	131.0	-262.0	-491.7	-918.0	-1574.0
Balasto mín.		-853.0	-499.0	-268.9	-145.0	67.5	280.0	422.0	282.0	70.5	-141.0	-264.6	-494.0	-847.0
Resto Carga muerta		-466.0	-272.5	-146.7	-79.0	37.0	153.0	231.0	154.0	38.5	-77.0	-144.6	-270.0	-463.0
Retracción y fluencia		486.0	485.8	485.7	485.7	485.6	485.5	485.1	484.8	484.6	484.6	484.5	484.4	484.3
Sobrecarga uniforme +	1	9.0	8.0	7.3	7.0	29.0	51.0	64.0	51.0	34.0	17.0	16.1	14.5	12.0
Sobrecarga uniforme -	1	-93.0	-61.0	-40.2	-29.0	-25.0	-21.0	-14.0	-6.0	-3.5	-1.0	-8.9	-23.5	-46.0
Tren +	1	131.0	170.5	196.2	210.0	473.5	737.0	918.0	743.0	497.0	251.0	245.6	235.5	220.0
Tren -	1	-1383.0	-1015.5	-776.6	-648.0	-561.0	-474.0	-301.0	-127.0	-67.5	-8.0	-124.2	-340.0	-672.0
Gradiente Térmico	2	561.5	560.8	560.3	560.1	559.8	559.1	557.4	555.6	554.9	554.6	554.4	554.0	553.3

	ENVOLVENTE CON COEFICIENTES DE EXCENTRICIDAD												
Mk+	-2839.8	-75.6	874.1	874.1	2440.1	4533.8	6046.4	4550.1	2512.3	1003.2	378.4	-889.1	-2589.4
Mk-	-7326.8	-3568.1	-2407.5	-2407.5	-1545.8	-156.0	1193.9	807.4	-175.2	-629.7	-1447.4	-3073.1	-5324.4
Md+	-1908.1	392.149	1243.49	1243.49	3108.32	6009.28	8128.46	6035.62	3219.03	1432.72	916.583	-149.12	-1538.8
Md-	-11558	-5482.5	-3703.4	-3703.4	-2360.1	-812.06	776.799	631.342	-306.67	-1033.2	-2343.6	-4921.4	-8550.2

Cortantes máximos en vano 1

		VALORES CARACTERÍSTICOS DE LOS ESFUERZOS										
Tipo de cargas		***0.00***	***2.67***	***5.33***	***8.00***	***10.67***	***16.00***	***21.33***	***24.00***	***26.67***	***29.33***	***32.00***
Fase 1:Montaje de vigas		-118.7	-98.9	-59.6	-39.6	-19.8	39.6	79.1	118.7	151.8	173.8	184.8
Montaje de prelosas		-33.6	-28.0	-16.8	-11.2	-5.6	11.2	22.4	33.6	42.4	48.3	51.2
Losa fase 1 sobre pilas		-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	0.4	18.9	33.5	43.2	48.0
Losa fase 1; resto		-46.9	-37.6	-19.1	-9.9	8.6	27.1	40.9	40.9	40.9	40.9	40.9
Losa fase 2		-28.3	-23.5	-14.0	-9.3	0.3	9.8	19.3	28.8	36.3	41.3	43.8
ΣPp		**-231.6**	**-192.3**	**-113.7**	**-74.1**	**-20.7**	**83.4**	**162.2**	**240.9**	**304.9**	**347.5**	**368.8**
Balasto máx.		-141.0	-109.5	-78.0	-46.5	-15.0	48.0	111.0	142.5	174.0	205.5	237.0
Balasto mín.		-76.0	-59.0	-42.0	-25.0	-8.0	26.0	60.0	77.0	94.0	111.0	128.0
Resto Carga muerta		-42.0	-32.5	-23.0	-13.5	-4.0	14.0	33.0	42.0	51.0	60.5	70.0
Retracción y fluencia		-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0
Sobrecarga paseos +	1	1.5	1.5	1.5	1.5	1.5	3.0	6.0	7.0	8.0	9.5	11.0
Sobrecarga paseos -	1	-8.0	-6.5	-5.0	-3.5	-2.0	0.0	0.0	0.0	0.0	0.0	0.0
Tren +	1	27.0	27.0	27.0	27.0	27.0	37.0	80.0	101.5	123.0	156.5	190.0
Tren -	1	-165.0	-117.5	-70.0	-48.5	-27.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0
Gradiente térmico	2	-21.4	-21.4	-21.4	-21.4	-21.4	-21.4	-21.4	-21.4	-21.4	-21.4	-21.4

	ENVOLVENTE CON COEFICIENTES DE EXCENTRICIDAD										
Qk+	-272.5	-204.0	-96.3	-27.5	55.0	275.2	586.8	780.6	959.5	1156.9	1333.0
Qk-	-987.6	-751.5	-476.2	-322.8	-155.7	80.4	217.5	324.8	417.4	489.2	539.6
Qd+	-228.1	-159.5	-51.8	16.9	99.4	390.0	832.2	1104.3	1356.4	1639.4	1893.6
Qd-	-1409.0	-1067.5	-673.0	-455.7	-219.8	64.4	201.5	308.8	401.4	473.2	523.6

Viaducto s/ el Río Francolí. UTE ALT CAMP *Envolvente de esfuerzos*

Cortantes máximos en vano 2

		VALORES CARACTERÍSTICOS DE LOS ESFUERZOS											
Tipo de cargas		***0.00***	***3.00***	***3.33***	***6.67***	***8.00***	***11.33***	***20.00***	***28.67***	***32.00***	***33.33***	***34.50***	***36.67***	***40.00***
Fase 1:Montaje de vigas		-184.8	-173.8	-162.8	-129.7	-118.7	-79.1	0.0	79.1	118.7	129.7	140.7	162.8	184.8
Montaje de prelosas		-51.2	-48.3	-45.4	-36.5	-33.6	-22.4	0.0	22.4	33.6	36.5	39.5	45.4	51.2
Losa fase 1 sobre pilas		-52.3	-47.4	-42.6	-28.0	-23.2	-4.7	-0.1	4.5	23.0	27.8	32.7	42.4	52.1
Losa fase 1; resto		-32.2	-32.2	-32.2	-32.2	-32.2	-32.2	0.1	32.5	32.5	32.5	32.5	32.5	32.5
Losa fase 2		-43.6	-41.1	-38.6	-31.1	-28.6	-19.1	0.0	19.0	28.5	31.0	33.5	38.5	43.5
ΣPp		**-364.1**	**-325.8**	**-321.5**	**-257.6**	**-236.2**	**-157.5**	**0.0**	**157.5**	**236.3**	**257.6**	**280.0**	**321.5**	**364.2**
Balasto máx.		-235.0	-199.9	-196.0	-157.0	-117.5	-78.0	1.0	80.0	119.5	159.0	172.7	198.0	237.0
Balasto mín.		-127.0	-107.6	-105.5	-84.0	-63.0	-42.0	1.0	43.0	64.0	85.0	92.5	106.5	128.0
Resto Carga muerta		-69.0	-58.6	-57.5	-46.0	-34.5	-23.0	1.0	24.0	35.5	47.0	51.0	58.5	70.0
Retracción y fluencia		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Sobrecarga paseos +	1	0.0	0.0	0.0	0.0	0.0	0.0	1.0	5.0	7.0	9.0	9.7	11.0	13.0
Sobrecarga paseos -	1	-12.0	-10.6	-10.5	-9.0	-7.0	-5.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Tren +	1	21.5	21.5	21.5	21.5	21.5	21.5	21.5	77.0	103.5	130.0	139.3	156.5	183.0
Tren -	1	-216.0	-178.2	-174.0	-132.0	-105.5	-79.0	-16.5	-16.5	-16.5	-16.5	-16.5	-16.5	-16.5
Gradiente térmico	2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2

	ENVOLVENTE CON COEFICIENTES DE EXCENTRICIDAD												
Qk+	-506.5	-435.5	-427.6	-327.4	-270.3	-155.8	77.2	531.3	754.4	920.0	992.7	1127.7	1314.1
Qk-	-1388.2	-1179.2	-1156.0	-902.4	-740.3	-520.8	-50.5	178.5	293.0	350.1	385.2	450.3	529.3
Qd+	-470.9	-399.9	-392.0	-291.8	-234.7	-120.2	114.5	755.2	1069.5	1306.4	1409.2	1600.0	1864.9
Qd-	-1977.6	-1677.2	-1643.9	-1281.4	-1050.0	-741.0	-76.8	152.2	266.7	323.7	358.8	424.0	502.9

Cortantes máximos en vano 3

	VALORES CARACTERÍSTICOS DE LOS ESFUERZOS												
Tipo de cargas	***0.00***	***3.33***	***5.50***	***6.67***	***8.00***	***11.33***	***20.00***	***28.67***	***32.00***	***33.33***	***34.50***	***36.67***	***40.00***
Fase 1:Montaje de vigas	-184.8	-173.8	-151.8	-129.7	-118.7	-79.1	0.0	79.1	118.7	129.7	140.7	162.8	184.8
Montaje de prelosas	-51.2	-48.3	-42.4	-36.5	-33.6	-22.4	0.0	22.4	33.6	36.5	39.5	45.4	51.2
Losa fase 1 sobre pilas	-52.2	-47.3	-37.6	-27.9	-23.1	-4.6	0.0	4.6	23.1	27.9	32.8	42.5	52.2
Losa fase 1; resto	-32.3	-32.3	-32.3	-32.3	-32.3	-32.3	0.0	32.3	32.3	32.3	32.3	32.3	32.3
Losa fase 2	-43.6	-41.1	-36.1	-31.1	-28.6	-19.0	0.0	19.0	28.6	31.1	33.6	38.6	43.6
ΣPp	**-364.1**	**-342.8**	**-287.4**	**-257.6**	**-236.2**	**-157.5**	**0.0**	**157.5**	**236.2**	**257.6**	**279.9**	**321.5**	**364.1**
Balasto máx.	-237.0	-197.5	-171.8	-158.0	-118.5	-79.0	-1.0	79.0	118.0	157.0	170.8	196.5	236.0
Balasto mín.	-127.0	-106.0	-92.3	-85.0	-64.0	-43.0	0.0	42.0	63.5	85.0	92.4	106.0	127.0
Resto Carga muerta	-70.0	-58.5	-51.0	-47.0	-35.0	-23.0	0.0	23.0	34.5	46.0	50.2	58.0	70.0
Retracción y fluencia	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2
Sobrecarga uniforme + 1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	4.0	5.5	7.0	7.7	9.0	11.0
Sobrecarga uniforme - 1	-13.0	-11.0	-9.7	-9.0	-7.0	-5.0	-2.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Tren + 1	5.0	5.0	5.0	5.0	5.0	5.0	5.0	53.0	79.5	106.0	115.5	133.0	160.0
Tren - 1	-206.0	-167.0	-141.6	-128.0	-101.5	-75.0	-26.0	-26.0	-1.1	-26.0	-17.3	-1.1	-26.0
Gradiente térmico 2	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1

	ENVOLVENTE CON COEFICIENTES DE EXCENTRICIDAD												
Qk+	-563.1	-506.0	-427.3	-385.0	-327.4	-212.3	17.8	446.1	667.7	831.9	905.6	1042.4	1231.4
Qk-	-1364.5	-1162.6	-989.7	-896.7	-734.1	-514.0	-89.0	141.1	335.6	313.8	376.6	493.4	492.9
Qd+	-554.2	-497.1	-418.5	-376.1	-318.5	-203.4	26.6	628.7	941.0	1175.8	1279.9	1473.3	1742.1
Qd-	-1939.4	-1648.1	-1402.6	-1270.4	-1038.3	-728.5	-131.2	99.2	333.4	271.9	348.7	491.3	451.1

CÁLCULO A FLEXIÓN POSITIVA

CÁLCULO A ROTURA (E.L.U.)

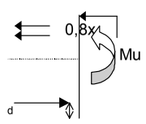
CÁLCULO A ROTURA, flexión positiva en sección final

Tipo de cable: 0.6'

fypk (kg/cm2): 17100 **fysk (kg/cm2):** 5100

γ : 1.15

fypd (kg/cm2): 14869.57 **fysd (kg/cm2):** 4434.78



Ancho de losa eficaz: 6 m

Espesor medio de losa: 0.29 m

fck: 300 kg/cm2

fcd: 200.00 kg/cm2

	VIGA 32m										
Sección:	*0.00*	*2.67*	*5.33*	*8.00*	*10.67*	*16.00*	*21.33*	*24.00*	*26.67*	*29.33*	*32.00*
hviga	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400
Arm. Activa											
Fila 1 Nº cables	96	96	192	192	192	192	144	72	0	0	0
$d_{inf.}$	0.400	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.400
Fila 2 Nº cables											
$d_{inf.}$											
Fila 3 Nº cables											
$d_{inf.}$											
Arm. Pasiva											
Fila 1 A (cm2)									257.60		
$d_{inf.}$									0.05		
Fila 2 A (cm2)											
$d_{inf.}$											
$A_{p,\ compr.}$ (cm2)											
$d_{sup.}$											
C_p											
T	1998.47	1998.47	3996.94	3996.94	3996.94	3996.94	2997.70	1498.85	1142.40	0.00	0.00
0,8x	0.196	0.196	0.392	0.392	0.392	0.392	0.294	0.147	0.112	0.000	0.000
Mu	4380.72	4980.26	9568.96	9568.96	9568.96	9568.96	7323.55	3771.90	2951.96	0.00	0.00
Md (+)	0.00	2393.98	5094.25	6221.59	7229.90	7032.15	4804.86	2395.59	436.37	-737.74	-1616.60
	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)

	VIGA 40m (1)												
Sección:	***0.00***	***3.00***	***3.33***	***6.67***	***10.00***	***13.33***	***20.00***	***26.67***	***30.00***	***33.33***	***34.50***	***36.67***	***40.00***
hviga	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400
Arm. Activa													
Fila 1 Nº cables	0	0	0	0	72	144	216	216	144	72	0	0	0
$d_{inf.}$	0.100	0.100	0.300	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
Fila 2 Nº cables													
$d_{inf.}$													
Fila 3 Nº cables													
$d_{inf.}$													
Arm. Pasiva													
Fila 1 A (cm2)				257.60							257.60		
$d_{inf.}$				0.05							0.05		
Fila 2 A (cm2)													
$d_{inf.}$													
$A_{p,\ compr.}$ (cm2)													
$d_{sup.}$													
C_p													
T	0.00	0.00	0.00	1142.40	1498.85	2997.70	4496.56	4496.56	2997.70	1498.85	1142.40	0.00	0.00
0,8x	0.000	0.000	0.000	0.112	0.147	0.294	0.441	0.441	0.294	0.147	0.112	0.000	0.000
Mu	0.00	0.00	0.00	2951.96	3771.90	7323.55	10654.95	10654.95	7323.55	3771.90	2951.96	0.00	0.00
Md (+)	-1602.20	-532.41	-111.39	1523.94	3651.10	6776.81	9365.01	6533.46	3604.20	1503.25	906.22	-309.92	-1930.90
	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)

Viaducto s/ el Río Francolí. UTE ALT CAMP *Flexión positiva. Cálculo a rotura*

	VIGA 40m (2)												
Sección:	***0.00***	***3.33***	***5.50***	***6.67***	***10.00***	***13.33***	***20.00***	***26.67***	***30.00***	***33.33***	***34.50***	***36.67***	***40.00***
hviga	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400
Arm. Activa													
Fila 1 Nº cables	0	0	0	0	72	144	216	216	144	72	0	0	0
$d_{inf.}$	0.100	0.100	0.300	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
Fila 2 Nº cables													
$d_{inf.}$													
Fila 3 Nº cables													
$d_{inf.}$													
Arm. Pasiva													
Fila 1 A (cm2)		257.60	257.60	257.60							257.60		
$d_{inf.}$		0.05	0.05	0.05							0.05		
Fila 2 A (cm2)													
$d_{inf.}$													
$A_{p,\ compr.}$ (cm2)													
$d_{sup.}$													
C_p													
T	0.00	1142.40	1142.40	1142.40	1498.85	2997.70	4496.56	4496.56	2997.70	1498.85	1142.40	0.00	0.00
0,8x	0.000	0.112	0.112	0.112	0.147	0.294	0.441	0.441	0.294	0.147	0.112	0.000	0.000
Mu	0.00	2951.96	2951.96	2951.96	3771.90	7323.55	10654.95	10654.95	7323.55	3771.90	2951.96	0.00	0.00
Md (+)	-1908.10	392.15	1243.49	1243.49	3108.32	6009.28	8128.46	6035.62	3219.03	1432.72	916.58	-149.12	-1538.80
	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)	VALE (Mu > Md)

CÁLCULO EN SERVICIO (E.L.S.)

VIGA LATERAL (Máximo momento flector positivo)

(8 torones de 12ϕ0.6''; postesado minorado)

```
1.902,1.194,1.48,-0.920,10,3.80,3.20,0.,0.30,0.27,0.,0.,0. !DOS FASES
5000,3000,3000,0,51000,171000,20000000,2,.02,70
4,1,1,1,1,1,1,0,0
0.00335,-0.88 !PASIVA VIGA
0.00188,-0.71 !PASIVA VIGA
0.00314,0.20 !PASIVA VIGA
0.0040,1.33 !PASIVA VIGA
0.00672,-0.82,130000,0.01767 !POSTESA VIGA (4 TORONES DE 12)
0.00672,-0.82,130000,0.01767
0.00509,0.05 !PASIVA SUPERIOR LOSA I
0.00199,0.05 !PASIVA INFERIOR LOSA I
0.00429,0.05 !PASIVA SUPERIOR LOSA II
0.00168,0.05 !PASIVA SUPERIOR LOSA II
1.,3.,8.,9.,30.,35.,30.,80.
316.50,202.30,74.1,0.,479,1114.5,321.92
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TENSIONES TOTALES EN EL HORMIGON
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INT.	INST.(d)	F.SUP.V	F.INF.V	F.SUP.L1	F.INF.L1	F.SUP.L2	F.INF.L2	F.SUP.L3	F.INF.L3
1	.0	.0	.0	.00	.00	.00	.00	.00	.00
2	1.1	.0	.0	.00	.00	.00	.00	.00	.00
2	1.3	.0	.0	.00	.00	.00	.00	.00	.00
2	1.6	.0	.0	.00	.00	.00	.00	.00	.00
2	2.0	.0	.0	.00	.00	.00	.00	.00	.00
2	3.0	.0	.0	.00	.00	.00	.00	.00	.00
3	3.0	18.7	-706.1	.00	.00	.00	.00	.00	.00
3	3.1	17.6	-701.7	.00	.00	.00	.00	.00	.00
3	3.1	17.3	-700.6	.00	.00	.00	.00	.00	.00
3	3.1	17.1	-699.6	.00	.00	.00	.00	.00	.00
3	3.1	16.9	-698.7	.00	.00	.00	.00	.00	.00
3	3.1	16.7	-697.9	.00	.00	.00	.00	.00	.00
3	3.2	16.5	-697.0	.00	.00	.00	.00	.00	.00
3	3.2	16.3	-696.1	.00	.00	.00	.00	.00	.00
3	3.3	16.1	-695.3	.00	.00	.00	.00	.00	.00
3	3.4	15.8	-694.3	.00	.00	.00	.00	.00	.00
3	3.4	15.6	-693.3	.00	.00	.00	.00	.00	.00
3	3.5	15.4	-692.3	.00	.00	.00	.00	.00	.00
3	3.7	15.1	-691.2	.00	.00	.00	.00	.00	.00
3	3.9	14.9	-690.0	.00	.00	.00	.00	.00	.00
3	4.1	14.6	-688.7	.00	.00	.00	.00	.00	.00
3	4.3	14.3	-687.3	.00	.00	.00	.00	.00	.00
3	4.7	13.9	-685.8	.00	.00	.00	.00	.00	.00
3	5.1	13.6	-684.2	.00	.00	.00	.00	.00	.00
3	5.6	13.2	-682.4	.00	.00	.00	.00	.00	.00
3	6.2	12.8	-680.5	.00	.00	.00	.00	.00	.00
3	8.0	11.9	-676.5	.00	.00	.00	.00	.00	.00
4	8.1	411.7	-1638.3	.00	.00	.00	.00	.00	.00
4	8.1	405.2	-1624.8	.00	.00	.00	.00	.00	.00
4	8.2	403.9	-1622.1	.00	.00	.00	.00	.00	.00
4	8.2	402.8	-1619.9	.00	.00	.00	.00	.00	.00
4	8.3	401.8	-1617.8	.00	.00	.00	.00	.00	.00
4	8.5	400.9	-1615.8	.00	.00	.00	.00	.00	.00
4	8.6	399.9	-1613.7	.00	.00	.00	.00	.00	.00
4	8.8	398.9	-1611.6	.00	.00	.00	.00	.00	.00
4	9.1	397.3	-1608.5	.00	.00	.00	.00	.00	.00
4	9.4	395.6	-1605.3	.00	.00	.00	.00	.00	.00
4	9.8	393.8	-1601.8	.00	.00	.00	.00	.00	.00
4	10.2	391.8	-1598.0	.00	.00	.00	.00	.00	.00
4	10.8	389.7	-1593.9	.00	.00	.00	.00	.00	.00
4	11.6	387.5	-1589.5	.00	.00	.00	.00	.00	.00
4	12.5	385.0	-1584.6	.00	.00	.00	.00	.00	.00
4	13.7	382.4	-1579.3	.00	.00	.00	.00	.00	.00
4	15.1	379.5	-1573.5	.00	.00	.00	.00	.00	.00
4	16.9	376.4	-1567.2	.00	.00	.00	.00	.00	.00
4	19.2	373.1	-1560.4	.00	.00	.00	.00	.00	.00
4	22.1	369.5	-1553.0	.00	.00	.00	.00	.00	.00
4	29.9	361.5	-1536.3	.00	.00	.00	.00	.00	.00
5	30.1	123.7	-1392.3	.00	.00	.00	.00	.00	.00
5	30.1	125.7	-1393.4	-.03	-.02	.00	.00	.00	.00
5	30.1	126.2	-1393.7	-.02	-.01	.00	.00	.00	.00
5	30.1	126.7	-1393.9	-.05	-.02	.00	.00	.00	.00
5	30.1	127.1	-1394.2	-.10	-.04	.00	.00	.00	.00
5	30.1	127.5	-1394.4	-.16	-.06	.00	.00	.00	.00
5	30.2	128.0	-1394.5	-.22	-.07	.00	.00	.00	.00
5	30.2	128.4	-1394.7	-.28	-.07	.00	.00	.00	.00
5	30.3	128.8	-1394.8	-.33	-.06	.00	.00	.00	.00
5	30.4	129.1	-1395.0	-.37	-.02	.00	.00	.00	.00
5	30.4	129.4	-1395.1	-.40	.04	.00	.00	.00	.00
5	30.5	129.6	-1395.1	-.41	.13	.00	.00	.00	.00
5	30.7	129.8	-1395.1	-.38	.25	.00	.00	.00	.00
5	30.9	129.8	-1395.0	-.31	.42	.00	.00	.00	.00
5	31.1	129.7	-1394.9	-.19	.62	.00	.00	.00	.00
5	31.3	129.5	-1394.6	-.02	.88	.00	.00	.00	.00

Viaducto s/ el Río Francolí. UTE ALT CAMP Flexión positiva. Cálculo en servicio.

5	31.7	129.0	-1394.2	.24	1.19	.00	.00	.00	.00
5	32.1	128.4	-1393.7	.58	1.56	.00	.00	.00	.00
5	32.6	127.5	-1392.9	1.03	1.99	.00	.00	.00	.00
5	33.2	126.3	-1392.0	1.60	2.49	.00	.00	.00	.00
5	35.0	122.6	-1389.2	3.28	3.76	.00	.00	.00	.00
6	35.0	97.4	-1353.2	-20.78	-14.71	.00	.00	.00	.00
6	35.1	96.9	-1353.3	-19.82	-14.03	-.18	-.15	.00	.00
6	35.2	95.1	-1352.8	-21.02	-15.10	1.02	1.11	.00	.00
6	35.2	94.0	-1352.4	-21.53	-15.56	1.65	1.80	.00	.00
6	35.4	92.8	-1352.1	-22.10	-16.09	2.34	2.56	.00	.00
6	35.5	91.4	-1351.6	-22.69	-16.64	3.07	3.36	.00	.00
6	35.6	90.0	-1351.1	-23.31	-17.21	3.84	4.22	.00	.00
6	35.8	88.4	-1350.5	-23.94	-17.80	4.67	5.13	.00	.00
6	36.1	86.6	-1349.9	-24.59	-18.42	5.56	6.11	.00	.00
6	36.4	84.7	-1349.1	-25.23	-19.04	6.51	7.15	.00	.00
6	36.8	82.5	-1348.2	-25.86	-19.67	7.53	8.25	.00	.00
6	37.3	80.1	-1347.1	-26.46	-20.30	8.63	9.42	.00	.00
6	37.9	77.4	-1345.8	-27.02	-20.93	9.81	10.64	.00	.00
6	38.7	74.3	-1344.3	-27.52	-21.54	11.08	11.92	.00	.00
6	39.6	70.9	-1342.5	-27.94	-22.13	12.47	13.26	.00	.00
6	40.8	67.0	-1340.4	-28.26	-22.70	13.97	14.65	.00	.00
6	42.3	62.6	-1337.8	-28.46	-23.25	15.61	16.10	.00	.00
6	44.1	57.6	-1334.8	-28.53	-23.77	17.41	17.61	.00	.00
6	46.5	52.0	-1331.3	-28.44	-24.27	19.39	19.18	.00	.00
6	49.4	45.6	-1327.2	-28.18	-24.76	21.58	20.82	.00	.00
6	57.5	27.9	-1316.0	-27.26	-26.25	27.53	24.82	.00	.00
7	57.5	29.6	-1316.5	-27.15	-25.82	26.89	24.47	.00	.00
7	57.6	29.5	-1316.5	-27.16	-25.85	26.92	24.49	.00	.00
7	57.6	29.6	-1316.5	-27.16	-25.84	26.91	24.48	.00	.00
7	57.6	29.6	-1316.5	-27.15	-25.83	26.90	24.48	.00	.00
7	57.6	29.6	-1316.5	-27.15	-25.81	26.89	24.47	.00	.00
7	57.7	29.6	-1316.4	-27.14	-25.80	26.88	24.47	.00	.00
7	57.7	29.6	-1316.4	-27.13	-25.79	26.88	24.47	.00	.00
7	57.8	29.6	-1316.4	-27.12	-25.77	26.88	24.47	.00	.00
7	57.9	29.6	-1316.3	-27.10	-25.76	26.88	24.48	.00	.00
7	58.0	29.6	-1316.2	-27.09	-25.75	26.90	24.49	.00	.00
7	58.1	29.5	-1316.1	-27.07	-25.73	26.93	24.52	.00	.00
7	58.3	29.3	-1316.0	-27.04	-25.73	26.97	24.55	.00	.00
7	58.5	29.1	-1315.8	-27.01	-25.72	27.04	24.60	.00	.00
7	58.7	28.8	-1315.5	-26.97	-25.72	27.13	24.66	.00	.00
7	59.0	28.4	-1315.2	-26.93	-25.73	27.26	24.75	.00	.00
7	59.4	27.9	-1314.8	-26.87	-25.74	27.43	24.86	.00	.00
7	59.9	27.2	-1314.3	-26.80	-25.76	27.64	25.00	.00	.00
7	60.5	26.4	-1313.6	-26.72	-25.80	27.92	25.19	.00	.00
7	61.3	25.3	-1312.8	-26.61	-25.84	28.28	25.42	.00	.00
7	62.2	23.9	-1311.8	-26.48	-25.90	28.72	25.70	.00	.00
7	63.4	22.2	-1310.5	-26.31	-25.98	29.27	26.06	.00	.00
7	64.9	20.1	-1309.0	-26.10	-26.07	29.96	26.49	.00	.00
7	66.7	17.5	-1307.1	-25.84	-26.19	30.79	27.01	.00	.00
7	69.0	14.4	-1304.7	-25.52	-26.33	31.80	27.64	.00	.00
7	71.9	10.6	-1301.9	-25.12	-26.49	33.02	28.38	.00	.00
7	80.0	-.5	-1294.1	-24.01	-27.15	36.63	30.47	.00	.00
8	80.0	-59.4	-1090.2	-103.13	-77.94	-42.44	-20.41	.00	.00
8	85.0	-73.5	-1088.1	-100.46	-79.02	-34.74	-17.75	.00	.00
8	91.2	-78.8	-1084.6	-99.11	-78.40	-33.13	-16.26	.00	.00
8	98.9	-87.2	-1079.5	-97.88	-78.81	-29.73	-14.65	.00	.00
8	108.5	-96.0	-1073.6	-96.43	-78.83	-26.69	-12.85	.00	.00
8	120.6	-105.9	-1066.6	-94.90	-79.00	-23.16	-10.91	.00	.00
8	135.6	-116.7	-1058.7	-93.18	-79.07	-19.44	-8.77	.00	.00
8	154.5	-128.4	-1049.8	-91.29	-79.10	-15.40	-6.46	.00	.00
8	178.0	-141.0	-1040.0	-89.20	-79.01	-11.15	-3.98	.00	.00
8	207.4	-154.4	-1029.3	-86.91	-78.78	-6.68	-1.33	.00	.00
8	244.2	-168.2	-1017.7	-84.38	-78.32	-2.08	1.43	.00	.00
8	290.2	-182.4	-1005.5	-81.58	-77.59	2.57	4.26	.00	.00
8	347.7	-196.7	-992.8	-78.48	-76.50	7.17	7.08	.00	.00
8	419.5	-210.7	-979.6	-75.00	-74.96	11.61	9.81	.00	.00
8	509.3	-224.2	-966.2	-71.09	-72.89	15.75	12.31	.00	.00
8	621.6	-236.8	-952.8	-66.68	-70.22	19.44	14.46	.00	.00
8	761.9	-248.0	-939.6	-61.72	-66.90	22.57	16.11	.00	.00
8	937.3	-257.7	-926.8	-56.16	-62.89	25.00	17.13	.00	.00
8	1156.5	-265.3	-914.5	-50.02	-58.24	26.64	17.42	.00	.00
8	1430.6	-270.8	-902.8	-43.35	-53.00	27.45	16.90	.00	.00
8	1773.1	-273.9	-892.0	-36.24	-47.32	27.41	15.53	.00	.00
8	2201.3	-274.6	-881.9	-28.86	-41.35	26.58	13.37	.00	.00

8	2736.6	-273.0	-872.8	-21.37	-35.29	25.05	10.49	.00	.00
8	3405.6	-269.3	-864.5	-13.98	-29.33	22.96	7.02	.00	.00
8	4242.0	-263.8	-856.9	-6.86	-23.64	20.43	3.13	.00	.00
8	5287.4	-257.0	-850.1	-.18	-18.35	17.63	-1.02	.00	.00
8	6594.2	-249.2	-843.9	5.94	-13.57	14.70	-5.26	.00	.00
8	8227.6	-241.0	-838.3	11.44	-9.32	11.74	-9.43	.00	.00
8	10269.5	-232.6	-833.0	16.28	-5.63	8.87	-13.42	.00	.00
8	12821.7	-224.4	-828.1	20.47	-2.48	6.14	-17.15	.00	.00
8	20000.0	-382.3	-204.8	-209.44	-148.99	-238.94	-178.82	.00	.00

VIGA CENTRAL (c.d.v.)

(9 torones de 12ϕ0.6''; postesado minorado)

```
1.902,1.194,1.48,-0.920,10,3.80,3.20,0.,0.30,0.27,0.,0.,0. !DOS FASES
5000,3000,3000,0,51000,171000,20000000,2,.02,70
4,1,1,1,1,1,1,0,0
0.00335,-0.88 !PASIVA VIGA
0.00188,-0.71 !PASIVA VIGA
0.00314,0.20 !PASIVA VIGA
0.0040,1.33 !PASIVA VIGA
0.00672,-0.82,130000,0.01767 !POSTESA VIGA (4 TORONES DE 12)
0.00840,-0.82,130000,0.02209 !POSTESA VIGA (5 TORONES DE 12)
0.00509,0.05 !PASIVA SUPERIOR LOSA I
0.00199,0.05 !PASIVA INFERIOR LOSA I
0.00429,0.05 !PASIVA SUPERIOR LOSA II
0.00168,0.05 !PASIVA SUPERIOR LOSA II
1.,3.,8.,9.,30.,35.,30.,80.
356.05,221.71,77.1,0.,517.5,1662.1, 603.14
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TENSIONES TOTALES EN EL HORMIGON

INT.	INST.(d)	F.SUP.V	F.INF.V	F.SUP.L1	F.INF.L1	F.SUP.L2	F.INF.L2	F.SUP.L3	F.INF.L3
1	.0	.0	.0	.00	.00	.00	.00	.00	.00
2	1.1	.0	.0	.00	.00	.00	.00	.00	.00
2	1.3	.0	.0	.00	.00	.00	.00	.00	.00
2	1.6	.0	.0	.00	.00	.00	.00	.00	.00
2	2.0	.0	.0	.00	.00	.00	.00	.00	.00
2	3.0	.0	.0	.00	.00	.00	.00	.00	.00
3	3.0	-25.7	-681.0	.00	.00	.00	.00	.00	.00
3	3.1	-26.6	-676.8	.00	.00	.00	.00	.00	.00
3	3.1	-26.8	-675.7	.00	.00	.00	.00	.00	.00
3	3.1	-27.0	-674.7	.00	.00	.00	.00	.00	.00
3	3.1	-27.2	-673.9	.00	.00	.00	.00	.00	.00
3	3.1	-27.4	-673.1	.00	.00	.00	.00	.00	.00
3	3.2	-27.5	-672.2	.00	.00	.00	.00	.00	.00
3	3.2	-27.7	-671.4	.00	.00	.00	.00	.00	.00
3	3.3	-27.8	-670.5	.00	.00	.00	.00	.00	.00
3	3.4	-28.0	-669.6	.00	.00	.00	.00	.00	.00
3	3.4	-28.2	-668.7	.00	.00	.00	.00	.00	.00
3	3.5	-28.4	-667.6	.00	.00	.00	.00	.00	.00
3	3.7	-28.6	-666.6	.00	.00	.00	.00	.00	.00
3	3.9	-28.8	-665.4	.00	.00	.00	.00	.00	.00
3	4.1	-29.0	-664.1	.00	.00	.00	.00	.00	.00
3	4.3	-29.3	-662.8	.00	.00	.00	.00	.00	.00
3	4.7	-29.6	-661.3	.00	.00	.00	.00	.00	.00
3	5.1	-29.9	-659.8	.00	.00	.00	.00	.00	.00
3	5.6	-30.2	-658.1	.00	.00	.00	.00	.00	.00
3	6.2	-30.5	-656.2	.00	.00	.00	.00	.00	.00
3	8.0	-31.2	-652.3	.00	.00	.00	.00	.00	.00
4	8.1	471.0	-1860.3	.00	.00	.00	.00	.00	.00
4	8.1	462.8	-1843.2	.00	.00	.00	.00	.00	.00
4	8.2	461.2	-1840.0	.00	.00	.00	.00	.00	.00
4	8.2	459.9	-1837.2	.00	.00	.00	.00	.00	.00
4	8.3	458.6	-1834.6	.00	.00	.00	.00	.00	.00
4	8.5	457.5	-1832.1	.00	.00	.00	.00	.00	.00
4	8.6	456.3	-1829.6	.00	.00	.00	.00	.00	.00
4	8.8	455.1	-1827.0	.00	.00	.00	.00	.00	.00
4	9.1	452.9	-1823.1	.00	.00	.00	.00	.00	.00
4	9.4	450.7	-1819.0	.00	.00	.00	.00	.00	.00
4	9.8	448.3	-1814.6	.00	.00	.00	.00	.00	.00
4	10.2	445.8	-1809.9	.00	.00	.00	.00	.00	.00
4	10.8	443.1	-1804.8	.00	.00	.00	.00	.00	.00
4	11.6	440.2	-1799.3	.00	.00	.00	.00	.00	.00
4	12.5	437.1	-1793.3	.00	.00	.00	.00	.00	.00
4	13.7	433.7	-1786.9	.00	.00	.00	.00	.00	.00
4	15.1	430.1	-1779.8	.00	.00	.00	.00	.00	.00
4	16.9	426.2	-1772.2	.00	.00	.00	.00	.00	.00
4	19.2	422.0	-1764.0	.00	.00	.00	.00	.00	.00
4	22.1	417.4	-1755.1	.00	.00	.00	.00	.00	.00
4	29.9	407.3	-1735.1	.00	.00	.00	.00	.00	.00
5	30.1	146.9	-1578.0	.00	.00	.00	.00	.00	.00
5	30.1	149.2	-1579.3	-.03	-.02	.00	.00	.00	.00
5	30.1	149.7	-1579.6	-.03	-.01	.00	.00	.00	.00
5	30.1	150.3	-1579.9	-.07	-.04	.00	.00	.00	.00
5	30.1	150.8	-1580.1	-.13	-.07	.00	.00	.00	.00
5	30.1	151.3	-1580.3	-.20	-.10	.00	.00	.00	.00
5	30.2	151.8	-1580.6	-.29	-.13	.00	.00	.00	.00
5	30.2	152.3	-1580.8	-.37	-.15	.00	.00	.00	.00
5	30.3	152.8	-1580.9	-.46	-.17	.00	.00	.00	.00
5	30.4	153.2	-1581.1	-.53	-.16	.00	.00	.00	.00
5	30.4	153.6	-1581.2	-.59	-.13	.00	.00	.00	.00
5	30.5	154.0	-1581.3	-.63	-.07	.00	.00	.00	.00
5	30.7	154.2	-1581.3	-.64	.02	.00	.00	.00	.00
5	30.9	154.4	-1581.3	-.61	.14	.00	.00	.00	.00
5	31.1	154.4	-1581.1	-.53	.31	.00	.00	.00	.00
5	31.3	154.3	-1580.9	-.39	.52	.00	.00	.00	.00

Viaducto s/ el Río Francolí. UTE ALT CAMP Flexión positiva. Cálculo en servicio.

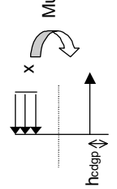
5	31.7	153.9	-1580.5	-.18	.78	.00	.00	.00	.00
5	32.1	153.4	-1579.9	.13	1.10	.00	.00	.00	.00
5	32.6	152.6	-1579.1	.55	1.47	.00	.00	.00	.00
5	33.2	151.4	-1578.0	1.10	1.92	.00	.00	.00	.00
5	35.0	147.7	-1575.0	2.76	3.05	.00	.00	.00	.00
6	35.0	121.5	-1537.6	-22.25	-16.13	.00	.00	.00	.00
6	35.1	121.0	-1537.7	-21.25	-15.42	-.19	-.16	.00	.00
6	35.2	119.2	-1537.2	-22.44	-16.49	1.01	1.10	.00	.00
6	35.2	118.1	-1536.8	-22.94	-16.95	1.64	1.79	.00	.00
6	35.4	116.8	-1536.5	-23.50	-17.47	2.32	2.53	.00	.00
6	35.5	115.5	-1536.0	-24.08	-18.02	3.04	3.33	.00	.00
6	35.6	114.1	-1535.5	-24.68	-18.59	3.81	4.18	.00	.00
6	35.8	112.5	-1534.9	-25.30	-19.18	4.64	5.08	.00	.00
6	36.1	110.7	-1534.2	-25.93	-19.79	5.52	6.05	.00	.00
6	36.4	108.8	-1533.3	-26.55	-20.42	6.47	7.07	.00	.00
6	36.8	106.6	-1532.4	-27.16	-21.06	7.49	8.15	.00	.00
6	37.3	104.1	-1531.2	-27.74	-21.69	8.58	9.29	.00	.00
6	37.9	101.4	-1529.8	-28.28	-22.33	9.76	10.48	.00	.00
6	38.7	98.3	-1528.2	-28.75	-22.95	11.04	11.72	.00	.00
6	39.6	94.8	-1526.3	-29.13	-23.56	12.43	13.02	.00	.00
6	40.8	90.9	-1523.9	-29.41	-24.16	13.94	14.36	.00	.00
6	42.3	86.3	-1521.2	-29.56	-24.73	15.60	15.76	.00	.00
6	44.1	81.2	-1517.9	-29.57	-25.29	17.42	17.20	.00	.00
6	46.5	75.3	-1514.0	-29.41	-25.84	19.43	18.70	.00	.00
6	49.4	68.7	-1509.4	-29.07	-26.38	21.66	20.25	.00	.00
6	57.5	50.2	-1497.1	-27.89	-28.03	27.75	24.00	.00	.00
7	57.5	52.0	-1497.6	-27.83	-27.59	27.08	23.69	.00	.00
7	57.6	51.9	-1497.6	-27.84	-27.61	27.11	23.70	.00	.00
7	57.6	52.0	-1497.5	-27.83	-27.60	27.10	23.69	.00	.00
7	57.6	52.0	-1497.5	-27.83	-27.59	27.09	23.69	.00	.00
7	57.6	52.0	-1497.5	-27.83	-27.58	27.08	23.69	.00	.00
7	57.7	52.0	-1497.5	-27.82	-27.57	27.07	23.68	.00	.00
7	57.7	52.1	-1497.5	-27.81	-27.55	27.06	23.68	.00	.00
7	57.8	52.0	-1497.4	-27.80	-27.54	27.06	23.69	.00	.00
7	57.9	52.0	-1497.3	-27.79	-27.52	27.06	23.69	.00	.00
7	58.0	52.0	-1497.3	-27.77	-27.51	27.08	23.71	.00	.00
7	58.1	51.9	-1497.1	-27.75	-27.50	27.11	23.73	.00	.00
7	58.3	51.7	-1497.0	-27.72	-27.50	27.16	23.76	.00	.00
7	58.5	51.5	-1496.7	-27.69	-27.49	27.22	23.81	.00	.00
7	58.7	51.2	-1496.5	-27.65	-27.50	27.32	23.87	.00	.00
7	59.0	50.8	-1496.1	-27.60	-27.51	27.44	23.95	.00	.00
7	59.4	50.2	-1495.6	-27.54	-27.52	27.61	24.05	.00	.00
7	59.9	49.5	-1495.1	-27.47	-27.55	27.83	24.19	.00	.00
7	60.5	48.6	-1494.3	-27.37	-27.59	28.12	24.36	.00	.00
7	61.3	47.5	-1493.4	-27.25	-27.65	28.48	24.58	.00	.00
7	62.2	46.0	-1492.3	-27.10	-27.72	28.93	24.84	.00	.00
7	63.4	44.2	-1490.9	-26.91	-27.81	29.50	25.17	.00	.00
7	64.9	42.0	-1489.2	-26.68	-27.93	30.20	25.58	.00	.00
7	66.7	39.3	-1487.0	-26.38	-28.07	31.05	26.07	.00	.00
7	69.0	36.0	-1484.4	-26.02	-28.24	32.09	26.65	.00	.00
7	71.9	32.0	-1481.3	-25.58	-28.45	33.33	27.34	.00	.00
7	80.0	20.3	-1472.6	-24.31	-29.22	37.05	29.27	.00	.00
8	80.0	-43.2	-1252.5	-109.71	-84.01	-48.26	-25.58	.00	.00
8	85.0	-58.3	-1250.4	-106.75	-85.20	-40.00	-22.85	.00	.00
8	91.2	-63.9	-1246.6	-105.27	-84.57	-38.36	-21.40	.00	.00
8	98.9	-72.8	-1240.9	-103.92	-85.07	-34.81	-19.87	.00	.00
8	108.5	-82.1	-1234.3	-102.33	-85.16	-31.67	-18.15	.00	.00
8	120.6	-92.5	-1226.5	-100.66	-85.42	-28.02	-16.32	.00	.00
8	135.6	-104.0	-1217.7	-98.78	-85.58	-24.18	-14.30	.00	.00
8	154.5	-116.4	-1207.8	-96.74	-85.72	-20.03	-12.13	.00	.00
8	178.0	-129.7	-1196.9	-94.50	-85.75	-15.65	-9.78	.00	.00
8	207.4	-143.8	-1185.0	-92.05	-85.64	-11.07	-7.30	.00	.00
8	244.2	-158.5	-1172.2	-89.36	-85.33	-6.36	-4.70	.00	.00
8	290.2	-173.5	-1158.6	-86.41	-84.74	-1.61	-2.05	.00	.00
8	347.7	-188.6	-1144.4	-83.16	-83.79	3.09	.60	.00	.00
8	419.5	-203.4	-1129.8	-79.56	-82.40	7.61	3.13	.00	.00
8	509.3	-217.7	-1115.0	-75.53	-80.48	11.82	5.45	.00	.00
8	621.6	-231.0	-1100.1	-71.02	-77.96	15.58	7.41	.00	.00
8	761.9	-243.0	-1085.5	-65.97	-74.78	18.75	8.88	.00	.00
8	937.3	-253.3	-1071.2	-60.34	-70.92	21.21	9.73	.00	.00
8	1156.5	-261.5	-1057.6	-54.15	-66.39	22.88	9.85	.00	.00
8	1430.6	-267.6	-1044.7	-47.44	-61.28	23.69	9.16	.00	.00
8	1773.1	-271.2	-1032.6	-40.31	-55.72	23.65	7.65	.00	.00
8	2201.3	-272.3	-1021.4	-32.91	-49.86	22.80	5.35	.00	.00

8	2736.6	-271.1	-1011.2	-25.43	-43.90	21.25	2.34	.00	.00
8	3405.6	-267.7	-1001.9	-18.05	-38.03	19.12	-1.24	.00	.00
8	4242.0	-262.5	-993.4	-10.96	-32.43	16.56	-5.24	.00	.00
8	5287.4	-256.0	-985.8	-4.31	-27.22	13.72	-9.48	.00	.00
8	6594.2	-248.4	-978.8	1.78	-22.50	10.74	-13.79	.00	.00
8	8227.6	-240.4	-972.3	7.24	-18.31	7.73	-18.04	.00	.00
8	10269.5	-232.2	-966.3	12.04	-14.67	4.81	-22.09	.00	.00
8	12821.7	-224.1	-960.7	16.18	-11.56	2.03	-25.87	.00	.00
8	20000.0	-483.4	18.0	-351.15	-246.06	-380.50	-275.54	.00	.00

CÁLCULO A FLEXIÓN NEGATIVA

CÁLCULO SOBRE SECCIÓN INICIAL (E.L.U. Rotura y E.L.S.)

COMPROBACIÓN EN ROTURA SOBRE SECCIÓN INICIAL



Tipo de cable: 0.6"

f_{ck}:	600	kg/cm2
γ_c:	1.5	
f_{cd}:	400.00	kg/cm2
	140000	t/m2
Tensión de tesado inicial:	154000	t/m2
Tensión de tesado mayorado:	126000	t/m2
Tensión de tesado minorado:		

f_{ypk} (kg/cm2):	17100	
f_{ysk} (kg/cm2):	5100	
γ_s:	1.15	
f_{ypd} (kg/cm2):	14869.57	
f_{yed} (kg/cm2):	4434.78	

VANO 32,0m

Distancia al estribo	***29.33***	***32.00***
Md- (ley decalada un canto)	-1487.4	-1947.5
Inercia	2.388	2.388
Área	3.804	3.804
V_a	1.480	1.480
W_a	1.614	1.614
recubrimiento A_s	0.15	0.15
h_{viga}	2.40	2.40
espesor de fondo	0.25	0.30
ancho de fondo	5.00	5.00
espesor de alma (m)	0.90	0.90
Armadura pasiva dispuesta (cm2)	0.00	0.00
nº cables dispuestos arriba	72	72
Armadura pasiva equivalente requerida	105.00	190.00
Armadura mínima mecánica de flexión	122.05	151.62
Armadura mínima geométrica	106.51	106.51
Armadura pasiva equiv. dispuesta (cm2)	337.98	337.98

NOTA: El cálculo de la armadura estricta se ha realizado utilizando el prontuario informático

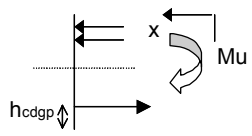
COMPROBACIÓN EN SERVICIO SOBRE SECCIÓN INICIAL

VANO 32,0m			
Distancia al estribo		***29.33***	***32.00***
M_{k-}		-1101.8	-1442.6
nº de cables abajo		0	0
h_{viga}		2.40	2.40
Va		1.480	1.480
Vb		-0.920	-0.920
h_{cdgp}		0.10	0.10
V_{cdgp}		-0.820	-0.820
Área		3.804	3.804
Inercia		2.388	2.388
$N_{pretensadoinf.}$		0.0	0.0
$M_{pretensadoinf.}$		0.0	0.0
Mtotal		-1101.8	-1442.6
Tiempo inicial	σ_a (t/m2)	-682.75	-893.93
	σ_b (t/m2)	424.64	555.98
nº de cables dispuestos arriba		72	72
	h_{cdgp}	0.15	0.15
	V_{cdgp}	1.330	1.330
Tiempo inicial	σ_a (t/m2)	1380.41	1380.41
	σ_b (t/m2)	-316.98	-316.98
Tiempo inicial	σ_{2a} (t/m2)	697.66	486.48
	σ_{2b} (t/m2)	107.66	239.00

COMPROBACIÓN EN ROTURA SOBRE SECCIÓN INICIAL

Tipo de cable: 0.6"

f_{ypk} (kg/cm2): 17100
f_{ysk} (kg/cm2): 5100
γ: 1.15
f_{ypd} (kg/cm2): 14869.57
f_{ysd} (kg/cm2): 4434.78



f_{ck}: 600 kg/cm2
γ: 1.5
f_{cd}: 400.00 kg/cm2

Tensión de tesado inicial: 140000 t/m2
Tensión de tesado mayorado: 154000 t/m2
Tensión de tesado minorado: 126000 t/m2

VANO 40,0m				
Distancia a la pila	***0.00***	***3.33***	***36.67***	***40.00***
Md- (ley decalada un canto)	-1942.4	-1178.8	-1178.8	-1942.4
Inercia	2.388	2.388	2.388	2.388
Área	3.804	3.804	3.804	3.804
Va	1.480	1.480	1.480	1.480
Wa	1.614	1.614	1.614	1.614
recubrimiento As	0.15	0.15	0.15	0.15
h_{viga}	2.40	2.40	2.40	2.40
espesor de fondo	0.30	0.30	0.30	0.30
ancho de fondo	5.00	5.00	5.00	5.00
espesor de alma (m)	0.90	0.90	0.90	0.90
Armadura pasiva dispuesta (cm2)				
nº cables dispuestos arriba	72	72	72	72
Armadura pasiva equivalente requerida	190.00	95.00	95.00	190.00
Armadura mínima mecánica de flexión	151.62	113.48	113.48	151.62
Armadura mínima geométrica	106.51	106.51	106.51	106.51
Armadura pasiva equiv. dispuesta (cm2)	337.98	337.98	337.98	337.98

NOTA: El cálculo de la armadura estricta se ha realizado utilizando el prontuario informático

COMPROBACIÓN EN SERVICIO SOBRE SECCIÓN INICIAL

VANO 40,0m					
Distancia a pila		***0.00***	***3.33***	***36.67***	***40.00***
	M_{k-}	-1438.8	-873.2	-873.2	-1438.8
	nº de cables abajo	0	0	0	0
	h_{viga}	2.40	2.40	2.40	2.40
	Va	1.480	1.480	1.480	1.480
	Vb	-0.920	-0.920	-0.920	-0.920
	h_{cdgp}	0.10	0.10	0.10	0.10
	V_{cdgp}	-0.820	-0.820	-0.820	-0.820
	Área	3.804	3.804	3.804	3.804
	Inercia	2.388	2.388	2.388	2.388
	$N_{pretensadoinf.}$	0.0	0.0	0.0	0.0
	$M_{pretensadoinf.}$	0.0	0.0	0.0	0.0
	Mtotal	-1438.8	-873.2	-873.2	-1438.8
Tiempo inicial	σ_a (t/m2)	-891.58	-541.09	-541.09	-891.58
	σ_b (t/m2)	554.52	336.53	336.53	554.52
nº de cables dispuestos arriba		72	72	72	72
	h_{cdgp}	0.15	0.15	0.15	0.15
	V_{cdgp}	1.330	1.330	1.330	1.330
Tiempo inicial	σ_a (t/m2)	1380.41	1380.41	1380.41	1380.41
	σ_b (t/m2)	-316.98	-316.98	-316.98	-316.98
Tiempo inicial	σ_{2a} (t/m2)	488.83	839.31	839.31	488.83
	σ_{2b} (t/m2)	237.54	19.55	19.55	237.54

CÁLCULO SOBRE SECCIÓN FINAL. ARMADURA DE LOSA

ARMADURA LONGITUDINAL DE LA LOSA

VANO 32,0m

Distancia al estribo 1	13.30	18.63	21.30	23.97	26.63	29.30
Md - (ley decalada un canto)	0	-1420	-2982	-5177	-8241	-10907
H total (m)	2.70	2.70	2.70	2.70	2.70	2.70
Ancho fondo (m)	5.00	5.00	5.00	5.00	5.00	5.00
Espesor de fondo (m)	0.25	0.25	0.25	0.25	0.25	0.30
Espesor total de almas (m)	0.90	0.90	0.90	0.90	0.90	0.90
Inercia (m 4)	7.091	7.091	7.091	7.091	7.091	7.091
Área (m 2)	7.589	7.589	7.589	7.589	7.589	7.589
V a	1.034	1.034	1.034	1.034	1.034	1.034
W a (m3)	6.861	6.861	6.861	6.861	6.861	6.861
Armadura estricta (cm2)	**0.00**	**127.37**	**269.54**	**472.77**	**764.21**	**1025.50**
Espesor del bloque de compresiones (m)	*0.000*	*0.134*	*0.187*	*0.246*	*0.381*	*0.550*
Armadura mínima mecánica (cm2)	0.00	174.49	330.14	480.96	477.49	477.49
Armadura mínima geométrica (cm2)	212.50	212.50	212.50	212.50	212.50	212.50
nº cables en losa	0	0	48	96	168	168
Armadura pasiva necesaria	212.50	212.50	50.00	50.00	50.00	250.00
Armadura pasiva equiv. dispuesta (cm2)	**212.50**	**212.50**	**275.32**	**500.64**	**838.61**	**1038.61**

Recubrimiento: 7 cm

fypk =	5100	Kg/cm2	γ_s = 1.15	**fypd =**	4434.78
fyak =	17100	Kg/cm2			
fck =	500	Kg/cm3	γ_c = 1.50	**fcd =**	333.33
	(viga)				

Viaducto s/ el Río Francolí. UTE ALT CAMP — Flexión negativa sobre sección final

VANO 40,0m (1)

Distancia a pila 1	2.70	6.03	8.20	10.70	14.03	20.00
Md - (ley decalada un canto)	-11558	-7505	-4651	-1907	-567	0
H total (m)	2.70	2.70	2.70	2.70	2.70	2.70
Ancho fondo (m)	5.00	5.00	5.00	5.00	5.00	5.00
Espesor de fondo (m)	0.30	0.25	0.25	0.25	0.25	0.25
Espesor total de almas (m)	0.90	0.90	0.90	0.90	0.90	0.90
Inercia (m 4)	7.091	7.091	7.091	7.091	7.091	7.091
Área (m 2)	7.589	7.589	7.589	7.589	7.589	7.589
V a	1.034	1.034	1.034	1.034	1.034	1.034
W a (m3)	6.861	6.861	6.861	6.861	6.861	6.861
Armadura estricta (cm2)	**1090.50**	**693.35**	**423.70**	**171.49**	**50.68**	**0.00**
Espesor del bloque de compresiones (m)	*0.786*	*0.424*	*0.250*	*0.162*	*0.134*	*0.134*
Armadura mínima mecánica (cm2)	477.49	477.49	452.26	227.21	73.40	0.00
Armadura mínima geométrica (cm2)	212.50	212.50	212.50	212.50	212.50	212.50
nº cables en losa	168	72	72	0	0	0
Armadura pasiva necesaria	360.00	360.00	100.00	212.50	212.50	212.50
Armadura pasiva equiv. dispuesta (cm2)	**1148.61**	**697.98**	**437.98**	**212.50**	**212.50**	**212.50**

Recubrimiento: 7 cm

fypk =	5100	Kg/cm2	γ_s = 1.15	**fypd =**	4434.78
fyak =	17100	Kg/cm2			
fck =	500	Kg/cm3	γ_c = 1.50	**fcd =**	333.33
	(viga)				

ARMADO LOSA VANO 32 m

CARACTERISTICAS MECANICAS:

Vb: distancia a fibra superior losa
Va: distancia a fibra superior viga
Vc: distancia a fibra inferior viga

0.3084

	SEMIFINALES			
SECCION	AREA	INERCIA	Vic	Vib
	6.002786	6.417006	1.478931	1.301385

2.780316

	SEMIFINALES				FINALES			
SECCION	INERCIA	Vfa	Vfb	Vfc	INERCIA	Vfa	Vfb	Vfc
	6.417006	0.992985	1.301385	1.478931	7.129961	0.826314	1.134714	1.645602
				2.780316				2.780316

FLECTORES:

SECCION	PP+PR	LOSA F 1	LOSA F 2	C. PERM.	SOB. ACERA	0.6*TREN	
16	0.000	-225.400	-148.200	-677.732	21.600	698.700	**-331.032**
21.33	0.000	-97.000	-90.100	-288.125	28.800	932.160	**485.735**
24	0.000	105.500	6.200	94.450	32.400	1048.860	**1287.410**
26.67	0.000	316.900	108.800	638.000	36.000	1165.620	**2265.320**
29.33	0.000	483.200	190.300	1419.550	54.900	1580.640	**3728.590**
32	0.000	578.000	244.600	2201.100	73.800	1995.660	**5093.160**

CABLES DE POSTESADO:

SECCION	Nº CABLES	N	e	pc	pb
16	0	0	1.141385	0	0
21.33	48	874.944	1.141385	-84.4026388	348.2846448
24	96	1749.888	1.141385	-168.805278	696.5692895
26.67	168	3062.304	1.141385	-295.409236	1218.996257
29.33	168	3062.304	1.141385	-295.409236	1218.996257
32	168	3062.304	1.141385	-295.409236	1218.996257

Viaducto s/ el Río Francolí. UTE ALT CAMP *Flexión negativa sobre sección final*

TENSIONES:

SECCION		PP+PR	LOSA F 1	LOSA F 2	C. PERM.	SOB. ACERA	0.6*TREN	TOTAL			
16	**Sa**	0	-51.9480654	-22.932872	-78.54453059	2.503293132	80.9745792	-69.9475956	**FABRICA**	**Sa+0,95pa=**	**0**
	Sb	0	45.7116884	30.0553337	107.8592139	-3.437581552	-111.196214	68.9924402	**SERVICIO**	**Sa+0,8pa=**	**-69.9475956**
	Sc	0	0	-34.1557378	-156.4212111	4.98530121	161.260646	-24.3310016		**Sb+0,8pb=**	**68.9924402**
SECCION		**PP+PR**	**LOSA F 1**	**LOSA F 2**	**C. PERM.**	**SOB. ACERA**	**0.6*TREN**	**TOTAL**			
21.33	**Sa**	0	-22.3556448	-13.9423196	-33.39175158	3.337724175	108.031006	41.679014	**FABRICA**	**Sa+0,95pa=**	**-80.1825068**
	Sb	0	19.6718446	18.2725072	45.85434593	-4.583442069	-148.350742	-69.1354859	**SERVICIO**	**Sa+0,8pa=**	**-25.843097**
	Sc	0	0	-20.7653979	-66.49957908	6.64706828	215.143443	134.525535		**Sb+0,8pb=**	**209.49223**
SECCION		**PP+PR**	**LOSA F 1**	**LOSA F 2**	**C. PERM.**	**SOB. ACERA**	**0.6*TREN**	**TOTAL**			
24	**Sa**	0	24.3146446	0.9594049	10.94611279	3.754939697	121.555742	161.530844	**FABRICA**	**Sa+0,95pa=**	**-160.365014**
	Sb	0	-21.3956661	-1.25737564	-15.03146193	-5.156372328	-166.923231	-209.764107	**SERVICIO**	**Sa+0,8pa=**	**26.4866223**
	Sc	0	0	1.4289175	21.79915274	7.477951815	242.077918	272.78394		**Sb+0,8pb=**	**347.491325**
SECCION		**PP+PR**	**LOSA F 1**	**LOSA F 2**	**C. PERM.**	**SOB. ACERA**	**0.6*TREN**	**TOTAL**			
26.67	**Sa**	0	73.0361221	16.8360086	73.93986194	4.172155219	135.087432	303.07158	**FABRICA**	**Sa+0,95pa=**	**-280.638774**
	Sb	0	-64.2681192	-22.0649144	-101.5359736	-5.729302587	-185.505269	-379.103579	**SERVICIO**	**Sa+0,8pa=**	**66.7441918**
	Sc	0	0	25.0751975	147.2510265	8.30883535	269.026241	449.6613		**Sb+0,8pb=**	**596.093427**
SECCION		**PP+PR**	**LOSA F 1**	**LOSA F 2**	**C. PERM.**	**SOB. ACERA**	**0.6*TREN**	**TOTAL**			
29.33	**Sa**	0	111.363377	29.4475407	164.5161928	6.36253671	183.185428	494.875076	**FABRICA**	**Sa+0,95pa=**	**-280.638774**
	Sb	0	-97.9941786	-38.5933199	-225.9175413	-8.737186445	-251.554579	-622.796805	**SERVICIO**	**Sa+0,8pa=**	**258.547687**
	Sc	0	0	43.8585486	327.6335339	12.67097391	364.813264	748.97632		**Sb+0,8pb=**	**352.4002**
SECCION		**PP+PR**	**LOSA F 1**	**LOSA F 2**	**C. PERM.**	**SOB. ACERA**	**0.6*TREN**	**TOTAL**			
32	**Sa**	0	133.211987	37.8500707	255.0925237	8.5529182	231.283425	665.990924	**FABRICA**	**Sa+0,95pa=**	**-280.638774**
	Sb	0	-117.219858	-49.6054969	-350.299109	-11.7450703	-317.603889	-846.473423	**SERVICIO**	**Sa+0,8pa=**	**429.663535**
	Sc	0	0	56.3731003	508.0160414	17.03311247	460.600288	1042.02254		**Sb+0,8pb=**	**128.723583**

ARMADO LOSA VANO 40 m.

CARACTERISTICAS MECANICAS:

Vb: distancia a fibra superior losa
Va: distancia a fibra superior viga
Vc: distancia a fibra inferior viga

0.3084

	SEMIFINALES				
SECCION	AREA	INERCIA	Vic	Vib	
	6.002786	6.417006	1.478931	1.301385	2.780316

	SEMIFINALES				FINALES			
SECCION	INERCIA	Vfa	Vfb	Vfc	INERCIA	Vfa	Vfb	Vfc
	6.417006	0.992985	1.301385	1.478931	7.129961	0.826314	1.134714	1.645602
				2.780316				2.780316

FLECTORES:

SECCION	PP+PR	LOSA F 1	LOSA F 2	C. PERM.	SOB. ACERA	0.6*TREN	
20	0.000	-241.900	-154.200	-731.940	0.000	393.942	**-734.098**
28.67	0.000	-93.800	-78.200	-485.254	4.500	625.740	**-27.014**
32	0.000	91.000	16.900	-121.609	12.150	740.880	**739.321**
33.33	0.000	151.800	48.200	376.200	19.800	855.960	**1451.960**
34.5	0.000	217.600	82.100	705.000	30.983	1098.540	**2134.223**
36.67	0.000	364.600	157.800	1315.600	51.750	1549.020	**3438.770**
40	0.000	531.900	243.900	2255.000	83.700	2242.080	**5356.580**

CABLES DE POSTESADO:

SECCION	Nº CABLES	N	e	pc	pb
20	0	0	1.141385	0	0
28.67	0	0	1.141385	0	0
32	72	1312.416	1.141385	-126.603958	522.4269671
33.33	72	1312.416	1.141385	-126.603958	522.4269671
34.5	168	3062.304	1.141385	-295.409236	1218.996257
36.67	168	3062.304	1.141385	-295.409236	1218.996257
40	168	3062.304	1.141385	-295.409236	1218.996257

Viaducto s/ el Río Francolí. UTE ALT CAMP *Flexión negativa sobre sección final*

TENSIONES:

SECCION		PP+PR	LOSA F 1	LOSA F 2	C. PERM.	SOB. ACERA	0.6*TREN	TOTAL			
20	**Sa**	0	-55.7508297	-23.8613283	-84.8268692	0	45.6551992	-118.783828	**FABRICA**	**Sa+0,95pa=**	**0**
	Sb	0	49.0579301	31.2721489	116.4862704	0	-62.6948033	134.121546	**SERVICIO**	**Sa+0,8pa=**	**-118.783828**
	Sc	0	0	-35.5385612	-168.9324707	0	90.9222004	-113.548831		**Sb+0,8pb=**	**134.121546**
SECCION		**PP+PR**	**LOSA F 1**	**LOSA F 2**	**C. PERM.**	**SOB. ACERA**	**0.6*TREN**	**TOTAL**			
28.67	**Sa**	0	-21.618139	-12.1008812	-56.23763913	0.521519402	72.5190113	-16.9161286	**FABRICA**	**Sa+0,95pa=**	**0**
	Sb	0	19.0228766	15.8591572	77.22686104	-0.716162823	-99.5848278	11.8079042	**SERVICIO**	**Sa+0,8pa=**	**-16.9161286**
	Sc	0	0	-18.0227982	-111.9970997	1.038604419	144.421406	15.440113		**Sb+0,8pb=**	**11.8079042**
SECCION		**PP+PR**	**LOSA F 1**	**LOSA F 2**	**C. PERM.**	**SOB. ACERA**	**0.6*TREN**	**TOTAL**			
32	**Sa**	0	20.9728214	2.61515207	-14.09370258	1.408102387	85.8629544	96.7653277	**FABRICA**	**Sa+0,95pa=**	**-120.27376**
	Sb	0	-18.4550295	-3.42736262	19.35380694	-1.933639623	-117.909047	-122.371272	**SERVICIO**	**Sa+0,8pa=**	**-4.51783878**
	Sc	0	0	3.89495255	-28.06756893	2.804231931	170.995832	149.627447		**Sb+0,8pb=**	**295.570302**
SECCION		**PP+PR**	**LOSA F 1**	**LOSA F 2**	**C. PERM.**	**SOB. ACERA**	**0.6*TREN**	**TOTAL**			
33.33	**Sa**	0	34.9854318	7.45859938	43.59902204	2.294685371	99.1999439	187.537683	**FABRICA**	**Sa+0,95pa=**	**-120.27376**
	Sb	0	-30.7854228	-9.77508156	-59.87121203	-3.151116423	-136.223718	-239.806551	**SERVICIO**	**Sa+0,8pa=**	**86.254516**
	Sc	0	0	11.1086812	86.82732941	4.569859442	197.556409	300.062279		**Sb+0,8pb=**	**178.135023**
SECCION		**PP+PR**	**LOSA F 1**	**LOSA F 2**	**C. PERM.**	**SOB. ACERA**	**0.6*TREN**	**TOTAL**			
34.5	**Sa**	0	50.150395	12.7043778	81.70470638	3.590695854	127.313317	275.463492	**FABRICA**	**Sa+0,95pa=**	**-280.638774**
	Sb	0	-44.1298288	-16.650087	-112.1988423	-4.930828783	-174.829668	-352.739255	**SERVICIO**	**Sa+0,8pa=**	**39.136103**
	Sc	0	0	18.9216334	162.7146923	7.150860663	253.544111	442.331297		**Sb+0,8pb=**	**622.45775**
SECCION		**PP+PR**	**LOSA F 1**	**LOSA F 2**	**C. PERM.**	**SOB. ACERA**	**0.6*TREN**	**TOTAL**			
36.67	**Sa**	0	84.0295681	24.4184021	152.4690946	5.997473128	179.520885	446.435423	**FABRICA**	**Sa+0,95pa=**	**-280.638774**
	Sb	0	-73.9417995	-32.002238	-209.3741801	-8.235872468	-246.522341	-570.076431	**SERVICIO**	**Sa+0,8pa=**	**210.108035**
	Sc	0	0	36.3682552	303.6417718	11.94395082	357.515337	709.469315		**Sb+0,8pb=**	**405.120574**
SECCION		**PP+PR**	**LOSA F 1**	**LOSA F 2**	**C. PERM.**	**SOB. ACERA**	**0.6*TREN**	**TOTAL**			
40	**Sa**	0	122.587294	37.7417508	261.3391672	9.700260885	259.841827	691.2103	**FABRICA**	**Sa+0,95pa=**	**-280.638774**
	Sb	0	-107.870661	-49.4635351	-358.8771481	-13.32062851	-356.820965	-886.352938	**SERVICIO**	**Sa+0,8pa=**	**454.882911**
	Sc	0	0	56.2117709	520.4562143	19.31804219	517.474266	1113.46029		**Sb+0,8pb=**	**88.8440671**

FLEXIÓN TRANSVERSAL DE LA LOSA

Flexión transversal

Longitud del vuelo = 3.10 m.

Luz de cálculo = Longitud de vuelo + 0.15 m **= *3.25 m***

Canto de la losa en el extremo: 0.30

Hormigón fck = 300 kg/cm^2, γ_c = 1.5; Acero fyk = 5100 kg/cm^2, γ_s = 1.15

Cargas aplicadas:

- PESO PROPIO VUELO: Actúa sobre la placa de encofrado perdido
- CARGAS MUERTAS:

  Barandilla; P_1 = 0.05 t/m → Mp$_1$ = 0.05 × 3.25 = 0.16 m·t/ml

  Paseos; P_2 = 0.5 t/m^2 → Mp$_2$ = 1.18 m·t/ml

  Conductos + murete; P_3 = 0.45 t/m^2 → Mp$_3$ = 0.52 m·t/ml

  Balasto; $P_4 \approx 0.5$ t/m^2 → Mp$_4$ = 0.25 m·t/ml

  En TOTAL = **2.1** m·t/ml
- SOBRECARGA EN PASEOS: P = 0,5 t/m^2 en cada paseo → Msc = **1.18** m·t/ml

Cálculo en situación persistente o transitoria

Md = 1.35 × 2.1 + 1.5 × 1.18 = **4.61** m·t/ml → ***Anec = 5 cm2 /m***

Adispuesta = 7 ∅ 20 > Anec → *O.K.*

Cálculo en situación persistente o transitoria

Cargas accidentales aplicadas (situación I de descarrilamiento): 2 cargas de 6.05 t/m separadas el ancho de la vía en un área equivalente a 1,5 veces el ancho de la vía a cada lado del eje de la misma y en la posición más desfavorable; es decir, que una carga se encontrará a 2.35 + 1.5 * 1.435 = 4.50 m del eje del tablero y otra a 4.5-1.435 = 3.065 m (solo dará por tanto momento la primera).

(M $_{\text{carga accidental}}$ = (4.5 – 3.75) × 6.05 = 4.537 m·t/ml)

M$_d$ = 1.35 × 2.1 + 1 * 4.537 + 0.5 * 1.5 * 1.18 = **8.257** mt/m

→ ***Anec = 8 cm^2 /m***

Adispuesta = 7 ∅ 20 > Anec → *O.K*

CÁLCULO A CORTANTE

(E.L.U.)

CÁLCULO A CORTANTE Y TORSIÓN VANO 1

fck:	6000	t/m2	γc: 1.5	espesor de la losa central:	0.30 m
fcd:	4000.0	t/m2		espesor de la losa de fondo:	0.25 m
f1cd:	2400.0	t/m2		espesor de las almas:	0.45 m
fyk:	51000	t/m2		Tensión de tesado inicial (t/m2):	140000 t/m2
fpk:	171000	t/m2	γs: 1.15	*Tipo de cable: 0.6"*	
fyd:	40000	t/m2			

Cuantía mínima de cortante: 9.00 cm2/m

VANO LATERAL. CORTANTE

Distancia al estribo (m)	Área	d	bo	As,eqv. traccionada (cm2)	Nd (t)	ρ	cotgθ	z	σ'cd (t/m2)	ζ	**Vu1** (t)	**Vcu** (t)	**Vd** (t)	**Vrd** (t)	**As (cm2/m)**
0.00	3.47	2.60	0.45	*225.32*	-941	0.019	1.07	2.34	-270.913	1.2774	1400.38	120.34	704.5	704.5	58.08
					-792		1.06		-228.137		1400.38	112.83		704.5	59.46
2.67	3.47	2.60	0.45	*225.32*	-941	0.019	1.16	2.34	-270.913	1.2774	1389.04	120.34	533.8	533.8	38.14
					-792		1.16		-228.137		1389.04	112.83		533.8	38.90
5.33	3.47	2.60	0.45	*450.64*	-1882	0.020	1.37	2.34	-541.826	1.2774	1338.30	168.81	336.5	336.5	13.11
					-1585		1.36		-456.275		1338.30	153.79		336.5	14.32
8.00	3.47	2.60	0.45	*450.64*	-1882	0.020	1.43	2.34	-541.826	1.2774	1317.96	168.81	227.9	227.9	4.40
					-1585		1.43		-456.275		1317.96	153.79		227.9	5.53
10.67	3.47	2.60	0.45	*450.64*	-1882	0.020	1.47	2.34	-541.826	1.2774	1305.48	168.81	109.9	109.9	Vrd < Vu2
					-1585		1.47		-456.275		1305.48	153.79		109.9	Vrd < Vu2
16.00	3.47	2.60	0.45	*450.64*	-1882	0.020	1.42	2.34	-541.826	1.2774	1321.55	168.81	195.0	195.0	1.97
					-1585		1.42		-456.275		1321.55	153.79		195.0	3.10
21.33	3.47	2.60	0.45	*450.64*	-1411	0.020	1.26	2.34	-406.37	1.2774	1367.01	145.03	416.0	416.0	22.95
					-1188		1.26		-342.206		1367.01	133.77		416.0	23.95
24.00	3.47	2.60	0.45	*450.64*	-706	0.020	1.76	2.34	-203.185	1.2774	1205.13	109.37	552.2	552.2	26.84
					-594		1.67		-171.103		1205.13	103.74		552.2	28.74
26.67	3.47	2.60	0.45	*225.32*	-706	0.019	1.58	2.34	-203.185	1.2774	1267.53	108.45	678.2	678.2	38.43
					-594		1.48		-171.103		1267.53	102.82		678.2	41.63
29.33	3.47	2.60	0.45	*450.64*	-706	0.020	1.42	2.34	-203.185	1.2774	1321.67	109.37	819.7	819.7	53.42
					-594		1.30		-171.103		1321.67	103.74		819.7	58.85
32.00	3.47	2.60	0.45	*450.64*	-706	0.020	1.30	2.34	-203.185	1.2774	1355.80	109.37	946.8	946.8	68.58
					-594		1.17		-171.103		1355.80	103.74		946.8	76.87

Cotangentes de cálculo de vano 1 (32,0m)

Tipo de cable: 0.6"

0.95P0: 140000 t/m2 **0.8P0:** 117895 t/m2 γp: 1

fck: 600 kg/cm2
fct,k: 45.98 kg/cm2

Distancia a estribo		***0.00***	***2.67***	***5.33***	***8.00***	***10.67***	***16.00***	***21.33***	***24.00***	***26.67***	***29.33***	***32.00***
Nº de cables en la fibra inferior de viga		96	96	192	192	192	192	144	0	0	0	0
hcdg torones inf.		0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.30
Nº de cables en la fibra superior de viga									72	72	72	72
hcdg torones sup.									2.25	2.25	2.25	2.25
Ap		0.013	0.013	0.027	0.027	0.027	0.027	0.020	0.010	0.010	0.010	0.010
Np0		-1881.60	-1881.60	-3763.20	-3763.20	-3763.20	-3763.20	-2822.40	-1411.20	-1411.20	-1411.20	-1411.20
Mp0		-1355.32	-1543.48	-3086.95	-3086.95	-3086.95	-3086.95	-2315.21	1876.47	1876.47	1876.47	1876.47
(Np0) postesado losa												
Hviga		2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
Vb inicial		-0.920	-0.920	-0.920	-0.920	-0.920	-0.920	-0.920	-0.920	-0.920	-0.920	-0.920
Área inicial		3.804	3.804	3.804	3.804	3.804	3.804	3.804	3.804	3.804	3.804	3.804
Inercia inicial		2.388	2.388	2.388	2.388	2.388	2.388	2.388	2.388	2.388	2.388	2.388
Vb intermedia		-1.477	-1.477	-1.477	-1.477	-1.477	-1.477	-1.477	-1.477	-1.477	-1.477	-1.477
Inercia intermedia		5.917	5.917	5.917	5.917	5.917	5.917	5.917	5.917	5.917	5.917	5.917
Vb intermedia 2		-1.477	-1.477	-1.477	-1.477	-1.477	-1.477	-1.477	-1.477	-1.477	-1.477	-1.477
Inercia intermedia 2		5.917	5.917	5.917	5.917	5.917	5.917	5.917	5.917	5.917	5.917	5.917
Vb final		-1.667	-1.667	-1.667	-1.667	-1.667	-1.667	-1.667	-1.667	-1.667	-1.667	-1.667
Área final		6.945	6.945	6.945	6.945	6.945	6.945	6.945	6.945	6.945	6.945	6.945
Md1 (sobre sección inicial)		0	455	1179	1448	1611	1401	796	58	-790	-1489	-1948
Md2 (sobre sección intermedia 1)		0	64	165	203	227	200	142	-209	-521	-747	-815
Md3 (sobre sección intermedia 2)		0	0	0	0	0	0	0	0	0	0	0
σxd,p (t/m2)		-71.084	-12.278	-24.557	-24.557	-24.557	-24.557	-18.418	-957.454	-957.454	-957.454	-957.454
σxd,1 (t/m2)		0.000	-142.355	-368.629	-452.633	-503.601	-437.782	-248.636	-18.142	246.864	465.248	608.658
σxd,2 (t/m2)		0.000	-2.036	-5.284	-6.499	-7.277	-6.408	-4.557	6.689	16.698	23.936	26.090
TIEMPO 0 **σxd** (t/m2)		-71.084	-156.670	-398.470	-483.688	-535.434	-468.746	-271.611	-968.908	-693.892	-468.269	-322.706
cotgθ		**1.07**	**1.16**	**1.37**	**1.43**	**1.47**	**1.42**	**1.26**	**1.76**	**1.58**	**1.42**	**1.30**
TIEMPO INFINITO **σxd** (t/m2)		-59.860	-154.731	-394.592	-479.811	-531.557	-464.869	-268.703	-817.731	-542.715	-317.092	-171.529
cotgθ		**1.06**	**1.16**	**1.36**	**1.43**	**1.47**	**1.42**	**1.26**	**1.67**	**1.48**	**1.30**	**1.17**

CÁLCULO A CORTANTE Y TORSIÓN VANO 2

fck: 5000 t/m2 γc: 1.5
fcd: 3333.3 t/m2
f1cd: 2000.0 t/m2

fyk: 51000 t/m2
fpk: 171000 t/m2 γs: 1.15
fyd: 40000 t/m2

espesor de la losa central: 0.30 m
espesor de la losa de fondo: 0.25 m
espesor de las almas: 0.45 m

Tensión de tesado inicial (t/m2): 140000 t/m2
Tipo de cable: 0.6"

Cuantía mínima de cortante: 7.50 cm2/m

VANO 40,0m (1). CORTANTE

Distancia al estribo (m)	Área	d	b_0	As,eqv. traccionada (cm2)	Nd (t)	ρ	cotgθ	z	σ'cd (t/m2)	ζ	**Vu1** (t)	**Vcu** (t)	**Vd** (t)	**Vrd** (t)	**As (cm2/m)**
0.00	3.47	2.60	0.5	*112.66*	-706	0.009	1.34	2.34	-203.185	1.2774	1246.54	97.95	988.8	988.8	71.09
					-594		1.00		-171.103		1246.54	91.69		988.8	95.85
3.00	3.47	2.60	0.5	*112.66*	938	0.009	1.45	2.34	270.175	1.2774	1214.44	5.64	838.6	838.6	61.27
					790		1.32		227.516		1214.44	13.96		838.6	66.83
3.33	3.47	2.60	0.5	*112.66*	-706	0.009	1.55	2.34	-203.185	1.2774	1184.62	97.95	822.0	822.0	49.92
					-594		1.42		-171.103		1184.62	91.69		822.0	54.77
6.67	3.47	2.60	0.5	*112.66*	-706	0.009	1.77	2.34	-203.185	1.2774	1112.01	97.95	640.7	640.7	32.68
					-594		1.67		-171.103		1112.01	91.69		640.7	35.19
8.00-	3.47	2.60	0.5	*112.66*	-706	0.009	1.82	2.34	-203.185	1.2774	1096.71	97.95	525.0	525.0	25.04
					-594		1.72		-171.103		1096.71	91.69		525.0	26.96
8.00+	3.47	2.60	0.45	*225.32*	-706	0.019	1.10	2.34	-203.185	1.2774	1164.85	104.16	525.0	525.0	40.93
					-594		1.08		-171.103		1164.85	98.53		525.0	42.14
11.33	3.47	2.60	0.45	*563.29*	-1411	0.020	1.29	2.34	-406.37	1.2774	1133.55	140.69	370.5	370.5	19.07
					-1188		1.29		-342.206		1133.55	129.43		370.5	20.04
20.00	3.47	2.60	0.45	*563.29*	-2117	0.020	1.51	2.34	-609.555	1.2774	1077.08	176.35	57.3	57.3	Vrd < Vu2
					-1783		1.51		-513.309		1077.08	159.45		57.3	Vrd < Vu2
28.67	3.47	2.60	0.45	*563.29*	-1411	0.020	1.26	2.34	-406.37	1.2774	1139.44	140.69	377.6	377.6	20.09
					-1188		1.26		-342.206		1139.44	129.43		377.6	21.09
32.00-	3.47	2.60	0.45	*450.64*	-706	0.020	1.02	2.34	-203.185	1.2774	1169.87	105.03	534.8	534.8	45.22
					-594		1.01		-171.103		1169.87	99.40		534.8	45.90
32.00+	3.47	2.60	0.5	*112.66*	-706	0.009	1.83	2.34	-203.185	1.2774	1093.13	97.95	534.8	534.8	25.46
					-594		1.73		-171.103		1093.13	91.69		534.8	27.38
33.33	3.47	2.60	0.5	*112.66*	-706	0.009	0.91	2.34	-203.185	1.2774	1293.84	97.95	653.2	653.2	65.40
					-594		0.91		-171.103		1293.84	91.69		653.2	66.28
34.50	3.47	2.60	0.5	*112.66*	-706	0.009	1.71	2.34	-203.185	1.2774	1133.10	97.95	704.6	704.6	37.91
					-594		1.60		-171.103		1133.10	91.69		704.6	40.99
36.67	3.47	2.60	0.5	*112.66*	-706	0.009	1.55	2.34	-203.185	1.2774	1184.32	97.95	800.0	800.0	48.38
					-594		1.43		-171.103		1184.32	91.69		800.0	53.08
40.00	3.47	2.60	0.5	*112.66*	-706	0.009	1.00	2.34	-203.185	1.2774	1300.00	58.32	932.5	932.5	93.39
					-594		1.00		-171.103		1300.00	58.32		932.5	93.39

Cotangentes de cálculo de vano 2 (40,0m)

Tipo de cable: 0.6"

0.95P0: 140000 t/m2 **0.8P0:** 117895 t/m2 γp: 1

fck: 500 kg/cm2

fct,k: 40.72 kg/cm2

Distancia a estribo		***0.00***	***3.00***	***3.33***	***6.67***	***8.00-***	***8.00+***	***11.33***	***20.00***	***28.67***	***32.00-***	***32.00***	***33.33***	***34.50***	***36.67***	***40.00***
Nº de cables en la fibra inferior de viga		0	0	0	0	0	72	144	216	144	72	0	72	0	0	0
hcdg torones inf.						0.30	0.30	0.10	0.10	0.10	0.10	0.00	0.10	0.00	0.00	0.00
Nº de cables en la fibra superior de viga		72	72	72	72	72					0	72		72	72	72
hcdg torones sup.		2.25	2.25	2.25	2.25	2.25					0.00	2.25	2.25	2.25	2.25	2.25
Ap		0.010	0.010	0.010	0.010	0.010	0.010	0.020	0.030	0.020	0.010	0.010	0.010	0.010	0.010	0.010
Np_0		-1411.20	-1411.20	-1411.20	-1411.20	-1411.20	-1411.20	-2822.40	-4233.60	-2822.40	-1411.20	-1411.20	-1411.20	-1411.20	-1411.20	-1411.20
Mp_0		1876.47	1876.47	1876.47	1876.47	1876.47	-875.37	-2315.21	-3472.82	-2315.21	-1157.61	1876.47	-1157.61	1876.47	1876.47	1876.47
(N_{p0}) postesado losa																
Hviga		2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
Vb inicial		-0.920	-0.920	-0.920	-0.920	-0.920	-0.920	-0.920	-0.920	-0.920	-0.920	-0.920	-0.920	-0.920	-0.920	-0.920
Área inicial		3.804	3.804	3.804	3.804	3.804	3.804	3.804	3.804	3.804	3.804	3.804	3.804	3.804	3.804	3.804
Inercia inicial		2.388	2.388	2.388	2.388	2.388	2.388	2.388	2.388	2.388	2.388	2.388	2.388	2.388	2.388	2.388
Vb intermedia		-1.477	-1.477	-1.477	-1.477	-1.477	-1.477	-1.477	-1.477	-1.477	-1.477	-1.477	-1.477	-1.477	-1.477	-1.477
Inercia intermedia		5.917	5.917	5.917	5.917	5.917	5.917	5.917	5.917	5.917	5.917	5.917	5.917	5.917	5.917	5.917
Vb intermedia 2		-1.477	-1.477	-1.477	-1.477	-1.477	-1.477	-1.477	-1.477	-1.477	-1.477	-1.477	-1.477	-1.477	-1.477	-1.477
Inercia intermedia 2		5.917	5.917	5.917	5.917	5.917	5.917	5.917	5.917	5.917	5.917	5.917	5.917	5.917	5.917	5.917
Vb final		-1.667	-1.667	-1.667	-1.667	-1.667	-1.667	-1.667	-1.667	-1.667	-1.667	-1.667	-1.667	-1.667	-1.667	-1.667
Área final		6.945	6.945	6.945	6.945	6.945	6.945	6.945	6.945	6.945	6.945	6.945	6.945	6.945	6.945	6.945
Md1 (sobre sección inicial)		-1948	-1552	-1183	-237	-25	-25	785	1560	717	28	28	-234	-522	-1179	-1942
Md2 (sobre sección intermedia 1)		-815	-645	-543	-258	-170	-170	133	208	-106	-174	-174	-262	-354	-548	-757
Md3 (sobre sección intermedia 2)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
σxd,p (t/m2)		-957.454	-957.454	-957.454	-957.454	-957.454	-97.418	-18.418	-27.626	-18.418	-9.209	-957.454	-9.209	-957.454	-957.454	-957.454
σxd,1 (t/m2)		608.658	485.078	369.811	74.131	7.763	7.763	-245.429	-487.568	-224.207	-8.818	-8.818	72.992	163.113	368.418	607.055
σxd,2 (t/m2)		26.090	20.655	17.386	8.258	5.444	5.444	-4.246	-6.667	3.381	5.569	5.569	8.397	11.337	17.559	24.230
TIEMPO 0 — **σxd** (t/m2)		-322.706	-451.721	-570.258	-875.065	-944.247	-84.211	-268.093	-521.861	-239.243	-12.458	-960.703	72.180	-783.004	-571.477	-326.169
cotgθ		**1.34**	**1.45**	**1.55**	**1.77**	**1.82**	**1.10**	**1.29**	**1.51**	**1.26**	**1.02**	**1.83**	**0.91**	**1.71**	**1.55**	**1.34**
TIEMPO INFINITO — **σxd** (t/m2)		-171.529	-300.544	-419.081	-723.888	-793.070	-68.829	-265.185	-517.499	-236.335	-11.004	-809.526	73.634	-631.827	-420.300	-174.992
cotgθ		**1.19**	**1.32**	**1.42**	**1.67**	**1.72**	**1.08**	**1.29**	**1.51**	**1.26**	**1.01**	**1.73**	**0.91**	**1.60**	**1.43**	**1.20**

CÁLCULO A RASANTE(E.L.U.)

CÁLCULO A RASANTE (redistribución plástica)

$f_{y\alpha,d}$ =	40000	t/m2	(armadura de cosido)

f_{yk} =	171000	t/m2	(cables de pretensado)
γ =	1.15		
f_{yk} =	51000	t/m2	(armadura pasiva)
γ =	1.15		

Área de los cables = 1.4 cm2

coef. μ superficie de contacto viga-losa: 0.9

f_{ck} =	6000	t/m2	(hormigón viga)
γ =	1.5		
f_{ck} =	3000	t/m2	(hormigón losa)
γ =	1.5		

(Vano 1)

ZONA 1: ***Estribo 1*** - ***Máx Mf(+)***

Mf_d- (apoyo) =	0.0	mt	en x =	0.0	m
Mf_d+ (máx) =	3615.0	mt	en x =	10.7	m

APOYO

$W_{est.}$ = 0 cm2 (para el momento de cálculo solicitante según el prontuario)

T_d = **0.0** t

C.D.V (o de máx Mf+)

nº de cables existentes abajo: 96

T_u = 1998.5

Mu = 4706.2 mt

(cálculo a rotura)

T_d (= T_u x M_d/M_u) = **1535.1** t

RASANTE INFERIOR [$A_s = (T_d(-) + T_d(+))/f_{y\alpha,d}$]

$A_{s,est.}$ = **383.8** cm2

RASANTE SUPERIOR [$A_s = (T_d(-) + T_d(+))/\mu * f_{y\alpha,d}$]

$A_{s,est.}$ = **426.4** cm2

(Vano 1)

ZONA 2: ***Máx Mf(+)*** - ***Pila 1***

Mf_d- (máx) =	458.8	mt	en x =	10.7	m
Mf_d- (apoyo) =	-54503.5	mt	en x =	32.0	m

C.D.V (o de máx Mf+)

nº de cables existentes abajo: 96

T_u = 1998.5

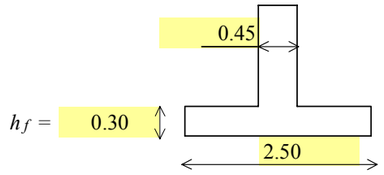
Mu = 4706.2 mt

(cálculo a rotura)

T_d (= T_u x M_d/M_u) = **194.8** t

APOYO

$W_{est.}$ = 512.75 cm2 (para el momento de cálculo solicitante según el prontuario)



f_{ck} =	6000	t/m2
γ =	1.5	
f_{yk} =	51000	t/m2
γ =	1.15	
r =	12	cm

T_d = **2273.9** t

RASANTE INFERIOR [$A_s = (T_d(-) + T_d(+))/f_{y\alpha,d}$]

$A_{s,est.}$ = **617.2** cm2

RASANTE SUPERIOR [$A_s = (T_d(-) + T_d(+))/\mu * f_{y\alpha,d}$]

$A_{s,est.}$ = **685.8** cm2

(Vano 2)

ZONA 3: ***Pila 1*** - ***Máx Mf(+)***

Mf_d- (apoyo) =	-54503.5	mt	en x =	0.0	m
Mf_d- (máx) =	513.6	mt	en x =	20.0	m

APOYO

$W_{est.}$ = 512.75 cm2

T_d = **2273.9** t

C.D.V (o de máx Mf+)

nº de cables existentes abajo: 108

T_u = 2248.3

Mu = 5262.1 mt

(cálculo a rotura)

T_d (= T_u x M_d/M_u) = **219.5** t

RASANTE INFERIOR [$A_s = (T_d(-) + T_d(+))/f_{y\alpha,d}$]

$A_{s,est.}$ = **623.3** cm2

RASANTE SUPERIOR [$A_s = (T_d(-) + T_d(+))/\mu * f_{y\alpha,d}$]

$A_{s,est.}$ = **692.6** cm2

(Vano 2)

ZONA 4: ***Máx Mf(+)*** **-** ***Pila 2***

Mfd- (máx) = 513.6 mt en x = 20.0 m

Mfd- (apoyo) = -6187.5 mt en x = 40.0 m

C.D.V (o de máx Mf+)

nº de cables existentes abajo: 108

T_u = 2248.3

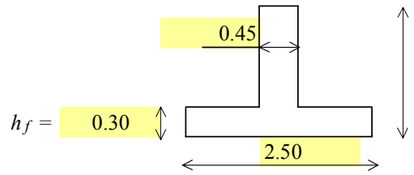
Mu = 5262.1 mt

(cálculo a rotura)

T_d (= T_u x M_d/M_u) = **219.5** t

APOYO

$W_{est.}$ = 545.25 cm2 (para el momento de cálculo solicitante según el prontuario)



fck = 6000 t/m2

γ = 1.5

fyk = 51000 t/m2

γ = 1.15

r = 12 cm

T_d = **2418.1** t

RASANTE INFERIOR [As = (Td(-) + Td(+))/fyα,d]

As,est. = **659.4** cm2

RASANTE SUPERIOR [As = (Td(-) + Td(+))/μ*fyα,d]

As,est. = **732.6** cm2

(Vano 3)

ZONA 5: ***Pila 2*** **-** ***Máx Mf(+)***

Mfd- (apoyo) = -6187.5 mt en x = 0.0 m

Mfd- (máx) = 388.4 mt en x = 20.0 m

APOYO

$W_{est.}$ = 545.25 cm2

T_d = **2418.1** t

C.D.V (o de máx Mf+)

nº de cables existentes abajo: 108

T_u = 2248.3

Mu = 5262.1 mt

(cálculo a rotura)

T_d (= T_u x M_d/M_u) = **165.9** t

RASANTE INFERIOR [As = (Td(-) + Td(+))/fyα,d]

As,est. = **646.0** cm2

RASANTE SUPERIOR [As = (Td(-) + Td(+))/μ*fyα,d]

As,est. = **717.8** cm2

ARMADURA DISPUESTA (RASANTE INFERIOR)

ZONA 1 $A_{s,est.}$ = **383.8** cm2 (longitud del tramo = 10.7 m)

de	a	As (cm2/m)		As parcial	As acum.
-0.5	3.0	(ϕ16 + ϕ10) juntos c/0.15	74.56	260.96	260.96
3.0	6.0	ϕ12 c/0.15	30.13	90.39	351.35
6.0	10.7	ϕ10 c/0.15	20.93	97.74	449.09

ZONA 2 $A_{s,est.}$ = **617.2** cm2 (longitud del tramo = 21.3 m)

de	a	As (cm2/m)		As parcial	As acum.
10.7	20.0	ϕ10 c/0.15	20.93	195.28	195.28
20.0	25.5	ϕ12 c/0.15	30.13	165.72	360.99
25.5	29.0	ϕ16 c/0.15	53.60	187.60	548.59
29.0	32.0	2ϕ12 juntos c/0.15	60.27	180.81	729.40

ZONA 3 $A_{s,est.}$ = **623.3** cm2 (longitud del tramo = 20.0 m)

de	a	As (cm2/m)		As parcial	As acum.
0.0	3.0	ϕ16 c/0.15 + ϕ10 c/0.30	64.07	192.21	192.21
3.0	6.0	(ϕ16 + ϕ12) alternos c/0.15	41.87	125.61	317.82
6.0	9.5	ϕ12 c/0.15	30.13	105.46	423.28
9.5	13.0	ϕ12 c/0.15	30.13	105.46	528.73
13.0	20.0	ϕ10 c/0.15	20.93	146.51	675.24

ZONA 4 $A_{s,est.}$ = **659.4** cm2 (longitud del tramo = 20.0 m)

de	a	As (cm2/m)		As parcial	As acum.
20.0	25.5	ϕ10 c/0.15	20.93	115.12	115.12
25.5	28.5	ϕ10 c/0.15	20.93	62.79	177.91
28.5	31.5	ϕ12 c/0.15	30.13	90.39	268.30
31.5	34.5	(ϕ16 + ϕ12) alternos c/0.15	41.87	125.61	393.91
34.5	37.5	ϕ16 c/0.15 + ϕ10 c/0.30	64.07	192.21	586.12
37.5	40.0	(ϕ16 + ϕ10) juntos c/0.15	74.53	186.33	772.44

ZONA 5 $A_{s,est.}$ = **646.0** cm2 (longitud del tramo = 20.0 m)

de	a	As (cm2/m)		As parcial	As acum.
0.0	2.5	(ϕ16 + ϕ10) juntos c/0.15	74.53	186.33	186.33
2.5	5.5	ϕ16 c/0.15 + ϕ10 c/0.30	64.07	194.77	381.10
5.5	8.5	ϕ16 c/0.15	53.60	162.94	544.04
8.5	11.5	ϕ12 c/0.15	30.13	91.60	635.64
11.5	14.5	ϕ10 c/0.15	20.93	62.79	698.43
14.5	20.0	ϕ10 c/0.15	20.93	115.12	813.54

COMPROBACIÓN DE ARMADURA DISPUESTA (RASANTE SUPERIOR)

ZONA 1 $A_{s,est.}$ = **426.4** cm2 (longitud del tramo = 10.7 m)

de	a		A_s (cm2/m)	A_s parcial	A_s acum.
-0.5	3.0	Eϕ16 c/0.15 + Eϕ10 c/0.30	64.07	224.25	224.25
3.0	6.0	(Eϕ16 + Eϕ12) alternos c/0.15	41.87	125.61	349.86
6.0	16.0	Eϕ10 c/0.15	20.93	209.30	559.16

ZONA 2 $A_{s,est.}$ = **685.8** cm2 (longitud del tramo = 21.3 m)

de	a		A_s (cm2/m)	A_s parcial	A_s acum.
16.0	20.0	Eϕ10 c/0.15	20.93	83.72	83.72
20.0	25.5	Eϕ12 c/0.15	30.13	165.72	249.44
25.5	29.0	Eϕ16 c/0.15	53.60	187.60	437.04
29.0	32.0	(Eϕ16 + Eϕ12) juntos c/0.15	83.70	251.10	688.14

ZONA 3 $A_{s,est.}$ = **692.6** cm2 (longitud del tramo = 20.0 m)

de	a		A_s (cm2/m)	A_s parcial	A_s acum.
0.0	3.0	Eϕ16 c/0.15 + (Eϕ16 + Eϕ10) alternos c/0.15	90.90	272.70	272.70
3.0	6.0	Eϕ16 c/0.15 + Eϕ16 c/0.30	80.40	241.20	513.90
6.0	9.5	Eϕ16 c/0.15	53.60	187.60	701.50
9.5	13.0	Eϕ12 c/0.15	30.13	105.46	806.96
13.0	20.0	Eϕ10 c/0.15	20.93	146.51	953.47

ZONA 4 $A_{s,est.}$ = **732.6** cm2 (longitud del tramo = 20.0 m)

de	a		A_s (cm2/m)	A_s parcial	A_s acum.
20.0	25.5	Eϕ10 c/0.15	20.93	115.12	115.12
25.5	28.5	Eϕ12 c/0.15	30.13	90.39	205.51
28.5	31.5	Eϕ16 c/0.15	53.60	160.80	366.31
31.5	34.5	(Eϕ16 + Eϕ10) juntos c/0.15	74.53	223.59	589.90
34.5	37.5	(Eϕ16 + Eϕ10) juntos c/0.15	74.53	223.59	813.49
37.5	40.0	2Eϕ16 c/0.15	107.20	268.00	1081.49

ZONA 5 $A_{s,est.}$ = **717.8** cm2 (longitud del tramo = 20.0 m)

de	a		A_s (cm2/m)	A_s parcial	A_s acum.
0.0	2.5	2Eϕ16 c/0.15	107.20	268.00	268.00
2.5	5.5	(Eϕ16 + Eϕ10) juntos c/0.15	74.53	226.57	494.57
5.5	8.5	Eϕ16 c/0.15 + Eϕ10 c/0.30	64.07	194.77	689.34
8.5	11.5	Eϕ16 c/0.15	53.60	162.94	852.29
11.5	14.5	Eϕ12 c/0.15	30.13	90.39	942.68
14.5	20.0	Eϕ10 c/0.15	20.93	115.12	1057.79

CÁLCULO DE REACCIONES

U.T.E. ALT CAMP
L.A.V. MADRID-BARCELONA
SUBTRAMO V
VIADUCTO RIO FRANCOLI

REACCIONES VERTICALES (EN ESTRIBOS)

	ESTRIBO 1 Y 2	
	APOYO 1	APOYO 2
VIGA (T)	59.340	59.340
PRELOSAS (T)	16.800	16.800
LOSA FASE 1 (T)	27.365	27.365
LOSA FASE 2 (T)	14.152	14.152
CARGAS MUERTAS MAX (T)	91.012	91.012
CARGAS MUERTAS MIN (T)	58.533	58.533
SOBRECARGA PASEOS (T)	20.060	-11.960
HIPOTESIS 1 (T)	280.190	-73.280
TREN 1 VIA RIPADA		
VELOCIDAD 120 Km/h		
COEFICIENTE DE IMPACTO= 1		
COEFICIENTE DE CLASIFICACIÓN= 1.21		
COEFICIENTE DE REDUCCION= 1		
HIPOTESIS 2 (T)	206.910	206.910
TREN 2 VIAS RIPADAS		
VELOCIDAD 120 Km/h		
COEFICIENTE DE IMPACTO= 1		
COEFICIENTE DE CLASIFICACIÓN= 1.21		
COEFICIENTE DE REDUCCION= 1		
HIPOTESIS 3 (T)	97.790	-25.580
TREN 1 VIA RIPADA		
VELOCIDAD 350 Km/h		
COEFICIENTE DE IMPACTO= 1		
COEFICIENTE DE CLASIFICACIÓN= 1		
COEFICIENTE DE REDUCCION= 0.571		
HIPOTESIS 4 (T)	72.210	72.210
TREN 2 VIAS RIPADAS		
VELOCIDAD 350 Km/h		
COEFICIENTE DE IMPACTO= 1		
COEFICIENTE DE CLASIFICACIÓN= 1		
COEFICIENTE DE REDUCCION= 0.571		
MAX (Tn)	508.918	508.918
MIN (Tn)	90.949	90.949

Viaducto s/ el Río Francolí. UTE ALT CAMP

REACCIONES HORIZONTALES (EN ESTRIBOS)

TRANSVERSALES	ESTRIBO 1 Y 2
VIENTO (CON SOBRECARGA) (T)	21.98
LAZO (T)	10
HIPOTESIS 1 CENTRIFUGA (T)	3.24
TREN 1 VIA RIPADA	
VELOCIDAD 120 Km/h	
COEFICIENTE DE IMPACTO= 1	
COEFICIENTE DE CLASIFICACIÓN= 1.21	
COEFICIENTE DE REDUCCION= 1	
HIPOTESIS 2 CENTRIFUGA (T)	6.47
TREN 2 VIAS RIPADAS	
VELOCIDAD 120 Km/h	
COEFICIENTE DE IMPACTO= 1	
COEFICIENTE DE CLASIFICACIÓN= 1.21	
COEFICIENTE DE REDUCCION= 1	
HIPOTESIS 3 CENTRIFUGA (T)	9.61
TREN 1 VIA RIPADA	
VELOCIDAD 350 Km/h	
COEFICIENTE DE IMPACTO= 1	
COEFICIENTE DE CLASIFICACIÓN= 1	
COEFICIENTE DE REDUCCION= 0.453	
HIPOTESIS 4 CENTRIFUGA (T)	19.21
TREN 2 VIAS RIPADAS	
VELOCIDAD 350 Km/h	
COEFICIENTE DE IMPACTO= 1	
COEFICIENTE DE CLASIFICACIÓN= 1	
COEFICIENTE DE REDUCCION= 0.453	

LONGITUDINALES
ROZAMIENTO CONSIDERADO EN TEFLÓN: 0.05 DE CARGAS PERMANENTES

	ESTRIBO 1 (FIJO)
FRENADO (T)	445.28
ARRANQUE (T)	121
INTERACCION CARRIL-TABLERO (T)	144

SUBTRAMO V
VIADUCTO RIO FRANCOLI

REACCIONES VERTICALES (EN CABEZA DE PILA)

	PILAS 1,2,3 Y 4	
	APOYO 1	APOYO 2
VIGA (T)	202.680	202.680
PRELOSAS (T)	56.000	56.000
LOSA FASE 1 (T)	92.770	92.770
LOSA FASE 2 (T)	47.740	47.740
CARGAS MUERTAS MAX (T)	306.235	306.235
CARGAS MUERTAS MIN (T)	196.952	196.952
SOBRECARGA PASEOS (T)	54.480	-32.480
HIPOTESIS 1 (T)	685.890	-179.390
TREN 1 VIA RIPADA		
VELOCIDAD 120 Km/h		
COEFICIENTE DE IMPACTO= 1		
COEFICIENTE DE CLASIFICACIÓN= 1.21		
COEFICIENTE DE REDUCCION= 1		
HIPOTESIS 2 (T)	506.510	506.510
TREN 2 VIAS RIPADAS		
VELOCIDAD 120 Km/h		
COEFICIENTE DE IMPACTO= 1		
COEFICIENTE DE CLASIFICACIÓN= 1.21		
COEFICIENTE DE REDUCCION= 1		
HIPOTESIS 3 (T)	239.380	-62.610
TREN 1 VIA RIPADA		
VELOCIDAD 350 Km/h		
COEFICIENTE DE IMPACTO= 1		
COEFICIENTE DE CLASIFICACIÓN= 1		
COEFICIENTE DE REDUCCION= 0.453		
HIPOTESIS 4 (T)	176.770	176.770
TREN 2 VIAS RIPADAS		
VELOCIDAD 350 Km/h		
COEFICIENTE DE IMPACTO= 1		
COEFICIENTE DE CLASIFICACIÓN= 1		
COEFICIENTE DE REDUCCION= 0.453		
MAX (Tn)	1445.795	1445.795
MIN (Tn)	384.272	384.272

Viaducto s/ el Río Francolí. UTE ALT CAMP

REACCIONES HORIZONTALES (EN CABEZA DE PILA)

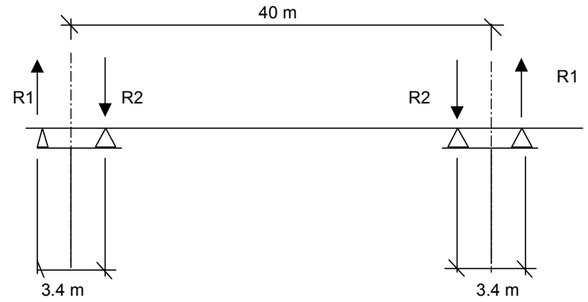
TRANSVERSALES	PILAS 1,2,3 Y 4
VIENTO (CON SOBRECARGA) (T)	53.4
LAZO (T)	10
HIPOTESIS 1 CENTRIFUGA (T)	7.92
TREN 1 VIA RIPADA	
VELOCIDAD 120 Km/h	
COEFICIENTE DE IMPACTO= 1	
COEFICIENTE DE CLASIFICACIÓN= 1.21	
COEFICIENTE DE REDUCCION= 1	
HIPOTESIS 2 CENTRIFUGA (T)	15.84
TREN 2 VIAS RIPADAS	
VELOCIDAD 120 Km/h	
COEFICIENTE DE IMPACTO= 1	
COEFICIENTE DE CLASIFICACIÓN= 1.21	
COEFICIENTE DE REDUCCION= 1	
HIPOTESIS 3 CENTRIFUGA (T)	23.52
TREN 1 VIA RIPADA	
VELOCIDAD 350 Km/h	
COEFICIENTE DE IMPACTO= 1	
COEFICIENTE DE CLASIFICACIÓN= 1	
COEFICIENTE DE REDUCCION= 0.453	
HIPOTESIS 4 CENTRIFUGA (T)	47.04
TREN 2 VIAS RIPADAS	
VELOCIDAD 350 Km/h	
COEFICIENTE DE IMPACTO= 1	
COEFICIENTE DE CLASIFICACIÓN= 1	
COEFICIENTE DE REDUCCION= 0.453	

LONGITUDINALES
ROZAMIENTO CONSIDERADO EN TEFLÓN: 0.05 DE CARGAS PERMANENTES

U.T.E. ALT CAMP
L.A.V. MADRID-BARCELONA
SUBTRAMO V
VIADUCTO RIO FRANCOLI

ACCIONES SOBRE CABEZA DE PILAS 1,2,3 Y 4

	R1	R2
P.P. VIGA (Tn)	-135.890	422.602



Acciones sobre cabeza de pila en el momento en que se encuentra montada la viga "sombrero" sobre pila (Lv= 16 m) y la viga de cierre en vano de 40 m (Lv= 24 m)

LISTADO DE RESULTADOS DE LOS MODELOS DE CÁLCULO(Fases de Montaje)

D A T O S

Archivo : C:\Amaya\B-08.937 UTE AL CAMP RIO FRANCOLI\fase1.AVW
Proyecto :
Unidades : Ton-M
Fecha : 08/05/02
Hora : 10:55:44

N U D O S

Nudo	X [M]	Y [M]	Z [M]	Piso
1	0	0	0	0
2	24	0	0	0
3	30.3	0	0	0
4	32	0	0	0
5	33.7	0	0	0
6	40	0	0	0
7	64	0	0	0
8	70.3	0	0	0
9	72	0	0	0
10	73.7	0	0	0
11	80	0	0	0
12	104	0	0	0
13	110.3	0	0	0
14	112	0	0	0
15	113.7	0	0	0
16	120	0	0	0
17	144	0	0	0
18	150.3	0	0	0
19	152	0	0	0
20	153.7	0	0	0
21	160	0	0	0
22	184	0	0	0

R E S T R I C C I O N E S

Nudo	TX	TY	TZ	RX	RY	RZ
1	0	1	0	0	0	0
3	0	1	0	0	0	0
5	0	1	0	0	0	0
8	0	1	0	0	0	0
10	0	1	0	0	0	0
13	0	1	0	0	0	0
15	0	1	0	0	0	0
18	0	1	0	0	0	0
20	0	1	0	0	0	0
22	0	1	0	0	0	0

V I G A S

Viga	NJ	NK	Descripcion	SecciÛn	Material
1	1	2		alt frain25	H 500x5100
2	2	3		alt frain30	H 500x5100
3	3	4		alt frain30	H 500x5100
4	4	5		alt frain30	H 500x5100
5	5	6		alt frain30	H 500x5100
6	6	7		alt frain25	H 500x5100
7	7	8		alt frain30	H 500x5100
8	8	9		alt frain30	H 500x5100
9	9	10		alt frain30	H 500x5100
10	10	11		alt frain30	H 500x5100
11	11	12		alt frain25	H 500x5100
12	12	13		alt frain30	H 500x5100
13	13	14		alt frain30	H 500x5100
14	14	15		alt frain30	H 500x5100
15	15	16		alt frain30	H 500x5100
16	16	17		alt frain25	H 500x5100
17	17	18		alt frain30	H 500x5100
18	18	19		alt frain30	H 500x5100
19	19	20		alt frain30	H 500x5100
20	20	21		alt frain30	H 500x5100
21	21	22		alt frain25	H 500x5100

Viaducto s/ el Río Francolí. UTE ALT CAMP

A R T I C U L A C I O N E S

Viga	JM3	KM3	JM2	KM2	TOR	JV2	KV2	JV3	KV3	AXI
1	0	1	0	0	0	0	0	0	0	0
6	1	1	0	0	0	0	0	0	0	0
11	1	1	0	0	0	0	0	0	0	0
16	1	1	0	0	0	0	0	0	0	0
21	1	0	0	0	0	0	0	0	0	0

FUERZA DISTRIBUIDA SOBRE VIGAS

Estado	Viga	Dir.	Valor [Ton/M]
pp	1	Y	-9.89
	2	Y	-10.5
	3	Y	-10.5
	4	Y	-10.5
	5	Y	-10.5
	6	Y	-9.89
	7	Y	-10.5
	8	Y	-10.5
	9	Y	-10.5
	10	Y	-10.5
	11	Y	-9.89
	12	Y	-10.5
	13	Y	-10.5
	14	Y	-10.5
	15	Y	-10.5
	16	Y	-9.89
	17	Y	-10.5
	18	Y	-10.5
	19	Y	-10.5
	20	Y	-10.5
	21	Y	-9.89
pr	1	Y	-2.8
	2	Y	-2.8
	3	Y	-2.8
	4	Y	-2.8
	5	Y	-2.8
	6	Y	-2.8
	7	Y	-2.8
	8	Y	-2.8
	9	Y	-2.8
	10	Y	-2.8
	11	Y	-2.8
	12	Y	-2.8
	13	Y	-2.8
	14	Y	-2.8
	15	Y	-2.8
	16	Y	-2.8
	17	Y	-2.8
	18	Y	-2.8
	19	Y	-2.8
	20	Y	-2.8
	21	Y	-2.8

E S T A D O S D E C A R G A

Estado	DescripciÛn	Comb.	MultX	MultY	MultZ
pp	Peso Propio	0	0	0	0
pr	prelosas	0	0	0	0
h1	pp+pr	1	0	0	0

S I S M O

Estado	Acel.	Dir.	Amort. [%]
pp	0	0	0
pr	0	0	0
h1	0	0	0

R E S U L T A D O S D E L A N A L I S I S

Archivo : C:\Amaya\B-08.937 UTE AL CAMP RIO FRANCOLI\fase1.AVW
Proyecto :
Unidades : Ton-M
Fecha : 08/05/02
Hora : 11:04:58

N U D O S

T R A S L A C I O N E S

	TRASLACIONES [M]			ROTACIONES [Rad]		
Nudo	TX	TY	TZ	RX	RY	RZ
Estado pp=Peso Propio						
1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00086
2	0.00000	-0.00275	0.00000	0.00000	0.00000	0.00055
3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00020
4	0.00000	0.00017	0.00000	0.00000	0.00000	0.00000
5	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00020
6	0.00000	-0.00275	0.00000	0.00000	0.00000	-0.00055
7	0.00000	-0.00275	0.00000	0.00000	0.00000	0.00055
8	0.00000	0.00000	0.00000	0.00000	0.00000	0.00020
9	0.00000	0.00017	0.00000	0.00000	0.00000	0.00000
10	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00020
11	0.00000	-0.00275	0.00000	0.00000	0.00000	-0.00055
12	0.00000	-0.00275	0.00000	0.00000	0.00000	0.00055
13	0.00000	0.00000	0.00000	0.00000	0.00000	0.00020
14	0.00000	0.00017	0.00000	0.00000	0.00000	0.00000
15	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00020
16	0.00000	-0.00275	0.00000	0.00000	0.00000	-0.00055
17	0.00000	-0.00275	0.00000	0.00000	0.00000	0.00055
18	0.00000	0.00000	0.00000	0.00000	0.00000	0.00020
19	0.00000	0.00017	0.00000	0.00000	0.00000	0.00000
20	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00020
21	0.00000	-0.00275	0.00000	0.00000	0.00000	-0.00055
22	0.00000	0.00000	0.00000	0.00000	0.00000	0.00086
Estado pr=prelosas						
1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00024
2	0.00000	-0.00077	0.00000	0.00000	0.00000	0.00015
3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00006
4	0.00000	0.00005	0.00000	0.00000	0.00000	0.00000
5	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00006
6	0.00000	-0.00077	0.00000	0.00000	0.00000	-0.00015
7	0.00000	-0.00077	0.00000	0.00000	0.00000	0.00015
8	0.00000	0.00000	0.00000	0.00000	0.00000	0.00006
9	0.00000	0.00005	0.00000	0.00000	0.00000	0.00000
10	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00006
11	0.00000	-0.00077	0.00000	0.00000	0.00000	-0.00015
12	0.00000	-0.00077	0.00000	0.00000	0.00000	0.00015
13	0.00000	0.00000	0.00000	0.00000	0.00000	0.00006
14	0.00000	0.00005	0.00000	0.00000	0.00000	0.00000
15	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00006
16	0.00000	-0.00077	0.00000	0.00000	0.00000	-0.00015
17	0.00000	-0.00077	0.00000	0.00000	0.00000	0.00015
18	0.00000	0.00000	0.00000	0.00000	0.00000	0.00006
19	0.00000	0.00005	0.00000	0.00000	0.00000	0.00000
20	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00006
21	0.00000	-0.00077	0.00000	0.00000	0.00000	-0.00015
22	0.00000	0.00000	0.00000	0.00000	0.00000	0.00024
Estado h1=pp+pr						
1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00110
2	0.00000	-0.00351	0.00000	0.00000	0.00000	0.00070
3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00026
4	0.00000	0.00022	0.00000	0.00000	0.00000	0.00000
5	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00026
6	0.00000	-0.00351	0.00000	0.00000	0.00000	-0.00070
7	0.00000	-0.00351	0.00000	0.00000	0.00000	0.00070
8	0.00000	0.00000	0.00000	0.00000	0.00000	0.00026
9	0.00000	0.00022	0.00000	0.00000	0.00000	0.00000
10	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00026
11	0.00000	-0.00351	0.00000	0.00000	0.00000	-0.00070
12	0.00000	-0.00351	0.00000	0.00000	0.00000	0.00070
13	0.00000	0.00000	0.00000	0.00000	0.00000	0.00026
14	0.00000	0.00022	0.00000	0.00000	0.00000	0.00000
15	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00026
16	0.00000	-0.00351	0.00000	0.00000	0.00000	-0.00070
17	0.00000	-0.00351	0.00000	0.00000	0.00000	0.00070
18	0.00000	0.00000	0.00000	0.00000	0.00000	0.00026
19	0.00000	0.00022	0.00000	0.00000	0.00000	0.00000
20	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00026
21	0.00000	-0.00351	0.00000	0.00000	0.00000	-0.00070
22	0.00000	0.00000	0.00000	0.00000	0.00000	0.00110

R E A C C I O N E S

	FUERZAS [Ton]			MOMENTOS [Ton*M]		
Nudo	FX	FY	FZ	MX	MY	MZ
Estado pp=Peso Propio						
1	0.00000	118.68000	0.00000	0.00000	0.00000	0.00000
3	0.00000	202.68000	0.00000	0.00000	0.00000	0.00000
5	0.00000	202.68000	0.00000	0.00000	0.00000	0.00000
8	0.00000	202.68000	0.00000	0.00000	0.00000	0.00000
10	0.00000	202.68000	0.00000	0.00000	0.00000	0.00000
13	0.00000	202.68000	0.00000	0.00000	0.00000	0.00000
15	0.00000	202.68000	0.00000	0.00000	0.00000	0.00000
18	0.00000	202.68000	0.00000	0.00000	0.00000	0.00000
20	0.00000	202.68000	0.00000	0.00000	0.00000	0.00000
22	0.00000	118.68000	0.00000	0.00000	0.00000	0.00000
SUM	0.00000	1858.80000	0.00000	0.00000	0.00000	0.00000
Estado pr=prelosas						
1	0.00000	33.60000	0.00000	0.00000	0.00000	0.00000
3	0.00000	56.00000	0.00000	0.00000	0.00000	0.00000
5	0.00000	56.00000	0.00000	0.00000	0.00000	0.00000
8	0.00000	56.00000	0.00000	0.00000	0.00000	0.00000
10	0.00000	56.00000	0.00000	0.00000	0.00000	0.00000
13	0.00000	56.00000	0.00000	0.00000	0.00000	0.00000
15	0.00000	56.00000	0.00000	0.00000	0.00000	0.00000
18	0.00000	56.00000	0.00000	0.00000	0.00000	0.00000
20	0.00000	56.00000	0.00000	0.00000	0.00000	0.00000
22	0.00000	33.60000	0.00000	0.00000	0.00000	0.00000
SUM	0.00000	515.20000	0.00000	0.00000	0.00000	0.00000
Estado h1=pp+pr						
1	0.00000	152.28000	0.00000	0.00000	0.00000	0.00000
3	0.00000	258.68000	0.00000	0.00000	0.00000	0.00000
5	0.00000	258.68000	0.00000	0.00000	0.00000	0.00000
8	0.00000	258.68000	0.00000	0.00000	0.00000	0.00000
10	0.00000	258.68000	0.00000	0.00000	0.00000	0.00000
13	0.00000	258.68000	0.00000	0.00000	0.00000	0.00000
15	0.00000	258.68000	0.00000	0.00000	0.00000	0.00000
18	0.00000	258.68000	0.00000	0.00000	0.00000	0.00000
20	0.00000	258.68000	0.00000	0.00000	0.00000	0.00000
22	0.00000	152.28000	0.00000	0.00000	0.00000	0.00000
SUM	0.00000	2374.00000	0.00000	0.00000	0.00000	0.00000

V I G A S

E S F U E R Z O S

	M33 [Ton*M]	V2 [Ton]	M22 [Ton*M]	V3 [Ton]
Viga 1				
Estado pp=Peso Propio				
0%	0.00	-118.68	0.00	0.00
16%	395.60	-79.12	0.00	0.00
33%	632.96	-39.56	0.00	0.00
50%	712.08	0.00	0.00	0.00
66%	632.96	39.56	0.00	0.00
83%	395.60	79.12	0.00	0.00
100%	0.00	118.68	0.00	0.00

```
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado pr=prelosas
  0%  0.00          -33.60        0.00          0.00
 16%  112.00        -22.40        0.00          0.00
 33%  179.20        -11.20        0.00          0.00
 50%  201.60        0.00          0.00          0.00
 66%  179.20        11.20         0.00          0.00
 83%  112.00        22.40         0.00          0.00
100%  0.00          33.60         0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado h1=pp+pr
  0%  0.00          -152.28       0.00          0.00
 16%  507.60        -101.52       0.00          0.00
 33%  812.16        -50.76        0.00          0.00
 50%  913.68        0.00          0.00          0.00
 66%  812.16        50.76         0.00          0.00
 83%  507.60        101.52        0.00          0.00
100%  0.00          152.28        0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-----------------------------------------------------
Viga 2
Estado pp=Peso Propio
  0%  0.00          118.68        0.00          0.00
 16%  -130.40       129.71        0.00          0.00
 33%  -272.38       140.73        0.00          0.00
 50%  -425.94       151.76        0.00          0.00
 66%  -591.07       162.78        0.00          0.00
 83%  -767.77       173.81        0.00          0.00
100%  -956.06       184.83        0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado pr=prelosas
  0%  0.00          33.60         0.00          0.00
 16%  -36.82        36.54         0.00          0.00
 33%  -76.73        39.48         0.00          0.00
 50%  -119.73       42.42         0.00          0.00
 66%  -165.82       45.36         0.00          0.00
 83%  -214.99       48.30         0.00          0.00
100%  -267.25       51.24         0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado h1=pp+pr
  0%  0.00          152.28        0.00          0.00
 16%  -167.23       166.25        0.00          0.00
 33%  -349.11       180.21        0.00          0.00
 50%  -545.67       194.18        0.00          0.00
 66%  -756.88       208.14        0.00          0.00
 83%  -982.76       222.11        0.00          0.00
100%  -1223.30      236.07        0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-----------------------------------------------------
Viga 3
Estado pp=Peso Propio
  0%  -956.06       -17.85        0.00          0.00
 16%  -951.42       -14.88        0.00          0.00
 33%  -947.63       -11.90        0.00          0.00
 50%  -944.68       -8.93         0.00          0.00
 66%  -942.57       -5.95         0.00          0.00
 83%  -941.31       -2.98         0.00          0.00
100%  -940.88       0.00          0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado pr=prelosas
  0%  -267.25       -4.76         0.00          0.00
 16%  -266.01       -3.97         0.00          0.00
 33%  -265.00       -3.17         0.00          0.00
 50%  -264.21       -2.38         0.00          0.00
 66%  -263.65       -1.59         0.00          0.00
 83%  -263.31       -0.79         0.00          0.00
100%  -263.20       0.00          0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado h1=pp+pr
  0%  -1223.30      -22.61        0.00          0.00
 16%  -1217.43      -18.84        0.00          0.00
 33%  -1212.63      -15.07        0.00          0.00
 50%  -1208.89      -11.31        0.00          0.00
 66%  -1206.22      -7.54         0.00          0.00
 83%  -1204.62      -3.77         0.00          0.00
100%  -1204.08      0.00          0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
```



```
-----------------------------------------------------
Viga 4
Estado pp=Peso Propio
  0%  -940.88       0.00          0.00          0.00
 16%  -941.31       2.98          0.00          0.00
 33%  -942.57       5.95          0.00          0.00
 50%  -944.68       8.93          0.00          0.00
 66%  -947.63       11.90         0.00          0.00
 83%  -951.42       14.88         0.00          0.00
100%  -956.06       17.85         0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado pr=prelosas
  0%  -263.20       0.00          0.00          0.00
 16%  -263.31       0.79          0.00          0.00
 33%  -263.65       1.59          0.00          0.00
 50%  -264.21       2.38          0.00          0.00
 66%  -265.00       3.17          0.00          0.00
 83%  -266.01       3.97          0.00          0.00
100%  -267.25       4.76          0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado h1=pp+pr
  0%  -1204.08      0.00          0.00          0.00
 16%  -1204.62      3.77          0.00          0.00
 33%  -1206.22      7.54          0.00          0.00
 50%  -1208.89      11.31         0.00          0.00
 66%  -1212.63      15.07         0.00          0.00
 83%  -1217.43      18.84         0.00          0.00
100%  -1223.30      22.61         0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-----------------------------------------------------
Viga 5
Estado pp=Peso Propio
  0%  -956.06       -184.83       0.00          0.00
 16%  -767.77       -173.81       0.00          0.00
 33%  -591.07       -162.78       0.00          0.00
 50%  -425.94       -151.76       0.00          0.00
 66%  -272.38       -140.73       0.00          0.00
 83%  -130.40       -129.71       0.00          0.00
100%  0.00          -118.68       0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado pr=prelosas
  0%  -267.25       -51.24        0.00          0.00
 16%  -214.99       -48.30        0.00          0.00
 33%  -165.82       -45.36        0.00          0.00
 50%  -119.73       -42.42        0.00          0.00
 66%  -76.73        -39.48        0.00          0.00
 83%  -36.82        -36.54        0.00          0.00
100%  0.00          -33.60        0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado h1=pp+pr
  0%  -1223.30      -236.07       0.00          0.00
 16%  -982.76       -222.11       0.00          0.00
 33%  -756.88       -208.14       0.00          0.00
 50%  -545.67       -194.18       0.00          0.00
 66%  -349.11       -180.21       0.00          0.00
 83%  -167.23       -166.25       0.00          0.00
100%  0.00          -152.28       0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-----------------------------------------------------
Viga 6
Estado pp=Peso Propio
  0%  0.00          -118.68       0.00          0.00
 16%  395.60        -79.12        0.00          0.00
 33%  632.96        -39.56        0.00          0.00
 50%  712.08        0.00          0.00          0.00
 66%  632.96        39.56         0.00          0.00
 83%  395.60        79.12         0.00          0.00
100%  0.00          118.68        0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado pr=prelosas
  0%  0.00          -33.60        0.00          0.00
 16%  112.00        -22.40        0.00          0.00
 33%  179.20        -11.20        0.00          0.00
 50%  201.60        0.00          0.00          0.00
 66%  179.20        11.20         0.00          0.00
 83%  112.00        22.40         0.00          0.00
100%  0.00          33.60         0.00          0.00
```

```
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado h1=pp+pr
  0%  0.00          -152.28       0.00          0.00
 16%  507.60        -101.52       0.00          0.00
 33%  812.16        -50.76        0.00          0.00
 50%  913.68        0.00          0.00          0.00
 66%  812.16        50.76         0.00          0.00
 83%  507.60        101.52        0.00          0.00
100%  0.00          152.28        0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 7
Estado pp=Peso Propio
  0%  0.00          118.68        0.00          0.00
 16%  -130.40       129.71        0.00          0.00
 33%  -272.38       140.73        0.00          0.00
 50%  -425.94       151.76        0.00          0.00
 66%  -591.07       162.78        0.00          0.00
 83%  -767.77       173.81        0.00          0.00
100%  -956.06       184.83        0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado pr=prelosas
  0%  0.00          33.60         0.00          0.00
 16%  -36.82        36.54         0.00          0.00
 33%  -76.73        39.48         0.00          0.00
 50%  -119.73       42.42         0.00          0.00
 66%  -165.82       45.36         0.00          0.00
 83%  -214.99       48.30         0.00          0.00
100%  -267.25       51.24         0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado h1=pp+pr
  0%  0.00          152.28        0.00          0.00
 16%  -167.23       166.25        0.00          0.00
 33%  -349.11       180.21        0.00          0.00
 50%  -545.67       194.18        0.00          0.00
 66%  -756.88       208.14        0.00          0.00
 83%  -982.76       222.11        0.00          0.00
100%  -1223.30      236.07        0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 8
Estado pp=Peso Propio
  0%  -956.06       -17.85        0.00          0.00
 16%  -951.42       -14.88        0.00          0.00
 33%  -947.63       -11.90        0.00          0.00
 50%  -944.68       -8.93         0.00          0.00
 66%  -942.57       -5.95         0.00          0.00
 83%  -941.31       -2.98         0.00          0.00
100%  -940.88       0.00          0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado pr=prelosas
  0%  -267.25       -4.76         0.00          0.00
 16%  -266.01       -3.97         0.00          0.00
 33%  -265.00       -3.17         0.00          0.00
 50%  -264.21       -2.38         0.00          0.00
 66%  -263.65       -1.59         0.00          0.00
 83%  -263.31       -0.79         0.00          0.00
100%  -263.20       0.00          0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado h1=pp+pr
  0%  -1223.30      -22.61        0.00          0.00
 16%  -1217.43      -18.84        0.00          0.00
 33%  -1212.63      -15.07        0.00          0.00
 50%  -1208.89      -11.31        0.00          0.00
 66%  -1206.22      -7.54         0.00          0.00
 83%  -1204.62      -3.77         0.00          0.00
100%  -1204.08      0.00          0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 9
Estado pp=Peso Propio
  0%  -940.88       0.00          0.00          0.00
 16%  -941.31       2.98          0.00          0.00
 33%  -942.57       5.95          0.00          0.00
 50%  -944.68       8.93          0.00          0.00
 66%  -947.63       11.90         0.00          0.00
 83%  -951.42       14.88         0.00          0.00
```



```
100%  -956.06       17.85         0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado pr=prelosas
  0%  -263.20       0.00          0.00          0.00
 16%  -263.31       0.79          0.00          0.00
 33%  -263.65       1.59          0.00          0.00
 50%  -264.21       2.38          0.00          0.00
 66%  -265.00       3.17          0.00          0.00
 83%  -266.01       3.97          0.00          0.00
100%  -267.25       4.76          0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado h1=pp+pr
  0%  -1204.08      0.00          0.00          0.00
 16%  -1204.62      3.77          0.00          0.00
 33%  -1206.22      7.54          0.00          0.00
 50%  -1208.89      11.31         0.00          0.00
 66%  -1212.63      15.07         0.00          0.00
 83%  -1217.43      18.84         0.00          0.00
100%  -1223.30      22.61         0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 10
Estado pp=Peso Propio
  0%  -956.06       -184.83       0.00          0.00
 16%  -767.77       -173.81       0.00          0.00
 33%  -591.07       -162.78       0.00          0.00
 50%  -425.94       -151.76       0.00          0.00
 66%  -272.38       -140.73       0.00          0.00
 83%  -130.40       -129.71       0.00          0.00
100%  0.00          -118.68       0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado pr=prelosas
  0%  -267.25       -51.24        0.00          0.00
 16%  -214.99       -48.30        0.00          0.00
 33%  -165.82       -45.36        0.00          0.00
 50%  -119.73       -42.42        0.00          0.00
 66%  -76.73        -39.48        0.00          0.00
 83%  -36.82        -36.54        0.00          0.00
100%  0.00          -33.60        0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado h1=pp+pr
  0%  -1223.30      -236.07       0.00          0.00
 16%  -982.76       -222.11       0.00          0.00
 33%  -756.88       -208.14       0.00          0.00
 50%  -545.67       -194.18       0.00          0.00
 66%  -349.11       -180.21       0.00          0.00
 83%  -167.23       -166.25       0.00          0.00
100%  0.00          -152.28       0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 11
Estado pp=Peso Propio
  0%  0.00          -118.68       0.00          0.00
 16%  395.60        -79.12        0.00          0.00
 33%  632.96        -39.56        0.00          0.00
 50%  712.08        0.00          0.00          0.00
 66%  632.96        39.56         0.00          0.00
 83%  395.60        79.12         0.00          0.00
100%  0.00          118.68        0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado pr=prelosas
  0%  0.00          -33.60        0.00          0.00
 16%  112.00        -22.40        0.00          0.00
 33%  179.20        -11.20        0.00          0.00
 50%  201.60        0.00          0.00          0.00
 66%  179.20        11.20         0.00          0.00
 83%  112.00        22.40         0.00          0.00
100%  0.00          33.60         0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado h1=pp+pr
  0%  0.00          -152.28       0.00          0.00
 16%  507.60        -101.52       0.00          0.00
 33%  812.16        -50.76        0.00          0.00
 50%  913.68        0.00          0.00          0.00
 66%  812.16        50.76         0.00          0.00
 83%  507.60        101.52        0.00          0.00
100%  0.00          152.28        0.00          0.00
```

```
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-----------------------------------------------------
Viga 12
Estado pp=Peso Propio
  0%  0.00          118.68        0.00          0.00
 16%  -130.40       129.71        0.00          0.00
 33%  -272.38       140.73        0.00          0.00
 50%  -425.94       151.76        0.00          0.00
 66%  -591.07       162.78        0.00          0.00
 83%  -767.77       173.81        0.00          0.00
100%  -956.06       184.83        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado pr=prelosas
  0%  0.00          33.60         0.00          0.00
 16%  -36.82        36.54         0.00          0.00
 33%  -76.73        39.48         0.00          0.00
 50%  -119.73       42.42         0.00          0.00
 66%  -165.82       45.36         0.00          0.00
 83%  -214.99       48.30         0.00          0.00
100%  -267.25       51.24         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado h1=pp+pr
  0%  0.00          152.28        0.00          0.00
 16%  -167.23       166.25        0.00          0.00
 33%  -349.11       180.21        0.00          0.00
 50%  -545.67       194.18        0.00          0.00
 66%  -756.88       208.14        0.00          0.00
 83%  -982.76       222.11        0.00          0.00
100%  -1223.30      236.07        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-----------------------------------------------------
Viga 13
Estado pp=Peso Propio
  0%  -956.06       -17.85        0.00          0.00
 16%  -951.42       -14.88        0.00          0.00
 33%  -947.63       -11.90        0.00          0.00
 50%  -944.68       -8.93         0.00          0.00
 66%  -942.57       -5.95         0.00          0.00
 83%  -941.31       -2.98         0.00          0.00
100%  -940.88       0.00          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado pr=prelosas
  0%  -267.25       -4.76         0.00          0.00
 16%  -266.01       -3.97         0.00          0.00
 33%  -265.00       -3.17         0.00          0.00
 50%  -264.21       -2.38         0.00          0.00
 66%  -263.65       -1.59         0.00          0.00
 83%  -263.31       -0.79         0.00          0.00
100%  -263.20       0.00          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado h1=pp+pr
  0%  -1223.30      -22.61        0.00          0.00
 16%  -1217.43      -18.84        0.00          0.00
 33%  -1212.63      -15.07        0.00          0.00
 50%  -1208.89      -11.31        0.00          0.00
 66%  -1206.22      -7.54         0.00          0.00
 83%  -1204.62      -3.77         0.00          0.00
100%  -1204.08      0.00          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-----------------------------------------------------
Viga 14
Estado pp=Peso Propio
  0%  -940.88       0.00          0.00          0.00
 16%  -941.31       2.98          0.00          0.00
 33%  -942.57       5.95          0.00          0.00
 50%  -944.68       8.93          0.00          0.00
 66%  -947.63       11.90         0.00          0.00
 83%  -951.42       14.88         0.00          0.00
100%  -956.06       17.85         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado pr=prelosas
  0%  -263.20       0.00          0.00          0.00
 16%  -263.31       0.79          0.00          0.00
 33%  -263.65       1.59          0.00          0.00
 50%  -264.21       2.38          0.00          0.00
 66%  -265.00       3.17          0.00          0.00
 83%  -266.01       3.97          0.00          0.00
```



```
100%  -267.25       4.76          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado h1=pp+pr
  0%  -1204.08      0.00          0.00          0.00
 16%  -1204.62      3.77          0.00          0.00
 33%  -1206.22      7.54          0.00          0.00
 50%  -1208.89      11.31         0.00          0.00
 66%  -1212.63      15.07         0.00          0.00
 83%  -1217.43      18.84         0.00          0.00
100%  -1223.30      22.61         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-----------------------------------------------------
Viga 15
Estado pp=Peso Propio
  0%  -956.06       -184.83       0.00          0.00
 16%  -767.77       -173.81       0.00          0.00
 33%  -591.07       -162.78       0.00          0.00
 50%  -425.94       -151.76       0.00          0.00
 66%  -272.38       -140.73       0.00          0.00
 83%  -130.40       -129.71       0.00          0.00
100%  0.00          -118.68       0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado pr=prelosas
  0%  -267.25       -51.24        0.00          0.00
 16%  -214.99       -48.30        0.00          0.00
 33%  -165.82       -45.36        0.00          0.00
 50%  -119.73       -42.42        0.00          0.00
 66%  -76.73        -39.48        0.00          0.00
 83%  -36.82        -36.54        0.00          0.00
100%  0.00          -33.60        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado h1=pp+pr
  0%  -1223.30      -236.07       0.00          0.00
 16%  -982.76       -222.11       0.00          0.00
 33%  -756.88       -208.14       0.00          0.00
 50%  -545.67       -194.18       0.00          0.00
 66%  -349.11       -180.21       0.00          0.00
 83%  -167.23       -166.25       0.00          0.00
100%  0.00          -152.28       0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-----------------------------------------------------
Viga 16
Estado pp=Peso Propio
  0%  0.00          -118.68       0.00          0.00
 16%  395.60        -79.12        0.00          0.00
 33%  632.96        -39.56        0.00          0.00
 50%  712.08        0.00          0.00          0.00
 66%  632.96        39.56         0.00          0.00
 83%  395.60        79.12         0.00          0.00
100%  0.00          118.68        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado pr=prelosas
  0%  0.00          -33.60        0.00          0.00
 16%  112.00        -22.40        0.00          0.00
 33%  179.20        -11.20        0.00          0.00
 50%  201.60        0.00          0.00          0.00
 66%  179.20        11.20         0.00          0.00
 83%  112.00        22.40         0.00          0.00
100%  0.00          33.60         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado h1=pp+pr
  0%  0.00          -152.28       0.00          0.00
 16%  507.60        -101.52       0.00          0.00
 33%  812.16        -50.76        0.00          0.00
 50%  913.68        0.00          0.00          0.00
 66%  812.16        50.76         0.00          0.00
 83%  507.60        101.52        0.00          0.00
100%  0.00          152.28        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-----------------------------------------------------
Viga 17
Estado pp=Peso Propio
  0%  0.00          118.68        0.00          0.00
 16%  -130.40       129.71        0.00          0.00
 33%  -272.38       140.73        0.00          0.00
 50%  -425.94       151.76        0.00          0.00
 66%  -591.07       162.78        0.00          0.00
```

```
 83%  -767.77       173.81        0.00          0.00
100%  -956.06       184.83        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado pr=prelosas
  0%  0.00           33.60         0.00          0.00
 16%  -36.82         36.54         0.00          0.00
 33%  -76.73         39.48         0.00          0.00
 50%  -119.73        42.42         0.00          0.00
 66%  -165.82        45.36         0.00          0.00
 83%  -214.99        48.30         0.00          0.00
100%  -267.25        51.24         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado h1=pp+pr
  0%  0.00           152.28        0.00          0.00
 16%  -167.23        166.25        0.00          0.00
 33%  -349.11        180.21        0.00          0.00
 50%  -545.67        194.18        0.00          0.00
 66%  -756.88        208.14        0.00          0.00
 83%  -982.76        222.11        0.00          0.00
100%  -1223.30       236.07        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-----------------------------------------------------
Viga 18
Estado pp=Peso Propio
  0%  -956.06        -17.85        0.00          0.00
 16%  -951.42        -14.88        0.00          0.00
 33%  -947.63        -11.90        0.00          0.00
 50%  -944.68        -8.93         0.00          0.00
 66%  -942.57        -5.95         0.00          0.00
 83%  -941.31        -2.98         0.00          0.00
100%  -940.88        0.00          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado pr=prelosas
  0%  -267.25        -4.76         0.00          0.00
 16%  -266.01        -3.97         0.00          0.00
 33%  -265.00        -3.17         0.00          0.00
 50%  -264.21        -2.38         0.00          0.00
 66%  -263.65        -1.59         0.00          0.00
 83%  -263.31        -0.79         0.00          0.00
100%  -263.20        0.00          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado h1=pp+pr
  0%  -1223.30       -22.61        0.00          0.00
 16%  -1217.43       -18.84        0.00          0.00
 33%  -1212.63       -15.07        0.00          0.00
 50%  -1208.89       -11.31        0.00          0.00
 66%  -1206.22       -7.54         0.00          0.00
 83%  -1204.62       -3.77         0.00          0.00
100%  -1204.08       0.00          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-----------------------------------------------------
Viga 19
Estado pp=Peso Propio
  0%  -940.88        0.00          0.00          0.00
 16%  -941.31        2.98          0.00          0.00
 33%  -942.57        5.95          0.00          0.00
 50%  -944.68        8.93          0.00          0.00
 66%  -947.63        11.90         0.00          0.00
 83%  -951.42        14.88         0.00          0.00
100%  -956.06        17.85         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado pr=prelosas
  0%  -263.20        0.00          0.00          0.00
 16%  -263.31        0.79          0.00          0.00
 33%  -263.65        1.59          0.00          0.00
 50%  -264.21        2.38          0.00          0.00
 66%  -265.00        3.17          0.00          0.00
 83%  -266.01        3.97          0.00          0.00
100%  -267.25        4.76          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado h1=pp+pr
  0%  -1204.08       0.00          0.00          0.00
 16%  -1204.62       3.77          0.00          0.00
 33%  -1206.22       7.54          0.00          0.00
 50%  -1208.89       11.31         0.00          0.00
 66%  -1212.63       15.07         0.00          0.00
 83%  -1217.43       18.84         0.00          0.00
```



```
100%  -1223.30       22.61         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-----------------------------------------------------
Viga 20
Estado pp=Peso Propio
  0%  -956.06        -184.83       0.00          0.00
 16%  -767.77        -173.81       0.00          0.00
 33%  -591.07        -162.78       0.00          0.00
 50%  -425.94        -151.76       0.00          0.00
 66%  -272.38        -140.73       0.00          0.00
 83%  -130.40        -129.71       0.00          0.00
100%  0.00           -118.68       0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado pr=prelosas
  0%  -267.25        -51.24        0.00          0.00
 16%  -214.99        -48.30        0.00          0.00
 33%  -165.82        -45.36        0.00          0.00
 50%  -119.73        -42.42        0.00          0.00
 66%  -76.73         -39.48        0.00          0.00
 83%  -36.82         -36.54        0.00          0.00
100%  0.00           -33.60        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado h1=pp+pr
  0%  -1223.30       -236.07       0.00          0.00
 16%  -982.76        -222.11       0.00          0.00
 33%  -756.88        -208.14       0.00          0.00
 50%  -545.67        -194.18       0.00          0.00
 66%  -349.11        -180.21       0.00          0.00
 83%  -167.23        -166.25       0.00          0.00
100%  0.00           -152.28       0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-----------------------------------------------------
Viga 21
Estado pp=Peso Propio
  0%  0.00           -118.68       0.00          0.00
 16%  395.60         -79.12        0.00          0.00
 33%  632.96         -39.56        0.00          0.00
 50%  712.08         0.00          0.00          0.00
 66%  632.96         39.56         0.00          0.00
 83%  395.60         79.12         0.00          0.00
100%  0.00           118.68        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado pr=prelosas
  0%  0.00           -33.60        0.00          0.00
 16%  112.00         -22.40        0.00          0.00
 33%  179.20         -11.20        0.00          0.00
 50%  201.60         0.00          0.00          0.00
 66%  179.20         11.20         0.00          0.00
 83%  112.00         22.40         0.00          0.00
100%  0.00           33.60         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado h1=pp+pr
  0%  0.00           -152.28       0.00          0.00
 16%  507.60         -101.52       0.00          0.00
 33%  812.16         -50.76        0.00          0.00
 50%  913.68         0.00          0.00          0.00
 66%  812.16         50.76         0.00          0.00
 83%  507.60         101.52        0.00          0.00
100%  0.00           152.28        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-----------------------------------------------------


                P E N D I E N T E S
Viga      Pend.2        @%        Pend.3        @%
-----------------------------------------------------
Estado pp=Peso Propio
1         -0.00082      0.16667   0.00000       0.00000
2         0.00054       0.16667   0.00000       0.00000
3         0.00018       0.16667   0.00000       0.00000
4         -0.00018      1.00000   0.00000       0.00000
5         -0.00054      1.00000   0.00000       0.00000
6         -0.00071      0.16667   0.00000       0.00000
7         0.00054       0.16667   0.00000       0.00000
8         0.00018       0.16667   0.00000       0.00000
9         -0.00018      1.00000   0.00000       0.00000
10        -0.00054      1.00000   0.00000       0.00000
```

11	-0.00071	0.16667	0.00000	0.00000
12	0.00054	0.16667	0.00000	0.00000
13	0.00018	0.16667	0.00000	0.00000
14	-0.00018	1.00000	0.00000	0.00000
15	-0.00054	1.00000	0.00000	0.00000
16	-0.00071	0.16667	0.00000	0.00000
17	0.00054	0.16667	0.00000	0.00000
18	0.00018	0.16667	0.00000	0.00000
19	-0.00018	1.00000	0.00000	0.00000
20	-0.00054	1.00000	0.00000	0.00000
21	0.00082	1.00000	0.00000	0.00000

Estado pr=prelosas

1	-0.00023	0.16667	0.00000	0.00000
2	0.00015	0.16667	0.00000	0.00000
3	0.00005	0.16667	0.00000	0.00000
4	-0.00005	1.00000	0.00000	0.00000
5	-0.00015	1.00000	0.00000	0.00000
6	-0.00020	0.16667	0.00000	0.00000
7	0.00015	0.16667	0.00000	0.00000
8	0.00005	0.16667	0.00000	0.00000
9	-0.00005	1.00000	0.00000	0.00000
10	-0.00015	1.00000	0.00000	0.00000
11	-0.00020	0.16667	0.00000	0.00000
12	0.00015	0.16667	0.00000	0.00000
13	0.00005	0.16667	0.00000	0.00000
14	-0.00005	1.00000	0.00000	0.00000
15	-0.00015	1.00000	0.00000	0.00000
16	-0.00020	0.16667	0.00000	0.00000
17	0.00015	0.16667	0.00000	0.00000
18	0.00005	0.16667	0.00000	0.00000
19	-0.00005	1.00000	0.00000	0.00000
20	-0.00015	1.00000	0.00000	0.00000
21	0.00023	1.00000	0.00000	0.00000

Estado h1=pp+pr

1	-0.00105	0.16667	0.00000	0.00000
2	0.00070	0.16667	0.00000	0.00000
3	0.00023	0.16667	0.00000	0.00000
4	-0.00023	1.00000	0.00000	0.00000
5	-0.00070	1.00000	0.00000	0.00000
6	-0.00091	0.16667	0.00000	0.00000
7	0.00070	0.16667	0.00000	0.00000
8	0.00023	0.16667	0.00000	0.00000
9	-0.00023	1.00000	0.00000	0.00000
10	-0.00070	1.00000	0.00000	0.00000
11	-0.00091	0.16667	0.00000	0.00000
12	0.00070	0.16667	0.00000	0.00000
13	0.00023	0.16667	0.00000	0.00000
14	-0.00023	1.00000	0.00000	0.00000
15	-0.00070	1.00000	0.00000	0.00000
16	-0.00091	0.16667	0.00000	0.00000
17	0.00070	0.16667	0.00000	0.00000
18	0.00023	0.16667	0.00000	0.00000
19	-0.00023	1.00000	0.00000	0.00000
20	-0.00070	1.00000	0.00000	0.00000
21	0.00105	1.00000	0.00000	0.00000

D A T O S

Archivo : C:\Amaya\B-08.937 UTE AL CAMP RIO FRANCOLI\fase22.AVW
Proyecto :
Unidades : Ton-M
Fecha : 08/05/02
Hora : 11:09:30

N U D O S

Nudo	X [M]	Y [M]	Z [M]	Piso
1	0	0	0	0
2	24	0	0	0
3	30.3	0	0	0
4	32	0	0	0
5	33.7	0	0	0
6	40	0	0	0
7	64	0	0	0
8	70.3	0	0	0
9	72	0	0	0
10	73.7	0	0	0
11	80	0	0	0
12	104	0	0	0
13	110.3	0	0	0
14	112	0	0	0
15	113.7	0	0	0
16	120	0	0	0
17	144	0	0	0
18	150.3	0	0	0
19	152	0	0	0
20	153.7	0	0	0
21	160	0	0	0
22	184	0	0	0

R E S T R I C C I O N E S

Nudo	TX	TY	TZ	RX	RY	RZ
1	0	1	0	0	0	0
3	0	1	0	0	0	0
5	0	1	0	0	0	0
8	0	1	0	0	0	0
10	0	1	0	0	0	0
13	0	1	0	0	0	0
15	0	1	0	0	0	0
18	0	1	0	0	0	0
20	0	1	0	0	0	0
22	0	1	0	0	0	0

V I G A S

Viga	NJ	NK	Descripcion	SecciÛn	Material
1	1	2		alt frain25	H 500-5100
2	2	3		alt frain30	H 500-5100
3	3	4		alt frain30	H 500-5100
4	4	5		alt frain30	H 500-5100
5	5	6		alt frain30	H 500-5100
6	6	7		alt frain25	H 500-5100
7	7	8		alt frain30	H 500-5100
8	8	9		alt frain30	H 500-5100
9	9	10		alt frain30	H 500-5100
10	10	11		alt frain30	H 500-5100
11	11	12		alt frain25	H 500-5100
12	12	13		alt frain30	H 500-5100
13	13	14		alt frain30	H 500-5100
14	14	15		alt frain30	H 500-5100
15	15	16		alt frain30	H 500-5100
16	16	17		alt frain25	H 500-5100
17	17	18		alt frain30	H 500-5100
18	18	19		alt frain30	H 500-5100
19	19	20		alt frain30	H 500-5100
20	20	21		alt frain30	H 500-5100
21	21	22		alt frain25	H 500-5100

FUERZA DISTRIBUIDA SOBRE VIGAS

Estado	Viga	Dir.	Valor [Ton/M]
f1	1	Y	-4.62
	2	Y	-4.62
	3	Y	-4.62
	4	Y	-4.62
	5	Y	-4.62
	6	Y	-4.62
	7	Y	-4.62
	8	Y	-4.62
	9	Y	-4.62
	10	Y	-4.62
	11	Y	-4.62
	12	Y	-4.62
	13	Y	-4.62
	14	Y	-4.62
	15	Y	-4.62
	16	Y	-4.62
	17	Y	-4.62
	18	Y	-4.62
	19	Y	-4.62
	20	Y	-4.62
	21	Y	-4.62

E S T A D O S D E C A R G A

Estado	DescripciÛn	Comb.	MultX	MultY	MultZ
f1	losa fase1	0	0	0	0

S I S M O

Estado	Acel.	Dir.	Amort. [%]
f1	0	0	0

R E S U L T A D O S D E L A N A L I S I S

Archivo : C:\Amaya\B-08.937 UTE AL CAMP RIO FRANCOLI\fase22.AVW
Proyecto :
Unidades : Ton-M
Fecha : 08/05/02
Hora : 11:11:03

N U D O S

T R A S L A C I O N E S

Nudo	TRASLACIONES [M] TX	TY	TZ	ROTACIONES [Rad] RX	RY	RZ
Estado f1=losa fase1						
1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00007
2	0.00000	-0.00044	0.00000	0.00000	0.00000	0.00008
3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00004
4	0.00000	0.00003	0.00000	0.00000	0.00000	0.00000
5	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00004
6	0.00000	-0.00057	0.00000	0.00000	0.00000	-0.00011
7	0.00000	-0.00058	0.00000	0.00000	0.00000	0.00011
8	0.00000	0.00000	0.00000	0.00000	0.00000	0.00004
9	0.00000	0.00004	0.00000	0.00000	0.00000	0.00000
10	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00004
11	0.00000	-0.00058	0.00000	0.00000	0.00000	-0.00011
12	0.00000	-0.00058	0.00000	0.00000	0.00000	0.00011
13	0.00000	0.00000	0.00000	0.00000	0.00000	0.00004
14	0.00000	0.00004	0.00000	0.00000	0.00000	0.00000
15	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00004
16	0.00000	-0.00058	0.00000	0.00000	0.00000	-0.00011
17	0.00000	-0.00057	0.00000	0.00000	0.00000	0.00011
18	0.00000	0.00000	0.00000	0.00000	0.00000	0.00004
19	0.00000	0.00003	0.00000	0.00000	0.00000	0.00000
20	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00004
21	0.00000	-0.00044	0.00000	0.00000	0.00000	-0.00008
22	0.00000	0.00000	0.00000	0.00000	0.00000	0.00007

R E A C C I O N E S

Nudo	FUERZAS [Ton] FX	FY	FZ	MOMENTOS [Ton*M] MX	MY	MZ
Estado f1=losa fase1						
1	0.00000	4.19834	0.00000	0.00000	0.00000	0.00000
3	0.00000	40.72577	0.00000	0.00000	0.00000	0.00000
5	0.00000	75.26235	0.00000	0.00000	0.00000	0.00000
8	0.00000	59.55593	0.00000	0.00000	0.00000	0.00000
10	0.00000	60.38673	0.00000	0.00000	0.00000	0.00000
13	0.00000	60.38673	0.00000	0.00000	0.00000	0.00000
15	0.00000	59.55593	0.00000	0.00000	0.00000	0.00000
18	0.00000	75.26235	0.00000	0.00000	0.00000	0.00000
20	0.00000	40.72577	0.00000	0.00000	0.00000	0.00000
22	0.00000	4.19834	0.00000	0.00000	0.00000	0.00000
SUM	0.00000	480.25824	0.00000	0.00000	0.00000	0.00000

V I G A S

E S F U E R Z O S

	M33 [Ton*M]	V2 [Ton]	M22 [Ton*M]	V3 [Ton]
Viga 1				
Estado f1=losa fase1				
0%	0.00	-4.20	0.00	0.00
16%	16.79	-4.20	0.00	0.00
33%	33.59	-4.20	0.00	0.00
50%	50.38	-4.20	0.00	0.00
66%	67.17	-4.20	0.00	0.00
83%	81.66	0.42	0.00	0.00

```
100%  43.01         18.90         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-----------------------------------------------------
Viga 2
Estado f1=losa fase1
  0%  43.01         18.90         0.00          0.00
 16%  20.62         23.75         0.00          0.00
 33%  -6.87         28.60         0.00          0.00
 50%  -39.45        33.45         0.00          0.00
 66%  -77.13        38.31         0.00          0.00
 83%  -119.89       43.16         0.00          0.00
100%  -167.75       48.01         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-----------------------------------------------------
Viga 3
Estado f1=losa fase1
  0%  -167.75       7.28          0.00          0.00
 16%  -170.00       8.59          0.00          0.00
 33%  -172.62       9.90          0.00          0.00
 50%  -175.61       11.21         0.00          0.00
 66%  -178.97       12.52         0.00          0.00
 83%  -182.71       13.83         0.00          0.00
100%  -186.81       15.14         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-----------------------------------------------------
Viga 4
Estado f1=losa fase1
  0%  -186.81       15.14         0.00          0.00
 16%  -191.28       16.44         0.00          0.00
 33%  -196.13       17.75         0.00          0.00
 50%  -201.34       19.06         0.00          0.00
 66%  -206.93       20.37         0.00          0.00
 83%  -212.89       21.68         0.00          0.00
100%  -219.22       22.99         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-----------------------------------------------------
Viga 5
Estado f1=losa fase1
  0%  -219.22       -52.27        0.00          0.00
 16%  -166.88       -47.42        0.00          0.00
 33%  -119.63       -42.57        0.00          0.00
 50%  -77.48        -37.72        0.00          0.00
 66%  -40.42        -32.87        0.00          0.00
 83%  -8.46         -28.02        0.00          0.00
100%  18.42         -23.17        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-----------------------------------------------------
Viga 6
Estado f1=losa fase1
  0%  18.42         -23.17        0.00          0.00
 16%  74.12         -4.69         0.00          0.00
 33%  76.81         -0.10         0.00          0.00
 50%  77.22         -0.10         0.00          0.00
 66%  77.64         -0.10         0.00          0.00
 83%  75.78         4.48          0.00          0.00
100%  20.90         22.96         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-----------------------------------------------------
Viga 7
Estado f1=losa fase1
  0%  20.90         22.96         0.00          0.00
 16%  -5.76         27.81         0.00          0.00
 33%  -37.50        32.66         0.00          0.00
 50%  -74.35        37.51         0.00          0.00
 66%  -116.28       42.36         0.00          0.00
 83%  -163.31       47.21         0.00          0.00
100%  -215.43       52.07         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-----------------------------------------------------
Viga 8
Estado f1=losa fase1
  0%  -215.43       -7.49         0.00          0.00
 16%  -213.49       -6.18         0.00          0.00
 33%  -211.93       -4.87         0.00          0.00
 50%  -210.73       -3.56         0.00          0.00
 66%  -209.91       -2.25         0.00          0.00
 83%  -209.46       -0.95         0.00          0.00
```

Viaducto s/ el Río Francolí. UTE ALT CAMP

```
100%  -209.37       0.36          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-----------------------------------------------------
Viga 9
Estado f1=losa fase1
  0%  -209.37       0.36          0.00          0.00
 16%  -209.66       1.67          0.00          0.00
 33%  -210.32       2.98          0.00          0.00
 50%  -211.35       4.29          0.00          0.00
 66%  -212.75       5.60          0.00          0.00
 83%  -214.52       6.91          0.00          0.00
100%  -216.67       8.22          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-----------------------------------------------------
Viga 10
Estado f1=losa fase1
  0%  -216.67       -52.17        0.00          0.00
 16%  -164.44       -47.32        0.00          0.00
 33%  -117.30       -42.47        0.00          0.00
 50%  -75.26        -37.62        0.00          0.00
 66%  -38.31        -32.77        0.00          0.00
 83%  -6.45         -27.91        0.00          0.00
100%  20.31         -23.06        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-----------------------------------------------------
Viga 11
Estado f1=losa fase1
  0%  20.31         -23.06        0.00          0.00
 16%  75.61         -4.58         0.00          0.00
 33%  77.88         0.00          0.00          0.00
 50%  77.88         0.00          0.00          0.00
 66%  77.88         0.00          0.00          0.00
 83%  75.61         4.58          0.00          0.00
100%  20.31         23.06         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-----------------------------------------------------
Viga 12
Estado f1=losa fase1
  0%  20.31         23.06         0.00          0.00
 16%  -6.45         27.91         0.00          0.00
 33%  -38.31        32.77         0.00          0.00
 50%  -75.26        37.62         0.00          0.00
 66%  -117.30       42.47         0.00          0.00
 83%  -164.44       47.32         0.00          0.00
100%  -216.67       52.17         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-----------------------------------------------------
Viga 13
Estado f1=losa fase1
  0%  -216.67       -8.22         0.00          0.00
 16%  -214.52       -6.91         0.00          0.00
 33%  -212.75       -5.60         0.00          0.00
 50%  -211.35       -4.29         0.00          0.00
 66%  -210.32       -2.98         0.00          0.00
 83%  -209.66       -1.67         0.00          0.00
100%  -209.37       -0.36         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-----------------------------------------------------
Viga 14
Estado f1=losa fase1
  0%  -209.37       -0.36         0.00          0.00
 16%  -209.46       0.95          0.00          0.00
 33%  -209.91       2.25          0.00          0.00
 50%  -210.73       3.56          0.00          0.00
 66%  -211.93       4.87          0.00          0.00
 83%  -213.49       6.18          0.00          0.00
100%  -215.43       7.49          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-----------------------------------------------------
Viga 15
Estado f1=losa fase1
  0%  -215.43       -52.07        0.00          0.00
 16%  -163.31       -47.21        0.00          0.00
 33%  -116.28       -42.36        0.00          0.00
 50%  -74.35        -37.51        0.00          0.00
 66%  -37.50        -32.66        0.00          0.00
 83%  -5.76         -27.81        0.00          0.00
```

```
100%  20.90         -22.96        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 16
Estado f1=losa fase1
  0%  20.90         -22.96        0.00          0.00
 16%  75.78         -4.48         0.00          0.00
 33%  77.64         0.10          0.00          0.00
 50%  77.22         0.10          0.00          0.00
 66%  76.81         0.10          0.00          0.00
 83%  74.12         4.69          0.00          0.00
100%  18.42         23.17         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 17
Estado f1=losa fase1
  0%  18.42         23.17         0.00          0.00
 16%  -8.46         28.02         0.00          0.00
 33%  -40.42        32.87         0.00          0.00
 50%  -77.48        37.72         0.00          0.00
 66%  -119.63       42.57         0.00          0.00
 83%  -166.88       47.42         0.00          0.00
100%  -219.22       52.27         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 18
Estado f1=losa fase1
  0%  -219.22       -22.99        0.00          0.00
 16%  -212.89       -21.68        0.00          0.00
 33%  -206.93       -20.37        0.00          0.00
 50%  -201.34       -19.06        0.00          0.00
 66%  -196.13       -17.75        0.00          0.00
 83%  -191.28       -16.44        0.00          0.00
100%  -186.81       -15.14        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 19
Estado f1=losa fase1
  0%  -186.81       -15.14        0.00          0.00
 16%  -182.71       -13.83        0.00          0.00
 33%  -178.97       -12.52        0.00          0.00
 50%  -175.61       -11.21        0.00          0.00
 66%  -172.62       -9.90         0.00          0.00
 83%  -170.00       -8.59         0.00          0.00
100%  -167.75       -7.28         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 20
Estado f1=losa fase1
  0%  -167.75       -48.01        0.00          0.00
 16%  -119.89       -43.16        0.00          0.00
 33%  -77.13        -38.31        0.00          0.00
 50%  -39.45        -33.45        0.00          0.00
 66%  -6.87         -28.60        0.00          0.00
 83%  20.62         -23.75        0.00          0.00
100%  43.01         -18.90        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 21
Estado f1=losa fase1
  0%  43.01         -18.90        0.00          0.00
 16%  81.66         -0.42         0.00          0.00
 33%  67.17         4.20          0.00          0.00
 50%  50.38         4.20          0.00          0.00
 66%  33.59         4.20          0.00          0.00
 83%  16.79         4.20          0.00          0.00
100%  0.00          4.20          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------


              P E N D I E N T E S
Viga      Pend.2        @%        Pend.3        @%
-------------------------------------------------------
Estado f1=losa fase1
1         -0.00007      0.16667   0.00000       0.00000
2         0.00008       0.33333   0.00000       0.00000
```



```
3         0.00004       0.16667   0.00000       0.00000
4         -0.00004      1.00000   0.00000       0.00000
5         -0.00011      1.00000   0.00000       0.00000
6         -0.00010      0.16667   0.00000       0.00000
7         0.00011       0.16667   0.00000       0.00000
8         0.00004       0.16667   0.00000       0.00000
9         -0.00004      1.00000   0.00000       0.00000
10        -0.00011      1.00000   0.00000       0.00000
11        -0.00010      0.16667   0.00000       0.00000
12        0.00011       0.16667   0.00000       0.00000
13        0.00004       0.16667   0.00000       0.00000
14        -0.00004      1.00000   0.00000       0.00000
15        -0.00011      1.00000   0.00000       0.00000
16        0.00010       1.00000   0.00000       0.00000
17        0.00011       0.16667   0.00000       0.00000
18        0.00004       0.16667   0.00000       0.00000
19        -0.00004      1.00000   0.00000       0.00000
20        -0.00008      0.83333   0.00000       0.00000
21        0.00007       1.00000   0.00000       0.00000
-------------------------------------------------------
```

D A T O S

Archivo : C:\Amaya\B-08.937 UTE AL CAMP RIO FRANCOLI\fase23.AVW
Proyecto :
Unidades : Ton-M
Fecha : 08/05/02
Hora : 11:12:49

N U D O S

Nudo	X [M]	Y [M]	Z [M]	Piso
1	0	0	0	0
2	24	0	0	0
3	30.3	0	0	0
4	32	0	0	0
5	33.7	0	0	0
6	40	0	0	0
7	64	0	0	0
8	70.3	0	0	0
9	72	0	0	0
10	73.7	0	0	0
11	80	0	0	0
12	104	0	0	0
13	110.3	0	0	0
14	112	0	0	0
15	113.7	0	0	0
16	120	0	0	0
17	144	0	0	0
18	150.3	0	0	0
19	152	0	0	0
20	153.7	0	0	0
21	160	0	0	0
22	184	0	0	0

R E S T R I C C I O N E S

Nudo	TX	TY	TZ	RX	RY	RZ
1	0	1	0	0	0	0
3	0	1	0	0	0	0
5	0	1	0	0	0	0
8	0	1	0	0	0	0
10	0	1	0	0	0	0
13	0	1	0	0	0	0
15	0	1	0	0	0	0
18	0	1	0	0	0	0
20	0	1	0	0	0	0
22	0	1	0	0	0	0

V I G A S

Viga	NJ	NK	Descripcion	SecciÛn	Material
1	1	2		alt frain25	H 500-5100
2	2	3		alt frasem30	H 500-5100
3	3	4		alt frasem30	H 500-5100
4	4	5		alt frasem30	H 500-5100
5	5	6		alt frasem30	H 500-5100
6	6	7		alt frain25	H 500-5100
7	7	8		alt frasem30	H 500-5100
8	8	9		alt frasem30	H 500-5100
9	9	10		alt frasem30	H 500-5100
10	10	11		alt frasem30	H 500-5100
11	11	12		alt frain25	H 500-5100
12	12	13		alt frasem30	H 500-5100
13	13	14		alt frasem30	H 500-5100
14	14	15		alt frasem30	H 500-5100
15	15	16		alt frasem30	H 500-5100
16	16	17		alt frain25	H 500-5100
17	17	18		alt frasem30	H 500-5100
18	18	19		alt frasem30	H 500-5100
19	19	20		alt frasem30	H 500-5100
20	20	21		alt frasem30	H 500-5100
21	21	22		alt frain25	H 500-5100

FUERZA DISTRIBUIDA SOBRE VIGAS

Estado	Viga	Dir.	Valor [Ton/M]
f1	1	Y	-4.62
	2	Y	0
	3	Y	0
	4	Y	0
	5	Y	0
	6	Y	-4.62
	7	Y	0
	8	Y	0
	9	Y	0
	10	Y	0
	11	Y	-4.62
	12	Y	0
	13	Y	0
	14	Y	0
	15	Y	0
	16	Y	-4.62
	17	Y	0
	18	Y	0
	19	Y	0
	20	Y	0
	21	Y	-4.62

E S T A D O S D E C A R G A

Estado	DescripciÛn	Comb.	MultX	MultY	MultZ
f1	losa fase1	0	0	0	0

S I S M O

Estado	Acel.	Dir.	Amort. [%]
f1	0	0	0

R E S U L T A D O S D E L A N A L I S I S

Archivo : C:\Amaya\B-08.937 UTE AL CAMP RIO FRANCOLI\fase23.AVW
Proyecto :
Unidades : Ton-M
Fecha : 08/05/02
Hora : 11:13:50

N U D O S

T R A S L A C I O N E S

	TRASLACIONES [M]			ROTACIONES [Rad]		
Nudo	TX	TY	TZ	RX	RY	RZ
Estado f1=losa fase1						
1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00026
2	0.00000	-0.00053	0.00000	0.00000	0.00000	0.00012
3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00003
4	0.00000	0.00003	0.00000	0.00000	0.00000	0.00000
5	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00003
6	0.00000	-0.00044	0.00000	0.00000	0.00000	-0.00010
7	0.00000	-0.00043	0.00000	0.00000	0.00000	0.00010
8	0.00000	0.00000	0.00000	0.00000	0.00000	0.00003
9	0.00000	0.00002	0.00000	0.00000	0.00000	0.00000
10	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00003
11	0.00000	-0.00042	0.00000	0.00000	0.00000	-0.00010
12	0.00000	-0.00042	0.00000	0.00000	0.00000	0.00010
13	0.00000	0.00000	0.00000	0.00000	0.00000	0.00003
14	0.00000	0.00002	0.00000	0.00000	0.00000	0.00000
15	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00003
16	0.00000	-0.00043	0.00000	0.00000	0.00000	-0.00010
17	0.00000	-0.00044	0.00000	0.00000	0.00000	0.00010
18	0.00000	0.00000	0.00000	0.00000	0.00000	0.00003
19	0.00000	0.00003	0.00000	0.00000	0.00000	0.00000
20	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00003
21	0.00000	-0.00053	0.00000	0.00000	0.00000	-0.00012
22	0.00000	0.00000	0.00000	0.00000	0.00000	0.00026

R E A C C I O N E S

	FUERZAS [Ton]			MOMENTOS [Ton*M]		
Nudo	FX	FY	FZ	MX	MY	MZ
Estado f1=losa fase1						
1	0.00000	46.84851	0.00000	0.00000	0.00000	0.00000
3	0.00000	68.88052	0.00000	0.00000	0.00000	0.00000
5	0.00000	4.24757	0.00000	0.00000	0.00000	0.00000
8	0.00000	33.06307	0.00000	0.00000	0.00000	0.00000
10	0.00000	31.76033	0.00000	0.00000	0.00000	0.00000
13	0.00000	31.76033	0.00000	0.00000	0.00000	0.00000
15	0.00000	33.06307	0.00000	0.00000	0.00000	0.00000
18	0.00000	4.24757	0.00000	0.00000	0.00000	0.00000
20	0.00000	68.88052	0.00000	0.00000	0.00000	0.00000
22	0.00000	46.84851	0.00000	0.00000	0.00000	0.00000
SUM	0.00000	369.60000	0.00000	0.00000	0.00000	0.00000

V I G A S

E S F U E R Z O S

	M33	V2	M22	V3
	[Ton*M]	[Ton]	[Ton*M]	[Ton]
Viga 1				
Estado f1=losa fase1				
0%	0.00	-46.85	0.00	0.00
16%	150.43	-28.37	0.00	0.00
33%	226.95	-9.89	0.00	0.00
50%	229.54	8.59	0.00	0.00
66%	158.22	27.07	0.00	0.00
83%	15.28	40.93	0.00	0.00
100%	-148.45	40.93	0.00	0.00
Axial: 0.00 [Ton] Tor: 0.00 [Ton*M]				
Viga 2				
Estado f1=losa fase1				
0%	-148.45	40.93	0.00	0.00
16%	-191.42	40.93	0.00	0.00
33%	-234.40	40.93	0.00	0.00
50%	-277.38	40.93	0.00	0.00
66%	-320.36	40.93	0.00	0.00
83%	-363.34	40.93	0.00	0.00
100%	-406.31	40.93	0.00	0.00
Axial: 0.00 [Ton] Tor: 0.00 [Ton*M]				
Viga 3				
Estado f1=losa fase1				
0%	-406.31	-27.95	0.00	0.00
16%	-398.40	-27.95	0.00	0.00
33%	-390.48	-27.95	0.00	0.00
50%	-382.56	-27.95	0.00	0.00
66%	-374.64	-27.95	0.00	0.00
83%	-366.72	-27.95	0.00	0.00
100%	-358.80	-27.95	0.00	0.00
Axial: 0.00 [Ton] Tor: 0.00 [Ton*M]				
Viga 4				
Estado f1=losa fase1				
0%	-358.80	-27.95	0.00	0.00
16%	-350.88	-27.95	0.00	0.00
33%	-342.96	-27.95	0.00	0.00
50%	-335.04	-27.95	0.00	0.00
66%	-327.13	-27.95	0.00	0.00
83%	-319.21	-27.95	0.00	0.00
100%	-311.29	-27.95	0.00	0.00
Axial: 0.00 [Ton] Tor: 0.00 [Ton*M]				
Viga 5				
Estado f1=losa fase1				
0%	-311.29	-32.20	0.00	0.00
16%	-277.48	-32.20	0.00	0.00
33%	-243.67	-32.20	0.00	0.00
50%	-209.87	-32.20	0.00	0.00
66%	-176.06	-32.20	0.00	0.00
83%	-142.26	-32.20	0.00	0.00
100%	-108.45	-32.20	0.00	0.00
Axial: 0.00 [Ton] Tor: 0.00 [Ton*M]				
Viga 6				
Estado f1=losa fase1				
0%	-108.45	-32.20	0.00	0.00
16%	20.34	-32.20	0.00	0.00
33%	128.33	-18.34	0.00	0.00
50%	164.72	0.14	0.00	0.00
66%	127.19	18.62	0.00	0.00
83%	18.04	32.48	0.00	0.00
100%	-111.89	32.48	0.00	0.00
Axial: 0.00 [Ton] Tor: 0.00 [Ton*M]				
Viga 7				
Estado f1=losa fase1				
0%	-111.89	32.48	0.00	0.00
16%	-146.00	32.48	0.00	0.00
33%	-180.11	32.48	0.00	0.00
50%	-214.21	32.48	0.00	0.00
66%	-248.32	32.48	0.00	0.00
83%	-282.43	32.48	0.00	0.00
100%	-316.54	32.48	0.00	0.00
Axial: 0.00 [Ton] Tor: 0.00 [Ton*M]				
Viga 8				
Estado f1=losa fase1				
0%	-316.54	-0.58	0.00	0.00
16%	-316.37	-0.58	0.00	0.00
33%	-316.21	-0.58	0.00	0.00
50%	-316.04	-0.58	0.00	0.00
66%	-315.88	-0.58	0.00	0.00
83%	-315.71	-0.58	0.00	0.00

Viaducto s/ el Río Francolí. UTE ALT CAMP

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100%  -315.55       -0.58         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 9
Estado f1=losa fase1
  0%  -315.55       -0.58         0.00          0.00
 16%  -315.39       -0.58         0.00          0.00
 33%  -315.22       -0.58         0.00          0.00
 50%  -315.06       -0.58         0.00          0.00
 66%  -314.89       -0.58         0.00          0.00
 83%  -314.73       -0.58         0.00          0.00
100%  -314.57       -0.58         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 10
Estado f1=losa fase1
  0%  -314.57       -32.34        0.00          0.00
 16%  -280.61       -32.34        0.00          0.00
 33%  -246.65       -32.34        0.00          0.00
 50%  -212.69       -32.34        0.00          0.00
 66%  -178.74       -32.34        0.00          0.00
 83%  -144.78       -32.34        0.00          0.00
100%  -110.82       -32.34        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 11
Estado f1=losa fase1
  0%  -110.82       -32.34        0.00          0.00
 16%  18.54         -32.34        0.00          0.00
 33%  127.11        -18.48        0.00          0.00
 50%  164.07        0.00          0.00          0.00
 66%  127.11        18.48         0.00          0.00
 83%  18.54         32.34         0.00          0.00
100%  -110.82       32.34         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 12
Estado f1=losa fase1
  0%  -110.82       32.34         0.00          0.00
 16%  -144.78       32.34         0.00          0.00
 33%  -178.74       32.34         0.00          0.00
 50%  -212.69       32.34         0.00          0.00
 66%  -246.65       32.34         0.00          0.00
 83%  -280.61       32.34         0.00          0.00
100%  -314.57       32.34         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 13
Estado f1=losa fase1
  0%  -314.57       0.58          0.00          0.00
 16%  -314.73       0.58          0.00          0.00
 33%  -314.89       0.58          0.00          0.00
 50%  -315.06       0.58          0.00          0.00
 66%  -315.22       0.58          0.00          0.00
 83%  -315.39       0.58          0.00          0.00
100%  -315.55       0.58          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 14
Estado f1=losa fase1
  0%  -315.55       0.58          0.00          0.00
 16%  -315.71       0.58          0.00          0.00
 33%  -315.88       0.58          0.00          0.00
 50%  -316.04       0.58          0.00          0.00
 66%  -316.21       0.58          0.00          0.00
 83%  -316.37       0.58          0.00          0.00
100%  -316.54       0.58          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 15
Estado f1=losa fase1
  0%  -316.54       -32.48        0.00          0.00
 16%  -282.43       -32.48        0.00          0.00
 33%  -248.32       -32.48        0.00          0.00
 50%  -214.21       -32.48        0.00          0.00
 66%  -180.11       -32.48        0.00          0.00
 83%  -146.00       -32.48        0.00          0.00
```



```
100%  -111.89       -32.48        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 16
Estado f1=losa fase1
  0%  -111.89       -32.48        0.00          0.00
 16%  18.04         -32.48        0.00          0.00
 33%  127.19        -18.62        0.00          0.00
 50%  164.72        -0.14         0.00          0.00
 66%  128.33        18.34         0.00          0.00
 83%  20.34         32.20         0.00          0.00
100%  -108.45       32.20         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 17
Estado f1=losa fase1
  0%  -108.45       32.20         0.00          0.00
 16%  -142.26       32.20         0.00          0.00
 33%  -176.06       32.20         0.00          0.00
 50%  -209.87       32.20         0.00          0.00
 66%  -243.67       32.20         0.00          0.00
 83%  -277.48       32.20         0.00          0.00
100%  -311.29       32.20         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 18
Estado f1=losa fase1
  0%  -311.29       27.95         0.00          0.00
 16%  -319.21       27.95         0.00          0.00
 33%  -327.13       27.95         0.00          0.00
 50%  -335.04       27.95         0.00          0.00
 66%  -342.96       27.95         0.00          0.00
 83%  -350.88       27.95         0.00          0.00
100%  -358.80       27.95         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 19
Estado f1=losa fase1
  0%  -358.80       27.95         0.00          0.00
 16%  -366.72       27.95         0.00          0.00
 33%  -374.64       27.95         0.00          0.00
 50%  -382.56       27.95         0.00          0.00
 66%  -390.48       27.95         0.00          0.00
 83%  -398.40       27.95         0.00          0.00
100%  -406.31       27.95         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 20
Estado f1=losa fase1
  0%  -406.31       -40.93        0.00          0.00
 16%  -363.34       -40.93        0.00          0.00
 33%  -320.36       -40.93        0.00          0.00
 50%  -277.38       -40.93        0.00          0.00
 66%  -234.40       -40.93        0.00          0.00
 83%  -191.42       -40.93        0.00          0.00
100%  -148.45       -40.93        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 21
Estado f1=losa fase1
  0%  -148.45       -40.93        0.00          0.00
 16%  15.28         -40.93        0.00          0.00
 33%  158.22        -27.07        0.00          0.00
 50%  229.54        -8.59         0.00          0.00
 66%  226.95        9.89          0.00          0.00
 83%  150.43        28.37         0.00          0.00
100%  0.00          46.85         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------


                P E N D I E N T E S
Viga      Pend.2        @%        Pend.3        @%
-------------------------------------------------------
Estado f1=losa fase1
1         -0.00025      0.16667   0.00000       0.00000
2         0.00012       0.16667   0.00000       0.00000
```

3	0.00003	0.16667	0.00000	0.00000
4	-0.00003	1.00000	0.00000	0.00000
5	-0.00009	1.00000	0.00000	0.00000
6	-0.00011	0.16667	0.00000	0.00000
7	0.00009	0.16667	0.00000	0.00000
8	0.00003	0.16667	0.00000	0.00000
9	-0.00003	1.00000	0.00000	0.00000
10	-0.00009	1.00000	0.00000	0.00000
11	-0.00011	0.16667	0.00000	0.00000
12	0.00009	0.16667	0.00000	0.00000
13	0.00003	0.16667	0.00000	0.00000
14	-0.00003	1.00000	0.00000	0.00000
15	-0.00009	1.00000	0.00000	0.00000
16	0.00011	1.00000	0.00000	0.00000
17	0.00009	0.16667	0.00000	0.00000
18	0.00003	0.16667	0.00000	0.00000
19	-0.00003	1.00000	0.00000	0.00000
20	-0.00012	1.00000	0.00000	0.00000
21	0.00025	1.00000	0.00000	0.00000

D A T O S

Archivo : C:\Amaya\B-08.937 UTE AL CAMP RIO FRANCOLI\fase3.AVW
Proyecto :
Unidades : Ton-M
Fecha : 08/05/02
Hora : 11:15:20

N U D O S

Nudo	X [M]	Y [M]	Z [M]	Piso
1	0	0	0	0
2	24	0	0	0
3	30.3	0	0	0
4	32	0	0	0
5	33.7	0	0	0
6	40	0	0	0
7	64	0	0	0
8	70.3	0	0	0
9	72	0	0	0
10	73.7	0	0	0
11	80	0	0	0
12	104	0	0	0
13	110.3	0	0	0
14	112	0	0	0
15	113.7	0	0	0
16	120	0	0	0
17	144	0	0	0
18	150.3	0	0	0
19	152	0	0	0
20	153.7	0	0	0
21	160	0	0	0
22	184	0	0	0

R E S T R I C C I O N E S

Nudo	TX	TY	TZ	RX	RY	RZ
1	0	1	0	0	0	0
3	0	1	0	0	0	0
5	0	1	0	0	0	0
8	0	1	0	0	0	0
10	0	1	0	0	0	0
13	0	1	0	0	0	0
15	0	1	0	0	0	0
18	0	1	0	0	0	0
20	0	1	0	0	0	0
22	0	1	0	0	0	0

V I G A S

Viga	NJ	NK	Descripcion	SecciÛn	Material
1	1	2		alt frasem25	H 500-5100
2	2	3		alt frasem30	H 500-5100
3	3	4		alt frasem30	H 500-5100
4	4	5		alt frasem30	H 500-5100
5	5	6		alt frasem30	H 500-5100
6	6	7		alt frasem25	H 500-5100
7	7	8		alt frasem30	H 500-5100
8	8	9		alt frasem30	H 500-5100
9	9	10		alt frasem30	H 500-5100
10	10	11		alt frasem30	H 500-5100
11	11	12		alt frasem25	H 500-5100
12	12	13		alt frasem30	H 500-5100
13	13	14		alt frasem30	H 500-5100
14	14	15		alt frasem30	H 500-5100
15	15	16		alt frasem30	H 500-5100
16	16	17		alt frasem25	H 500-5100
17	17	18		alt frasem30	H 500-5100
18	18	19		alt frasem30	H 500-5100
19	19	20		alt frasem30	H 500-5100
20	20	21		alt frasem30	H 500-5100

21 21 22 alt frasem25 H 500-5100

FUERZA DISTRIBUIDA SOBRE VIGAS

Estado	Viga	Dir.	Valor [Ton/M]
f2	1	Y	-2.38
	2	Y	-2.38
	3	Y	-2.38
	4	Y	-2.38
	5	Y	-2.38
	6	Y	-2.38
	7	Y	-2.38
	8	Y	-2.38
	9	Y	-2.38
	10	Y	-2.38
	11	Y	-2.38
	12	Y	-2.38
	13	Y	-2.38
	14	Y	-2.38
	15	Y	-2.38
	16	Y	-2.38
	17	Y	-2.38
	18	Y	-2.38
	19	Y	-2.38
	20	Y	-2.38
	21	Y	-2.38

E S T A D O S D E C A R G A

Estado	DescripciÛn	Comb.	MultX	MultY	MultZ
f2	losa fase 2	0	0	0	0

S I S M O

Estado	Acel.	Dir.	Amort. [%]
f2	0	0	0

R E S U L T A D O S D E L A N A L I S I S

Archivo : C:\Amaya\B-08.937 UTE AL CAMP RIO FRANCOLI\fase3.AVW
Proyecto :
Unidades : Ton-M
Fecha : 08/05/02
Hora : 11:16:31

N U D O S

T R A S L A C I O N E S

Nudo	TRASLACIONES [M] TX	TY	TZ	ROTACIONES [Rad] RX	RY	RZ
Estado	f2=losa fase 2					
1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00008
2	0.00000	-0.00028	0.00000	0.00000	0.00000	0.00006
3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00002
4	0.00000	0.00002	0.00000	0.00000	0.00000	0.00000
5	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00002
6	0.00000	-0.00029	0.00000	0.00000	0.00000	-0.00006
7	0.00000	-0.00030	0.00000	0.00000	0.00000	0.00006
8	0.00000	0.00000	0.00000	0.00000	0.00000	0.00002
9	0.00000	0.00002	0.00000	0.00000	0.00000	0.00000
10	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00002
11	0.00000	-0.00030	0.00000	0.00000	0.00000	-0.00006
12	0.00000	-0.00030	0.00000	0.00000	0.00000	0.00006
13	0.00000	0.00000	0.00000	0.00000	0.00000	0.00002
14	0.00000	0.00002	0.00000	0.00000	0.00000	0.00000
15	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00002
16	0.00000	-0.00030	0.00000	0.00000	0.00000	-0.00006
17	0.00000	-0.00029	0.00000	0.00000	0.00000	0.00006
18	0.00000	0.00000	0.00000	0.00000	0.00000	0.00002
19	0.00000	0.00002	0.00000	0.00000	0.00000	0.00000
20	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00002
21	0.00000	-0.00028	0.00000	0.00000	0.00000	-0.00006
22	0.00000	0.00000	0.00000	0.00000	0.00000	0.00008

R E A C C I O N E S

Nudo	FUERZAS [Ton] FX	FY	FZ	MOMENTOS [Ton*M] MX	MY	MZ
Estado	f2=losa fase 2					
1	0.00000	28.30301	0.00000	0.00000	0.00000	0.00000
3	0.00000	45.00636	0.00000	0.00000	0.00000	0.00000
5	0.00000	50.47027	0.00000	0.00000	0.00000	0.00000
8	0.00000	47.51181	0.00000	0.00000	0.00000	0.00000
10	0.00000	47.66855	0.00000	0.00000	0.00000	0.00000
13	0.00000	47.66855	0.00000	0.00000	0.00000	0.00000
15	0.00000	47.51181	0.00000	0.00000	0.00000	0.00000
18	0.00000	50.47027	0.00000	0.00000	0.00000	0.00000
20	0.00000	45.00636	0.00000	0.00000	0.00000	0.00000
22	0.00000	28.30301	0.00000	0.00000	0.00000	0.00000
SUM	0.00000	437.92000	0.00000	0.00000	0.00000	0.00000

V I G A S

E S F U E R Z O S

	M33 [Ton*M]	V2 [Ton]	M22 [Ton*M]	V3 [Ton]
Viga 1				
Estado	f2=losa fase 2			
0%	0.00	-28.30	0.00	0.00
16%	94.17	-18.78	0.00	0.00
33%	150.26	-9.26	0.00	0.00
50%	168.28	0.26	0.00	0.00
66%	148.21	9.78	0.00	0.00
83%	90.06	19.30	0.00	0.00

```
100%  -6.17         28.82         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 2
Estado f2=losa fase 2
  0%  -6.17         28.82         0.00          0.00
 16%  -37.74        31.32         0.00          0.00
 33%  -71.93        33.81         0.00          0.00
 50%  -108.75       36.31         0.00          0.00
 66%  -148.19       38.81         0.00          0.00
 83%  -190.26       41.31         0.00          0.00
100%  -234.95       43.81         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 3
Estado f2=losa fase 2
  0%  -234.95       -1.20         0.00          0.00
 16%  -234.70       -0.52         0.00          0.00
 33%  -234.65       0.15          0.00          0.00
 50%  -234.79       0.83          0.00          0.00
 66%  -235.12       1.50          0.00          0.00
 83%  -235.64       2.18          0.00          0.00
100%  -236.35       2.85          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 4
Estado f2=losa fase 2
  0%  -236.35       2.85          0.00          0.00
 16%  -237.26       3.52          0.00          0.00
 33%  -238.35       4.20          0.00          0.00
 50%  -239.64       4.87          0.00          0.00
 66%  -241.11       5.55          0.00          0.00
 83%  -242.78       6.22          0.00          0.00
100%  -244.64       6.90          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 5
Estado f2=losa fase 2
  0%  -244.64       -43.57        0.00          0.00
 16%  -200.20       -41.07        0.00          0.00
 33%  -158.38       -38.58        0.00          0.00
 50%  -119.19       -36.08        0.00          0.00
 66%  -82.62        -33.58        0.00          0.00
 83%  -48.68        -31.08        0.00          0.00
100%  -17.36        -28.58        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 6
Estado f2=losa fase 2
  0%  -17.36        -28.58        0.00          0.00
 16%  77.92         -19.06        0.00          0.00
 33%  135.12        -9.54         0.00          0.00
 50%  154.24        -0.02         0.00          0.00
 66%  135.28        9.50          0.00          0.00
 83%  78.24         19.02         0.00          0.00
100%  -16.88        28.54         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 7
Estado f2=losa fase 2
  0%  -16.88        28.54         0.00          0.00
 16%  -48.16        31.04         0.00          0.00
 33%  -82.07        33.54         0.00          0.00
 50%  -118.59       36.04         0.00          0.00
 66%  -157.75       38.54         0.00          0.00
 83%  -199.52       41.04         0.00          0.00
100%  -243.92       43.53         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 8
Estado f2=losa fase 2
  0%  -243.92       -3.98         0.00          0.00
 16%  -242.89       -3.30         0.00          0.00
 33%  -242.05       -2.63         0.00          0.00
 50%  -241.40       -1.95         0.00          0.00
 66%  -240.94       -1.28         0.00          0.00
 83%  -240.67       -0.61         0.00          0.00
```

Viaducto s/ el Río Francolí. UTE ALT CAMP

```
100%  -240.60       0.07          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 9
Estado f2=losa fase 2
  0%  -240.60       0.07          0.00          0.00
 16%  -240.71       0.74          0.00          0.00
 33%  -241.02       1.42          0.00          0.00
 50%  -241.51       2.09          0.00          0.00
 66%  -242.20       2.77          0.00          0.00
 83%  -243.08       3.44          0.00          0.00
100%  -244.15       4.11          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 10
Estado f2=losa fase 2
  0%  -244.15       -43.55        0.00          0.00
 16%  -199.73       -41.06        0.00          0.00
 33%  -157.94       -38.56        0.00          0.00
 50%  -118.77       -36.06        0.00          0.00
 66%  -82.22        -33.56        0.00          0.00
 83%  -48.29        -31.06        0.00          0.00
100%  -16.99        -28.56        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 11
Estado f2=losa fase 2
  0%  -16.99        -28.56        0.00          0.00
 16%  78.21         -19.04        0.00          0.00
 33%  135.33        -9.52         0.00          0.00
 50%  154.37        0.00          0.00          0.00
 66%  135.33        9.52          0.00          0.00
 83%  78.21         19.04         0.00          0.00
100%  -16.99        28.56         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 12
Estado f2=losa fase 2
  0%  -16.99        28.56         0.00          0.00
 16%  -48.29        31.06         0.00          0.00
 33%  -82.22        33.56         0.00          0.00
 50%  -118.77       36.06         0.00          0.00
 66%  -157.94       38.56         0.00          0.00
 83%  -199.73       41.06         0.00          0.00
100%  -244.15       43.55         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 13
Estado f2=losa fase 2
  0%  -244.15       -4.11         0.00          0.00
 16%  -243.08       -3.44         0.00          0.00
 33%  -242.20       -2.77         0.00          0.00
 50%  -241.51       -2.09         0.00          0.00
 66%  -241.02       -1.42         0.00          0.00
 83%  -240.71       -0.74         0.00          0.00
100%  -240.60       -0.07         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 14
Estado f2=losa fase 2
  0%  -240.60       -0.07         0.00          0.00
 16%  -240.67       0.61          0.00          0.00
 33%  -240.94       1.28          0.00          0.00
 50%  -241.40       1.95          0.00          0.00
 66%  -242.05       2.63          0.00          0.00
 83%  -242.89       3.30          0.00          0.00
100%  -243.92       3.98          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 15
Estado f2=losa fase 2
  0%  -243.92       -43.53        0.00          0.00
 16%  -199.52       -41.04        0.00          0.00
 33%  -157.75       -38.54        0.00          0.00
 50%  -118.59       -36.04        0.00          0.00
 66%  -82.07        -33.54        0.00          0.00
 83%  -48.16        -31.04        0.00          0.00
```

```
100%  -16.88        -28.54        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 16
Estado f2=losa fase 2
  0%  -16.88        -28.54        0.00          0.00
 16%  78.24         -19.02        0.00          0.00
 33%  135.28        -9.50         0.00          0.00
 50%  154.24        0.02          0.00          0.00
 66%  135.12        9.54          0.00          0.00
 83%  77.92         19.06         0.00          0.00
100%  -17.36        28.58         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 17
Estado f2=losa fase 2
  0%  -17.36        28.58         0.00          0.00
 16%  -48.68        31.08         0.00          0.00
 33%  -82.62        33.58         0.00          0.00
 50%  -119.19       36.08         0.00          0.00
 66%  -158.38       38.58         0.00          0.00
 83%  -200.20       41.07         0.00          0.00
100%  -244.64       43.57         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 18
Estado f2=losa fase 2
  0%  -244.64       -6.90         0.00          0.00
 16%  -242.78       -6.22         0.00          0.00
 33%  -241.11       -5.55         0.00          0.00
 50%  -239.64       -4.87         0.00          0.00
 66%  -238.35       -4.20         0.00          0.00
 83%  -237.26       -3.52         0.00          0.00
100%  -236.35       -2.85         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 19
Estado f2=losa fase 2
  0%  -236.35       -2.85         0.00          0.00
 16%  -235.64       -2.18         0.00          0.00
 33%  -235.12       -1.50         0.00          0.00
 50%  -234.79       -0.83         0.00          0.00
 66%  -234.65       -0.15         0.00          0.00
 83%  -234.70       0.52          0.00          0.00
100%  -234.95       1.20          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 20
Estado f2=losa fase 2
  0%  -234.95       -43.81        0.00          0.00
 16%  -190.26       -41.31        0.00          0.00
 33%  -148.19       -38.81        0.00          0.00
 50%  -108.75       -36.31        0.00          0.00
 66%  -71.93        -33.81        0.00          0.00
 83%  -37.74        -31.32        0.00          0.00
100%  -6.17         -28.82        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 21
Estado f2=losa fase 2
  0%  -6.17         -28.82        0.00          0.00
 16%  90.06         -19.30        0.00          0.00
 33%  148.21        -9.78         0.00          0.00
 50%  168.28        -0.26         0.00          0.00
 66%  150.26        9.26          0.00          0.00
 83%  94.17         18.78         0.00          0.00
100%  0.00          28.30         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------


              P E N D I E N T E S
Viga      Pend.2        @%        Pend.3        @%
-------------------------------------------------------
Estado f2=losa fase 2
1         -0.00008      0.16667   0.00000       0.00000
2         0.00006       0.16667   0.00000       0.00000
```



```
3         0.00002       0.16667   0.00000       0.00000
4         -0.00002      1.00000   0.00000       0.00000
5         -0.00006      1.00000   0.00000       0.00000
6         -0.00006      0.16667   0.00000       0.00000
7         0.00006       0.16667   0.00000       0.00000
8         0.00002       0.16667   0.00000       0.00000
9         -0.00002      1.00000   0.00000       0.00000
10        -0.00006      1.00000   0.00000       0.00000
11        -0.00006      0.16667   0.00000       0.00000
12        0.00006       0.16667   0.00000       0.00000
13        0.00002       0.16667   0.00000       0.00000
14        -0.00002      1.00000   0.00000       0.00000
15        -0.00006      1.00000   0.00000       0.00000
16        0.00006       1.00000   0.00000       0.00000
17        0.00006       0.16667   0.00000       0.00000
18        0.00002       0.16667   0.00000       0.00000
19        -0.00002      1.00000   0.00000       0.00000
20        -0.00006      1.00000   0.00000       0.00000
21        0.00008       1.00000   0.00000       0.00000
-------------------------------------------------------
```

D A T O S

Archivo : C:\Amaya\B-08.937 UTE AL CAMP RIO FRANCOLI\fase4.AVW
Proyecto :
Unidades : Ton-M
Fecha : 08/05/02
Hora : 11:17:49

N U D O S

Nudo	X [M]	Y [M]	Z [M]	Piso
1	0	0	0	0
2	24	0	0	0
3	30.3	0	0	0
4	32	0	0	0
5	33.7	0	0	0
6	40	0	0	0
7	64	0	0	0
8	70.3	0	0	0
9	72	0	0	0
10	73.7	0	0	0
11	80	0	0	0
12	104	0	0	0
13	110.3	0	0	0
14	112	0	0	0
15	113.7	0	0	0
16	120	0	0	0
17	144	0	0	0
18	150.3	0	0	0
19	152	0	0	0
20	153.7	0	0	0
21	160	0	0	0
22	184	0	0	0

R E S T R I C C I O N E S

Nudo	TX	TY	TZ	RX	RY	RZ
1	0	1	0	0	0	0
4	0	1	0	0	0	0
9	0	1	0	0	0	0
14	0	1	0	0	0	0
19	0	1	0	0	0	0
22	0	1	0	0	0	0

V I G A S

Viga	NJ	NK	Descripcion	SecciÛn	Material
1	1	2		alt frasem25	H 500-5100
2	2	3		alt frasem30	H 500-5100
3	3	4		alt frasem30	H 500-5100
4	4	5		alt frasem30	H 500-5100
5	5	6		alt frasem30	H 500-5100
6	6	7		alt frasem25	H 500-5100
7	7	8		alt frasem30	H 500-5100
8	8	9		alt frasem30	H 500-5100
9	9	10		alt frasem30	H 500-5100
10	10	11		alt frasem30	H 500-5100
11	11	12		alt frasem25	H 500-5100
12	12	13		alt frasem30	H 500-5100
13	13	14		alt frasem30	H 500-5100
14	14	15		alt frasem30	H 500-5100
15	15	16		alt frasem30	H 500-5100
16	16	17		alt frasem25	H 500-5100
17	17	18		alt frasem30	H 500-5100
18	18	19		alt frasem30	H 500-5100
19	19	20		alt frasem30	H 500-5100
20	20	21		alt frasem30	H 500-5100
21	21	22		alt frasem25	H 500-5100

FUERZA DISTRIBUIDA SOBRE VIGAS

Viaducto s/ el Río Francolí. UTE ALT CAMP

Estado	Viga	Dir.	Valor [Ton/M]
ma	1	Y	-15.3
	2	Y	-15.3
	3	Y	-15.3
	4	Y	-15.3
	5	Y	-15.3
	6	Y	-15.3
	7	Y	-15.3
	8	Y	-15.3
	9	Y	-15.3
	10	Y	-15.3
	11	Y	-15.3
	12	Y	-15.3
	13	Y	-15.3
	14	Y	-15.3
	15	Y	-15.3
	16	Y	-15.3
	17	Y	-15.3
	18	Y	-15.3
	19	Y	-15.3
	20	Y	-15.3
	21	Y	-15.3
mi	1	Y	-9.84
	2	Y	-9.84
	3	Y	-9.84
	4	Y	-9.84
	5	Y	-9.84
	6	Y	-9.84
	7	Y	-9.84
	8	Y	-9.84
	9	Y	-9.84
	10	Y	-9.84
	11	Y	-9.84
	12	Y	-9.84
	13	Y	-9.84
	14	Y	-9.84
	15	Y	-9.84
	16	Y	-9.84
	17	Y	-9.84
	18	Y	-9.84
	19	Y	-9.84
	20	Y	-9.84
	21	Y	-9.84

E S T A D O S D E C A R G A

Estado	DescripciÛn	Comb.	MultX	MultY	MultZ
ma	cargas muertas maximo	0	0	0	0
mi	cargas muertas minimo	0	0	0	0

S I S M O

Estado	Acel.	Dir.	Amort. [%]
ma	0	0	0
mi	0	0	0

R E S U L T A D O S D E L A N A L I S I S

Archivo : C:\Amaya\B-08.937 UTE AL CAMP RIO FRANCOLI\fase4.AVW
Proyecto :
Unidades : Ton-M
Fecha : 08/05/02
Hora : 11:19:39

N U D O S

T R A S L A C I O N E S

Nudo	TRASLACIONES [M] TX	TY	TZ	ROTACIONES [Rad] RX	RY	RZ
Estado ma=cargas muertas maximo						
1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00053
2	0.00000	-0.00190	0.00000	0.00000	0.00000	0.00036
3	0.00000	-0.00010	0.00000	0.00000	0.00000	0.00013
4	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00002
5	0.00000	-0.00017	0.00000	0.00000	0.00000	-0.00018
6	0.00000	-0.00227	0.00000	0.00000	0.00000	-0.00041
7	0.00000	-0.00222	0.00000	0.00000	0.00000	0.00041
8	0.00000	-0.00015	0.00000	0.00000	0.00000	0.00016
9	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001
10	0.00000	-0.00013	0.00000	0.00000	0.00000	-0.00015
11	0.00000	-0.00210	0.00000	0.00000	0.00000	-0.00040
12	0.00000	-0.00210	0.00000	0.00000	0.00000	0.00040
13	0.00000	-0.00013	0.00000	0.00000	0.00000	0.00015
14	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00001
15	0.00000	-0.00015	0.00000	0.00000	0.00000	-0.00016
16	0.00000	-0.00222	0.00000	0.00000	0.00000	-0.00041
17	0.00000	-0.00227	0.00000	0.00000	0.00000	0.00041
18	0.00000	-0.00017	0.00000	0.00000	0.00000	0.00018
19	0.00000	0.00000	0.00000	0.00000	0.00000	0.00002
20	0.00000	-0.00010	0.00000	0.00000	0.00000	-0.00013
21	0.00000	-0.00190	0.00000	0.00000	0.00000	-0.00036
22	0.00000	0.00000	0.00000	0.00000	0.00000	0.00053
Estado mi=cargas muertas minimo						
1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00034
2	0.00000	-0.00122	0.00000	0.00000	0.00000	0.00023
3	0.00000	-0.00006	0.00000	0.00000	0.00000	0.00008
4	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00001
5	0.00000	-0.00011	0.00000	0.00000	0.00000	-0.00011
6	0.00000	-0.00146	0.00000	0.00000	0.00000	-0.00027
7	0.00000	-0.00143	0.00000	0.00000	0.00000	0.00027
8	0.00000	-0.00010	0.00000	0.00000	0.00000	0.00011
9	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	0.00000	-0.00008	0.00000	0.00000	0.00000	-0.00010
11	0.00000	-0.00135	0.00000	0.00000	0.00000	-0.00026
12	0.00000	-0.00135	0.00000	0.00000	0.00000	0.00026
13	0.00000	-0.00008	0.00000	0.00000	0.00000	0.00010
14	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000
15	0.00000	-0.00010	0.00000	0.00000	0.00000	-0.00011
16	0.00000	-0.00143	0.00000	0.00000	0.00000	-0.00027
17	0.00000	-0.00146	0.00000	0.00000	0.00000	0.00027
18	0.00000	-0.00011	0.00000	0.00000	0.00000	0.00011
19	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001
20	0.00000	-0.00006	0.00000	0.00000	0.00000	-0.00008
21	0.00000	-0.00122	0.00000	0.00000	0.00000	-0.00023
22	0.00000	0.00000	0.00000	0.00000	0.00000	0.00034

R E A C C I O N E S

Nudo	FUERZAS [Ton] FX	FY	FZ	MOMENTOS [Ton*M] MX	MY	MZ
Estado ma=cargas muertas maximo						
1	0.00000	182.02315	0.00000	0.00000	0.00000	0.00000
4	0.00000	612.47148	0.00000	0.00000	0.00000	0.00000
9	0.00000	613.10537	0.00000	0.00000	0.00000	0.00000
14	0.00000	613.10537	0.00000	0.00000	0.00000	0.00000
19	0.00000	612.47148	0.00000	0.00000	0.00000	0.00000
22	0.00000	182.02315	0.00000	0.00000	0.00000	0.00000
SUM	0.00000	2815.20000	0.00000	0.00000	0.00000	0.00000
Estado mi=cargas muertas minimo						
1	0.00000	117.06587	0.00000	0.00000	0.00000	0.00000
4	0.00000	393.90323	0.00000	0.00000	0.00000	0.00000
9	0.00000	394.31090	0.00000	0.00000	0.00000	0.00000
14	0.00000	394.31090	0.00000	0.00000	0.00000	0.00000
19	0.00000	393.90323	0.00000	0.00000	0.00000	0.00000
22	0.00000	117.06587	0.00000	0.00000	0.00000	0.00000
SUM	0.00000	1810.56000	0.00000	0.00000	0.00000	0.00000

Viaducto s/ el Río Francolí. UTE ALT CAMP

V I G A S

E S F U E R Z O S

	M33 [Ton*M]	V2 [Ton]	M22 [Ton*M]	V3 [Ton]
Viga 1				
Estado ma=cargas muertas maximo				
0%	0.00	-182.02	0.00	0.00
16%	605.69	-120.82	0.00	0.00
33%	966.59	-59.62	0.00	0.00
50%	1082.68	1.58	0.00	0.00
66%	953.97	62.78	0.00	0.00
83%	580.46	123.98	0.00	0.00
100%	-37.84	185.18	0.00	0.00
	Axial: 0.00 [Ton]		Tor: 0.00 [Ton*M]	
Estado mi=cargas muertas minimo				
0%	0.00	-117.07	0.00	0.00
16%	389.54	-77.71	0.00	0.00
33%	621.65	-38.35	0.00	0.00
50%	696.31	1.01	0.00	0.00
66%	613.53	40.37	0.00	0.00
83%	373.32	79.73	0.00	0.00
100%	-24.34	119.09	0.00	0.00
	Axial: 0.00 [Ton]		Tor: 0.00 [Ton*M]	
Viga 2				
Estado ma=cargas muertas maximo				
0%	-37.84	185.18	0.00	0.00
16%	-240.71	201.24	0.00	0.00
33%	-460.45	217.31	0.00	0.00
50%	-697.06	233.37	0.00	0.00
66%	-950.53	249.44	0.00	0.00
83%	-1220.88	265.50	0.00	0.00
100%	-1508.09	281.57	0.00	0.00
	Axial: 0.00 [Ton]		Tor: 0.00 [Ton*M]	
Estado mi=cargas muertas minimo				
0%	-24.34	119.09	0.00	0.00
16%	-154.81	129.43	0.00	0.00
33%	-296.13	139.76	0.00	0.00
50%	-448.30	150.09	0.00	0.00
66%	-611.32	160.42	0.00	0.00
83%	-785.19	170.75	0.00	0.00
100%	-969.91	181.09	0.00	0.00
	Axial: 0.00 [Ton]		Tor: 0.00 [Ton*M]	
Viga 3				
Estado ma=cargas muertas maximo				
0%	-1508.09	281.57	0.00	0.00
16%	-1588.48	285.90	0.00	0.00
33%	-1670.10	290.24	0.00	0.00
50%	-1752.95	294.57	0.00	0.00
66%	-1837.02	298.91	0.00	0.00
83%	-1922.33	303.24	0.00	0.00
100%	-2008.86	307.58	0.00	0.00
	Axial: 0.00 [Ton]		Tor: 0.00 [Ton*M]	
Estado mi=cargas muertas minimo				
0%	-969.91	181.09	0.00	0.00
16%	-1021.61	183.87	0.00	0.00
33%	-1074.10	186.66	0.00	0.00
50%	-1127.38	189.45	0.00	0.00

```
 66%  -1181.46      192.24        0.00          0.00
 83%  -1236.32      195.03        0.00          0.00
100%  -1291.97      197.81        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 4
Estado ma=cargas muertas maximo
  0%  -2008.86      -304.89       0.00          0.00
 16%  -1923.09      -300.56       0.00          0.00
 33%  -1838.54      -296.22       0.00          0.00
 50%  -1755.23      -291.89       0.00          0.00
 66%  -1673.14      -287.55       0.00          0.00
 83%  -1592.28      -283.22       0.00          0.00
100%  -1512.65      -278.88       0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado mi=cargas muertas minimo
  0%  -1291.97      -196.09       0.00          0.00
 16%  -1236.81      -193.30       0.00          0.00
 33%  -1182.43      -190.51       0.00          0.00
 50%  -1128.85      -187.73       0.00          0.00
 66%  -1076.06      -184.94       0.00          0.00
 83%  -1024.05      -182.15       0.00          0.00
100%  -972.84       -179.36       0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 5
Estado ma=cargas muertas maximo
  0%  -1512.65      -278.88       0.00          0.00
 16%  -1228.25      -262.82       0.00          0.00
 33%  -960.73       -246.75       0.00          0.00
 50%  -710.07       -230.69       0.00          0.00
 66%  -476.28       -214.62       0.00          0.00
 83%  -259.36       -198.56       0.00          0.00
100%  -59.30        -182.49       0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado mi=cargas muertas minimo
  0%  -972.84       -179.36       0.00          0.00
 16%  -789.93       -169.03       0.00          0.00
 33%  -617.88       -158.70       0.00          0.00
 50%  -456.67       -148.37       0.00          0.00
 66%  -306.31       -138.03       0.00          0.00
 83%  -166.80       -127.70       0.00          0.00
100%  -38.14        -117.37       0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 6
Estado ma=cargas muertas maximo
  0%  -59.30        -182.49       0.00          0.00
 16%  548.28        -121.29       0.00          0.00
 33%  911.05        -60.09        0.00          0.00
 50%  1029.03       1.11          0.00          0.00
 66%  902.21        62.31         0.00          0.00
 83%  530.59        123.51        0.00          0.00
100%  -85.83        184.71        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado mi=cargas muertas minimo
  0%  -38.14        -117.37       0.00          0.00
 16%  352.62        -78.01        0.00          0.00
 33%  585.93        -38.65        0.00          0.00
 50%  661.81        0.71          0.00          0.00
 66%  580.25        40.07         0.00          0.00
 83%  341.24        79.43         0.00          0.00
100%  -55.20        118.79        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 7
Estado ma=cargas muertas maximo
  0%  -85.83        184.71        0.00          0.00
 16%  -288.21       200.77        0.00          0.00
 33%  -507.45       216.84        0.00          0.00
 50%  -743.56       232.90        0.00          0.00
 66%  -996.54       248.97        0.00          0.00
 83%  -1266.39      265.03        0.00          0.00
100%  -1553.10      281.10        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado mi=cargas muertas minimo
  0%  -55.20        118.79        0.00          0.00
```



```
 16%  -185.36       129.12        0.00          0.00
 33%  -326.36       139.45        0.00          0.00
 50%  -478.21       149.79        0.00          0.00
 66%  -640.91       160.12        0.00          0.00
 83%  -814.46       170.45        0.00          0.00
100%  -998.86       180.78        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 8
Estado ma=cargas muertas maximo
  0%  -1553.10      281.10        0.00          0.00
 16%  -1633.36      285.43        0.00          0.00
 33%  -1714.85      289.77        0.00          0.00
 50%  -1797.56      294.10        0.00          0.00
 66%  -1881.50      298.44        0.00          0.00
 83%  -1966.68      302.77        0.00          0.00
100%  -2053.07      307.11        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado mi=cargas muertas minimo
  0%  -998.86       180.78        0.00          0.00
 16%  -1050.48      183.57        0.00          0.00
 33%  -1102.88      186.36        0.00          0.00
 50%  -1156.08      189.15        0.00          0.00
 66%  -1210.07      191.93        0.00          0.00
 83%  -1264.84      194.72        0.00          0.00
100%  -1320.41      197.51        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 9
Estado ma=cargas muertas maximo
  0%  -2053.07      -306.00       0.00          0.00
 16%  -1966.99      -301.67       0.00          0.00
 33%  -1882.13      -297.33       0.00          0.00
 50%  -1798.50      -293.00       0.00          0.00
 66%  -1716.10      -288.66       0.00          0.00
 83%  -1634.93      -284.33       0.00          0.00
100%  -1554.98      -279.99       0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado mi=cargas muertas minimo
  0%  -1320.41      -196.80       0.00          0.00
 16%  -1265.04      -194.01       0.00          0.00
 33%  -1210.47      -191.22       0.00          0.00
 50%  -1156.68      -188.44       0.00          0.00
 66%  -1103.69      -185.65       0.00          0.00
 83%  -1051.48      -182.86       0.00          0.00
100%  -1000.07      -180.07       0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 10
Estado ma=cargas muertas maximo
  0%  -1554.98      -279.99       0.00          0.00
 16%  -1269.43      -263.93       0.00          0.00
 33%  -1000.74      -247.86       0.00          0.00
 50%  -748.92       -231.80       0.00          0.00
 66%  -513.97       -215.73       0.00          0.00
 83%  -295.89       -199.67       0.00          0.00
100%  -94.67        -183.60       0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado mi=cargas muertas minimo
  0%  -1000.07      -180.07       0.00          0.00
 16%  -816.42       -169.74       0.00          0.00
 33%  -643.61       -159.41       0.00          0.00
 50%  -481.66       -149.08       0.00          0.00
 66%  -330.55       -138.74       0.00          0.00
 83%  -190.30       -128.41       0.00          0.00
100%  -60.89        -118.08       0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 11
Estado ma=cargas muertas maximo
  0%  -94.67        -183.60       0.00          0.00
 16%  517.33        -122.40       0.00          0.00
 33%  884.53        -61.20        0.00          0.00
 50%  1006.93       0.00          0.00          0.00
 66%  884.53        61.20         0.00          0.00
 83%  517.33        122.40        0.00          0.00
100%  -94.67        183.60        0.00          0.00
```

```
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado mi=cargas muertas minimo
  0%  -60.89        -118.08       0.00          0.00
 16%  332.71        -78.72        0.00          0.00
 33%  568.87        -39.36        0.00          0.00
 50%  647.59        0.00          0.00          0.00
 66%  568.87        39.36         0.00          0.00
 83%  332.71        78.72         0.00          0.00
100%  -60.89        118.08        0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 12
Estado ma=cargas muertas maximo
  0%  -94.67        183.60        0.00          0.00
 16%  -295.89       199.67        0.00          0.00
 33%  -513.97       215.73        0.00          0.00
 50%  -748.92       231.80        0.00          0.00
 66%  -1000.74      247.86        0.00          0.00
 83%  -1269.43      263.93        0.00          0.00
100%  -1554.98      279.99        0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado mi=cargas muertas minimo
  0%  -60.89        118.08        0.00          0.00
 16%  -190.30       128.41        0.00          0.00
 33%  -330.55       138.74        0.00          0.00
 50%  -481.66       149.08        0.00          0.00
 66%  -643.61       159.41        0.00          0.00
 83%  -816.42       169.74        0.00          0.00
100%  -1000.07      180.07        0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 13
Estado ma=cargas muertas maximo
  0%  -1554.98      279.99        0.00          0.00
 16%  -1634.93      284.33        0.00          0.00
 33%  -1716.10      288.66        0.00          0.00
 50%  -1798.50      293.00        0.00          0.00
 66%  -1882.13      297.33        0.00          0.00
 83%  -1966.99      301.67        0.00          0.00
100%  -2053.07      306.00        0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado mi=cargas muertas minimo
  0%  -1000.07      180.07        0.00          0.00
 16%  -1051.48      182.86        0.00          0.00
 33%  -1103.69      185.65        0.00          0.00
 50%  -1156.68      188.44        0.00          0.00
 66%  -1210.47      191.22        0.00          0.00
 83%  -1265.04      194.01        0.00          0.00
100%  -1320.41      196.80        0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 14
Estado ma=cargas muertas maximo
  0%  -2053.07      -307.11       0.00          0.00
 16%  -1966.68      -302.77       0.00          0.00
 33%  -1881.50      -298.44       0.00          0.00
 50%  -1797.56      -294.10       0.00          0.00
 66%  -1714.85      -289.77       0.00          0.00
 83%  -1633.36      -285.43       0.00          0.00
100%  -1553.10      -281.10       0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado mi=cargas muertas minimo
  0%  -1320.41      -197.51       0.00          0.00
 16%  -1264.84      -194.72       0.00          0.00
 33%  -1210.07      -191.93       0.00          0.00
 50%  -1156.08      -189.15       0.00          0.00
 66%  -1102.88      -186.36       0.00          0.00
 83%  -1050.48      -183.57       0.00          0.00
100%  -998.86       -180.78       0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 15
Estado ma=cargas muertas maximo
  0%  -1553.10      -281.10       0.00          0.00
 16%  -1266.39      -265.03       0.00          0.00
 33%  -996.54       -248.97       0.00          0.00
 50%  -743.56       -232.90       0.00          0.00
```



```
 66%  -507.45       -216.84       0.00          0.00
 83%  -288.21       -200.77       0.00          0.00
100%  -85.83        -184.71       0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado mi=cargas muertas minimo
  0%  -998.86       -180.78       0.00          0.00
 16%  -814.46       -170.45       0.00          0.00
 33%  -640.91       -160.12       0.00          0.00
 50%  -478.21       -149.79       0.00          0.00
 66%  -326.36       -139.45       0.00          0.00
 83%  -185.36       -129.12       0.00          0.00
100%  -55.20        -118.79       0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 16
Estado ma=cargas muertas maximo
  0%  -85.83        -184.71       0.00          0.00
 16%  530.59        -123.51       0.00          0.00
 33%  902.21        -62.31        0.00          0.00
 50%  1029.03       -1.11         0.00          0.00
 66%  911.05        60.09         0.00          0.00
 83%  548.28        121.29        0.00          0.00
100%  -59.30        182.49        0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado mi=cargas muertas minimo
  0%  -55.20        -118.79       0.00          0.00
 16%  341.24        -79.43        0.00          0.00
 33%  580.25        -40.07        0.00          0.00
 50%  661.81        -0.71         0.00          0.00
 66%  585.93        38.65         0.00          0.00
 83%  352.62        78.01         0.00          0.00
100%  -38.14        117.37        0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 17
Estado ma=cargas muertas maximo
  0%  -59.30        182.49        0.00          0.00
 16%  -259.36       198.56        0.00          0.00
 33%  -476.28       214.62        0.00          0.00
 50%  -710.07       230.69        0.00          0.00
 66%  -960.73       246.75        0.00          0.00
 83%  -1228.25      262.82        0.00          0.00
100%  -1512.65      278.88        0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado mi=cargas muertas minimo
  0%  -38.14        117.37        0.00          0.00
 16%  -166.80       127.70        0.00          0.00
 33%  -306.31       138.03        0.00          0.00
 50%  -456.67       148.37        0.00          0.00
 66%  -617.88       158.70        0.00          0.00
 83%  -789.93       169.03        0.00          0.00
100%  -972.84       179.36        0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 18
Estado ma=cargas muertas maximo
  0%  -1512.65      278.88        0.00          0.00
 16%  -1592.28      283.22        0.00          0.00
 33%  -1673.14      287.55        0.00          0.00
 50%  -1755.23      291.89        0.00          0.00
 66%  -1838.54      296.22        0.00          0.00
 83%  -1923.09      300.56        0.00          0.00
100%  -2008.86      304.89        0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado mi=cargas muertas minimo
  0%  -972.84       179.36        0.00          0.00
 16%  -1024.05      182.15        0.00          0.00
 33%  -1076.06      184.94        0.00          0.00
 50%  -1128.85      187.73        0.00          0.00
 66%  -1182.43      190.51        0.00          0.00
 83%  -1236.81      193.30        0.00          0.00
100%  -1291.97      196.09        0.00          0.00
      Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 19
Estado ma=cargas muertas maximo
  0%  -2008.86      -307.58       0.00          0.00
```

```
 16%  -1922.33      -303.24       0.00          0.00
 33%  -1837.02      -298.91       0.00          0.00
 50%  -1752.95      -294.57       0.00          0.00
 66%  -1670.10      -290.24       0.00          0.00
 83%  -1588.48      -285.90       0.00          0.00
100%  -1508.09      -281.57       0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado mi=cargas muertas minimo
  0%  -1291.97      -197.81       0.00          0.00
 16%  -1236.32      -195.03       0.00          0.00
 33%  -1181.46      -192.24       0.00          0.00
 50%  -1127.38      -189.45       0.00          0.00
 66%  -1074.10      -186.66       0.00          0.00
 83%  -1021.61      -183.87       0.00          0.00
100%  -969.91       -181.09       0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 20
Estado ma=cargas muertas maximo
  0%  -1508.09      -281.57       0.00          0.00
 16%  -1220.88      -265.50       0.00          0.00
 33%  -950.53       -249.44       0.00          0.00
 50%  -697.06       -233.37       0.00          0.00
 66%  -460.45       -217.31       0.00          0.00
 83%  -240.71       -201.24       0.00          0.00
100%  -37.84        -185.18       0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado mi=cargas muertas minimo
  0%  -969.91       -181.09       0.00          0.00
 16%  -785.19       -170.75       0.00          0.00
 33%  -611.32       -160.42       0.00          0.00
 50%  -448.30       -150.09       0.00          0.00
 66%  -296.13       -139.76       0.00          0.00
 83%  -154.81       -129.43       0.00          0.00
100%  -24.34        -119.09       0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 21
Estado ma=cargas muertas maximo
  0%  -37.84        -185.18       0.00          0.00
 16%  580.46        -123.98       0.00          0.00
 33%  953.97        -62.78        0.00          0.00
 50%  1082.68       -1.58         0.00          0.00
 66%  966.59        59.62         0.00          0.00
 83%  605.69        120.82        0.00          0.00
100%  0.00          182.02        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado mi=cargas muertas minimo
  0%  -24.34        -119.09       0.00          0.00
 16%  373.32        -79.73        0.00          0.00
 33%  613.53        -40.37        0.00          0.00
 50%  696.31        -1.01         0.00          0.00
 66%  621.65        38.35         0.00          0.00
 83%  389.54        77.71         0.00          0.00
100%  0.00          117.07        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------


              P E N D I E N T E S
Viga      Pend.2        @%        Pend.3        @%
-------------------------------------------------------
Estado ma=cargas muertas maximo
1         -0.00051      0.16667   0.00000       0.00000
2         0.00036       0.16667   0.00000       0.00000
3         0.00012       0.16667   0.00000       0.00000
4         -0.00016      1.00000   0.00000       0.00000
5         -0.00041      1.00000   0.00000       0.00000
6         0.00040       1.00000   0.00000       0.00000
7         0.00041       0.16667   0.00000       0.00000
8         0.00015       0.16667   0.00000       0.00000
9         -0.00014      1.00000   0.00000       0.00000
10        -0.00039      1.00000   0.00000       0.00000
11        -0.00039      0.16667   0.00000       0.00000
12        0.00039       0.16667   0.00000       0.00000
13        0.00014       0.16667   0.00000       0.00000
14        -0.00015      1.00000   0.00000       0.00000
```



```
15        -0.00041      1.00000   0.00000       0.00000
16        -0.00040      0.16667   0.00000       0.00000
17        0.00041       0.16667   0.00000       0.00000
18        0.00016       0.16667   0.00000       0.00000
19        -0.00012      1.00000   0.00000       0.00000
20        -0.00036      1.00000   0.00000       0.00000
21        0.00051       1.00000   0.00000       0.00000
-------------------------------------------------------
Estado mi=cargas muertas minimo
1         -0.00033      0.16667   0.00000       0.00000
2         0.00023       0.16667   0.00000       0.00000
3         0.00008       0.16667   0.00000       0.00000
4         -0.00011      1.00000   0.00000       0.00000
5         -0.00026      1.00000   0.00000       0.00000
6         0.00026       1.00000   0.00000       0.00000
7         0.00026       0.16667   0.00000       0.00000
8         0.00010       0.16667   0.00000       0.00000
9         -0.00009      1.00000   0.00000       0.00000
10        -0.00025      1.00000   0.00000       0.00000
11        -0.00025      0.16667   0.00000       0.00000
12        0.00025       0.16667   0.00000       0.00000
13        0.00009       0.16667   0.00000       0.00000
14        -0.00010      1.00000   0.00000       0.00000
15        -0.00026      1.00000   0.00000       0.00000
16        -0.00026      0.16667   0.00000       0.00000
17        0.00026       0.16667   0.00000       0.00000
18        0.00011       0.16667   0.00000       0.00000
19        -0.00008      1.00000   0.00000       0.00000
20        -0.00023      1.00000   0.00000       0.00000
21        0.00033       1.00000   0.00000       0.00000
-------------------------------------------------------
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LISTADO DE RESULTADOS DE LOS MODELOS DE CÁLCULO(Resto de cargas exteriores)

D A T O S

Archivo : C:\Amaya\B-08.937 UTE AL CAMP RIO FRANCOLI\602400 con secciones finales1.AVW
Proyecto :
Unidades : Ton-M
Fecha : 08/05/02
Hora : 12:03:39

V I G A S

Viga	NJ	NK	Descripcion	SecciÛn	Material
1	1	2		AVENECSO tabl_fin	HA-35
2	2	3		AVENECSO tabl_fin	HA-35
10	12	1		AVENECSO tabl_fin	HA-35

FUERZA DISTRIBUIDA SOBRE VIGAS

Estado	Viga	Dir.	Valor [Ton/M]
b1	1	y	-11.82
	2	y	-11.82
	10	y	-11.82
b2	1	y	-6.36
	2	y	-6.36
	10	y	-6.36
cm	1	y	-3.48
	2	y	-3.48
	10	y	-3.48
t1	1	Y	-8
	10	Y	-8
t2	1	Y	-8
	2	Y	-8
s1	1	y	-0.55
	10	y	-0.55
s2	1	y	-0.55
	2	y	-0.55
c1	1	z	0.1355
	2	z	0.1355
	10	z	0.1355
c2	1	z	1.1533
	2	z	1.1533
	10	z	1.1533
v1	1	z	0.77
	2	z	0.77
	10	z	0.77
v2	1	z	1.54
	2	z	1.54
	10	z	1.54
t3	2	Y	-8
	10	Y	-8
t4	1	Y	-8
t5	1	Y	-8
t6	1	Y	-8
s3	1	y	-0.55
s4	10	y	-0.55
t7	10	Y	-8
t8	2	Y	-8
t9	2	Y	-8
tt	10	Y	-8
s5	2	Y	-0.55
s6	1	Y	-0.55
	2	Y	-0.55
	10	Y	-0.55
pp	1	Y	-19.61
	2	Y	-19.61
	10	Y	-19.61

FUERZA CONCENTRADA SOBRE VIGAS

Estado	Viga	Dir.	Valor [Ton]	Distancia [M]	%
t1	1	Y	-25	0.8	0

	10	Y	-25	31.2	0
t2	1	Y	-25	37.6	0
	2	Y	-25	0.8	0
t3	10	Y	-25	0.0001	0
t4	1	Y	-25	19.2	0
t5	1	Y	-25	0.0001	0
t6	1	Y	-25	39.9999	0
t7	10	Y	-25	32	0
t8	2	Y	-25	0	0
t9	2	Y	-25	15.2	0
tt	10	Y	-25	11.4	0

PRESIONES Y TEMPERATURA

Estado	Viga	PresiÛn X [Ton/M2]	PresiÛn Y [Ton/M2]	PresiÛn Z [Ton/M2]	Temp1 [C]	Temp 2 [C/M]	Temp 3 [C/M]
gr	1	0	0	0	0	3.704	0
	2	0	0	0	0	3.704	0
	10	0	0	0	0	3.704	0

E S T A D O S D E C A R G A

Estado	DescripciÛn	Comb.	MultX	MultY	MultZ
b1	balasto max	0	0	0	0
b2	balasto min	0	0	0	0
cm	resto cargas muertas	0	0	0	0
t1	Tren UIC	0	0	0	0
t2	tren UIC2	0	0	0	0
s1	sc 1 paseo pila1	0	0	0	0
s2	sc 1 paseo pila2	0	0	0	0
fr	frenado	0	0	0	0
ar	arranque	0	0	0	0
c1	centrÌfuga v120	0	0	0	0
c2	centrÌfuga v350	0	0	0	0
l1	lazo pila1	0	0	0	0
l2	lazo pila2	0	0	0	0
v1	viento cp	0	0	0	0
v2	viento sc	0	0	0	0
te	temperatura 2 vÌas	0	0	0	0
t3	tren UIC en estribo	0	0	0	0
t4	tren centrado en vano2	0	0	0	0
t5	tren vano2 pila1	0	0	0	0
t6	tren vano2 pila2	0	0	0	0
s3	sc paseo vano2	0	0	0	0
s4	sc paseo vano1	0	0	0	0
t7	tren vano 1 pila1	0	0	0	0
t8	tren vano 3 pila 2	0	0	0	0
t9	tren vano 3 centro de van	0	0	0	0
tt	tren vano 1	0	0	0	0
s5	sc paseo vano3	0	0	0	0
s6	sobrecarga paseo todo el	0	0	0	0
gr	gradiente tÈrmico	0	0	0	0
z1	1b1+1cm	1	0	0	0
z2	1b2+1cm	1	0	0	0
pp	peso propio	0	0	0	0

S I S M O

Estado	Acel.	Dir.	Amort. [%]
b1	0	0	0
b2	0	0	0
cm	0	0	0
t1	0	0	0
t2	0	0	0
s1	0	0	0
s2	0	0	0
fr	0	0	0
ar	0	0	0
c1	0	0	0
c2	0	0	0
l1	0	0	0
l2	0	0	0

Viaducto s/ el Río Francolí. UTE ALT CAMP Cargas exteriores sobre sección final

v1	0	0	0
v2	0	0	0
te	0	0	0
t3	0	0	0
t4	0	0	0
t5	0	0	0
t6	0	0	0
s3	0	0	0
s4	0	0	0
t7	0	0	0
t8	0	0	0
t9	0	0	0
tt	0	0	0
s5	0	0	0
s6	0	0	0
gr	0	0	0
z1	0	0	0
z2	0	0	0
pp	0	0	0

R E S U L T A D O S D E L A N A L I S I S

Archivo : C:\Correo\602400 con secciones finales1.AVW
Proyecto :
Unidades : Ton-M
Fecha : 08/05/02
Hora : 12:55:16

V I G A S

E S F U E R Z O S

	M33 [Ton*M]	V2 [Ton]	M22 [Ton*M]	V3 [Ton]
Viga 2				
Estado b1=balasto max				
0%	-1584.11	-236.66	0.00	0.00
16%	-269.06	-157.86	0.00	0.00
33%	520.65	-79.06	0.00	0.00
50%	785.04	-0.26	0.00	0.00
66%	524.09	78.54	0.00	0.00
83%	-262.20	157.34	0.00	0.00
100%	-1573.82	236.14	0.00	0.00
Axial: 0.00 [Ton]		Tor: 0.00 [Ton*M]		
Estado b2=balasto min				
0%	-852.37	-127.34	0.00	0.00
16%	-144.78	-84.94	0.00	0.00
33%	280.15	-42.54	0.00	0.00
50%	422.40	-0.14	0.00	0.00
66%	281.99	42.26	0.00	0.00
83%	-141.08	84.66	0.00	0.00
100%	-846.82	127.06	0.00	0.00
Axial: 0.00 [Ton]		Tor: 0.00 [Ton*M]		
Estado cm=resto cargas muertas				
0%	-466.39	-69.68	0.00	0.00
16%	-79.22	-46.48	0.00	0.00
33%	153.29	-23.28	0.00	0.00
50%	231.13	-0.08	0.00	0.00
66%	154.30	23.12	0.00	0.00
83%	-77.20	46.32	0.00	0.00
100%	-463.36	69.52	0.00	0.00
Axial: 0.00 [Ton]		Tor: 0.00 [Ton*M]		
Estado t1=Tren UIC				
0%	-342.39	6.05	0.00	0.00
16%	-382.73	6.05	0.00	0.00
33%	-423.07	6.05	0.00	0.00
50%	-463.40	6.05	0.00	0.00
66%	-503.74	6.05	0.00	0.00
83%	-544.08	6.05	0.00	0.00
100%	-584.41	6.05	0.00	0.00
Axial: 0.00 [Ton]		Tor: 0.00 [Ton*M]		
Estado t2=tren UIC2				
0%	-1435.61	-211.76	0.00	0.00
16%	-325.27	-134.03	0.00	0.00
33%	390.48	-80.70	0.00	0.00
50%	750.67	-27.36	0.00	0.00
66%	755.31	25.97	0.00	0.00
83%	404.39	79.30	0.00	0.00
100%	-302.08	132.64	0.00	0.00
Axial: 0.00 [Ton]		Tor: 0.00 [Ton*M]		
Estado s1=sc 1 paseo pila1				
0%	-36.94	-1.17	0.00	0.00
16%	-29.13	-1.17	0.00	0.00
33%	-21.33	-1.17	0.00	0.00
50%	-13.52	-1.17	0.00	0.00
66%	-5.71	-1.17	0.00	0.00
83%	2.09	-1.17	0.00	0.00
100%	9.90	-1.17	0.00	0.00
Axial: 0.00 [Ton]		Tor: 0.00 [Ton*M]		
Estado s2=sc 1 paseo pila2				
0%	-92.62	-12.46	0.00	0.00
16%	-21.76	-8.80	0.00	0.00
33%	24.65	-5.13	0.00	0.00
50%	46.62	-1.46	0.00	0.00
66%	44.15	2.20	0.00	0.00

Viaducto s/ el Río Francolí. UTE ALT CAMP Cargas exteriores sobre sección final

83%	17.23	5.87	0.00	0.00
100%	-34.13	9.54	0.00	0.00
Axial: 0.00 [Ton]		Tor: 0.00 [Ton*M]		
Estado fr=frenado				
0%	0.00	0.00	0.00	0.00
16%	0.00	0.00	0.00	0.00
33%	0.00	0.00	0.00	0.00
50%	0.00	0.00	0.00	0.00
66%	0.00	0.00	0.00	0.00
83%	0.00	0.00	0.00	0.00
100%	0.00	0.00	0.00	0.00
Axial: 600.00 [Ton]		Tor: 0.00 [Ton*M]		
Estado ar=arranque				
0%	0.00	0.00	0.00	0.00
16%	0.00	0.00	0.00	0.00
33%	0.00	0.00	0.00	0.00
50%	0.00	0.00	0.00	0.00
66%	0.00	0.00	0.00	0.00
83%	0.00	0.00	0.00	0.00
100%	0.00	0.00	0.00	0.00
Axial: 99.00 [Ton]		Tor: 0.00 [Ton*M]		
Estado c1=centrÌfuga v120				
0%	0.00	0.00	-18.16	2.71
16%	0.00	0.00	-3.08	1.81
33%	0.00	0.00	5.97	0.91
50%	0.00	0.00	9.00	0.00
66%	0.00	0.00	6.01	-0.90
83%	0.00	0.00	-3.01	-1.80
100%	0.00	0.00	-18.04	-2.71
Axial: 0.00 [Ton]		Tor: 0.00 [Ton*M]		
Estado c2=centrÌfuga v350				
0%	0.00	0.00	-154.57	23.09
16%	0.00	0.00	-26.25	15.40
33%	0.00	0.00	50.80	7.71
50%	0.00	0.00	76.60	0.03
66%	0.00	0.00	51.14	-7.66
83%	0.00	0.00	-25.58	-15.35
100%	0.00	0.00	-153.56	-23.04
Axial: 0.00 [Ton]		Tor: 0.00 [Ton*M]		
Estado l1=lazo pila1				
0%	0.00	0.00	0.00	0.00
16%	0.00	0.00	0.00	0.00
33%	0.00	0.00	0.00	0.00
50%	0.00	0.00	0.00	0.00
66%	0.00	0.00	0.00	0.00
83%	0.00	0.00	0.00	0.00
100%	0.00	0.00	0.00	0.00
Axial: 0.00 [Ton]		Tor: 0.00 [Ton*M]		
Estado l2=lazo pila2				
0%	0.00	0.00	0.00	0.00
16%	0.00	0.00	0.00	0.00
33%	0.00	0.00	0.00	0.00
50%	0.00	0.00	0.00	0.00
66%	0.00	0.00	0.00	0.00
83%	0.00	0.00	0.00	0.00
100%	0.00	0.00	0.00	0.00
Axial: 0.00 [Ton]		Tor: 0.00 [Ton*M]		
Estado v1=viento cp				
0%	0.00	0.00	-103.20	15.42
16%	0.00	0.00	-17.53	10.28
33%	0.00	0.00	33.92	5.15
50%	0.00	0.00	51.14	0.02
66%	0.00	0.00	34.14	-5.12
83%	0.00	0.00	-17.08	-10.25
100%	0.00	0.00	-102.52	-15.38
Axial: 0.00 [Ton]		Tor: 0.00 [Ton*M]		
Estado v2=viento sc				
0%	0.00	0.00	-206.39	30.83
16%	0.00	0.00	-35.06	20.57
33%	0.00	0.00	67.83	10.30
50%	0.00	0.00	102.28	0.03
66%	0.00	0.00	68.28	-10.23
83%	0.00	0.00	-34.16	-20.50
100%	0.00	0.00	-205.05	-30.77
Axial: 0.00 [Ton]		Tor: 0.00 [Ton*M]		
Estado te=temperatura 2 vÌas				
0%	0.00	0.00	0.00	0.00

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 16%  0.00          0.00          0.00          0.00
 33%  0.00          0.00          0.00          0.00
 50%  0.00          0.00          0.00          0.00
 66%  0.00          0.00          0.00          0.00
 83%  0.00          0.00          0.00          0.00
100%  0.00          0.00          0.00          0.00
       Axial: 144.00      [Ton]     Tor: 0.00 [Ton*M]
Estado t3=tren UIC en estribo
  0%  -591.03       -161.83       0.00          0.00
 16%  310.04        -108.49       0.00          0.00
 33%  855.55        -55.16        0.00          0.00
 50%  1045.51       -1.83         0.00          0.00
 66%  879.91        51.51         0.00          0.00
 83%  358.76        104.84        0.00          0.00
100%  -517.95       158.17        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado t4=tren centrado en vano2
  0%  -625.22       -2.91         0.00          0.00
 16%  -605.79       -2.91         0.00          0.00
 33%  -586.36       -2.91         0.00          0.00
 50%  -566.93       -2.91         0.00          0.00
 66%  -547.49       -2.91         0.00          0.00
 83%  -528.06       -2.91         0.00          0.00
100%  -508.63       -2.91         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado t5=tren vano2 pila1
  0%  -687.34       -21.79        0.00          0.00
 16%  -542.09       -21.79        0.00          0.00
 33%  -396.84       -21.79        0.00          0.00
 50%  -251.59       -21.79        0.00          0.00
 66%  -106.33       -21.79        0.00          0.00
 83%  38.92         -21.79        0.00          0.00
100%  184.17        -21.79        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado t6=tren vano2 pila2
  0%  -720.69       -22.84        0.00          0.00
 16%  -568.39       -22.84        0.00          0.00
 33%  -416.09       -22.84        0.00          0.00
 50%  -263.79       -22.84        0.00          0.00
 66%  -111.49       -22.84        0.00          0.00
 83%  40.81         -22.84        0.00          0.00
100%  193.11        -22.84        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado s3=sc paseo vano2
  0%  -46.00        -1.46         0.00          0.00
 16%  -36.28        -1.46         0.00          0.00
 33%  -26.56        -1.46         0.00          0.00
 50%  -16.84        -1.46         0.00          0.00
 66%  -7.12         -1.46         0.00          0.00
 83%  2.60          -1.46         0.00          0.00
100%  12.33         -1.46         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado s4=sc paseo vano1
  0%  9.06          0.29          0.00          0.00
 16%  7.14          0.29          0.00          0.00
 33%  5.23          0.29          0.00          0.00
 50%  3.32          0.29          0.00          0.00
 66%  1.40          0.29          0.00          0.00
 83%  -0.51         0.29          0.00          0.00
100%  -2.43         0.29          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado t7=tren vano 1 pila1
  0%  129.81        4.11          0.00          0.00
 16%  102.38        4.11          0.00          0.00
 33%  74.95         4.11          0.00          0.00
 50%  47.51         4.11          0.00          0.00
 66%  20.08         4.11          0.00          0.00
 83%  -7.35         4.11          0.00          0.00
100%  -34.78        4.11          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado t8=tren vano 3 pila 2
  0%  -670.33       -145.89       0.00          0.00
 16%  208.97        -95.89        0.00          0.00
 33%  736.72        -53.83        0.00          0.00
 50%  917.79        -0.49         0.00          0.00
 66%  743.31        52.84         0.00          0.00
 83%  213.27        106.17        0.00          0.00
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100%  -672.32       159.51        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado t9=tren vano 3 centro de vano 3
  0%  -723.91       -165.05       0.00          0.00
 16%  198.65        -111.72       0.00          0.00
 33%  765.66        -58.38        0.00          0.00
 50%  980.94        -6.25         0.00          0.00
 66%  849.00        45.88         0.00          0.00
 83%  365.33        99.22         0.00          0.00
100%  -473.89       152.55        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado tt=tren vano 1
  0%  130.52        4.14          0.00          0.00
 16%  102.94        4.14          0.00          0.00
 33%  75.35         4.14          0.00          0.00
 50%  47.77         4.14          0.00          0.00
 66%  20.19         4.14          0.00          0.00
 83%  -7.39         4.14          0.00          0.00
100%  -34.97        4.14          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado s5=sc paseo vano3
  0%  -46.62        -11.00        0.00          0.00
 16%  14.52         -7.34         0.00          0.00
 33%  51.21         -3.67         0.00          0.00
 50%  63.46         -0.00         0.00          0.00
 66%  51.27         3.66          0.00          0.00
 83%  14.63         7.33          0.00          0.00
100%  -46.46        11.00         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado s6=sobrecarga paseo todo el puente
  0%  -73.71        -11.01        0.00          0.00
 16%  -12.52        -7.35         0.00          0.00
 33%  24.23         -3.68         0.00          0.00
 50%  36.53         -0.01         0.00          0.00
 66%  24.39         3.65          0.00          0.00
 83%  -12.20        7.32          0.00          0.00
100%  -73.23        10.99         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado gr=gradiente tÈrmico
  0%  516.38        -1.13         0.00          0.00
 16%  523.89        -1.13         0.00          0.00
 33%  531.41        -1.13         0.00          0.00
 50%  538.92        -1.13         0.00          0.00
 66%  546.44        -1.13         0.00          0.00
 83%  553.95        -1.13         0.00          0.00
100%  561.46        -1.13         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado z1=1b1+1cm
  0%  -2050.50      -306.33       0.00          0.00
 16%  -348.28       -204.33       0.00          0.00
 33%  673.94        -102.33       0.00          0.00
 50%  1016.16       -0.33         0.00          0.00
 66%  678.38        101.67        0.00          0.00
 83%  -339.39       203.67        0.00          0.00
100%  -2037.17      305.67        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado z2=1b2+1cm
  0%  -1318.75      -197.01       0.00          0.00
 16%  -223.99       -131.41       0.00          0.00
 33%  433.44        -65.81        0.00          0.00
 50%  653.53        -0.21         0.00          0.00
 66%  436.29        65.39         0.00          0.00
 83%  -218.28       130.99        0.00          0.00
100%  -1310.18      196.59        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado pp=peso propio
  0%  -2628.13      -392.63       0.00          0.00
 16%  -446.39       -261.89       0.00          0.00
 33%  863.79        -131.16       0.00          0.00
 50%  1302.41       -0.43         0.00          0.00
 66%  869.48        130.31        0.00          0.00
 83%  -435.00       261.04        0.00          0.00
100%  -2611.04      391.77        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 1
Estado b1=balasto max
```

```
  0%  -1545.73      -235.44       0.00          0.00
 16%  -238.79       -156.64       0.00          0.00
 33%  542.81        -77.84        0.00          0.00
 50%  799.08        0.96          0.00          0.00
 66%  530.01        79.76         0.00          0.00
 83%  -264.38       158.56        0.00          0.00
100%  -1584.11      237.36        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado b2=balasto min
  0%  -831.71       -126.68       0.00          0.00
 16%  -128.49       -84.28        0.00          0.00
 33%  292.07        -41.88        0.00          0.00
 50%  429.96        0.52          0.00          0.00
 66%  285.19        42.92         0.00          0.00
 83%  -142.26       85.32         0.00          0.00
100%  -852.37       127.72        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado cm=resto cargas muertas
  0%  -455.09       -69.32        0.00          0.00
 16%  -70.30        -46.12        0.00          0.00
 33%  159.81        -22.92        0.00          0.00
 50%  235.26        0.28          0.00          0.00
 66%  156.04        23.48         0.00          0.00
 83%  -77.84        46.68         0.00          0.00
100%  -466.39       69.88         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado t1=Tren UIC
  0%  -1284.96      -206.99       0.00          0.00
 16%  -206.45       -129.25       0.00          0.00
 33%  477.48        -75.92        0.00          0.00
 50%  805.84        -22.59        0.00          0.00
 66%  778.65        30.75         0.00          0.00
 83%  395.91        84.08         0.00          0.00
100%  -342.39       137.41        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado t2=tren UIC2
  0%  -500.93       -137.61       0.00          0.00
 16%  238.69        -84.28        0.00          0.00
 33%  622.75        -30.94        0.00          0.00
 50%  651.25        22.39         0.00          0.00
 66%  324.20        75.72         0.00          0.00
 83%  -358.41       129.06        0.00          0.00
100%  -1435.61      206.79        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado s1=sc 1 paseo pila1
  0%  -82.14        -12.13        0.00          0.00
 16%  -13.49        -8.46         0.00          0.00
 33%  30.71         -4.80         0.00          0.00
 50%  50.46         -1.13         0.00          0.00
 66%  45.77         2.54          0.00          0.00
 83%  16.64         6.20          0.00          0.00
100%  -36.94        9.87          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado s2=sc 1 paseo pila2
  0%  -35.38        -9.57         0.00          0.00
 16%  16.19         -5.90         0.00          0.00
 33%  43.32         -2.24         0.00          0.00
 50%  46.00         1.43          0.00          0.00
 66%  24.24         5.10          0.00          0.00
 83%  -21.97        8.76          0.00          0.00
100%  -92.62        12.43         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado fr=frenado
  0%  0.00          0.00          0.00          0.00
 16%  0.00          0.00          0.00          0.00
 33%  0.00          0.00          0.00          0.00
 50%  0.00          0.00          0.00          0.00
 66%  0.00          0.00          0.00          0.00
 83%  0.00          0.00          0.00          0.00
100%  0.00          0.00          0.00          0.00
       Axial: 600.00      [Ton]     Tor: 0.00 [Ton*M]
Estado ar=arranque
  0%  0.00          0.00          0.00          0.00
 16%  0.00          0.00          0.00          0.00
 33%  0.00          0.00          0.00          0.00
 50%  0.00          0.00          0.00          0.00
 66%  0.00          0.00          0.00          0.00
```

Viaducto s/ el Río Francolí. UTE ALT CAMP Cargas exteriores sobre sección final

```
 83%  0.00          0.00          0.00          0.00
100%  0.00          0.00          0.00          0.00
       Axial: 99.00       [Ton]     Tor: 0.00 [Ton*M]
Estado c1=centrÌfuga v120
  0%  0.00          0.00          -17.72        2.70
 16%  0.00          0.00          -2.74         1.80
 33%  0.00          0.00          6.22          0.89
 50%  0.00          0.00          9.16          -0.01
 66%  0.00          0.00          6.08          -0.91
 83%  0.00          0.00          -3.03         -1.82
100%  0.00          0.00          -18.16        -2.72
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado c2=centrÌfuga v350
  0%  0.00          0.00          -150.82       22.97
 16%  0.00          0.00          -23.30        15.28
 33%  0.00          0.00          52.96         7.60
 50%  0.00          0.00          77.97         -0.09
 66%  0.00          0.00          51.71         -7.78
 83%  0.00          0.00          -25.80        -15.47
100%  0.00          0.00          -154.57       -23.16
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado l1=lazo pila1
  0%  0.00          0.00          0.00          0.00
 16%  0.00          0.00          0.00          0.00
 33%  0.00          0.00          0.00          0.00
 50%  0.00          0.00          0.00          0.00
 66%  0.00          0.00          0.00          0.00
 83%  0.00          0.00          0.00          0.00
100%  0.00          0.00          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado l2=lazo pila2
  0%  0.00          0.00          0.00          0.00
 16%  0.00          0.00          0.00          0.00
 33%  0.00          0.00          0.00          0.00
 50%  0.00          0.00          0.00          0.00
 66%  0.00          0.00          0.00          0.00
 83%  0.00          0.00          0.00          0.00
100%  0.00          0.00          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado v1=viento cp
  0%  0.00          0.00          -100.69       15.34
 16%  0.00          0.00          -15.56        10.20
 33%  0.00          0.00          35.36         5.07
 50%  0.00          0.00          52.06         -0.06
 66%  0.00          0.00          34.53         -5.20
 83%  0.00          0.00          -17.22        -10.33
100%  0.00          0.00          -103.20       -15.46
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado v2=viento sc
  0%  0.00          0.00          -201.39       30.67
 16%  0.00          0.00          -31.11        20.41
 33%  0.00          0.00          70.72         10.14
 50%  0.00          0.00          104.11        -0.13
 66%  0.00          0.00          69.05         -10.39
 83%  0.00          0.00          -34.45        -20.66
100%  0.00          0.00          -206.39       -30.93
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado te=temperatura 2 vÌas
  0%  0.00          0.00          0.00          0.00
 16%  0.00          0.00          0.00          0.00
 33%  0.00          0.00          0.00          0.00
 50%  0.00          0.00          0.00          0.00
 66%  0.00          0.00          0.00          0.00
 83%  0.00          0.00          0.00          0.00
100%  0.00          0.00          0.00          0.00
       Axial: 144.00      [Ton]     Tor: 0.00 [Ton*M]
Estado t3=tren UIC en estribo
  0%  -317.92       6.83          0.00          0.00
 16%  -363.44       6.83          0.00          0.00
 33%  -408.96       6.83          0.00          0.00
 50%  -454.48       6.83          0.00          0.00
 66%  -499.99       6.83          0.00          0.00
 83%  -545.51       6.83          0.00          0.00
100%  -591.03       6.83          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado t4=tren centrado en vano2
  0%  -917.04       -191.70       0.00          0.00
```

```
 16%  183.15        -138.36       0.00          0.00
 33%  927.79        -85.03        0.00          0.00
 50%  1277.83       -7.30         0.00          0.00
 66%  1025.06       70.44         0.00          0.00
 83%  377.70        123.77        0.00          0.00
100%  -625.22       177.10        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado t5=tren vano2 pila1
  0%  -756.92       -215.46       0.00          0.00
 16%  246.37        -105.32       0.00          0.00
 33%  770.74        -51.99        0.00          0.00
 50%  939.55        1.34          0.00          0.00
 66%  752.81        54.68         0.00          0.00
 83%  210.51        108.01        0.00          0.00
100%  -687.34       161.34        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado t6=tren vano2 pila2
  0%  -722.62       -163.13       0.00          0.00
 16%  187.15        -109.80       0.00          0.00
 33%  741.37        -56.47        0.00          0.00
 50%  940.03        -3.13         0.00          0.00
 66%  783.13        50.20         0.00          0.00
 83%  270.68        103.53        0.00          0.00
100%  -720.69       213.67        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado s3=sc paseo vano2
  0%  -48.33        -11.06        0.00          0.00
 16%  13.17         -7.39         0.00          0.00
 33%  50.22         -3.73         0.00          0.00
 50%  62.83         -0.06         0.00          0.00
 66%  51.00         3.61          0.00          0.00
 83%  14.72         7.27          0.00          0.00
100%  -46.00        10.94         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado s4=sc paseo vano1
  0%  -33.81        -1.07         0.00          0.00
 16%  -26.66        -1.07         0.00          0.00
 33%  -19.52        -1.07         0.00          0.00
 50%  -12.37        -1.07         0.00          0.00
 66%  -5.23         -1.07         0.00          0.00
 83%  1.91          -1.07         0.00          0.00
100%  9.06          -1.07         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado t7=tren vano 1 pila1
  0%  -484.45       -15.36        0.00          0.00
 16%  -382.08       -15.36        0.00          0.00
 33%  -279.70       -15.36        0.00          0.00
 50%  -177.32       -15.36        0.00          0.00
 66%  -74.95        -15.36        0.00          0.00
 83%  27.43         -15.36        0.00          0.00
100%  129.81        -15.36        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado t8=tren vano 3 pila 2
  0%  186.20        21.41         0.00          0.00
 16%  43.45         21.41         0.00          0.00
 33%  -99.31        21.41         0.00          0.00
 50%  -242.06       21.41         0.00          0.00
 66%  -384.82       21.41         0.00          0.00
 83%  -527.57       21.41         0.00          0.00
100%  -670.33       21.41         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado t9=tren vano 3 centro de vano 3
  0%  201.09        23.12         0.00          0.00
 16%  46.92         23.12         0.00          0.00
 33%  -107.25       23.12         0.00          0.00
 50%  -261.41       23.12         0.00          0.00
 66%  -415.58       23.12         0.00          0.00
 83%  -569.74       23.12         0.00          0.00
100%  -723.91       23.12         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado tt=tren vano 1
  0%  -487.10       -15.44        0.00          0.00
 16%  -384.16       -15.44        0.00          0.00
 33%  -281.23       -15.44        0.00          0.00
 50%  -178.29       -15.44        0.00          0.00
 66%  -75.35        -15.44        0.00          0.00
 83%  27.58         -15.44        0.00          0.00
```

Viaducto s/ el Río Francolí. UTE ALT CAMP Cargas exteriores sobre sección final

```
100%  130.52        -15.44        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado s5=sc paseo vano3
  0%  12.95         1.49          0.00          0.00
 16%  3.02          1.49          0.00          0.00
 33%  -6.91         1.49          0.00          0.00
 50%  -16.84        1.49          0.00          0.00
 66%  -26.77        1.49          0.00          0.00
 83%  -36.69        1.49          0.00          0.00
100%  -46.62        1.49          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado s6=sobrecarga paseo todo el puente
  0%  -71.92        -10.96        0.00          0.00
 16%  -11.11        -7.29         0.00          0.00
 33%  25.26         -3.62         0.00          0.00
 50%  37.18         0.04          0.00          0.00
 66%  24.66         3.71          0.00          0.00
 83%  -12.30        7.38          0.00          0.00
100%  -73.71        11.04         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado gr=gradiente tÈrmico
  0%  684.41        4.20          0.00          0.00
 16%  656.41        4.20          0.00          0.00
 33%  628.40        4.20          0.00          0.00
 50%  600.40        4.20          0.00          0.00
 66%  572.39        4.20          0.00          0.00
 83%  544.39        4.20          0.00          0.00
100%  516.38        4.20          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado z1=1b1+1cm
  0%  -2000.82      -304.76       0.00          0.00
 16%  -309.10       -202.76       0.00          0.00
 33%  702.62        -100.76       0.00          0.00
 50%  1034.34       1.24          0.00          0.00
 66%  686.06        103.24        0.00          0.00
 83%  -342.22       205.24        0.00          0.00
100%  -2050.50      307.24        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado z2=1b2+1cm
  0%  -1286.80      -196.00       0.00          0.00
 16%  -198.79       -130.40       0.00          0.00
 33%  451.88        -64.80        0.00          0.00
 50%  665.22        0.80          0.00          0.00
 66%  441.23        66.40         0.00          0.00
 83%  -220.10       132.00        0.00          0.00
100%  -1318.75      197.60        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado pp=peso propio
  0%  -2564.44      -390.61       0.00          0.00
 16%  -396.17       -259.87       0.00          0.00
 33%  900.55        -129.14       0.00          0.00
 50%  1325.71       1.59          0.00          0.00
 66%  879.32        132.33        0.00          0.00
 83%  -438.63       263.06        0.00          0.00
100%  -2628.13      393.79        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
Viga 10
Estado b1=balasto max
  0%  0.00          -140.82       0.00          0.00
 16%  582.91        -77.78        0.00          0.00
 33%  829.61        -14.74        0.00          0.00
 50%  740.10        48.30         0.00          0.00
 66%  314.37        111.34        0.00          0.00
 83%  -447.57       174.38        0.00          0.00
100%  -1545.73      237.42        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado b2=balasto min
  0%  0.00          -75.77        0.00          0.00
 16%  313.65        -41.85        0.00          0.00
 33%  446.39        -7.93         0.00          0.00
 50%  398.22        25.99         0.00          0.00
 66%  169.15        59.91         0.00          0.00
 83%  -240.83       93.83         0.00          0.00
100%  -831.71       127.75        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado cm=resto cargas muertas
```

```
  0%  0.00          -41.46        0.00          0.00
 16%  171.62        -22.90        0.00          0.00
 33%  244.25        -4.34         0.00          0.00
 50%  217.90        14.22         0.00          0.00
 66%  92.55         32.78         0.00          0.00
 83%  -131.77       51.34         0.00          0.00
100%  -455.09       69.90         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado t1=Tren UIC
  0%  0.00          -89.06        0.00          0.00
 16%  361.24        -46.40        0.00          0.00
 33%  494.91        -3.73         0.00          0.00
 50%  401.04        38.94         0.00          0.00
 66%  79.61         81.60         0.00          0.00
 83%  -469.38       124.27        0.00          0.00
100%  -1284.96      191.34        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado t2=tren UIC2
  0%  0.00          15.65         0.00          0.00
 16%  -83.49        15.65         0.00          0.00
 33%  -166.98       15.65         0.00          0.00
 50%  -250.46       15.65         0.00          0.00
 66%  -333.95       15.65         0.00          0.00
 83%  -417.44       15.65         0.00          0.00
100%  -500.93       15.65         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado s1=sc 1 paseo pila1
  0%  0.00          -6.23         0.00          0.00
 16%  25.42         -3.30         0.00          0.00
 33%  35.20         -0.37         0.00          0.00
 50%  29.33         2.57          0.00          0.00
 66%  7.82          5.50          0.00          0.00
 83%  -29.34        8.43          0.00          0.00
100%  -82.14        11.37         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado s2=sc 1 paseo pila2
  0%  0.00          1.11          0.00          0.00
 16%  -5.90         1.11          0.00          0.00
 33%  -11.79        1.11          0.00          0.00
 50%  -17.69        1.11          0.00          0.00
 66%  -23.59        1.11          0.00          0.00
 83%  -29.49        1.11          0.00          0.00
100%  -35.38        1.11          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado fr=frenado
  0%  0.00          0.00          0.00          0.00
 16%  0.00          0.00          0.00          0.00
 33%  0.00          0.00          0.00          0.00
 50%  0.00          0.00          0.00          0.00
 66%  0.00          0.00          0.00          0.00
 83%  0.00          0.00          0.00          0.00
100%  0.00          0.00          0.00          0.00
       Axial: 600.00      [Ton]     Tor: 0.00 [Ton*M]
Estado ar=arranque
  0%  0.00          0.00          0.00          0.00
 16%  0.00          0.00          0.00          0.00
 33%  0.00          0.00          0.00          0.00
 50%  0.00          0.00          0.00          0.00
 66%  0.00          0.00          0.00          0.00
 83%  0.00          0.00          0.00          0.00
100%  0.00          0.00          0.00          0.00
       Axial: 99.00       [Ton]     Tor: 0.00 [Ton*M]
Estado c1=centrÌfuga v120
  0%  0.00          0.00          0.00          1.61
 16%  0.00          0.00          6.68          0.89
 33%  0.00          0.00          9.51          0.17
 50%  0.00          0.00          8.48          -0.55
 66%  0.00          0.00          3.60          -1.28
 83%  0.00          0.00          -5.13         -2.00
100%  0.00          0.00          -17.72        -2.72
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado c2=centrÌfuga v350
  0%  0.00          0.00          0.00          13.74
 16%  0.00          0.00          56.88         7.59
 33%  0.00          0.00          80.95         1.44
 50%  0.00          0.00          72.21         -4.71
 66%  0.00          0.00          30.67         -10.86
```

Viaducto s/ el Río Francolí. UTE ALT CAMP Cargas exteriores sobre sección final

```
 83%  0.00          0.00          -43.67        -17.01
100%  0.00          0.00          -150.82       -23.17
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado l1=lazo pila1
  0%  0.00          0.00          0.00          0.00
 16%  0.00          0.00          0.00          0.00
 33%  0.00          0.00          0.00          0.00
 50%  0.00          0.00          0.00          0.00
 66%  0.00          0.00          0.00          0.00
 83%  0.00          0.00          0.00          0.00
100%  0.00          0.00          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado l2=lazo pila2
  0%  0.00          0.00          0.00          0.00
 16%  0.00          0.00          0.00          0.00
 33%  0.00          0.00          0.00          0.00
 50%  0.00          0.00          0.00          0.00
 66%  0.00          0.00          0.00          0.00
 83%  0.00          0.00          0.00          0.00
100%  0.00          0.00          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado v1=viento cp
  0%  0.00          0.00          0.00          9.17
 16%  0.00          0.00          37.97         5.07
 33%  0.00          0.00          54.04         0.96
 50%  0.00          0.00          48.21         -3.15
 66%  0.00          0.00          20.48         -7.25
 83%  0.00          0.00          -29.16        -11.36
100%  0.00          0.00          -100.69       -15.47
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado v2=viento sc
  0%  0.00          0.00          0.00          18.35
 16%  0.00          0.00          75.95         10.13
 33%  0.00          0.00          108.09        1.92
 50%  0.00          0.00          96.43         -6.29
 66%  0.00          0.00          40.96         -14.51
 83%  0.00          0.00          -58.31        -22.72
100%  0.00          0.00          -201.39       -30.93
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado te=temperatura 2 vÌas
  0%  0.00          0.00          0.00          0.00
 16%  0.00          0.00          0.00          0.00
 33%  0.00          0.00          0.00          0.00
 50%  0.00          0.00          0.00          0.00
 66%  0.00          0.00          0.00          0.00
 83%  0.00          0.00          0.00          0.00
100%  0.00          0.00          0.00          0.00
       Axial: 144.00      [Ton]     Tor: 0.00 [Ton*M]
Estado t3=tren UIC en estribo
  0%  0.00          -171.01       0.00          0.00
 16%  618.72        -71.01        0.00          0.00
 33%  886.49        -28.88        0.00          0.00
 50%  926.72        13.79         0.00          0.00
 66%  739.40        56.46         0.00          0.00
 83%  324.52        99.12         0.00          0.00
100%  -317.92       141.79        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado t4=tren centrado en vano2
  0%  0.00          28.66         0.00          0.00
 16%  -152.84       28.66         0.00          0.00
 33%  -305.68       28.66         0.00          0.00
 50%  -458.52       28.66         0.00          0.00
 66%  -611.36       28.66         0.00          0.00
 83%  -764.20       28.66         0.00          0.00
100%  -917.04       28.66         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado t5=tren vano2 pila1
  0%  0.00          23.65         0.00          0.00
 16%  -126.15       23.65         0.00          0.00
 33%  -252.31       23.65         0.00          0.00
 50%  -378.46       23.65         0.00          0.00
 66%  -504.61       23.65         0.00          0.00
 83%  -630.77       23.65         0.00          0.00
100%  -756.92       23.65         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado t6=tren vano2 pila2
  0%  0.00          22.58         0.00          0.00
```

```
 16%  -120.44       22.58         0.00          0.00
 33%  -240.87       22.58         0.00          0.00
 50%  -361.31       22.58         0.00          0.00
 66%  -481.75       22.58         0.00          0.00
 83%  -602.18       22.58         0.00          0.00
100%  -722.62       22.58         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado s3=sc paseo vano2
  0%  0.00           1.51          0.00          0.00
 16%  -8.06          1.51          0.00          0.00
 33%  -16.11         1.51          0.00          0.00
 50%  -24.17         1.51          0.00          0.00
 66%  -32.22         1.51          0.00          0.00
 83%  -40.28         1.51          0.00          0.00
100%  -48.33         1.51          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado s4=sc paseo vano1
  0%  0.00           -7.74         0.00          0.00
 16%  33.48          -4.81         0.00          0.00
 33%  51.31          -1.88         0.00          0.00
 50%  53.50          1.06          0.00          0.00
 66%  40.04          3.99          0.00          0.00
 83%  10.94          6.92          0.00          0.00
100%  -33.81         9.86          0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado t7=tren vano 1 pila1
  0%  0.00           -112.18       0.00          0.00
 16%  484.52         -69.51        0.00          0.00
 33%  741.48         -26.85        0.00          0.00
 50%  770.89         15.82         0.00          0.00
 66%  573.88         54.22         0.00          0.00
 83%  151.38         104.22        0.00          0.00
100%  -484.45        154.22        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado t8=tren vano 3 pila 2
  0%  0.00           -5.82         0.00          0.00
 16%  31.03          -5.82         0.00          0.00
 33%  62.07          -5.82         0.00          0.00
 50%  93.10          -5.82         0.00          0.00
 66%  124.13         -5.82         0.00          0.00
 83%  155.17         -5.82         0.00          0.00
100%  186.20         -5.82         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado t9=tren vano 3 centro de vano 3
  0%  0.00           -6.28         0.00          0.00
 16%  33.51          -6.28         0.00          0.00
 33%  67.03          -6.28         0.00          0.00
 50%  100.54         -6.28         0.00          0.00
 66%  134.06         -6.28         0.00          0.00
 83%  167.57         -6.28         0.00          0.00
100%  201.09         -6.28         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado tt=tren vano 1
  0%  0.00           -110.95       0.00          0.00
 16%  477.97         -68.29        0.00          0.00
 33%  732.94         -34.15        0.00          0.00
 50%  765.09         15.85         0.00          0.00
 66%  583.91         65.85         0.00          0.00
 83%  159.91         99.98         0.00          0.00
100%  -487.10        142.65        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado s5=sc paseo vano3
  0%  0.00           -0.40         0.00          0.00
 16%  2.16           -0.40         0.00          0.00
 33%  4.32           -0.40         0.00          0.00
 50%  6.48           -0.40         0.00          0.00
 66%  8.63           -0.40         0.00          0.00
 83%  10.79          -0.40         0.00          0.00
100%  12.95          -0.40         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado s6=sobrecarga paseo todo el puente
  0%  0.00           -6.55         0.00          0.00
 16%  27.12          -3.62         0.00          0.00
 33%  38.60          -0.69         0.00          0.00
 50%  34.44          2.25          0.00          0.00
 66%  14.63          5.18          0.00          0.00
 83%  -20.83         8.11          0.00          0.00
```

Viaducto s/ el Río Francolí. UTE ALT CAMP Cargas exteriores sobre sección final

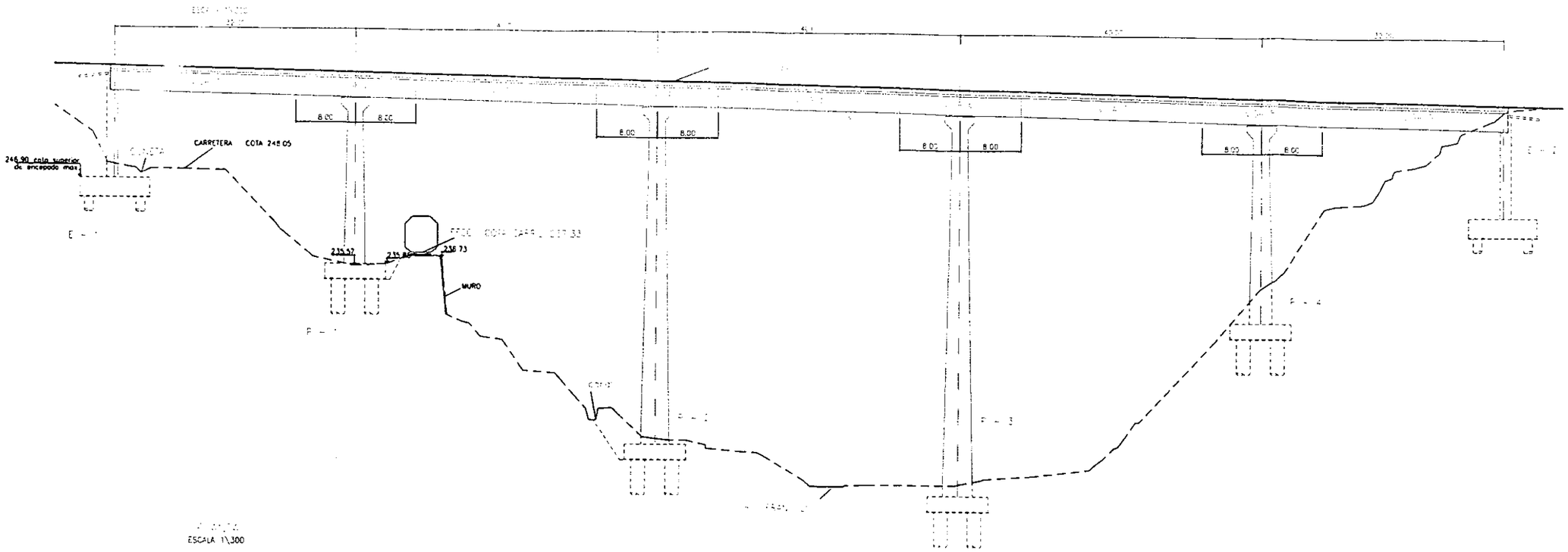
```
100%  -71.92        11.05         0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado gr=gradiente tÈrmico
  0%  0.00           -21.39        0.00          0.00
 16%  114.07         -21.39        0.00          0.00
 33%  228.14         -21.39        0.00          0.00
 50%  342.21         -21.39        0.00          0.00
 66%  456.27         -21.39        0.00          0.00
 83%  570.34         -21.39        0.00          0.00
100%  684.41         -21.39        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado z1=1b1+1cm
  0%  0.00           -182.27       0.00          0.00
 16%  754.53         -100.67       0.00          0.00
 33%  1073.86        -19.07        0.00          0.00
 50%  957.99         62.53         0.00          0.00
 66%  406.92         144.13        0.00          0.00
 83%  -579.35        225.73        0.00          0.00
100%  -2000.82       307.33        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado z2=1b2+1cm
  0%  0.00           -117.23       0.00          0.00
 16%  485.27         -64.75        0.00          0.00
 33%  690.64         -12.27        0.00          0.00
 50%  616.12         40.21         0.00          0.00
 66%  261.71         92.69         0.00          0.00
 83%  -372.60        145.17        0.00          0.00
100%  -1286.80       197.65        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
Estado pp=peso propio
  0%  0.00           -233.62       0.00          0.00
 16%  967.08         -129.03       0.00          0.00
 33%  1376.37        -24.45        0.00          0.00
 50%  1227.86        80.14         0.00          0.00
 66%  521.55         184.73        0.00          0.00
 83%  -742.55        289.31        0.00          0.00
100%  -2564.44       393.90        0.00          0.00
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------
       Axial: 0.00        [Ton]     Tor: 0.00 [Ton*M]
-------------------------------------------------------


                P E N D I E N T E S
Viga      Pend.2        @%        Pend.3        @%
-------------------------------------------------------
Estado b1=balasto max
2         -0.00038      0.33333   0.00000       0.00000
1         0.00039       0.83333   0.00000       0.00000
10        -0.00049      0.16667   0.00000       0.00000
-------------------------------------------------------
Estado b2=balasto min
2         -0.00020      0.33333   0.00000       0.00000
1         0.00021       0.83333   0.00000       0.00000
10        -0.00026      0.16667   0.00000       0.00000
-------------------------------------------------------
Estado cm=resto cargas muertas
2         -0.00011      0.33333   0.00000       0.00000
1         0.00011       0.83333   0.00000       0.00000
10        -0.00014      0.16667   0.00000       0.00000
-------------------------------------------------------
Estado t1=Tren UIC
2         -0.00055      1.00000   0.00000       0.00000
1         0.00058       1.00000   0.00000       0.00000
10        -0.00026      0.16667   0.00000       0.00000
-------------------------------------------------------
Estado t2=tren UIC2
2         0.00054       1.00000   0.00000       0.00000
1         -0.00041      0.16667   0.00000       0.00000
10        -0.00027      1.00000   0.00000       0.00000
-------------------------------------------------------
Estado s1=sc 1 paseo pila1
2         0.00002       0.16667   0.00000       0.00000
1         0.00003       1.00000   0.00000       0.00000
10        -0.00002      0.16667   0.00000       0.00000
-------------------------------------------------------
Estado s2=sc 1 paseo pila2
2         0.00003       1.00000   0.00000       0.00000
1         -0.00003      0.16667   0.00000       0.00000
```

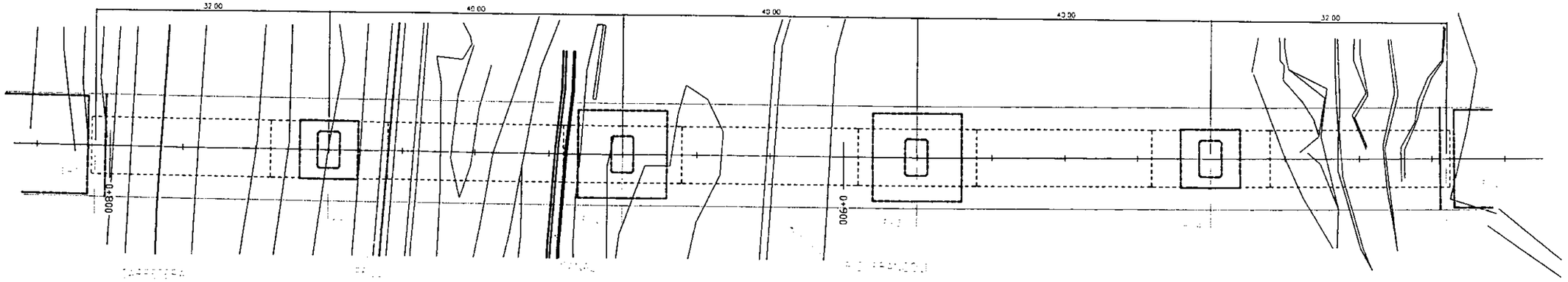
```
10        -0.00002      1.00000   0.00000       0.00000
-------------------------------------------------------
Estado fr=frenado
2         0.00000       0.00000   0.00000       0.00000
1         0.00000       0.00000   0.00000       0.00000
10        0.00000       0.00000   0.00000       0.00000
-------------------------------------------------------
Estado ar=arranque
2         0.00000       0.00000   0.00000       0.00000
1         0.00000       0.00000   0.00000       0.00000
10        0.00000       0.00000   0.00000       0.00000
-------------------------------------------------------
Estado c1=centrÌfuga v120
2         0.00000       0.00000   0.00000       0.33333
1         0.00000       0.00000   -0.00000      0.83333
10        0.00000       0.00000   0.00001       0.16667
-------------------------------------------------------
Estado c2=centrÌfuga v350
2         0.00000       0.00000   0.00004       0.33333
1         0.00000       0.00000   -0.00004      0.83333
10        0.00000       0.00000   0.00005       0.16667
-------------------------------------------------------
Estado l1=lazo pila1
2         0.00000       0.00000   0.00000       0.00000
1         0.00000       0.00000   0.00000       0.00000
10        0.00000       0.00000   0.00000       0.00000
-------------------------------------------------------
Estado l2=lazo pila2
2         0.00000       0.00000   0.00000       0.00000
1         0.00000       0.00000   0.00000       0.00000
10        0.00000       0.00000   0.00000       0.00000
-------------------------------------------------------
Estado v1=viento cp
2         0.00000       0.00000   0.00002       0.33333
1         0.00000       0.00000   -0.00003      0.83333
10        0.00000       0.00000   0.00003       0.16667
-------------------------------------------------------
Estado v2=viento sc
2         0.00000       0.00000   0.00005       0.33333
1         0.00000       0.00000   -0.00005      0.83333
10        0.00000       0.00000   0.00006       0.16667
-------------------------------------------------------
Estado te=temperatura 2 vÌas
2         0.00000       0.00000   0.00000       0.00000
1         0.00000       0.00000   0.00000       0.00000
10        0.00000       0.00000   0.00000       0.00000
-------------------------------------------------------
Estado t3=tren UIC en estribo
2         0.00075       1.00000   0.00000       0.00000
1         -0.00054      1.00000   0.00000       0.00000
10        -0.00065      0.16667   0.00000       0.00000
-------------------------------------------------------
Estado t4=tren centrado en vano2
2         0.00065       0.16667   0.00000       0.00000
1         0.00085       1.00000   0.00000       0.00000
10        -0.00050      1.00000   0.00000       0.00000
-------------------------------------------------------
Estado t5=tren vano2 pila1
2         0.00039       0.16667   0.00000       0.00000
1         -0.00062      0.16667   0.00000       0.00000
10        -0.00041      1.00000   0.00000       0.00000
-------------------------------------------------------
Estado t6=tren vano2 pila2
2         0.00041       0.16667   0.00000       0.00000
1         0.00063       1.00000   0.00000       0.00000
10        -0.00040      1.00000   0.00000       0.00000
-------------------------------------------------------
Estado s3=sc paseo vano2
2         0.00003       0.16667   0.00000       0.00000
1         0.00004       1.00000   0.00000       0.00000
10        -0.00003      1.00000   0.00000       0.00000
-------------------------------------------------------
Estado s4=sc paseo vano1
2         -0.00001      0.16667   0.00000       0.00000
1         0.00002       0.16667   0.00000       0.00000
10        -0.00004      0.16667   0.00000       0.00000
-------------------------------------------------------
```

Viaducto s/ el Río Francolí. UTE ALT CAMP Cargas exteriores sobre sección final

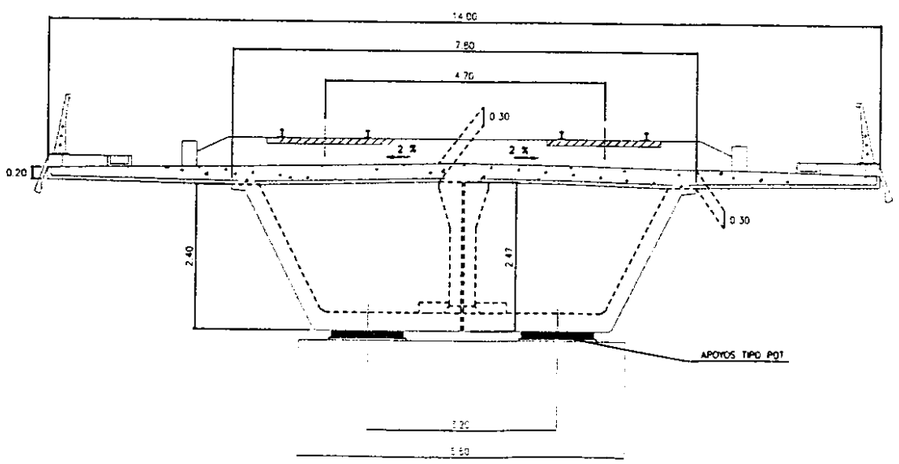
```
Estado t7=tren vano 1 pila1
2         -0.00007      0.16667   0.00000       0.00000
1         0.00027       0.16667   0.00000       0.00000
10        -0.00052      0.16667   0.00000       0.00000
-------------------------------------------------------
Estado t8=tren vano 3 pila 2
2         0.00060       1.00000   0.00000       0.00000
1         -0.00038      1.00000   0.00000       0.00000
10        0.00010       1.00000   0.00000       0.00000
-------------------------------------------------------
Estado t9=tren vano 3 centro de vano 3
2         0.00071       1.00000   0.00000       0.00000
1         -0.00041      1.00000   0.00000       0.00000
10        0.00011       1.00000   0.00000       0.00000
-------------------------------------------------------
Estado tt=tren vano 1
2         -0.00007      0.16667   0.00000       0.00000
1         0.00028       0.16667   0.00000       0.00000
10        -0.00052      0.16667   0.00000       0.00000
-------------------------------------------------------
Estado s5=sc paseo vano3
2         0.00004       1.00000   0.00000       0.00000
1         -0.00003      1.00000   0.00000       0.00000
10        0.00001       1.00000   0.00000       0.00000
-------------------------------------------------------
Estado s6=sobrecarga paseo todo el puente
2         -0.00002      0.33333   0.00000       0.00000
1         0.00002       0.83333   0.00000       0.00000
10        -0.00002      0.16667   0.00000       0.00000
-------------------------------------------------------
Estado gr=gradiente tÈrmico
2         0.00002       0.16667   0.00000       0.00000
1         -0.00008      0.16667   0.00000       0.00000
10        0.00026       0.16667   0.00000       0.00000
-------------------------------------------------------
Estado z1=1b1+1cm
2         -0.00049      0.33333   0.00000       0.00000
1         0.00051       0.83333   0.00000       0.00000
10        -0.00063      0.16667   0.00000       0.00000
-------------------------------------------------------
Estado z2=1b2+1cm
2         -0.00032      0.33333   0.00000       0.00000
1         0.00032       0.83333   0.00000       0.00000
10        -0.00041      0.16667   0.00000       0.00000
-------------------------------------------------------
Estado pp=peso propio
2         -0.00063      0.33333   0.00000       0.00000
1         0.00065       0.83333   0.00000       0.00000
10        -0.00081      0.16667   0.00000       0.00000
-------------------------------------------------------
```

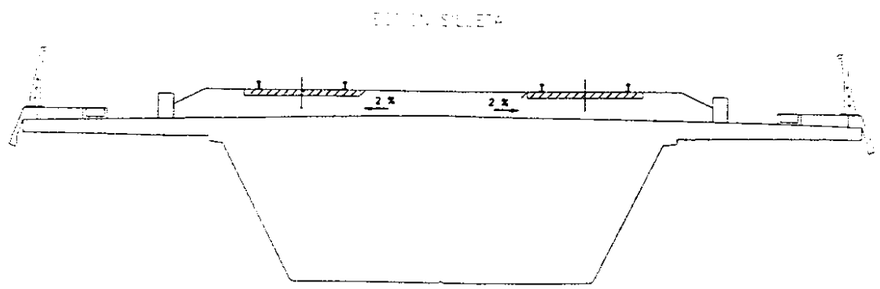


ESCALA 1\300



ESCALA 1\50





MATERIAL			NIVEL DE CONTROL	COEFICIENTE DE SEGURIDAD APLICADO EN
HORMIGON EN PREFABR	VIGAS PREFABR.	HP-60/B/17/II a		
	PILAS	HA-35/B/17/II a		
HORMIGON IN SITU	LOSA	HP-30/B/20/II a		
	CIMENTACIONES	HA-25/F/20/II a		
ACERO PASIVO	EN PREFABR	B 500 S		
	IN SITU	B 500 S		
ACERO ACTIVO	EN VIGAS	Cordones Y 1860S7		

TIPO DE ACCION	NIVEL DE CONTROL
PERMANENTE	
VARIABLE	

OFICINA TECNICA ALVISA S.L.

PRETENSADOS LIGEROS Y PESADOS

CLIENTE: UTE ALT CAMP — FECHA: — Nº PLANO:

L.A.V. MADRID-BARCELONA

Tramo LLEIDA-MARTORELL Subtramo V VALLS — 15-12-05 — 02-08 937-01-D

ESCALA: INDICADAS — DESIGNACION:

REFERENCIA

Nº de Expte.: 8-08 937

Este plano no puede ser reproducido total o parcialmente ni tratado por cualquier medio electrónico sin previa autorización escrita de ALVISA

COMP	MODIFICADO	FECHA	SUSTITUYE A
MARIA SUBIAS	05-08-05	02-08 937-01-C	
MARIA SUBIAS	06-09-05	02-08 937-01-B	
MARIA SUBIAS	29-09-05	02-08 937-01-A	

DIBUJADO: NURIA LUNA

OBSERVACIONES

FASE 2 – Colocación de placas sombrero P-1 y P-4 (sujetas a las pilas con barras verticales tipo macalloy) (*)
– Ejecución cosido transversal entre vigas

FASE 3 – Tesado de barras macalloy de anclaje a pila a 25 Tn cada una
– Colocación de vigas laterales (**)

FASE 4 – Colocación de placas sombrero P-2 y P-3 (sujetas a las pilas con barras verticales tipo macalloy) (*)
– Ejecución cosido transversal entre vigas

FASE 5 – Tesado de barras macalloy de anclaje a pila a 25 Tn cada una
– Colocación resto de vigas, ejecución cosido transversal y placas de encofrado autoportante

FASE 6 – Ejecución hormigonado
– Hormigonado losa de vanos 2 y 4
– Retirada de tornapuntas de vanos 2 y 4

Entre el hormigonado de las fases 6 y 7, deberán transcurrir al menos 48 horas ó H ≥ 200 Kg\cm2.

FASE 7 – Hormigonado resto de losa en fase 1

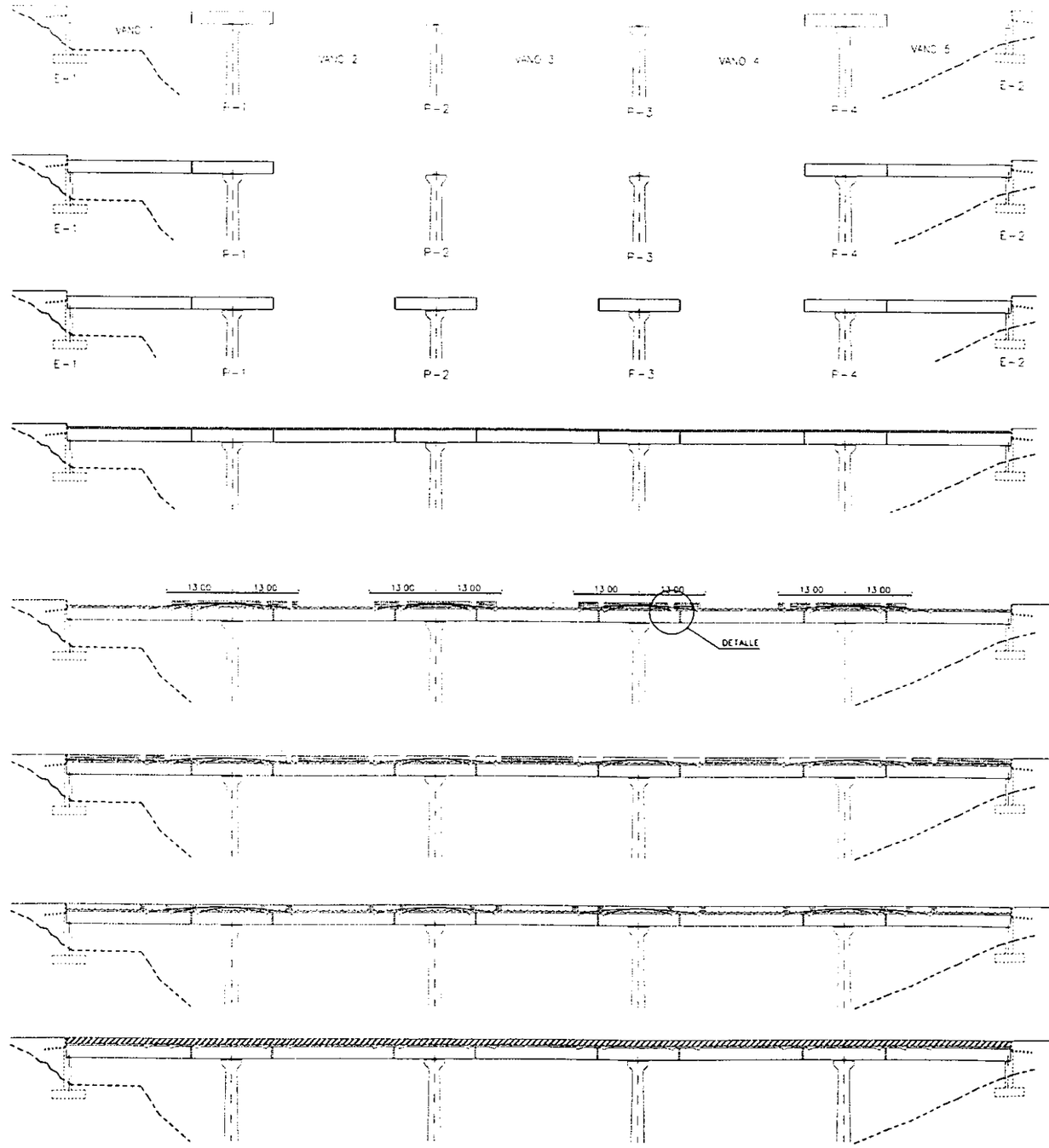
Para efectuar postesado de armadura activa H losa ≥ 250 Kg\cm2

FASE 8 – Tesado de armadura de losa
– Retirada de tornapuntas de placas

FASE 9 – Hormigonado de losa en fase II

FASE 10 – Retirada de gatos de arena

FASE 11 – Colocación de balasto, vías, catenarias y barreras



(*) – Para la colocación de placas sombrero se deberán ejecutar unos miseles provisionales de dimensiones en planta ~ 0.50 x 0.50 para apoyo de los gatos de arena. La altura de los gatos de arena considerada será de 18 cm.

(**) – Existe la posibilidad en esta fase de montaje de colocar las placas de encofrado autoportante sobre piezas sombrero, colocando siempre en primer lugar las prelosas correspondientes a los vanos 2 y 4 y posteriormente las de los vanos 1 y 5 para evitar desequilibrios.

DETALLE
SIN HORMIGONAR ZONA ENTRE NERVIOS DE PLACAS

LA ARMADURA PASIVA DE LA LOSA DE ESTA ZONA SE DISPONDRA UNA VEZ TESADOS LOS TORONES DE LOSA

FASE I
~ 0.50
~ 0.50
JUNTA DE HORMIGONADO CON NERVOMETAL O SIMILAR

FASE II – HORMIGONADO DE LOSA

FASE III

REV.	FECHA	MODIFICADO	COMP.
4	07-08 937-03-A	SUSTITUYE A	
3	06-11-02	MAN. SUBIAS	
2	31-07-02	J. SUBIAS	
1	02-08 937-02-C	10-12-02	REV. LUNA

OBSERVACIONES

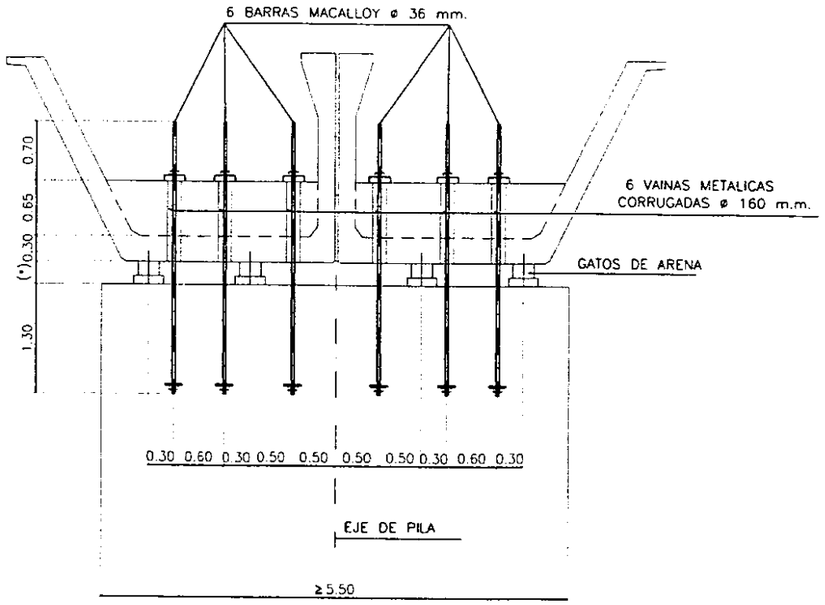
PREFABRICACION LIGERA Y PESADA
OFICINA TECNICA ALVISA S.L.

CLIENTE UTE ALT CAMP
L.A.V. MADRID–BARCELONA
TRAMO LLEIDA–MARTORELL SUBTRAMO V VIALS
FECHA 18-12-02
Nº PLANO 02-08 937-

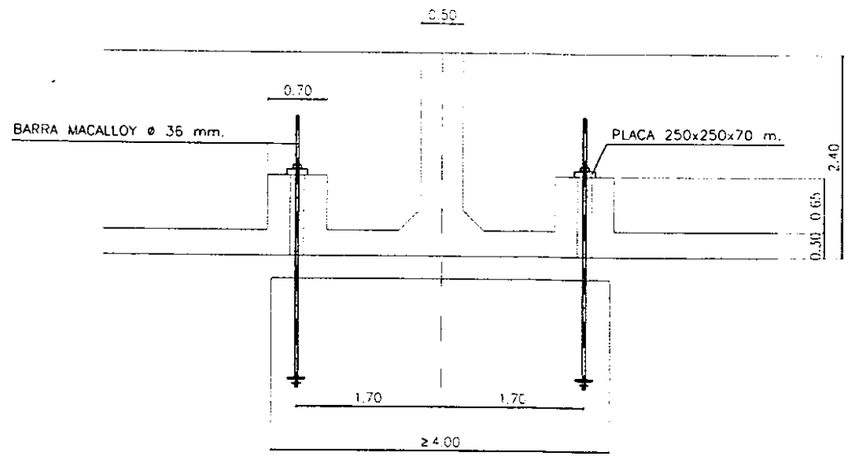
ESCALA INDICADAS
DESIGNACION
REFERENCIA
Nº de Expte. : B-08 937

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ESCALA 1\50

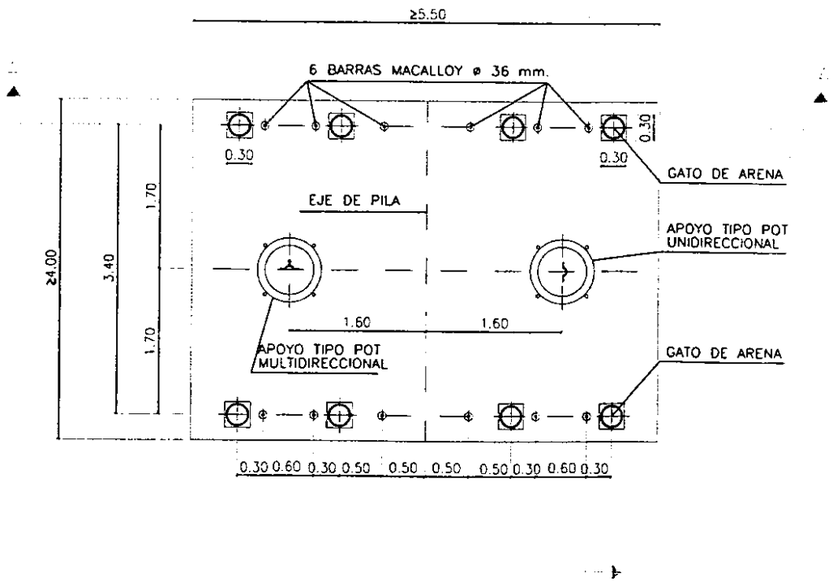


ESCALA 1\50



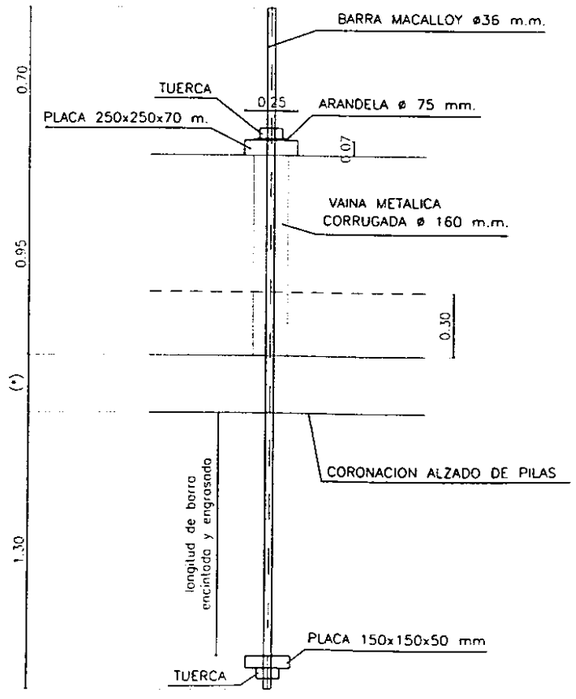
PLANTA PILA TIPO

ESCALA 1\50



DETALLE DE PILA E

ESCALA 1\20



(*) cota pendiente de dimensiones de apoyo tipo "POT"

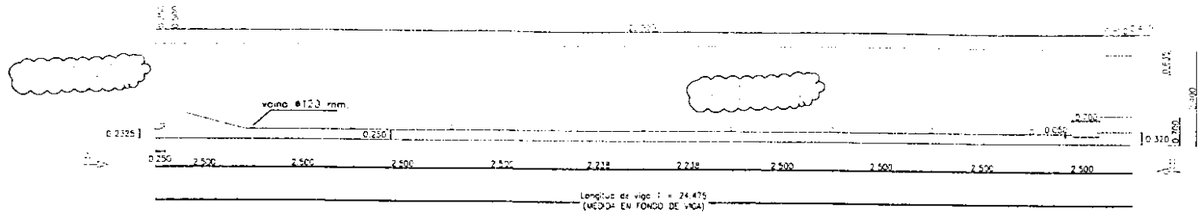
DIBUJADO	MARIA SUBIAS			
COMP.				
MODIFICADO	MARIA SUBIAS			
FECHA	08-05-02			
SUSTITUYE A	02-08.937-03-A			
OBSERVACIONES				

PREFABRICACION LIGERA Y PESADA

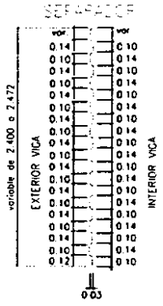
OFICINA TECNICA ALVISA ©

CLIENTE: UTE ALT CAMP L.A.V. MADRID-BARCELONA TRAMO: LLEIDA-MARTORELL SUBTRAMO V.VALLS	FECHA: 29-04-02	Nº PLANO: 02-08.937-03-B
ESCALA: INDICADAS	DESIGNACION: PILA E	
REFERENCIA		
Nº de Expte. : B-08.937		

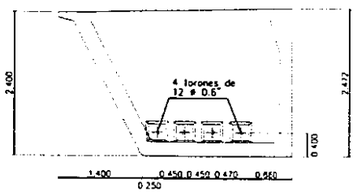
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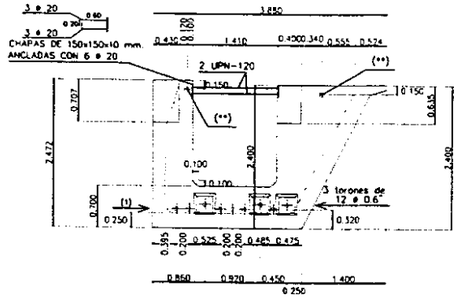
SEPARACION



VISTA POR A

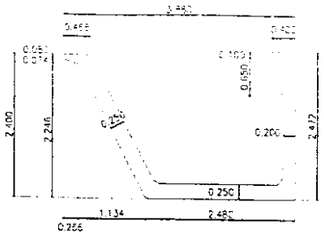


VISTA POR B

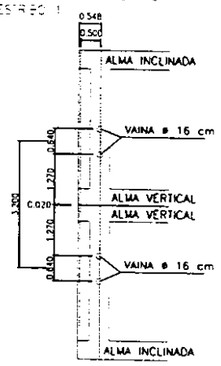


(*) = 1 vaina ø 80 mm. para pasar 4 torones sueltos y 4 ø 20 mm. roscados a 45° con placas de anclaje arandela y tuerca

(**) = 1 vaina ø 80 mm. para pasar barras Macalloy ø 32 mm. Tensadas a 65 t. con placa de anclaje arandela y tuerca



ESTRIBO 1



- HORMIGON
  - Viga HP-60/B/17/II o
- ACERO
  - PASIVO : B 500 S
  - ACTIVO : Cordones Y 1860S7

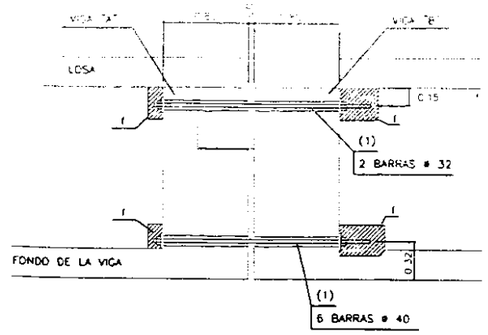


DIAGRAMA PARA EL CONTROL DE PUESTA EN OBRA

a = Montaje de piezas prefabricadas

b = Colocación de barras antiguadas M+N 1050 (1)

c = Apriete de ajuste

d = Relleno de pettogrout en la junta

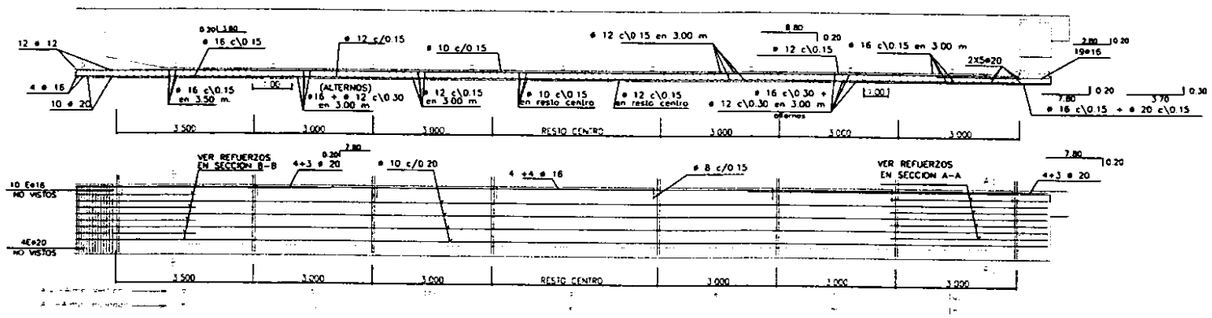
e = A los 24 horas apriete con gato a 70% de la carga de rotura
- ø 32 mm. mordaje 125x125 mm. se aprieta con 59 Tn. rotura 83 Tn.
- ø 40 mm. mordaje 150x150 mm. se aprieta con 91 Tn. rotura 130 Tn.
- ø 36 mm. mordaje 140x140 mm. se aprieta con 73 Tn. rotura 105 Tn.

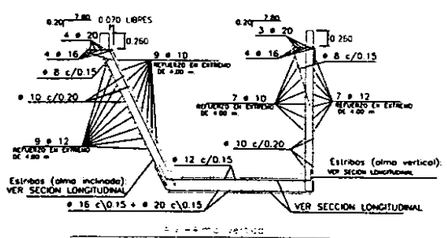
f = Hormigonado de cajas de protección de anclaje con pettogrout o similar

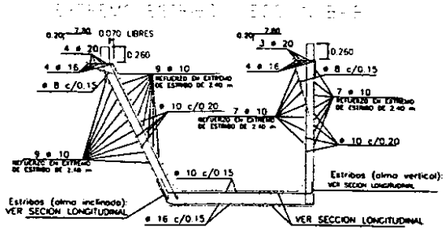
g = Hormigonado de la losa con su ferralla

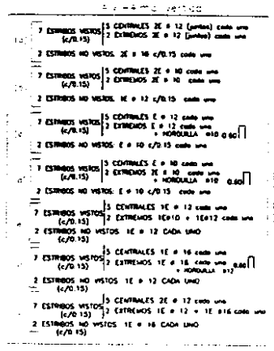
NOTA: EL CONTROL DEL TESADO DE BARRAS SE REALIZARA MEDIANTE DOBLE MANOMETRO DEBIDO A LA PEQUEÑA LONGITUD DE LAS BARRAS

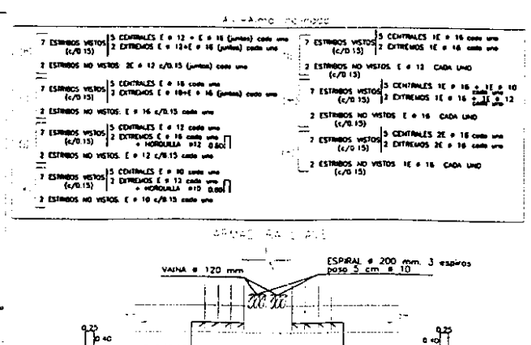
ARMADO DE LOSA Y ARMADO DE PILA

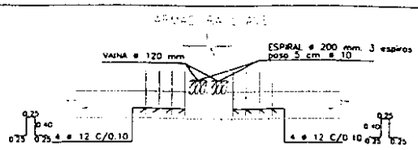


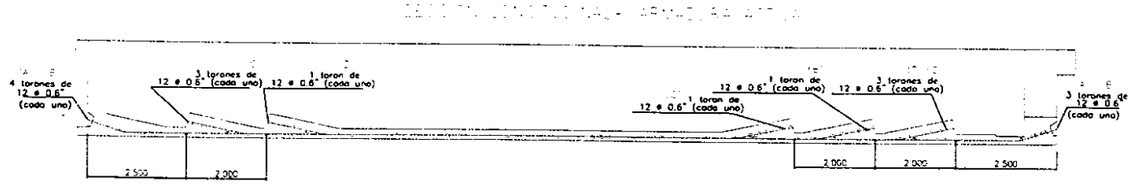


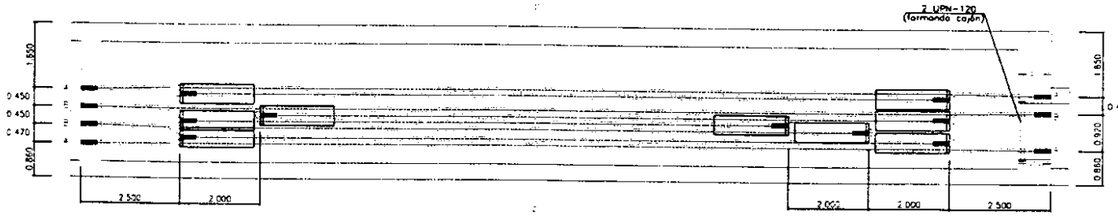


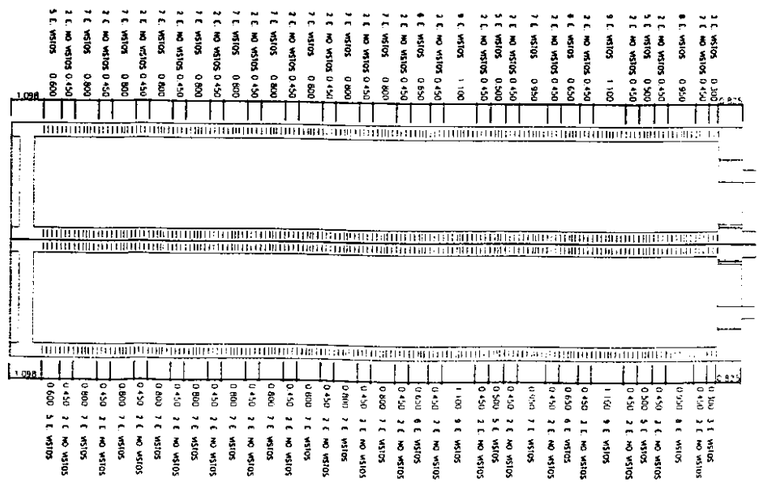




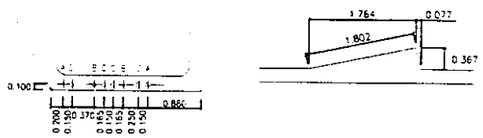








ESCALA 1:50

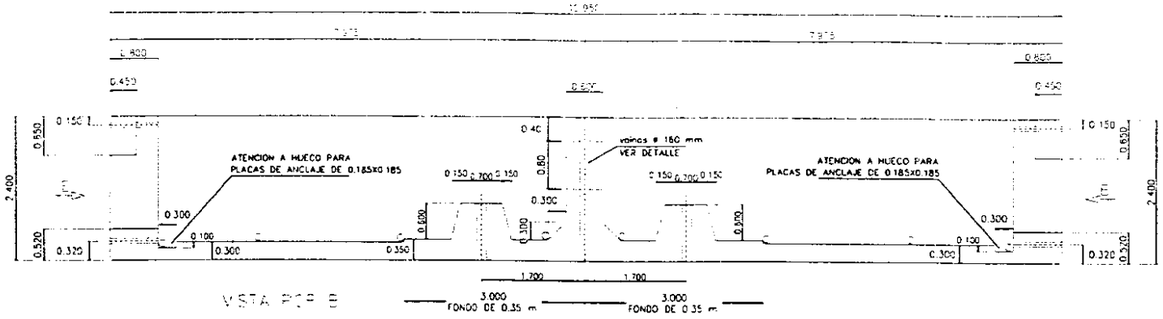


PREFABRICACION LIGERA Y PESADA
OFICINA TECNICA ALVISA

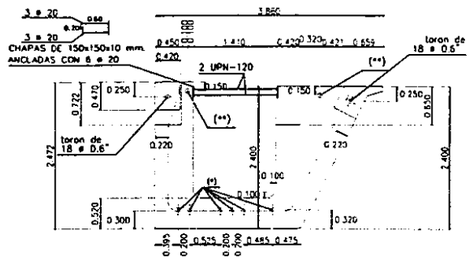
CLIENTE: I.T.E. DEL CENTRO
L.A.V. MADRID-BARCELONA
TRAMO LLEIDA-MARTORELL SUBTRAMO V VALLS
FECHA: 98-09-02
Nº PLANO: 98-08 937-04-5
ESCALA: INDICADAS
DESIGNACION:
REFERENCIA
Nº de Expte. : 8-08 937

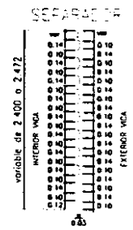
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ANA SUBIAS	30-01-02	03-08 937-04-4	SUSTITUYE A
DIBUJADO	MODIFICADO	FECHA	OBSERVACIONES

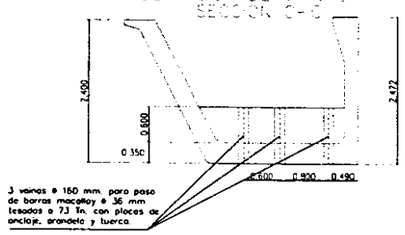


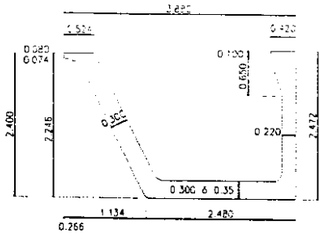
VISTA POR B





DEFINICION DE VAINAS SECCION C-C

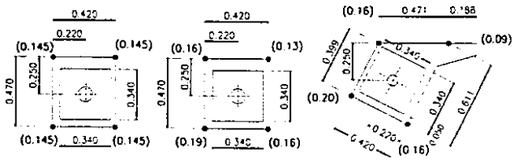




DETALLE VAINAS EN DIAFRAGMA

Entre parentesis aparece profundidad de los puntos del cajeados de torones

DETALLE CAJEADO DE TORONES



Compuesta por 12 cordones de 0.6"	1.650 mm²	13,80 Kg/m
Compuesto por 16 cordones de 0.6"	2.500 mm²	20,70 Kg/m

CARACTERISTICAS DEL ACERO

Tensión Garantizada de Rotura	Tensión máxima al 0,2 %	Relajación máxima a las 1.000 horas
190 Kg/mm²	170 Kg/mm²	2 %

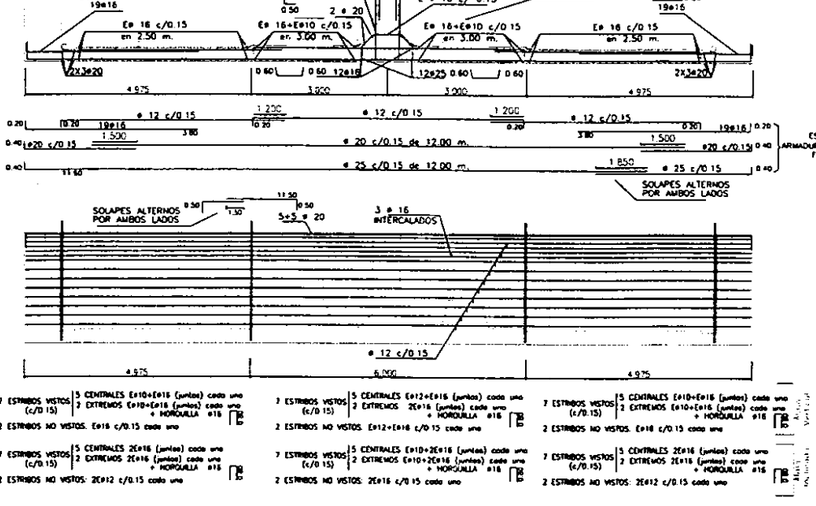
Valores considerados en el calculo de las perdidas de tensiones de las armaduras activas :

- Coeficiente de Rozamiento en curva $u = 0,20$
- Coeficiente de Rozamiento parasito $k = 0,005$
- Penetracion en cuñas < 4 mm
- Las vainas seran corrugadas estancas de { ø 75 mm. para 12 ø 0.6" / ø 100 mm. para 18 ø 0.6" } y 0,4 mm. como minimo de espesor
- El Esfuerzo inicial de tesado sera de { 249 Tn. en 12 ø 0.6" / 374 Tn. en 18 ø 0.6" } por cable, medido detras del anclaje.
- No se iniciara la puesta hasta que el relleno de la junta alcance una resistencia caracteristica superior a 400 Kg/cm.²
- Todo lo que no se indica explicitamente en los planos, se regira por la EHE

NOTAS :

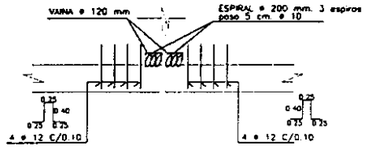
- Los recubrimientos y las longitudes de solape serán las correspondientes indicadas en la EHE

- HORMIGON
  - Viga: HP-60/B/17/II c
- ACERO
  - PASIVO : B 500 S
  - ACTIVO : Cordones Y 1860S7

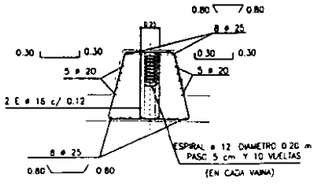


7 ESTRIBOS VISTOS (c/0.15)	5 CENTRALES E ø10+E ø16 (juntos) cada uno 2 EXTREMOS E ø10+E ø16 (juntos) cada uno + HORQUILLA ø16	5 CENTRALES E ø12+E ø16 (juntos) cada uno 2 EXTREMOS 2E ø16 (juntos) cada uno + HORQUILLA ø16	5 CENTRALES E ø10+E ø16 (juntos) cada uno 2 EXTREMOS E ø10+E ø16 (juntos) cada uno + HORQUILLA ø16
2 ESTRIBOS NO VISTOS. E ø16 c/0.15 cada uno			
7 ESTRIBOS VISTOS (c/0.15)	5 CENTRALES 2E ø16 (juntos) cada uno 2 EXTREMOS 2E ø16 (juntos) cada uno + HORQUILLA ø16	5 CENTRALES E ø10+2E ø16 (juntos) cada uno 2 EXTREMOS E ø10+2E ø16 (juntos) cada uno + HORQUILLA ø16	5 CENTRALES 2E ø16 (juntos) cada uno 2 EXTREMOS 2E ø16 (juntos) cada uno + HORQUILLA ø16
2 ESTRIBOS NO VISTOS: 2E ø12 c/0.15 cada uno	2 ESTRIBOS NO VISTOS. 2E ø16 c/0.15 cada uno	2 ESTRIBOS NO VISTOS: 2E ø12 c/0.15 cada uno	

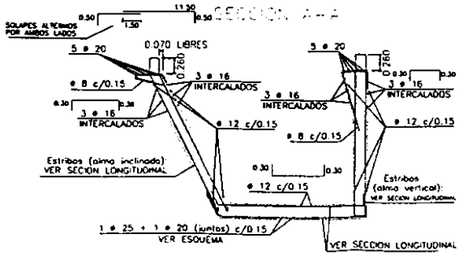
ARMADURA LOSA



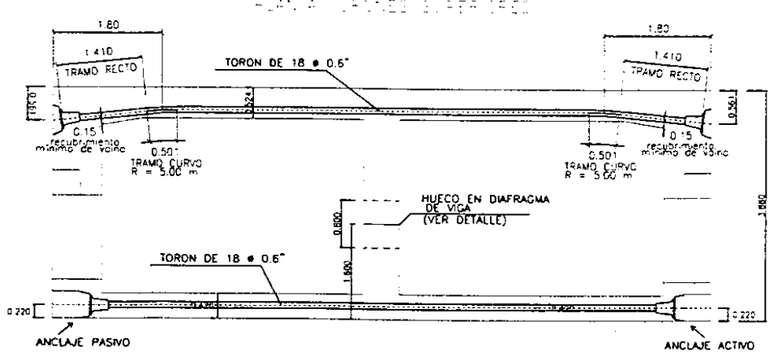
DETALLE-1 ARMADURA DIAFRAGMA



SECCION A-A

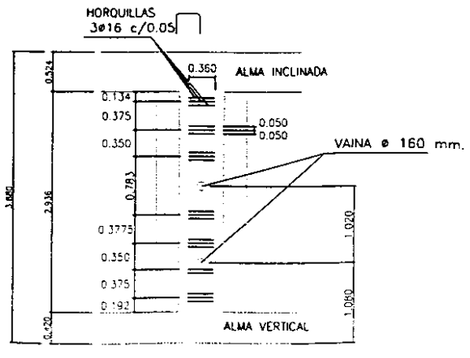


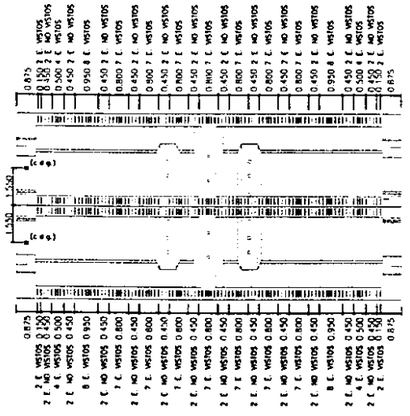
PLANTA TENDIDO SUPERIOR



ESTRIBOS EN ZONA DE LA PILA

PLANTA DE VANOS EN PLANTA



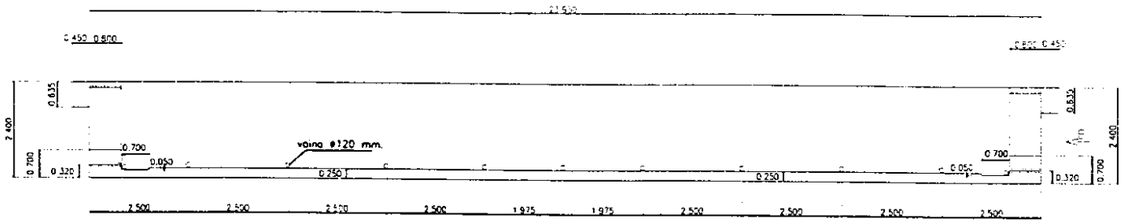


OBSERVACIONES					
SUSTITUYE A	02-08.937-05-A				
FECHA	20-01-03				
MODIFICADO	ANNA SUBIAS				
FOLIO					
DIBUJADO	ANNA SUBIAS				

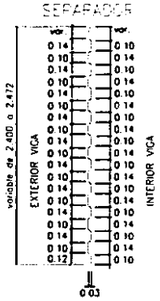
OFICINA TECNICA ALVISA

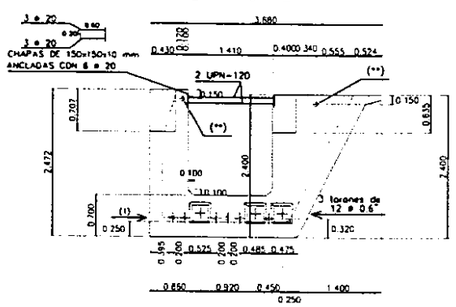
CLIENTE	L.A.V. MADRID-BARCELONA
TRAMO	LLEIDA-MARTORELL SUBTRAMO V VALLS
FECHA	26-05-03
Nº PLANO	02-08.937-V5-E
ESCALA	INDICADAS
DESIGNACION	
REFERENCIA	
Nº de Expte.	: 8-08.937

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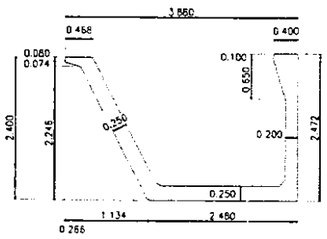


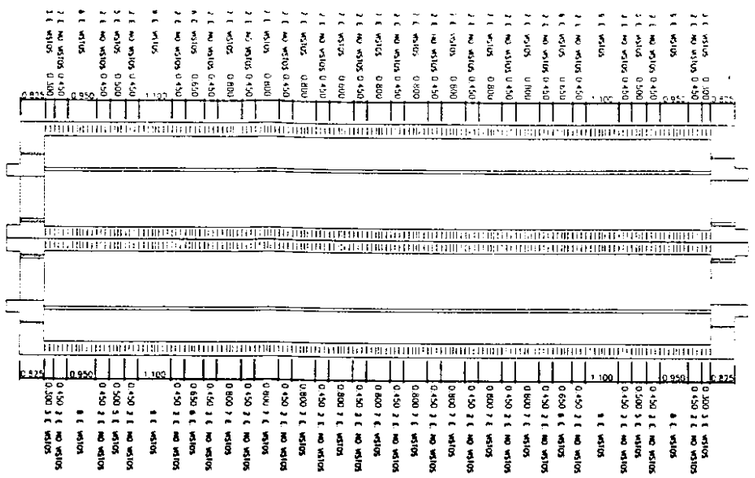
VISTA POR E



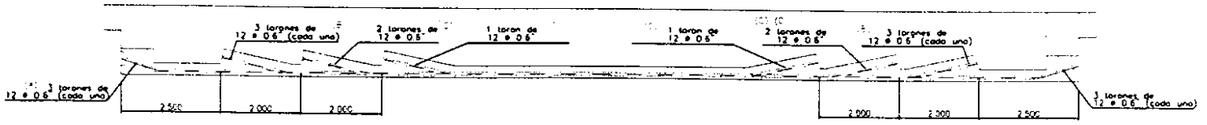


DEFINICION GEOMETRICA
SECCION TRANSVERSAL

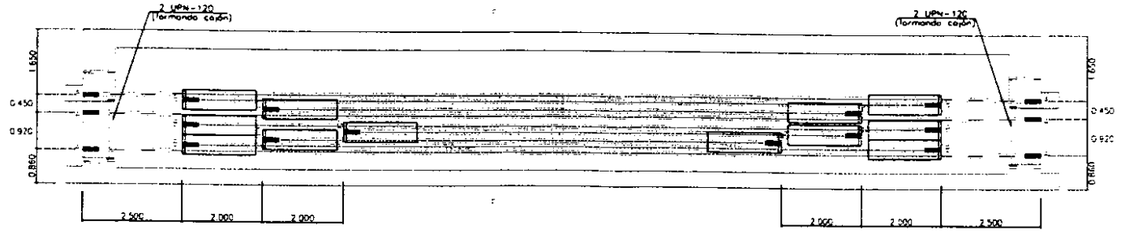


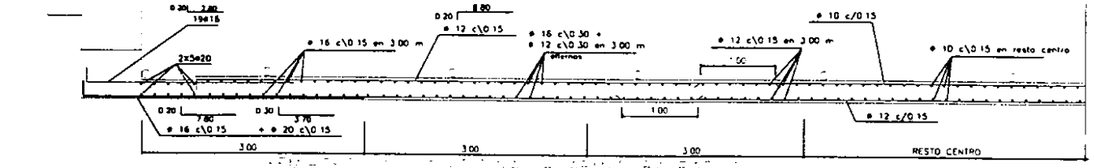


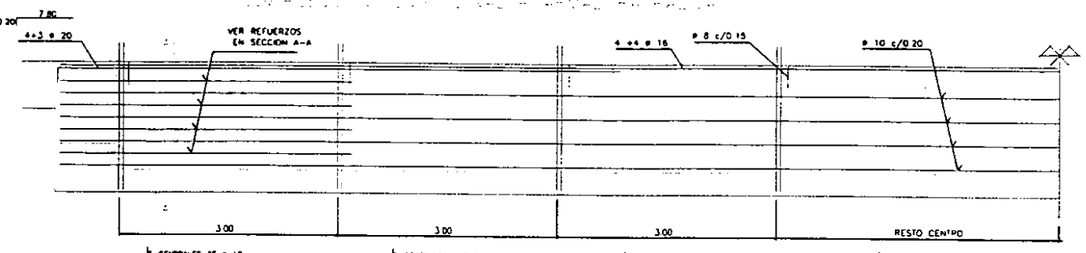
- HORMIGON
  - Viga: HP-60/B/17/II o
- ACERO
  PASIVO
  B 500 S
  ACTIVO :
  Cordones Y 1860S7



ALZADO

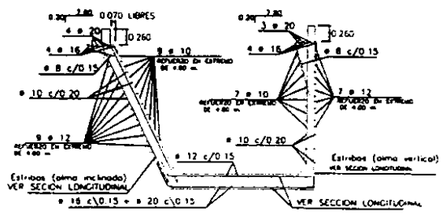




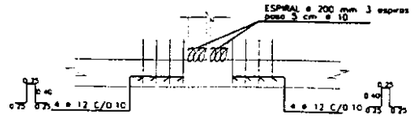


7 ESTRIBOS VISTOS (c/0.15) + 2 ESTRIBOS NO VISTOS 1 E ø 16 CADA UNO (c/0.15)	5 CENTRALES 2E ø 12 + 2 EXTREMOS 1E ø 12 + 1E ø 16	7 ESTRIBOS VISTOS (c/0.15) + 2 ESTRIBOS NO VISTOS 1 E ø 16 CADA UNO (c/0.15)	5 CENTRALES 1 E ø 16 + 2 EXTREMOS 1 E ø 16 + HORQUILLA ø12
7 ESTRIBOS VISTOS (c/0.15) + 2 ESTRIBOS NO VISTOS 1E ø 18 CADA UNO (c/0.15)	5 CENTRALES 2E ø 18 + 2 EXTREMOS 2E ø 18	7 ESTRIBOS VISTOS (c/0.15) + 2 ESTRIBOS NO VISTOS E ø 16 CADA UNO (c/0.15)	5 CENTRALES 1E ø 18 + 1E ø 10 + 2 EXTREMOS 1E ø 18 + 1E ø 12
7 ESTRIBOS VISTOS (c/0.15) + 2 ESTRIBOS NO VISTOS E ø 12 CADA UNO (c/0.15)	5 CENTRALES 1E ø 18 + 2 EXTREMOS 1E ø 16	7 ESTRIBOS VISTOS (c/0.15) + 2 ESTRIBOS NO VISTOS E ø 10 CADA UNO (c/0.15)	5 CENTRALES 1E ø 10 + 2 EXTREMOS 2 E ø 10 + 1E ø 10 + HORQUILLA ø10

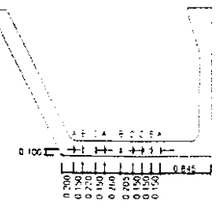
ARMADURA PASIVA
(SECCION A-A)



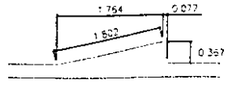
ARMADURA LLAVE



SECCION B-B



DETALLE DE FIJACION DE ANCLAJE
ESCALA 1:50



OBSERVACIONES				
SUSTITUYE A:				
02-08.937-06-A				
FECHA	30-01-03			
MODIFICADO				
COMP.				
DIBUJADO	MAN SUBIAS	MAN SUBIAS		

OFICINA TECNICA ALVISA

CLIENTE: UTE ALT CENIS
L.A.V. MADRID-BARCELONA
TRAMO LLEIDA-MARTORELL SUBTRAMO V VALLS

FECHA

Nº PLANO

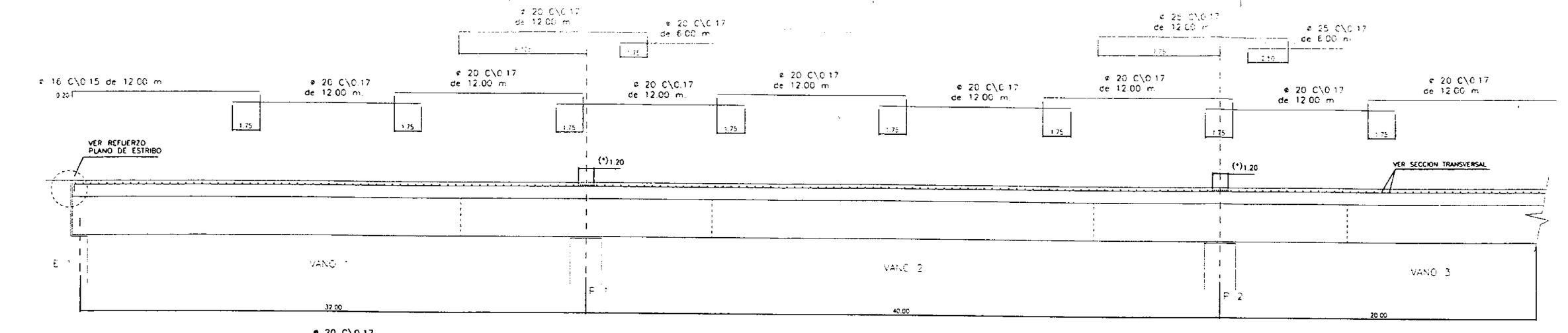
ESCALA: INDICADAS

DESIGNACION

REFERENCIA

Nº de Expte. : 8-08 937

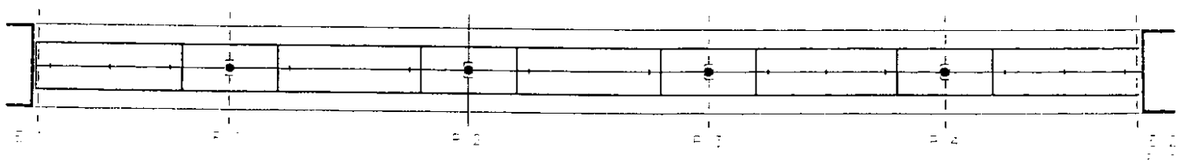
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(*) = 14 ø 25 sobre pilas (L=12.00 m)
(Adicional a la armadura del tablero)

ESQUEMA DE DISPOSICION DE APOYOS

LADO IZQUIERDO : APOYOS UD (A, C, E, G, I y K)

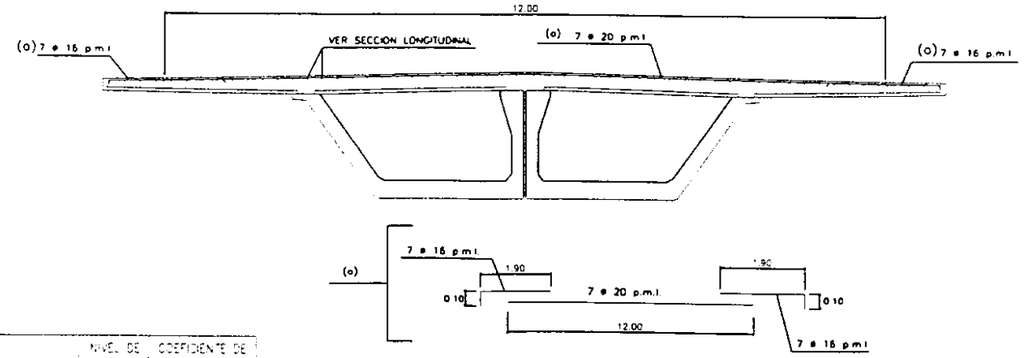


LADO DERECHO : APOYOS OD (B, D, F, H, J y L)

		Ref.	Reacción máx. (envolvente)	Reacción mín. (envolvente)	Carga permanente	Δ_t^+	Δ_t^-	Δ_r	Δ_{rp}
P-1	UD/1ud	A	509 Tn.	91 Tn.	51 Tn.	138mm.	-46 mm.	0	0
	OD/1ud	B	509 Tn.	91 Tn.	0 Tn.	138mm.	-46 mm.	2 mm.	-1 mm.
P-2	UD/1ud	C	1446 Tn.	384 Tn.	111 Tn.	114mm.	-38 mm.	0	0
	OD/1ud	D	1446 Tn.	384 Tn.	0 Tn.	114mm.	-38 mm.	2 mm.	-1 mm.
P-3	UD/1ud	E	1446 Tn.	384 Tn.	111 Tn.	84 mm.	-28 mm.	0	0
	OD/ud	F	1446 Tn.	384 Tn.	0 Tn.	84 mm.	-28 mm.	2 mm.	-1 mm.
P-3	UD/ud	G	1446 Tn.	384 Tn.	111 Tn.	54 mm.	-18 mm.	0	0
	OD/1ud	H	1446 Tn.	384 Tn.	0 Tn.	54 mm.	-18 mm.	2 mm.	-1 mm.
P-4	UD/ud	I	1446 Tn.	384 Tn.	111 Tn.	24 mm.	-8 mm	0	0
	OD/1ud	J	1446 Tn.	384 Tn.	0 Tn.	24 mm.	-8 mm.	2 mm.	-1 mm.
	UD/ud	K	509 Tn.	91 Tn.	51 Tn.	0 mm.	0 mm.	0	0
	OD/1ud	L	509 Tn.	91 Tn.	0 Tn.	0 mm.	0 mm.	2 mm.	-1 mm.

⊖
⊕

SECCION TRANSVERSAL
ARMADURA DE LOSA
ESCALA 1\50



MATERIAL			NIVEL DE CONTROL	COEFICIENTE DE PONDERACION
HORMIGON	EN PREFABR. VIGAS PREFABR.	HP-60/B/17/II o	[illegible]	γ_c = 1.5
	EN PREFABR. PRELOSA NERVADA	HP-40/B/17/II o	[illegible]	γ_c = 1.50
	IN SITU LOSA	HP-30/B/20/II o	[illegible]	γ_c = 1.50
ACERO	PASIVO EN PREFABR.	B 500 S	[illegible]	γ_s = 1.15
	PASIVO IN SITU	B 500 S	[illegible]	γ_s = 1.15
	ACTIVO [illegible]	Cordones Y 1860S7	[illegible]	γ_p = 1.15

[illegible] DE ACCIONES

PERMANENTE
VARIABLE

DIBUJADO	COMP	MODIFICADO	FECHA	OBSERVACIONES
MARIA SUBIAS		VIGAS SUBIAS	27-06-02	02-08.937-07-F
MARIA SUBIAS		VIGAS SUBIAS	29-07-02	02-08.937-07-E
MARIA SUBIAS		VIGAS SUBIAS	11-07-02	02-08.937-07-D
MARIA SUBIAS		VIGAS SUBIAS	11-07-02	02-08.937-07-C
DIBUJADO	COMP	MODIFICADO	FECHA	SUSTITUYE A

PREFABRICACION LIGERA Y PESADA

OFICINA TECNICA ALVISA S.L.

CLIENTE UTE ALT CAMP
L.A.V. MADRID-BARCELONA
TRAMO LLEIDA-MARTORELL SUBTRAMO V VALLS

FECHA 08-05-02

Nº PLANO 02-08.937-07-C

ESCALA INDICADAS

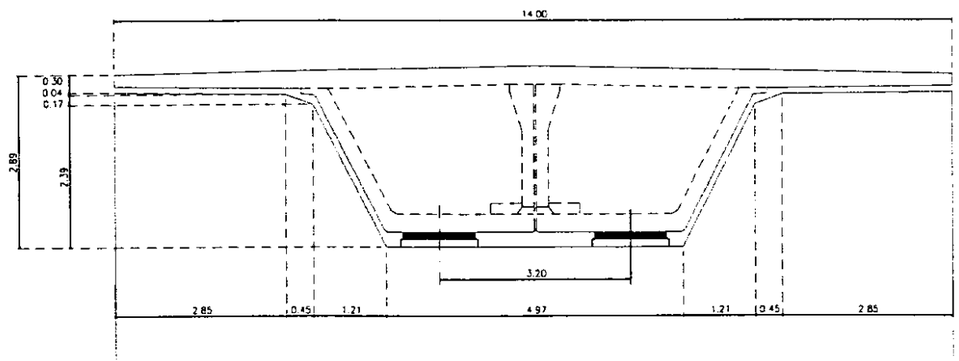
DESIGNACION

REFERENCIA

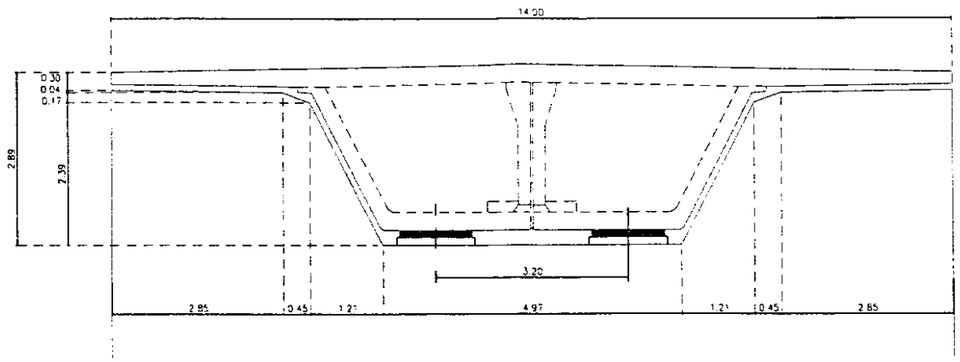
Nº de Expte. : 8-08.937

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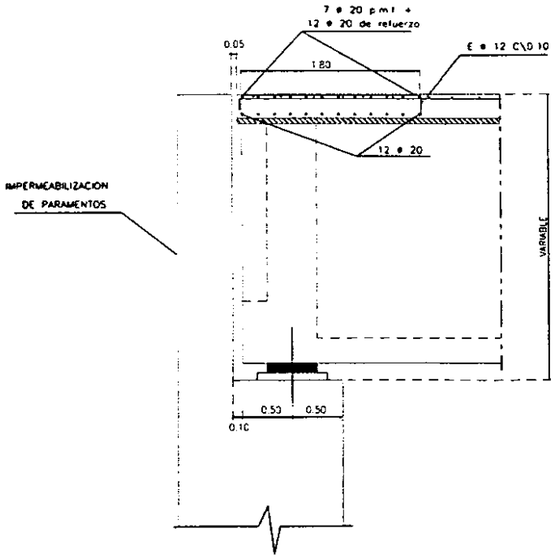
SECCION
ESCALA 1\50



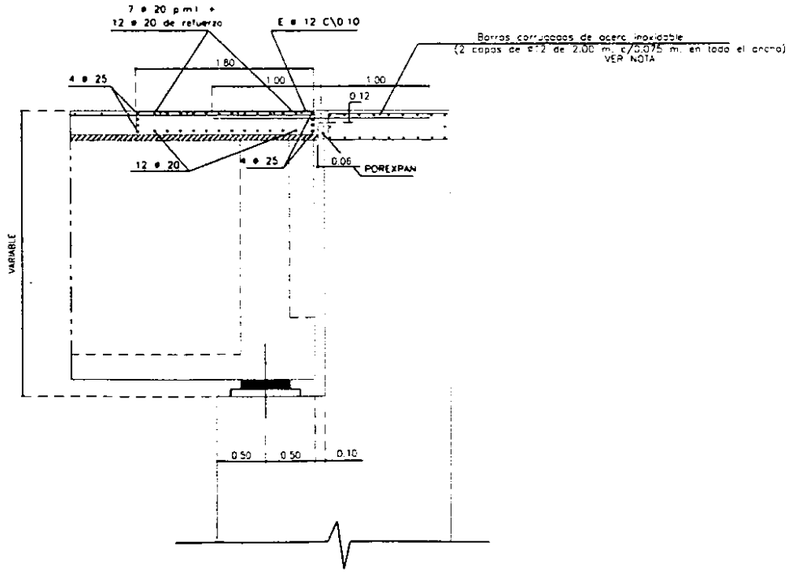
SECCION
ESCALA 1\50



ESCALA 1\30



ESCALA 1\30



NOTA
El acero inoxidable será de tipo AISI 304 o similar
Se pueden emplear barras de diámetros distintos a ø12 siempre que se disponga una cuantía parecida

MATERIAL			NIVEL DE CONTROL	COEFICIENTE DE PONDERACION
HORMIGON	EN PREFABR. VIGAS PREFABR.	HP-60/B/17/II a		
	EN PREFABR. PRELOSA NERVADA	HP-40/B/17/II a		
	IN SITU LOSA	HP-30/B/20/II a		
ACERO	PASIVO EN PREFABR.	B 500 S		
	PASIVO IN SITU	B 500 S		
	ACTIVO EN PREFABR.	Cordones Y 1860S7		

TIPO DE ACCION	NIVEL DE CONTROL
PERMANENTE	
VARIABLE	

SUBAS subs SUBAS	05-08-02	02-08.937-00-B	SUSTITUYE A		
SUBAS subs SUBAS	31-05-02	02-08.937-00-A			
AUTOR	FECHA	MODIFICADO	COMP		OBSERVACIONES

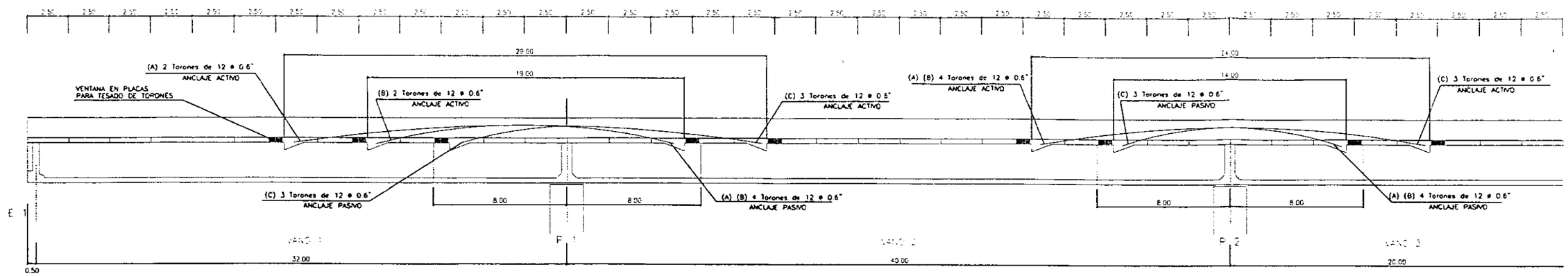
PREFABRICACION LIGERA Y PESADA

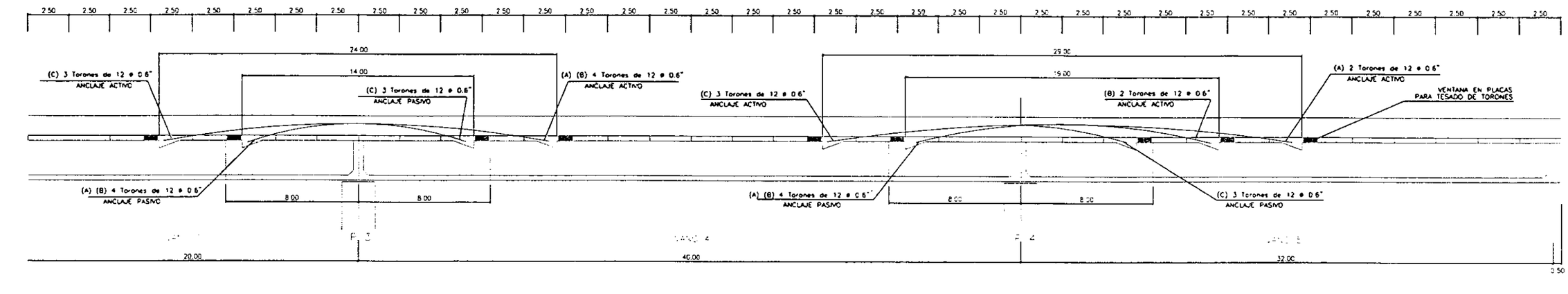
OFICINA TECNICA ALVISA S.L.

CLIENTE UTE ACT CAMP L.A.V. MADRID-BARCELONA TRAMO LLEIDA-MARTORELL SUBTRAMO V.VALLS	FECHA 08-05-02	Nº PLANO 02-08.937-08-C
ESCALA INDICADAS	DESIGNACION	
REFERENCIA Nº de Expte. : 8-08.937		

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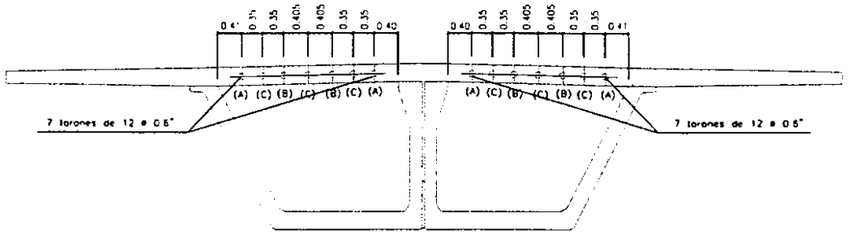
ESCALA 1\125



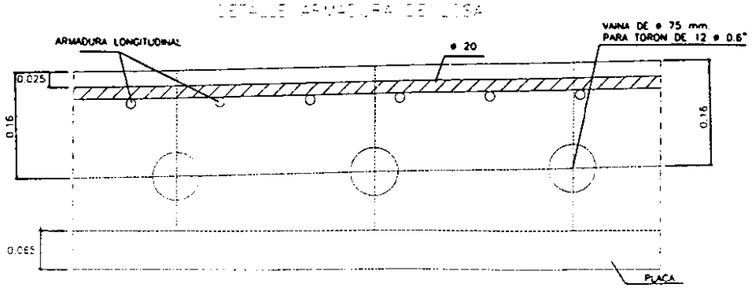


SECCION TRANSVERSAL

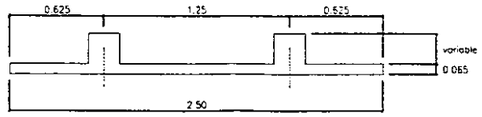
ESCALA 1\50



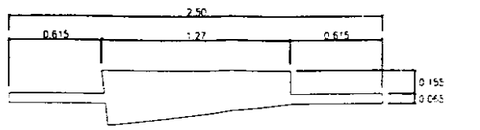
DETALLE ARMADURA DE LOSA



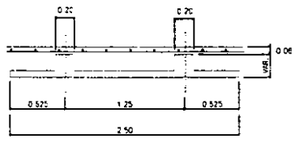
(*) PLACA NERVADA ALTERNATIVA



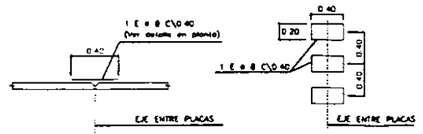
(**) PLACA NERVADA ALTERNATIVA
CON ANCLAJES DE POSTESADO INCORPORADOS



PLACA NERVADA



DETALLE ARMADURA DE PLACA



Tipo de Cable	Area Neta de Acero	Peso por metro
Compuesto por 12 cordones de 0.6"	1.680 mm²	13,80 Kg/m

Tensión Garantizada de Rotura	Tensión máxima a 0.2 %	Relajación máxima a 1000 horas
190 Kg/mm²	170 Kg/mm²	2 %

Valores considerados en el calculo de las perdidas de tensiones de las armaduras activas

- Coeficiente de Rozamiento en curva μ = 0,20
- Coeficiente de Rozamiento parasito κ = 0,005
- Penetracion en cuñas < 4 mm
- Las vainas serán corrugadas estancas de ø 75 mm. y 0,4 mm. como mínimo de espesor
- El Esfuerzo inicial de tesado será de 249 Tn. por cable, medido detras de anclaje
- Todo lo que no se indica explícitamente en los planos, se regirá por la EHE

NOTAS :

- Los recubrimientos y las longitudes de solape serán los correspondientes indicados en la EHE.

- HORMIGON
  - Losa: HP-30/B/20/II a
  - Viga: HP-60/B/17/II a
  - prelosa: HP-40/B/17/II a
- ACERO
  - PASIVO : B 500 S
  - ACTIVO : Cordones Y 1850S7

PREFABRICACION LIGERA Y PESADA

OFICINA TECNICA ALVISA

CLIENTE	UTE ALT CAMP	FECHA	Nº PLANO
	L.A.V. MADRID-BARCELONA		
	TRAMO LLEIDA-MARTORELL SUBTRAMO V.VALLS	24-07-02	02-UE 937-4-13-A

ESCALA: INDICADAS

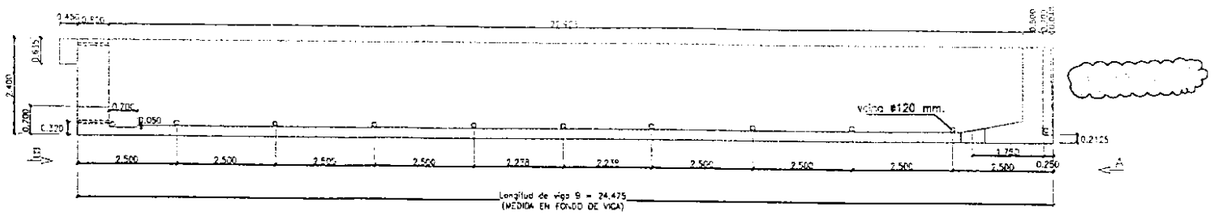
DESIGNACION:

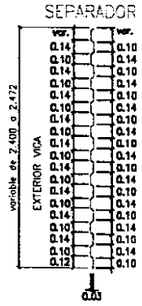
REFERENCIA

Nº de Expte. : 8-08.937

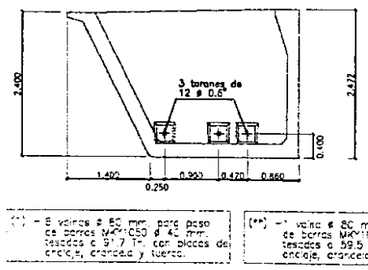
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Nº	FECHA	OBSERVACIONES
	20-08-02	SUSTITUYE A
	CIERRE	MODIFICADO
		COMP.
		ANULADO

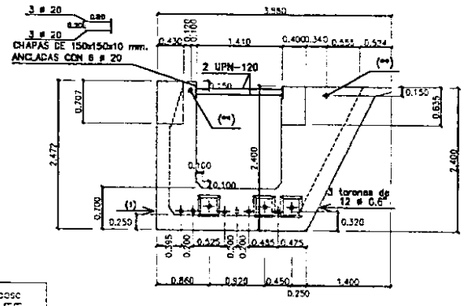




VISTA POR A



VISTA POR B

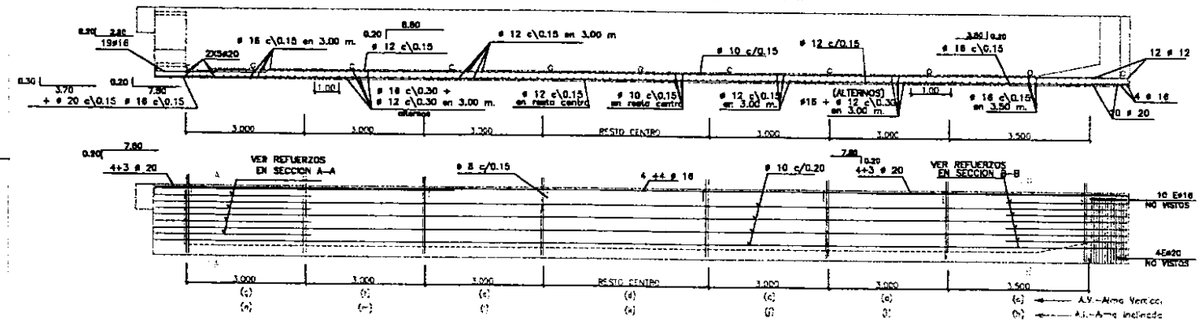


(*) = 8 vainas ø 80 mm. para paso de barras MKY 1050 ø 40 mm. tesadas a 91.7 Tn. con placas de anclaje, arandela y tuerca.

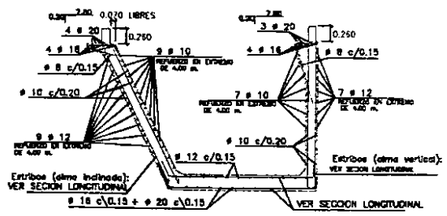
(**) = 1 vaina ø 80 mm. para paso de barras MKY 1050 ø 32 mm. tesadas a 59.5 Tn. con placa de anclaje, arandela y tuerca.

ARMADURA

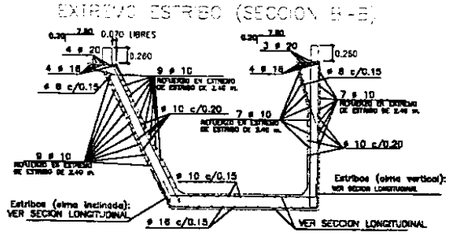
SECCION LONGITUDINAL – ARMADURA PASIVA

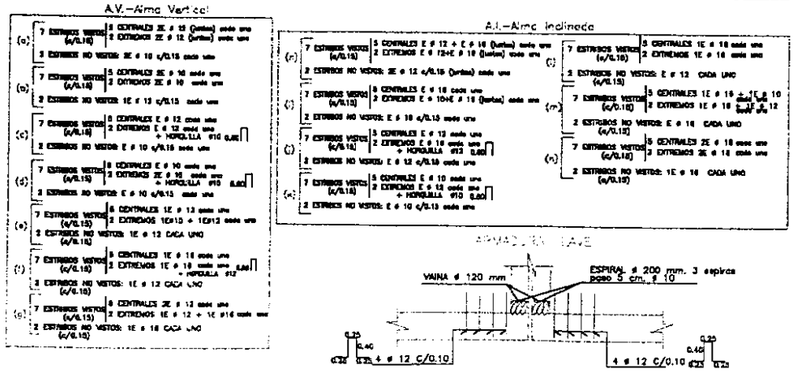


ARMADURA PASIVA (SECCION A-A)

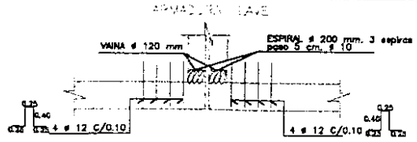


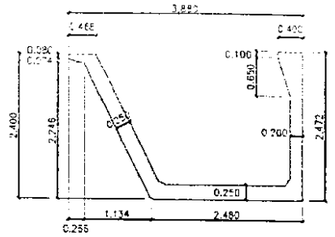
ARMADURA PASIVA EXTREMOS ESTRIBO (SECCION B-B)



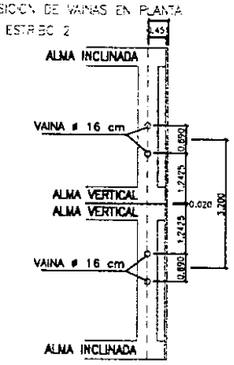


ARMADURA DE LOSA

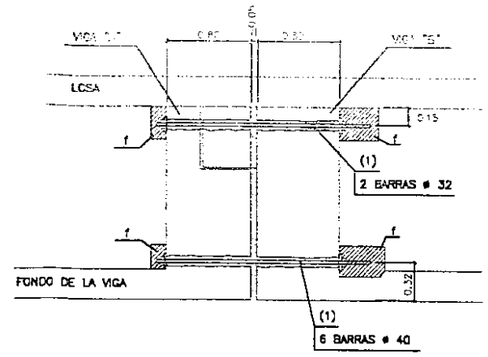




POSICION DE VAINAS EN PLANTA ESTRIBO 2



- HORMIGON
  - Viga: HP-60/B/17/II o
- ACERO
  - PASIVO : B 500 S
  - ACTIVO : Cordones Y 1860S7



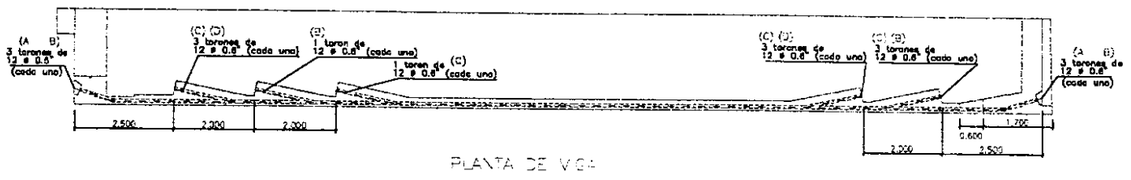
PROGRAMA PARA EJECUCION DE EMPALMES

c – Montaje de piezas prefabricadas
b – Colocación de barras enfundadas MKY 1050 (1)
c – Apriete de ajuste
c – Relleno de bettegrout en la junta
e – A los 24 horas apriete con gato al 70% de la carga de rotura
- ø 32 mm.–anclaje 125x125 mm.–se aprieta con 59Tn.–rotura 83Tn.
- ø 40 mm.–anclaje 150x150 mm.–se aprieta con 91Tn.–rotura 130Tn.
- ø 36 mm.–anclaje 140x140 mm.–se aprieta con 73 Tn.–rotura 105Tn.

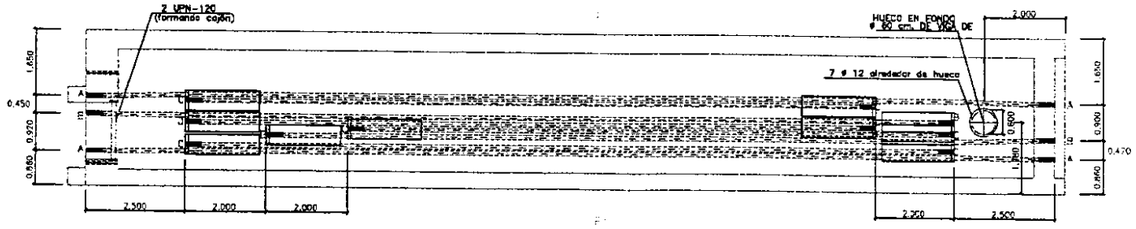
f – Hormigonado de cajas de protección de anclaje con bettegrout ó similar
g – Hormigonado de la losa con su ferralla

NOTA: EL CONTROL DEL TESADO DE BARRAS SE REALIZARA MEDIANTE DOBLE MANOMETRO DEBIDO A LA PEQUEÑA LONGITUD DE LAS BARRAS.

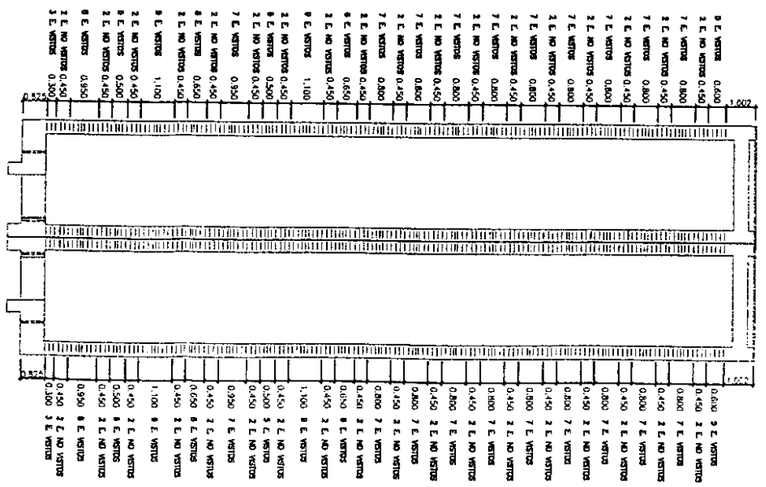
SECCION LONGITUDINAL – ARMADURA ACTIVA



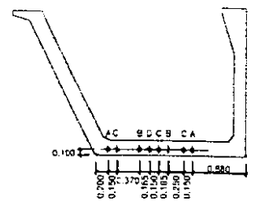
PLANTA DE VIGA



DISTRIBUCION DE ESTRIBOS VISTOS Y NO VISTOS



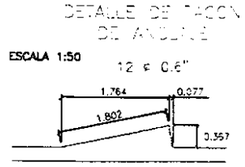
SECCION E-E



DETALLE DE FIJACION DE ANCLAJE

ESCALA 1:50

12 ø 0.6"



PRETENSADOS LLEIDA Y PENAGA

OFICINA TECNICA ALVISA

CLIENTE: UTE ALT CAMP		FECHA	Nº PLANO
L.A.V. MADRID–BARCELONA TRAMO: LLEIDA–MARTORELL SUBTRAMO V.VALLS		30-01-03	02-08.937-11-A
ESCALA: INDICADAS	DESIGNACION		
REFERENCIA Nº de Expte. : B-08.937			

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OBSERVACIONES	SUBSTITUYE A	FECHA	COPIADO	HAN SIDO DIBUJADO

UTE ALT CAMP

VIADUCTO SOBRE EL RIO FRANCOLI

E.L.S. de vibración

E.L.S. de deformación

MARZO-2003

ÍNDICE

E.L.S. DE VIBRACION

E.L.S. DE DEFORMACION

E.L.S. DE VIBRACION

```
     ***** ANSYS SOLUTION ROUTINE *****

*****  ANSYS SOLVE    COMMAND  *****

                    S O L U T I O N   O P T I O N S

  PROBLEM DIMENSIONALITY. . . . . .3-D
  DEGREES OF FREEDOM. . . . . UX   UY   UZ   ROTX ROTY ROTZ
  ANALYSIS TYPE . . . . . .MODAL
     EXTRACTION METHOD. . . . . .BLOCK LANCZOS
  EQUATION SOLVER OPTION. . . . . .SPARSE
  NUMBER OF MODES TO EXTRACT. . . . . 20
  MODAL EXTRACTION RANGE. . . . . 0.0000     TO   30.000
  CEs PROCESSED WITH LAGRANGE MULTIPLIERS . . . .ACCURATE SOLN.
  NUMBER OF MODES TO EXPAND . . . . . 20
  ELEMENT RESULTS CALCULATION . . . . . .OFF

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

  LOAD STEP NUMBER. . . . . 1
  PRINT OUTPUT CONTROLS . . . . . .NO PRINTOUT
  DATABASE OUTPUT CONTROLS. . . . . .ALL DATA WRITTEN


Estimated number of active DOF= 535.
Maximum wavefront= 28.



          ***** CENTROID, MASS, AND MASS MOMENTS OF INERTIA *****

 CALCULATIONS ASSUME ELEMENT MASS AT ELEMENT CENTROID

 TOTAL MASS =   6176.9

                              MOM. OF INERTIA          MOM. OF INERTIA
    CENTROID                   ABOUT ORIGIN            ABOUT CENTROID

 XC =   92.000          IXX =     0.000          IXX =     0.000
 YC =   0.0000          IYY =   0.6971E+08       IYY =   0.1742E+08
 ZC =   0.0000          IZZ =   0.6971E+08       IZZ =   0.1742E+08
                        IXY =     0.000          IXY =     0.000
                        IYZ =     0.000          IYZ =     0.000
                        IZX =     0.000          IZX =     0.000


  *** MASS SUMMARY BY ELEMENT TYPE ***

  TYPE      MASS
     1   6176.88

Range of element maximum matrix coefficients in global coordinates
Maximum= 3.184E+09 at element 92.
Minimum= 3.184E+09 at element 92.

   *** ELEMENT MATRIX FORMULATION TIMES
  TYPE  NUMBER    ENAME      TOTAL CP  AVE CP

     1      92  BEAM4          0.010   0.000109
Time at end of element matrix formulation CP= 4.44639349.

*** NOTE ***                            CP=       4.446   TIME= 20:02:40
Constraint Equations, if any are present in the model, will be
 processed by Lagrange Multipliers for the Block Lanczos Eigensolver.
Time at end of matrix assembly CP= 4.44639349.

  BLOCK LANCZOS CALCULATION OF UP TO   20 EIGENVECTORS.
  NUMBER OF EQUATIONS       =         535
  MAXIMUM WAVEFRONT         =          28
  MAXIMUM MODES STORED      =          20
  MINIMUM EIGENVALUE        =  0.0000
  MAXIMUM EIGENVALUE        =  30.000
  EST. OF MEMORY NEEDED     =  1.8537     (MB)
```



```
      MEMORY AVAILABLE FOR EIGENSOLVER =  57.423      (MB)

      MEMORY TO PERFORM EIGENEXTRACTION:
  MIN. TO COMPLETE VALUE INPUT                 =        6495     0.49553E-01 (MB)
  MIN. FOR PART IN-CORE AND OUT-OF-CORE        =       19572     0.14932     (MB)
  MIN. FOR IN-CORE                             =       22767     0.17370     (MB)
  RECOM. FOR PART IN-CORE AND OUT-OF-CORE      =       97272     0.74213     (MB)
  RECOM. FOR IN-CORE                           =      100467     0.76650     (MB)

 LANCZOS CYCLE NUMBER =   1

    new shift:  4.1166D+00     modes still needed:       20

 FREQUENCIES AT CURRENT LANCZOS CYCLE
    1  0.16571513E+02     2  0.16571513E+02     3  0.16033314E+02
    4  0.16033314E+02     5  0.15208907E+02     6  0.15023860E+02
    7  0.15023860E+02     8  0.15023860E+02     9  0.14976504E+02
   10  0.13226650E+02    11  0.13226650E+02    12  0.13226650E+02
   13  0.12220568E+02    14  0.12074029E+02    15  0.10457245E+02
   16  0.90889272E+01    17  0.82459910E+01    18  0.82459910E+01
   19  0.65929810E+01    20  0.65929810E+01    21  0.65929810E+01
   22  0.49615918E+01    23  0.46303352E+01    24  0.40731268E+01
   25  0.37482066E+01    26  0.29322353E+01    27  0.23458225E+01

    number of steps      :     11
    eigenvalues found    :     27
    total no. eigenvalues:     27

 LANCZOS CYCLE NUMBER =   2

    new shift:  8.9109D+03     modes still needed:        0
1

 ***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7      *****
 ANSYS/ED
 00000000          VERSION=INTEL NT      20:02:40  MAR 12, 2003 CP=      4.687

 Calculo dinamico


 ****************************************************
 *                                                  *
 *  ANSYS VERSION FOR EDUCATIONAL PURPOSES ONLY     *
 *                                                  *
 ****************************************************

  *** FREQUENCIES FROM BLOCK LANCZOS            ITERATION ***

   MODE    FREQUENCY (HERTZ)


    FREQUENCY RANGE REQUESTED=    0.00000       30.0000

     1      2.345822479663
     2      2.932235311104
     3      3.748206589833
     4      4.073126788685
     5      4.630335166046
     6      4.961591778877
     7      6.592981025794
     8      6.592981025794
     9      6.592981025794
    10      8.245990969589
    11      8.245990969589
    12      9.088927204327
    13      10.45724508576
    14      12.07402892901
    15      12.22056778115
    16      13.22664969600
    17      13.22664969600
    18      13.22664969600
    19      14.97650394112
    20      15.02386034606
       Block Lanczos CP Time (sec) =          0.250
  Block Lanczos ELAPSED Time (sec) =          0.265

1
```

***** ANSYS - ENGINEERING ANALYSIS SYSTEM RELEASE 5.7 *****
ANSYS/ED
00000000 VERSION=INTEL NT 20:02:40 MAR 12, 2003 CP= 4.747

Calculo dinamico

****
* *
* ANSYS VERSION FOR EDUCATIONAL PURPOSES ONLY *
* *
****

***** PARTICIPATION FACTOR CALCULATION ***** X DIRECTION

MODE FRACTION	FREQUENCY	PERIOD	PARTIC.FACTOR	RATIO	EFFECTIVE MASS	CUMULATIVE MASS
1	2.34582	0.42629	-0.93477E-14	0.000000	0.873799E-28	0.157098E-31
2	2.93224	0.34104	0.39137E-14	0.000000	0.153173E-28	0.184637E-31
3	3.74821	0.26679	0.15645E-12	0.000000	0.244765E-25	0.441902E-29
4	4.07313	0.24551	70.755	1.000000	5006.30	0.900070
5	4.63034	0.21597	0.20425E-13	0.000000	0.417185E-27	0.900070
6	4.96159	0.20155	0.76191E-13	0.000000	0.580509E-26	0.900070
7	6.59298	0.15168	-0.18506E-13	0.000000	0.342477E-27	0.900070
8	6.59298	0.15168	0.21207E-13	0.000000	0.449733E-27	0.900070
9	6.59298	0.15168	0.23919E-13	0.000000	0.572117E-27	0.900070
10	8.24599	0.12127	0.38694E-13	0.000000	0.149726E-26	0.900070
11	8.24599	0.12127	-0.42300E-13	0.000000	0.178932E-26	0.900070
12	9.08893	0.11002	-0.78005E-13	0.000000	0.608479E-26	0.900070
13	10.4572	0.95627E-01	-0.18292E-11	0.000000	0.334583E-23	0.900070
14	12.0740	0.82822E-01	0.20437E-10	0.000000	0.417677E-21	0.900070
15	12.2206	0.81829E-01	-23.576	0.333204	555.824	1.00000
16	13.2266	0.75605E-01	-0.49412E-10	0.000000	0.244152E-20	1.00000
17	13.2266	0.75605E-01	0.11967E-08	0.000000	0.143209E-17	1.00000
18	13.2266	0.75605E-01	-0.41716E-09	0.000000	0.174026E-18	1.00000
19	14.9765	0.66771E-01	0.25156E-07	0.000000	0.632825E-15	1.00000
20	15.0239	0.66561E-01	-0.11003E-07	0.000000	0.121077E-15	1.00000

SUM OF EFFECTIVE MASSES= 5562.13

***** PARTICIPATION FACTOR CALCULATION ***** Y DIRECTION

MODE FRACTION	FREQUENCY	PERIOD	PARTIC.FACTOR	RATIO	EFFECTIVE MASS	CUMULATIVE MASS
1	2.34582	0.42629	-0.99269	0.015135	0.985427	0.226406E-03
2	2.93224	0.34104	-0.36089E-11	0.000000	0.130241E-22	0.226406E-03
3	3.74821	0.26679	6.7965	0.103626	46.1929	0.108394E-01
4	4.07313	0.24551	-0.59232E-13	0.000000	0.350839E-26	0.108394E-01
5	4.63034	0.21597	0.49725E-11	0.000000	0.247258E-22	0.108394E-01
6	4.96159	0.20155	65.587	1.000000	4301.67	0.999167
7	6.59298	0.15168	-0.33664E-13	0.000000	0.113326E-26	0.999167
8	6.59298	0.15168	0.36687E-13	0.000000	0.134595E-26	0.999167
9	6.59298	0.15168	0.57504E-13	0.000000	0.330670E-26	0.999167
10	8.24599	0.12127	0.72531E-13	0.000000	0.526079E-26	0.999167
11	8.24599	0.12127	-0.28244E-13	0.000000	0.797718E-27	0.999167
12	9.08893	0.11002	0.10427E-11	0.000000	0.108719E-23	0.999167
13	10.4572	0.95627E-01	0.89455	0.013639	0.800221	0.999350
14	12.0740	0.82822E-01	-0.21570E-10	0.000000	0.465257E-21	0.999350
15	12.2206	0.81829E-01	0.78383E-10	0.000000	0.614396E-20	0.999350
16	13.2266	0.75605E-01	0.14370E-10	0.000000	0.206488E-21	0.999350
17	13.2266	0.75605E-01	-0.86891E-09	0.000000	0.754997E-18	0.999350
18	13.2266	0.75605E-01	0.40933E-09	0.000000	0.167552E-18	0.999350
19	14.9765	0.66771E-01	1.6814	0.025637	2.82726	1.00000
20	15.0239	0.66561E-01	0.31038E-08	0.000000	0.963369E-17	1.00000

SUM OF EFFECTIVE MASSES= 4352.47

***** PARTICIPATION FACTOR CALCULATION ***** Z DIRECTION

CUMULATIVE

MODE FRACTION	FREQUENCY	PERIOD	PARTIC.FACTOR	RATIO	EFFECTIVE MASS	MASS
1	2.34582	0.42629	-0.55542E-14	0.000000	0.308495E-28	0.191034E-31
2	2.93224	0.34104	0.56514E-14	0.000000	0.319382E-28	0.388810E-31
3	3.74821	0.26679	0.20711E-14	0.000000	0.428966E-29	0.415373E-31
4	4.07313	0.24551	-0.98681E-14	0.000000	0.973792E-28	0.101839E-30
5	4.63034	0.21597	-0.65706E-14	0.000000	0.431725E-28	0.128573E-30
6	4.96159	0.20155	-0.96821E-14	0.000000	0.937433E-28	0.186623E-30
7	6.59298	0.15168	-0.93255E-14	0.000000	0.869643E-28	0.240476E-30
8	6.59298	0.15168	0.94350E-14	0.000000	0.890195E-28	0.295601E-30
9	6.59298	0.15168	-0.50140E-15	0.000000	0.251404E-30	0.295756E-30
10	8.24599	0.12127	-0.62818E-14	0.000000	0.394615E-28	0.320193E-30
11	8.24599	0.12127	-0.27200E-14	0.000000	0.739860E-29	0.324774E-30
12	9.08893	0.11002	-0.54915E-13	0.000000	0.301566E-26	0.219221E-29
13	10.4572	0.95627E-01	-0.10586E-11	0.000000	0.112064E-23	0.696143E-27
14	12.0740	0.82822E-01	-0.13885E-10	0.000000	0.192806E-21	0.120090E-24
15	12.2206	0.81829E-01	-0.47646E-10	0.000000	0.227015E-20	0.152587E-23
16	13.2266	0.75605E-01	-0.43486E-10	0.000000	0.189106E-20	0.269689E-23
17	13.2266	0.75605E-01	0.45215E-09	0.000000	0.204442E-18	0.129296E-21
18	13.2266	0.75605E-01	-0.19359E-09	0.000000	0.374773E-19	0.152504E-21
19	14.9765	0.66771E-01	0.12723E-07	0.000000	0.161887E-15	0.100401E-18
20	15.0239	0.66561E-01	40.185	1.000000	1614.87	1.00000

SUM OF EFFECTIVE MASSES= 1614.87

***** PARTICIPATION FACTOR CALCULATION *****ROTX DIRECTION

MODE FRACTION	FREQUENCY	PERIOD	PARTIC.FACTOR	RATIO	EFFECTIVE MASS	CUMULATIVE MASS
1	2.34582	0.42629	0.66805E-13	0.000000	0.446285E-26	0.155181E-30
2	2.93224	0.34104	0.25340E-13	0.000000	0.642115E-27	0.177509E-30
3	3.74821	0.26679	0.34031E-13	0.000000	0.115810E-26	0.217778E-30
4	4.07313	0.24551	0.57724E-13	0.000000	0.333211E-26	0.333641E-30
5	4.63034	0.21597	-0.14458E-13	0.000000	0.209041E-27	0.340910E-30
6	4.96159	0.20155	0.76219E-14	0.000000	0.580926E-28	0.342930E-30
7	6.59298	0.15168	17.322	0.147985	300.049	0.104332E-01
8	6.59298	0.15168	69.172	0.590953	4784.81	0.176810
9	6.59298	0.15168	117.05	1.000000	13701.2	0.653225
10	8.24599	0.12127	84.784	0.724327	7188.33	0.903176
11	8.24599	0.12127	52.769	0.450816	2784.57	1.00000
12	9.08893	0.11002	-0.17036E-12	0.000000	0.290219E-25	1.00000
13	10.4572	0.95627E-01	-0.18276E-11	0.000000	0.334023E-23	1.00000
14	12.0740	0.82822E-01	0.34047E-10	0.000000	0.115917E-20	1.00000
15	12.2206	0.81829E-01	-0.11931E-09	0.000000	0.142338E-19	1.00000
16	13.2266	0.75605E-01	-0.41348E-10	0.000000	0.170968E-20	1.00000
17	13.2266	0.75605E-01	0.13619E-08	0.000000	0.185476E-17	1.00000
18	13.2266	0.75605E-01	-0.39583E-09	0.000000	0.156678E-18	1.00000
19	14.9765	0.66771E-01	0.19416E-07	0.000000	0.376991E-15	1.00000
20	15.0239	0.66561E-01	-0.15711E-07	0.000000	0.246836E-15	1.00000

SUM OF EFFECTIVE MASSES= 28759.0

***** PARTICIPATION FACTOR CALCULATION *****ROTY DIRECTION

MODE FRACTION	FREQUENCY	PERIOD	PARTIC.FACTOR	RATIO	EFFECTIVE MASS	CUMULATIVE MASS
1	2.34582	0.42629	0.75402E-12	0.000000	0.568547E-24	0.338482E-31
2	2.93224	0.34104	-0.69423E-12	0.000000	0.481958E-24	0.625414E-31
3	3.74821	0.26679	-0.61369E-13	0.000000	0.376618E-26	0.627656E-31
4	4.07313	0.24551	0.13147E-11	0.000000	0.172835E-23	0.165662E-30
5	4.63034	0.21597	0.79903E-12	0.000000	0.638452E-24	0.203672E-30
6	4.96159	0.20155	0.11409E-11	0.000000	0.130155E-23	0.281159E-30
7	6.59298	0.15168	0.12453E-11	0.000000	0.155079E-23	0.373485E-30
8	6.59298	0.15168	-0.12003E-11	0.000000	0.144077E-23	0.459261E-30
9	6.59298	0.15168	0.54884E-13	0.000000	0.301227E-26	0.459440E-30
10	8.24599	0.12127	0.79898E-12	0.000000	0.638364E-24	0.497445E-30
11	8.24599	0.12127	0.98932E-13	0.000000	0.978755E-26	0.498027E-30
12	9.08893	0.11002	0.65981E-11	0.000000	0.435352E-22	0.308988E-29
13	10.4572	0.95627E-01	0.15494E-09	0.000000	0.240077E-19	0.143238E-26
14	12.0740	0.82822E-01	-0.21379E-09	0.000000	0.457063E-19	0.415349E-26
15	12.2206	0.81829E-01	0.69018E-08	0.000000	0.476355E-16	0.284012E-23
16	13.2266	0.75605E-01	0.43551E-08	0.000000	0.189672E-16	0.396932E-23

```
      17      13.2266        0.75605E-01  -0.77394E-07       0.000000        0.598977E-14
   0.360568E-21
      18      13.2266        0.75605E-01   0.30540E-07       0.000000        0.932711E-15
0.416097E-21
   19      14.9765        0.66771E-01  -0.20061E-05       0.000000        0.402460E-11        0.240019E-18
   20      15.0239        0.66561E-01   -4098.4           1.000000        0.167969E+08         1.00000
                                                SUM OF EFFECTIVE MASSES=   0.167969E+08


          ***** PARTICIPATION FACTOR CALCULATION *****ROTZ DIRECTION

 MODE        FREQUENCY         PERIOD    PARTIC.FACTOR        RATIO       EFFECTIVE MASS       CUMULATIVE
 FRACTION                                                                                        MASS

    1        2.34582        0.42629         -91.327          0.015135         8340.65          0.168276E-03
    2        2.93224        0.34104          97.331          0.016130         9473.28          0.359404E-03
    3        3.74821        0.26679          625.28          0.103626         390977.          0.824755E-02
    4        4.07313        0.24551       -0.50325E-11       0.000000       0.253256E-22       0.824755E-02
    5        4.63034        0.21597          3386.1          0.561172       0.114658E+08       0.239576
    6        4.96159        0.20155          6034.0          1.000000       0.364093E+08       0.974151
    7        6.59298        0.15168       -0.50092E-11       0.000000       0.250917E-22       0.974151
    8        6.59298        0.15168        0.33778E-11       0.000000       0.114096E-22       0.974151
    9        6.59298        0.15168        0.46433E-11       0.000000       0.215599E-22       0.974151
   10        8.24599        0.12127        0.69680E-11       0.000000       0.485531E-22       0.974151
   11        8.24599        0.12127       -0.45543E-11       0.000000       0.207415E-22       0.974151
   12        9.08893        0.11002         -1099.6          0.182235       0.120914E+07       0.998546
   13        10.4572        0.95627E-01      82.299          0.013639         6773.07          0.998683
   14        12.0740        0.82822E-01     -203.40          0.033709         41371.5          0.999517
   15        12.2206        0.81829E-01     0.10382E-07       0.000000       0.107796E-15       0.999517
   16        13.2266        0.75605E-01     0.42748E-08       0.000000       0.182742E-16       0.999517
   17        13.2266        0.75605E-01    -0.12508E-06       0.000000       0.156440E-13       0.999517
   18        13.2266        0.75605E-01     0.65549E-07       0.000000       0.429664E-14       0.999517
   19        14.9765        0.66771E-01      154.69          0.025637         23929.9           1.00000
   20        15.0239        0.66561E-01     0.18710E-06       0.000000       0.350075E-13        1.00000
                                                SUM OF EFFECTIVE MASSES=   0.495652E+08

 *** PROBLEM STATISTICS
  ACTUAL NO. OF ACTIVE DEGREES OF FREEDOM =     535

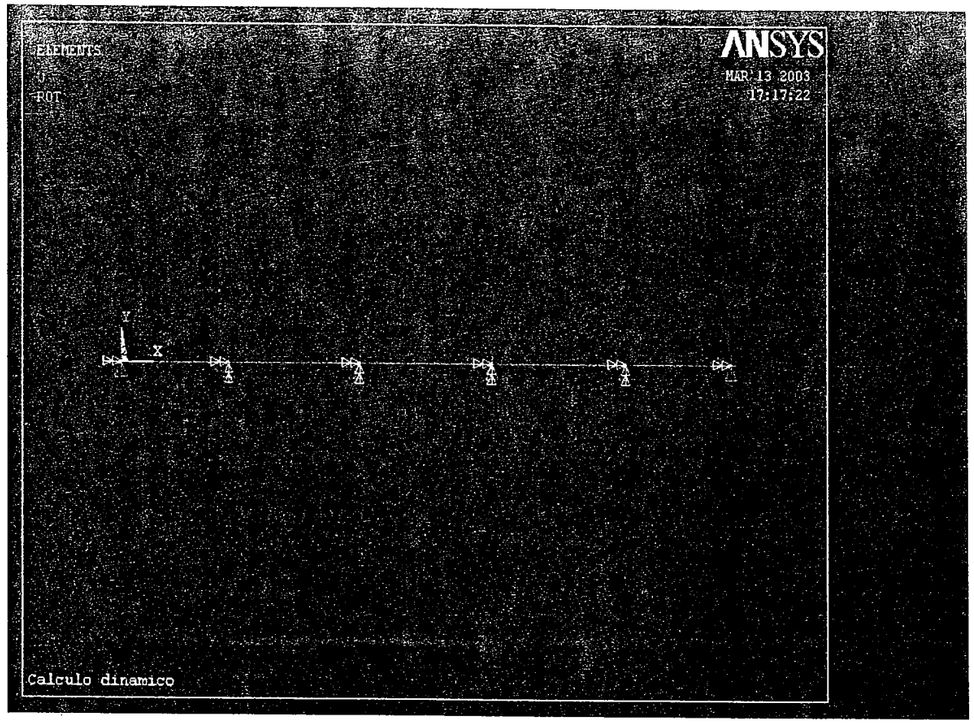
 *** ANSYS BINARY FILE STATISTICS
  BUFFER SIZE USED= 16384
        0.188 MB WRITTEN ON ELEMENT MATRIX FILE: Dinamico.emat
        0.125 MB WRITTEN ON ELEMENT SAVED DATA FILE: Dinamico.esav
        0.063 MB WRITTEN ON ASSEMBLED MATRIX FILE: Dinamico.full
        0.125 MB WRITTEN ON MODAL MATRIX FILE: Dinamico.mode
        0.188 MB WRITTEN ON RESULTS FILE: Dinamico.rst

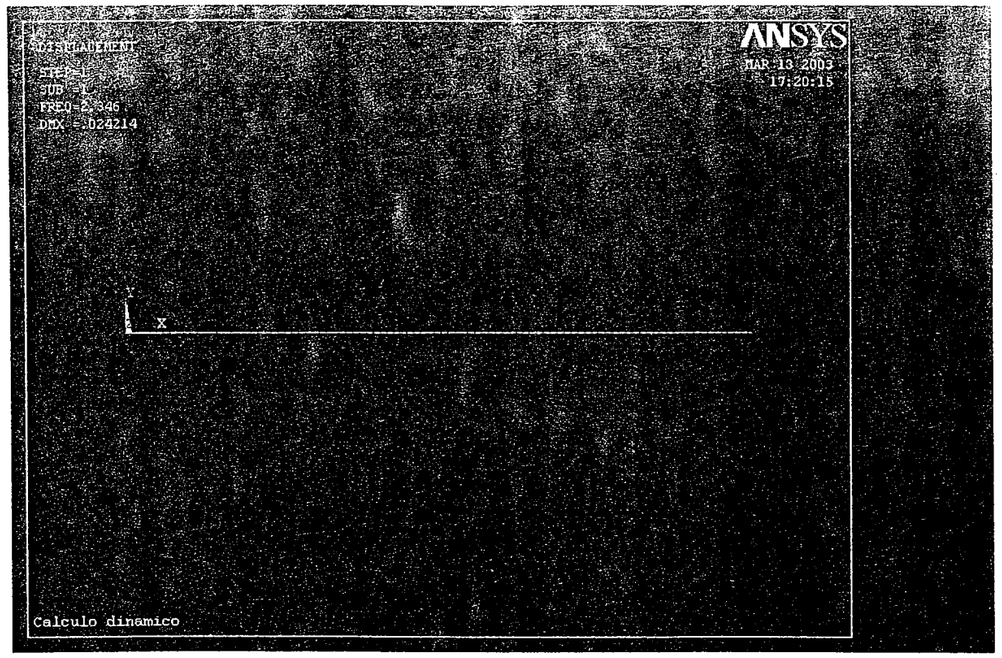
 FINISH SOLUTION PROCESSING

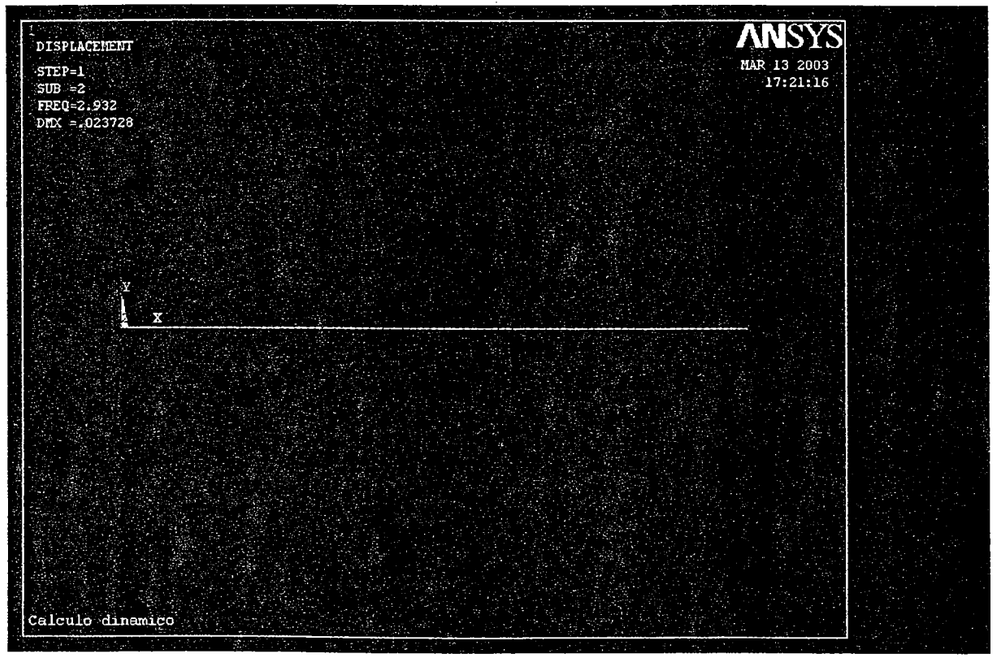

 ***** ROUTINE COMPLETED *****  CP =         4.847

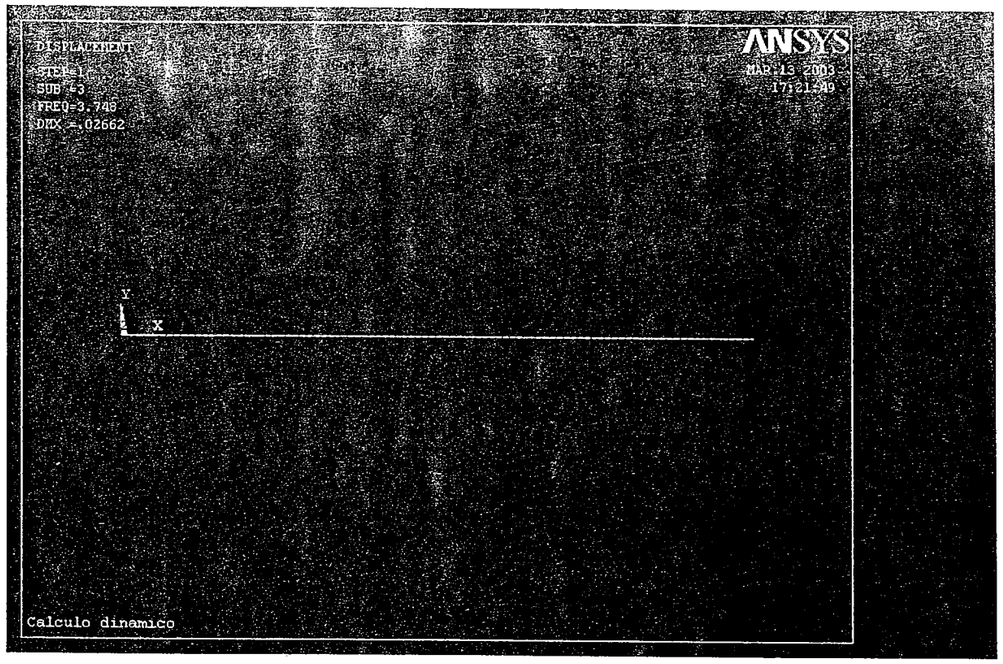

 EXIT ANSYS WITHOUT SAVING DATABASE

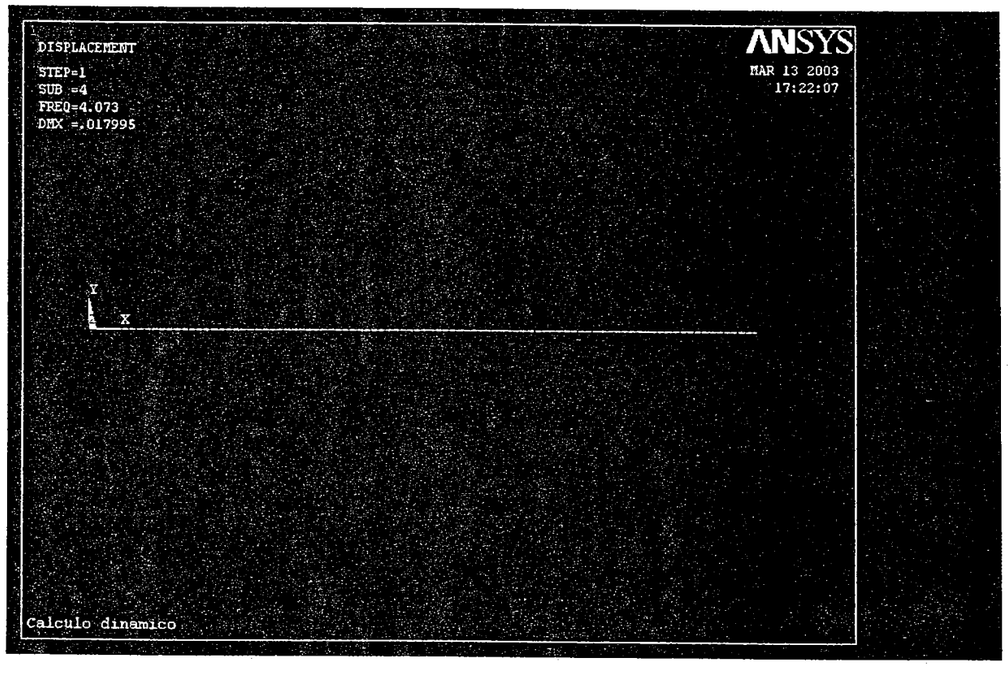

 NUMBER OF WARNING MESSAGES ENCOUNTERED=          0
 NUMBER OF ERROR   MESSAGES ENCOUNTERED=          0
```

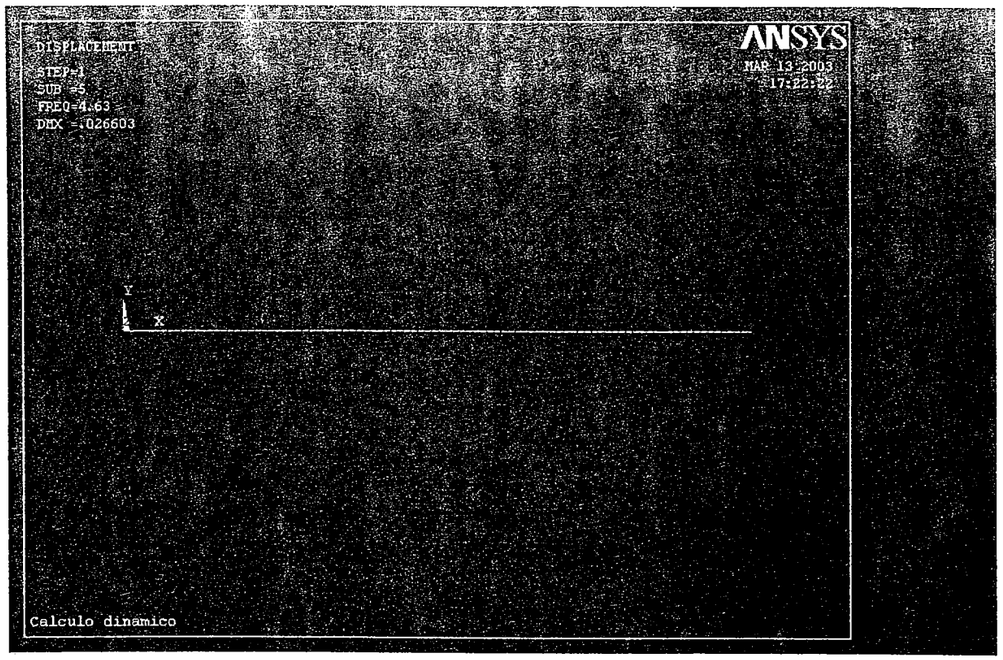



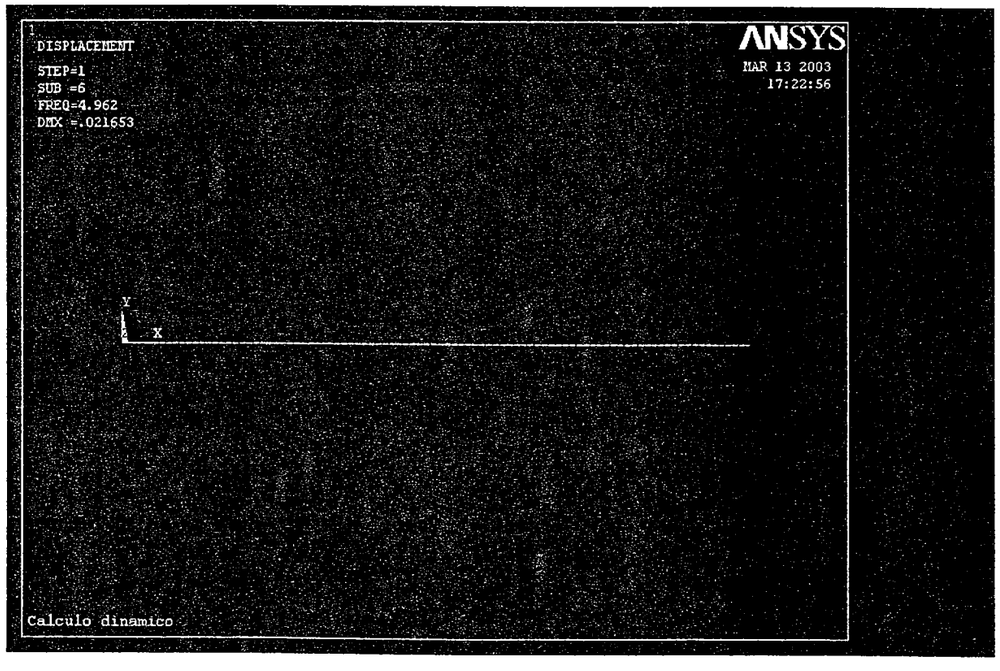

DISPLACEMENT
STEP=1
SUB =1
FREQ=2.946
DMX =.024214
ANSYS
MAR 13 2003
17:20:15
Y
X
Calculo dinamico

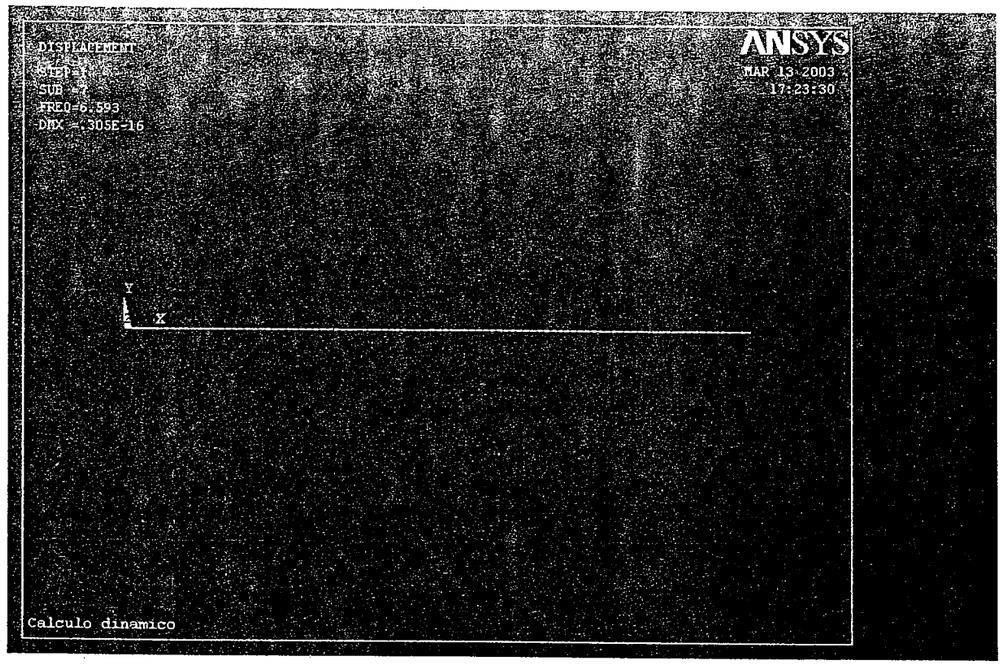

DISPLACEMENT
STEP=1
SUB =2
FREQ=2.932
DMX =.023728
ANSYS
MAR 13 2003
17:21:16
Y
X
Calculo dinamico

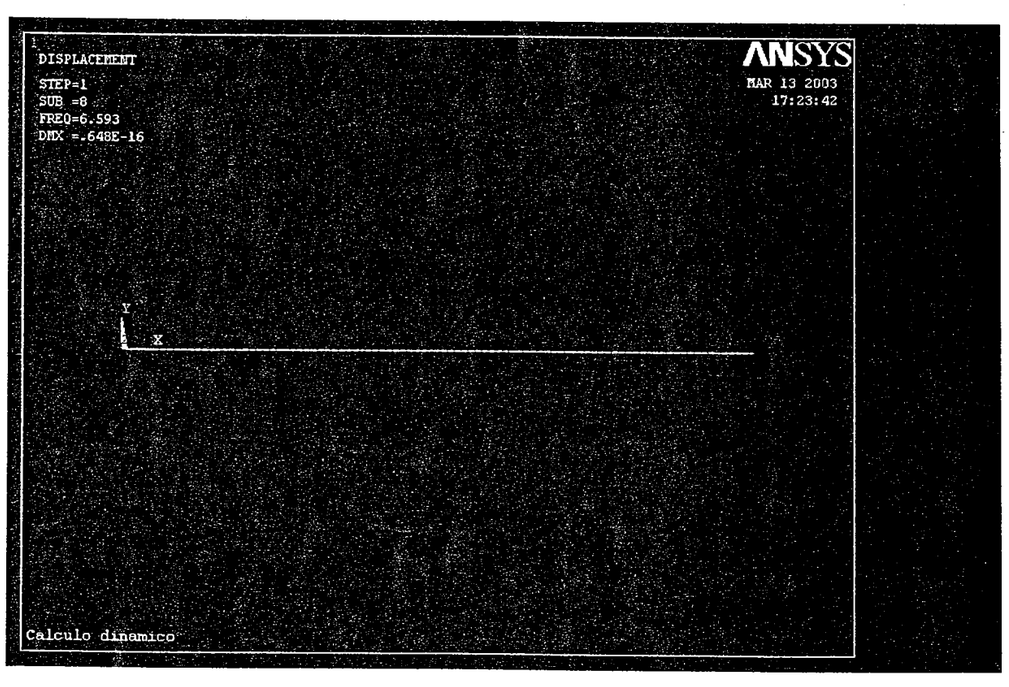

DISPLACEMENT
STEP=1
SUB =3
FREQ=3.748
DMX =.02662
ANSYS
MAR 13 2003
17:21:40
Y
X
Calculo dinamico

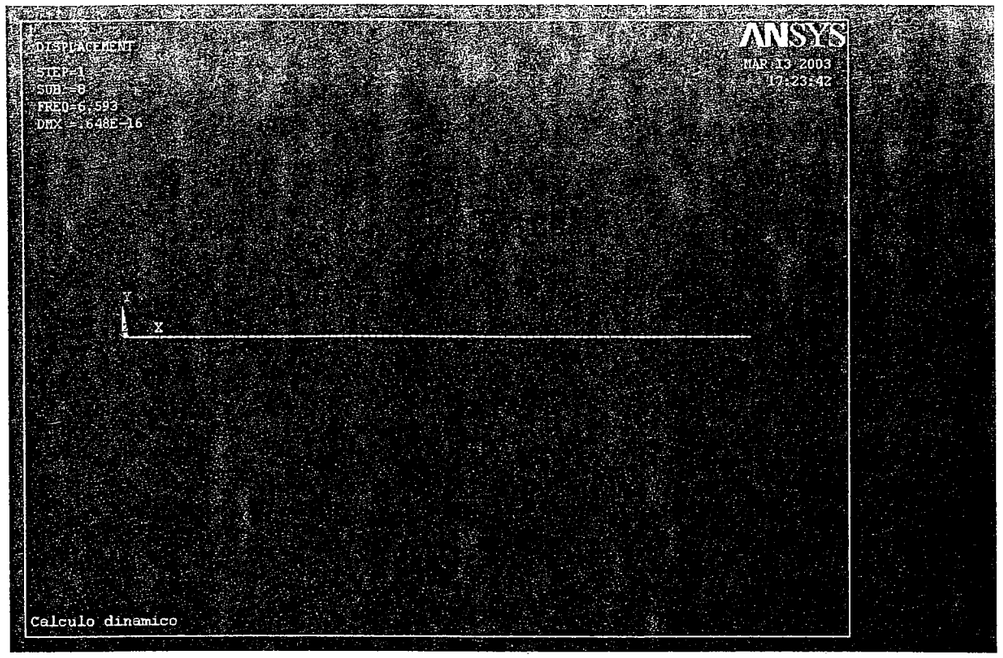

DISPLACEMENT
STEP=1
SUB =4
FREQ=4.073
DMX =.017995
ANSYS
MAR 13 2003
17:22:07
Y
X
Calculo dinamico

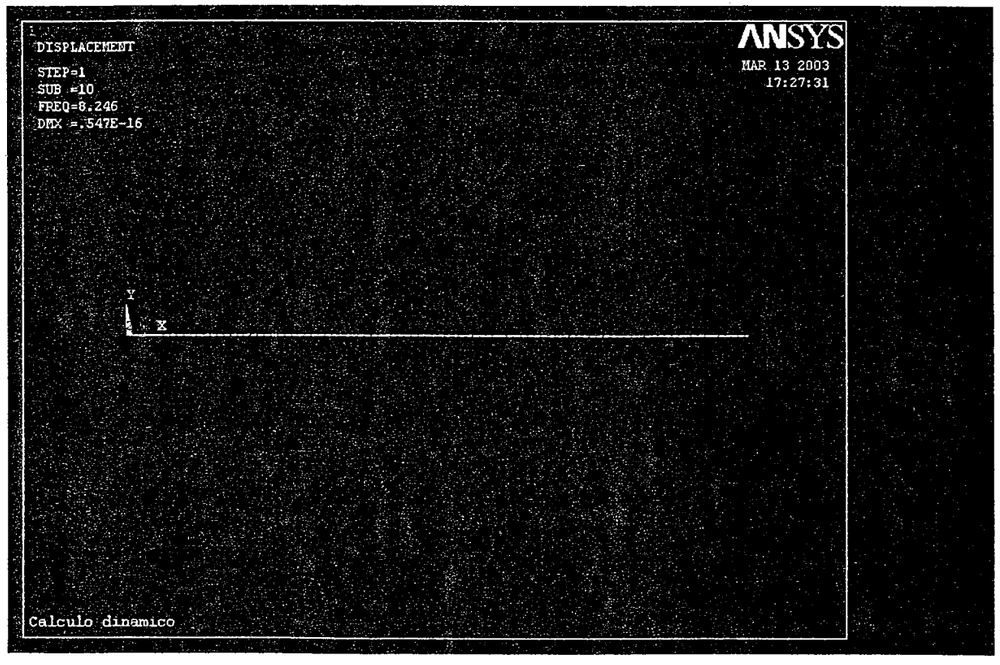

DISPLACEMENT
STEP=1
SUB =5
FREQ=4.63
DMX =.026603
ANSYS
MAR 13 2003
17:22:22
Y
Z
X
Calculo dinamico


DISPLACEMENT
STEP=1
SUB =6
FREQ=4.962
DMX =.021653
ANSYS
MAR 13 2003
17:22:56
Y
Z
X
Calculo dinamico


DISPLACEMENT
STEP=1
SUB =7
FREQ=6.593
DMX =.305E-16
ANSYS
MAR 13 2003
17:23:30
Y
Z
X
Calculo dinamico


DISPLACEMENT
STEP=1
SUB =8
FREQ=6.593
DMX =.648E-16
ANSYS
MAR 13 2003
17:23:42
Y
Z
X
Calculo dinamico





CONCLUSIONES: Se observa que la frecuencia fundamental de la estructura en dirección Y (página 6) resulta de 4.96 Hz (modo 6 con ratio=1). Según el artículo: *"Conclusiones de los ensayos realizados en el "Viaducto sobre el río Tajo" en la línea de alta velocidad Madrid-Sevilla. Consideraciones para el proyecto de obras de paso en FF.CC. de alta velocidad"*, publicado en el número 214 de Hormigón y Acero del 4º trimestre de 1999, esta frecuencia fundamental propia de la estructura resultaría siempre mayor que las frecuencias de paso de las cargas principales del tren de cargas. De esta forma se concluye que no se van a producir amplificaciones dinámicas, que en ningún caso pondrían en peligro la seguridad de la estructura en tanto en cuanto el tren de cargas de la instrucción es considerablemente pesado con relación a los trenes ligeros que utilizan estas líneas, pero si provocarían problemas en cuanto al cumplimiento de las condiciones de funcionalidad de la estructura: confort de los pasajeros, movimientos de la catenaria, etc...

E.L.S. DE DEFORMACION

HIPOTESIS CONSIDERADAS EN EL CALCULO:

DOS VIAS CARGADAS

H1: CARGAS PUNTUALES DE 250 KN EN CENTRO VANO 1
SOBRECARGA UNIFORME REPARTIDA DE 80 KN/M EN RESTO DE VANO 1
SOBRECARGA UNIFORME REPARTIDA DE 80 KN/M EN VANOS 3 Y 5

H2: CARGAS PUNTUALES DE 250 KN EN CENTRO VANO 1
SOBRECARGA UNIFORME REPARTIDA DE 80 KN/M EN RESTO DE VANO 1
SOBRECARGA UNIFORME REPARTIDA DE 80 KN/M EN VANOS 2,3,4 Y 5

H3: CARGAS PUNTUALES DE 250 KN EN TERCIO VANO 1
SOBRECARGA UNIFORME REPARTIDA DE 80 KN/M EN RESTO DE VANO 1
SOBRECARGA UNIFORME REPARTIDA DE 80 KN/M EN VANOS 3 Y 5

H4: CARGAS PUNTUALES DE 250 KN EN TERCIO VANO 1
SOBRECARGA UNIFORME REPARTIDA DE 80 KN/M EN RESTO DE VANO 1
SOBRECARGA UNIFORME REPARTIDA DE 80 KN/M EN VANOS 2,3,4 Y 5

H5: CARGAS PUNTUALES DE 250 KN EN CENTRO VANO 2
SOBRECARGA UNIFORME REPARTIDA DE 80 KN/M EN RESTO DE VANO 2
SOBRECARGA UNIFORME REPARTIDA DE 80 KN/M EN VANO 4

H6: CARGAS PUNTUALES DE 250 KN EN CENTRO VANO 2
SOBRECARGA UNIFORME REPARTIDA DE 80 KN/M EN RESTO DE VANO 2
SOBRECARGA UNIFORME REPARTIDA DE 80 KN/M EN VANOS 1,3,4 Y 5

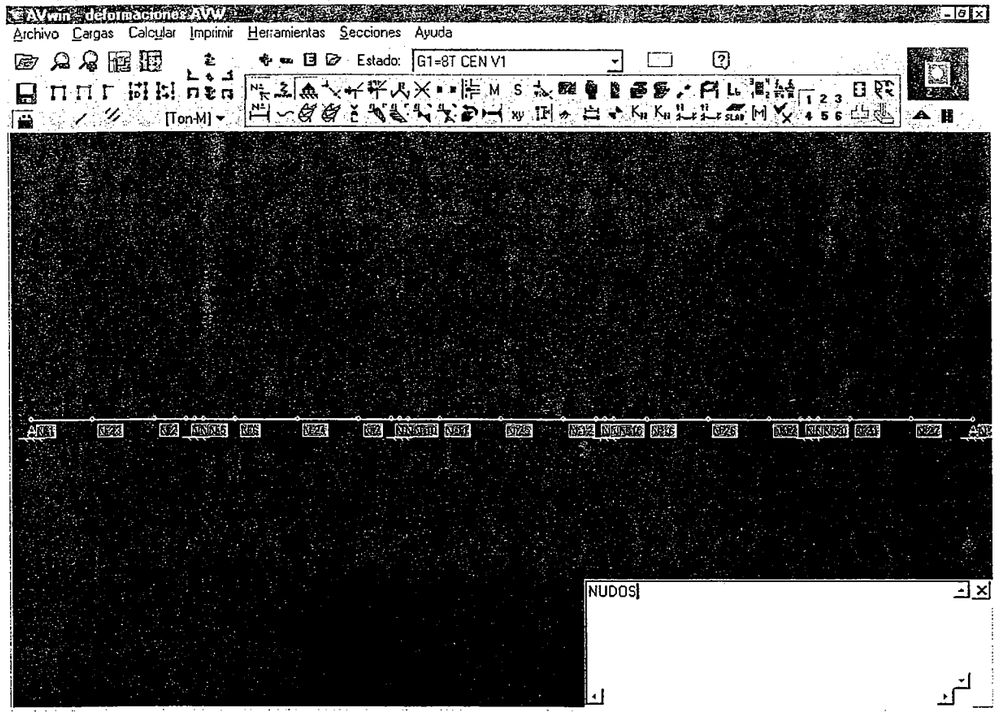
H7: CARGAS PUNTUALES DE 250 KN EN TERCIO 1 VANO 2
SOBRECARGA UNIFORME REPARTIDA DE 80 KN/M EN RESTO DE VANO 2
SOBRECARGA UNIFORME REPARTIDA DE 80 KN/M EN VANO 4

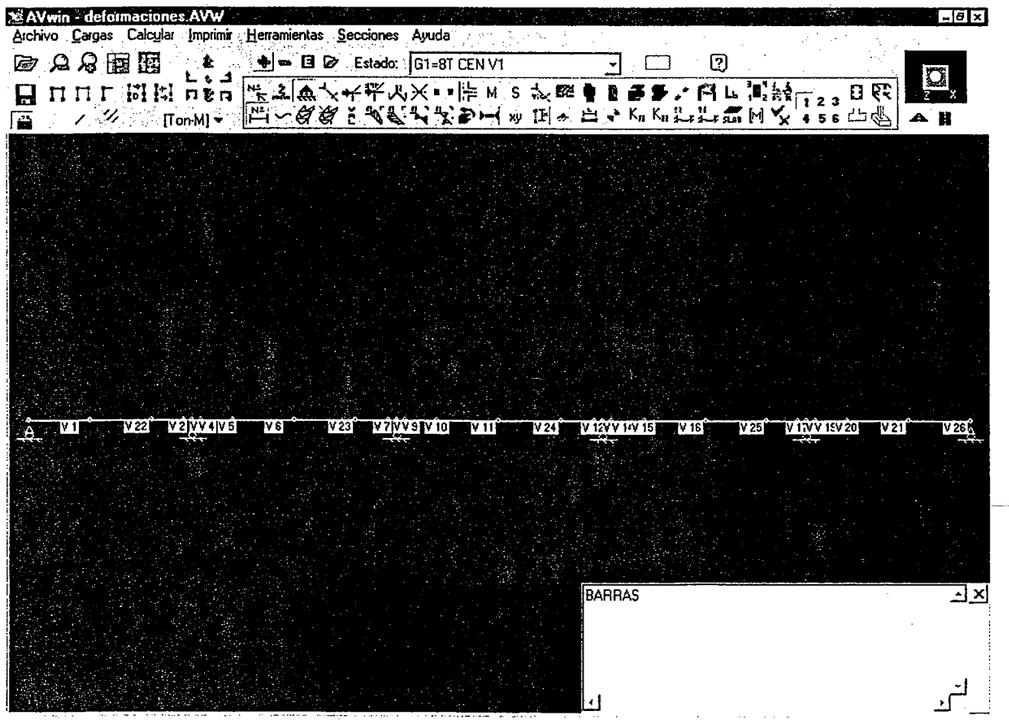
H8: CARGAS PUNTUALES DE 250 KN EN TERCIO 1 VANO 2
SOBRECARGA UNIFORME REPARTIDA DE 80 KN/M EN RESTO DE VANO 2
SOBRECARGA UNIFORME REPARTIDA DE 80 KN/M EN VANOS 1,3,4 Y 5

H9: CARGAS PUNTUALES DE 250 KN EN TERCIO 2 VANO 2
SOBRECARGA UNIFORME REPARTIDA DE 80 KN/M EN RESTO DE VANO 2
SOBRECARGA UNIFORME REPARTIDA DE 80 KN/M EN VANO 4

H0: CARGAS PUNTUALES DE 250 KN EN TERCIO 2 VANO 2
SOBRECARGA UNIFORME REPARTIDA DE 80 KN/M EN RESTO DE VANO 2
SOBRECARGA UNIFORME REPARTIDA DE 80 KN/M EN VANOS 1,3,4 Y 5

NUDOS Y BARRAS ESTRUCTURA:





R E S U L T A D O S D E L A N A L I S I S

Archivo :
C:\AVwin98\obras\AVanterior11sept02\altcamp\francoli\deformaciones.AVW
Proyecto :
Unidades : Ton-M
Fecha : 12/03/2003
Hora : 14:01:52

N U D O S

T R A S L A C I O N E S

	TRASLACIONES [M]			ROTACIONES [Rad]		
Nudo	TX	TY	TZ	RX	RY	RZ
Estado ma=cargas muertas maximo						
1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00048
2	0.00000	-0.00172	0.00000	0.00000	0.00000	0.00033
3	0.00000	-0.00009	0.00000	0.00000	0.00000	0.00012
4	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00002
5	0.00000	-0.00016	0.00000	0.00000	0.00000	-0.00016
6	0.00000	-0.00207	0.00000	0.00000	0.00000	-0.00038
7	0.00000	-0.00202	0.00000	0.00000	0.00000	0.00037
8	0.00000	-0.00014	0.00000	0.00000	0.00000	0.00015
9	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001
10	0.00000	-0.00011	0.00000	0.00000	0.00000	-0.00014
11	0.00000	-0.00191	0.00000	0.00000	0.00000	-0.00036
12	0.00000	-0.00191	0.00000	0.00000	0.00000	0.00036
13	0.00000	-0.00011	0.00000	0.00000	0.00000	0.00014
14	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00001
15	0.00000	-0.00014	0.00000	0.00000	0.00000	-0.00015
16	0.00000	-0.00202	0.00000	0.00000	0.00000	-0.00037
17	0.00000	-0.00207	0.00000	0.00000	0.00000	0.00038
18	0.00000	-0.00016	0.00000	0.00000	0.00000	0.00016
19	0.00000	0.00000	0.00000	0.00000	0.00000	0.00002
20	0.00000	-0.00009	0.00000	0.00000	0.00000	-0.00012
21	0.00000	-0.00172	0.00000	0.00000	0.00000	-0.00033
22	0.00000	0.00000	0.00000	0.00000	0.00000	0.00048
23	0.00000	-0.00389	0.00000	0.00000	0.00000	-0.00007
24	0.00000	-0.00491	0.00000	0.00000	0.00000	0.00000
25	0.00000	-0.00470	0.00000	0.00000	0.00000	0.00000
26	0.00000	-0.00491	0.00000	0.00000	0.00000	-0.00000
27	0.00000	-0.00389	0.00000	0.00000	0.00000	0.00007
Estado mi=cargas muertas minimo						
1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00031
2	0.00000	-0.00110	0.00000	0.00000	0.00000	0.00021
3	0.00000	-0.00006	0.00000	0.00000	0.00000	0.00008
4	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00001
5	0.00000	-0.00010	0.00000	0.00000	0.00000	-0.00010
6	0.00000	-0.00133	0.00000	0.00000	0.00000	-0.00024
7	0.00000	-0.00130	0.00000	0.00000	0.00000	0.00024
8	0.00000	-0.00009	0.00000	0.00000	0.00000	0.00010
9	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	0.00000	-0.00007	0.00000	0.00000	0.00000	-0.00009
11	0.00000	-0.00123	0.00000	0.00000	0.00000	-0.00023
12	0.00000	-0.00123	0.00000	0.00000	0.00000	0.00023
13	0.00000	-0.00007	0.00000	0.00000	0.00000	0.00009
14	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000
15	0.00000	-0.00009	0.00000	0.00000	0.00000	-0.00010
16	0.00000	-0.00130	0.00000	0.00000	0.00000	-0.00024
17	0.00000	-0.00133	0.00000	0.00000	0.00000	0.00024
18	0.00000	-0.00010	0.00000	0.00000	0.00000	0.00010
19	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001

	20	0.00000	-0.00006	0.00000	0.00000	0.00000	-0.00008
	21	0.00000	-0.00110	0.00000	0.00000	0.00000	-0.00021
	22	0.00000	0.00000	0.00000	0.00000	0.00000	0.00031
23		0.00000	-0.00250	0.00000	0.00000	0.00000	-0.00005
24		0.00000	-0.00316	0.00000	0.00000	0.00000	0.00000
25		0.00000	-0.00302	0.00000	0.00000	0.00000	0.00000
26		0.00000	-0.00316	0.00000	0.00000	0.00000	-0.00000
27		0.00000	-0.00250	0.00000	0.00000	0.00000	0.00005

Estado SC=SOBRECARGAS PASEOS

1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00003
2	0.00000	-0.00012	0.00000	0.00000	0.00000	0.00002
3	0.00000	-0.00001	0.00000	0.00000	0.00000	0.00001
4	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000
5	0.00000	-0.00001	0.00000	0.00000	0.00000	-0.00001
6	0.00000	-0.00015	0.00000	0.00000	0.00000	-0.00003
7	0.00000	-0.00015	0.00000	0.00000	0.00000	0.00003
8	0.00000	-0.00001	0.00000	0.00000	0.00000	0.00001
9	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	0.00000	-0.00001	0.00000	0.00000	0.00000	-0.00001
11	0.00000	-0.00014	0.00000	0.00000	0.00000	-0.00003
12	0.00000	-0.00014	0.00000	0.00000	0.00000	0.00003
13	0.00000	-0.00001	0.00000	0.00000	0.00000	0.00001
14	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	0.00000	-0.00001	0.00000	0.00000	0.00000	-0.00001
16	0.00000	-0.00015	0.00000	0.00000	0.00000	-0.00003
17	0.00000	-0.00015	0.00000	0.00000	0.00000	0.00003
18	0.00000	-0.00001	0.00000	0.00000	0.00000	0.00001
19	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	0.00000	-0.00001	0.00000	0.00000	0.00000	-0.00001
21	0.00000	-0.00012	0.00000	0.00000	0.00000	-0.00002
22	0.00000	0.00000	0.00000	0.00000	0.00000	0.00003
23	0.00000	-0.00028	0.00000	0.00000	0.00000	-0.00001
24	0.00000	-0.00035	0.00000	0.00000	0.00000	0.00000
25	0.00000	-0.00034	0.00000	0.00000	0.00000	0.00000
26	0.00000	-0.00035	0.00000	0.00000	0.00000	0.00000
27	0.00000	-0.00028	0.00000	0.00000	0.00000	0.00001

Estado S1=SOBRECARGA PASEOS VANOS ALTERNOS

1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00003
2	0.00000	0.00027	0.00000	0.00000	0.00000	-0.00002
3	0.00000	0.00008	0.00000	0.00000	0.00000	-0.00004
4	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00005
5	0.00000	-0.00009	0.00000	0.00000	0.00000	-0.00006
6	0.00000	-0.00049	0.00000	0.00000	0.00000	-0.00006
7	0.00000	-0.00053	0.00000	0.00000	0.00000	0.00006
8	0.00000	-0.00011	0.00000	0.00000	0.00000	0.00007
9	0.00000	0.00000	0.00000	0.00000	0.00000	0.00006
10	0.00000	0.00010	0.00000	0.00000	0.00000	0.00006
11	0.00000	0.00040	0.00000	0.00000	0.00000	0.00004
12	0.00000	0.00040	0.00000	0.00000	0.00000	-0.00004
13	0.00000	0.00010	0.00000	0.00000	0.00000	-0.00006
14	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00006
15	0.00000	-0.00011	0.00000	0.00000	0.00000	-0.00007
16	0.00000	-0.00053	0.00000	0.00000	0.00000	-0.00006
17	0.00000	-0.00049	0.00000	0.00000	0.00000	0.00006
18	0.00000	-0.00009	0.00000	0.00000	0.00000	0.00006
19	0.00000	0.00000	0.00000	0.00000	0.00000	0.00005
20	0.00000	0.00008	0.00000	0.00000	0.00000	0.00004
21	0.00000	0.00027	0.00000	0.00000	0.00000	0.00002
22	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00003
23	0.00000	0.00027	0.00000	0.00000	0.00000	0.00001
24	0.00000	-0.00092	0.00000	0.00000	0.00000	-0.00000
25	0.00000	0.00063	0.00000	0.00000	0.00000	0.00000
26	0.00000	-0.00092	0.00000	0.00000	0.00000	0.00000
27	0.00000	0.00027	0.00000	0.00000	0.00000	-0.00001

Estado H1=2V1+2G1

	1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00114
	2	0.00000	-0.00721	0.00000	0.00000	0.00000	0.00078
	3	0.00000	-0.00155	0.00000	0.00000	0.00000	0.00093
4		0.00000	0.00000	0.00000	0.00000	0.00000	0.00089
5		0.00000	0.00145	0.00000	0.00000	0.00000	0.00082
6		0.00000	0.00575	0.00000	0.00000	0.00000	0.00055
7		0.00000	0.00600	0.00000	0.00000	0.00000	-0.00055
8		0.00000	0.00154	0.00000	0.00000	0.00000	-0.00086
9		0.00000	0.00000	0.00000	0.00000	0.00000	-0.00095
10		0.00000	-0.00168	0.00000	0.00000	0.00000	-0.00102
11		0.00000	-0.00808	0.00000	0.00000	0.00000	-0.00094
12		0.00000	-0.00796	0.00000	0.00000	0.00000	0.00094
13		0.00000	-0.00163	0.00000	0.00000	0.00000	0.00099
14		0.00000	0.00000	0.00000	0.00000	0.00000	0.00092
15		0.00000	0.00148	0.00000	0.00000	0.00000	0.00083
16		0.00000	0.00564	0.00000	0.00000	0.00000	0.00050
17		0.00000	0.00492	0.00000	0.00000	0.00000	-0.00049
18		0.00000	0.00120	0.00000	0.00000	0.00000	-0.00068
19		0.00000	0.00000	0.00000	0.00000	0.00000	-0.00073
20		0.00000	-0.00127	0.00000	0.00000	0.00000	-0.00076
21		0.00000	-0.00575	0.00000	0.00000	0.00000	-0.00060
22		0.00000	0.00000	0.00000	0.00000	0.00000	0.00088
23		0.00000	-0.01027	0.00000	0.00000	0.00000	-0.00036
24		0.00000	0.00918	0.00000	0.00000	0.00000	0.00002
25		0.00000	-0.01433	0.00000	0.00000	0.00000	0.00001
26		0.00000	0.00825	0.00000	0.00000	0.00000	-0.00005
27		0.00000	-0.00796	0.00000	0.00000	0.00000	0.00029

Estado H2=2V1+2G1+2R1

1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00077
2	0.00000	-0.00327	0.00000	0.00000	0.00000	0.00052
3	0.00000	-0.00038	0.00000	0.00000	0.00000	0.00030
4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00014
5	0.00000	0.00008	0.00000	0.00000	0.00000	-0.00003
6	0.00000	-0.00130	0.00000	0.00000	0.00000	-0.00033
7	0.00000	-0.00169	0.00000	0.00000	0.00000	0.00033
8	0.00000	-0.00007	0.00000	0.00000	0.00000	0.00011
9	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00003
10	0.00000	-0.00019	0.00000	0.00000	0.00000	-0.00018
11	0.00000	-0.00223	0.00000	0.00000	0.00000	-0.00040
12	0.00000	-0.00211	0.00000	0.00000	0.00000	0.00039
13	0.00000	-0.00014	0.00000	0.00000	0.00000	0.00015
14	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	0.00000	-0.00013	0.00000	0.00000	0.00000	-0.00015
16	0.00000	-0.00205	0.00000	0.00000	0.00000	-0.00039
17	0.00000	-0.00214	0.00000	0.00000	0.00000	0.00039
18	0.00000	-0.00016	0.00000	0.00000	0.00000	0.00016
19	0.00000	0.00000	0.00000	0.00000	0.00000	0.00002
20	0.00000	-0.00010	0.00000	0.00000	0.00000	-0.00013
21	0.00000	-0.00181	0.00000	0.00000	0.00000	-0.00034
22	0.00000	0.00000	0.00000	0.00000	0.00000	0.00050
23	0.00000	-0.00640	0.00000	0.00000	0.00000	-0.00014
24	0.00000	-0.00414	0.00000	0.00000	0.00000	-0.00003
25	0.00000	-0.00518	0.00000	0.00000	0.00000	0.00001
26	0.00000	-0.00507	0.00000	0.00000	0.00000	-0.00001
27	0.00000	-0.00409	0.00000	0.00000	0.00000	0.00007

Estado H3=2B1+2I1

1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00103
2	0.00000	-0.00702	0.00000	0.00000	0.00000	0.00074
3	0.00000	-0.00153	0.00000	0.00000	0.00000	0.00092
4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00087
5	0.00000	0.00143	0.00000	0.00000	0.00000	0.00081
6	0.00000	0.00569	0.00000	0.00000	0.00000	0.00055
7	0.00000	0.00597	0.00000	0.00000	0.00000	-0.00055
8	0.00000	0.00154	0.00000	0.00000	0.00000	-0.00086
9	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00095
10	0.00000	-0.00167	0.00000	0.00000	0.00000	-0.00101

	11	0.00000	-0.00807	0.00000	0.00000	0.00000	-0.00094
	12	0.00000	-0.00796	0.00000	0.00000	0.00000	0.00094
	13	0.00000	-0.00163	0.00000	0.00000	0.00000	0.00099
14		0.00000	0.00000	0.00000	0.00000	0.00000	0.00092
15		0.00000	0.00148	0.00000	0.00000	0.00000	0.00083
16		0.00000	0.00564	0.00000	0.00000	0.00000	0.00050
17		0.00000	0.00492	0.00000	0.00000	0.00000	-0.00049
18		0.00000	0.00120	0.00000	0.00000	0.00000	-0.00068
19		0.00000	0.00000	0.00000	0.00000	0.00000	-0.00073
20		0.00000	-0.00127	0.00000	0.00000	0.00000	-0.00076
21		0.00000	-0.00575	0.00000	0.00000	0.00000	-0.00060
22		0.00000	0.00000	0.00000	0.00000	0.00000	0.00088
23		0.00000	-0.00951	0.00000	0.00000	0.00000	-0.00037
24		0.00000	0.00911	0.00000	0.00000	0.00000	0.00002
25		0.00000	-0.01431	0.00000	0.00000	0.00000	0.00001
26		0.00000	0.00825	0.00000	0.00000	0.00000	-0.00005
27		0.00000	-0.00796	0.00000	0.00000	0.00000	0.00029

Estado H4=2B1+2I1+2R1

1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00066
2	0.00000	-0.00308	0.00000	0.00000	0.00000	0.00048
3	0.00000	-0.00036	0.00000	0.00000	0.00000	0.00029
4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00012
5	0.00000	0.00006	0.00000	0.00000	0.00000	-0.00004
6	0.00000	-0.00137	0.00000	0.00000	0.00000	-0.00033
7	0.00000	-0.00172	0.00000	0.00000	0.00000	0.00034
8	0.00000	-0.00007	0.00000	0.00000	0.00000	0.00011
9	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00003
10	0.00000	-0.00018	0.00000	0.00000	0.00000	-0.00018
11	0.00000	-0.00221	0.00000	0.00000	0.00000	-0.00039
12	0.00000	-0.00210	0.00000	0.00000	0.00000	0.00039
13	0.00000	-0.00014	0.00000	0.00000	0.00000	0.00015
14	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	0.00000	-0.00013	0.00000	0.00000	0.00000	-0.00015
16	0.00000	-0.00205	0.00000	0.00000	0.00000	-0.00039
17	0.00000	-0.00214	0.00000	0.00000	0.00000	0.00039
18	0.00000	-0.00016	0.00000	0.00000	0.00000	0.00016
19	0.00000	0.00000	0.00000	0.00000	0.00000	0.00002
20	0.00000	-0.00010	0.00000	0.00000	0.00000	-0.00013
21	0.00000	-0.00181	0.00000	0.00000	0.00000	-0.00034
22	0.00000	0.00000	0.00000	0.00000	0.00000	0.00050
23	0.00000	-0.00564	0.00000	0.00000	0.00000	-0.00015
24	0.00000	-0.00421	0.00000	0.00000	0.00000	-0.00002
25	0.00000	-0.00516	0.00000	0.00000	0.00000	0.00001
26	0.00000	-0.00507	0.00000	0.00000	0.00000	-0.00001
27	0.00000	-0.00409	0.00000	0.00000	0.00000	0.00007

Estado H5=2V2+2G2

1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00046
2	0.00000	0.00478	0.00000	0.00000	0.00000	-0.00031
3	0.00000	0.00143	0.00000	0.00000	0.00000	-0.00077
4	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00091
5	0.00000	-0.00166	0.00000	0.00000	0.00000	-0.00103
6	0.00000	-0.00861	0.00000	0.00000	0.00000	-0.00108
7	0.00000	-0.00926	0.00000	0.00000	0.00000	0.00109
8	0.00000	-0.00191	0.00000	0.00000	0.00000	0.00116
9	0.00000	0.00000	0.00000	0.00000	0.00000	0.00108
10	0.00000	0.00175	0.00000	0.00000	0.00000	0.00098
11	0.00000	0.00675	0.00000	0.00000	0.00000	0.00061
12	0.00000	0.00629	0.00000	0.00000	0.00000	-0.00061
13	0.00000	0.00157	0.00000	0.00000	0.00000	-0.00089
14	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00096
15	0.00000	-0.00168	0.00000	0.00000	0.00000	-0.00101
16	0.00000	-0.00793	0.00000	0.00000	0.00000	-0.00090
17	0.00000	-0.00717	0.00000	0.00000	0.00000	0.00090
18	0.00000	-0.00139	0.00000	0.00000	0.00000	0.00086
19	0.00000	0.00000	0.00000	0.00000	0.00000	0.00076
20	0.00000	0.00119	0.00000	0.00000	0.00000	0.00064

	21	0.00000	0.00400	0.00000	0.00000	0.00000	0.00026
	22	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00038
	23	0.00000	0.00469	0.00000	0.00000	0.00000	0.00026
24		0.00000	-0.01642	0.00000	0.00000	0.00000	-0.00004
25		0.00000	0.01019	0.00000	0.00000	0.00000	-0.00003
26		0.00000	-0.01359	0.00000	0.00000	0.00000	0.00005
27		0.00000	0.00393	0.00000	0.00000	0.00000	-0.00022

Estado H6=2V2+2G2+2R2

1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00042
2	0.00000	-0.00096	0.00000	0.00000	0.00000	0.00029
3	0.00000	0.00016	0.00000	0.00000	0.00000	-0.00001
4	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00018
5	0.00000	-0.00046	0.00000	0.00000	0.00000	-0.00035
6	0.00000	-0.00372	0.00000	0.00000	0.00000	-0.00060
7	0.00000	-0.00368	0.00000	0.00000	0.00000	0.00060
8	0.00000	-0.00044	0.00000	0.00000	0.00000	0.00034
9	0.00000	0.00000	0.00000	0.00000	0.00000	0.00017
10	0.00000	0.00014	0.00000	0.00000	0.00000	-0.00000
11	0.00000	-0.00110	0.00000	0.00000	0.00000	-0.00031
12	0.00000	-0.00156	0.00000	0.00000	0.00000	0.00032
13	0.00000	-0.00004	0.00000	0.00000	0.00000	0.00009
14	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00005
15	0.00000	-0.00021	0.00000	0.00000	0.00000	-0.00019
16	0.00000	-0.00235	0.00000	0.00000	0.00000	-0.00041
17	0.00000	-0.00228	0.00000	0.00000	0.00000	0.00041
18	0.00000	-0.00019	0.00000	0.00000	0.00000	0.00018
19	0.00000	0.00000	0.00000	0.00000	0.00000	0.00003
20	0.00000	-0.00007	0.00000	0.00000	0.00000	-0.00011
21	0.00000	-0.00174	0.00000	0.00000	0.00000	-0.00034
22	0.00000	0.00000	0.00000	0.00000	0.00000	0.00049
23	0.00000	-0.00325	0.00000	0.00000	0.00000	-0.00003
24	0.00000	-0.00824	0.00000	0.00000	0.00000	0.00000
25	0.00000	-0.00387	0.00000	0.00000	0.00000	-0.00003
26	0.00000	-0.00541	0.00000	0.00000	0.00000	0.00000
27	0.00000	-0.00401	0.00000	0.00000	0.00000	0.00007

Estado H7=2B2+2I2

1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00047
2	0.00000	0.00489	0.00000	0.00000	0.00000	-0.00032
3	0.00000	0.00146	0.00000	0.00000	0.00000	-0.00079
4	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00093
5	0.00000	-0.00170	0.00000	0.00000	0.00000	-0.00105
6	0.00000	-0.00878	0.00000	0.00000	0.00000	-0.00110
7	0.00000	-0.00915	0.00000	0.00000	0.00000	0.00109
8	0.00000	-0.00188	0.00000	0.00000	0.00000	0.00114
9	0.00000	0.00000	0.00000	0.00000	0.00000	0.00106
10	0.00000	0.00172	0.00000	0.00000	0.00000	0.00096
11	0.00000	0.00666	0.00000	0.00000	0.00000	0.00061
12	0.00000	0.00625	0.00000	0.00000	0.00000	-0.00060
13	0.00000	0.00156	0.00000	0.00000	0.00000	-0.00088
14	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00095
15	0.00000	-0.00167	0.00000	0.00000	0.00000	-0.00101
16	0.00000	-0.00790	0.00000	0.00000	0.00000	-0.00090
17	0.00000	-0.00716	0.00000	0.00000	0.00000	0.00089
18	0.00000	-0.00138	0.00000	0.00000	0.00000	0.00086
19	0.00000	0.00000	0.00000	0.00000	0.00000	0.00076
20	0.00000	0.00119	0.00000	0.00000	0.00000	0.00064
21	0.00000	0.00400	0.00000	0.00000	0.00000	0.00026
22	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00038
23	0.00000	0.00481	0.00000	0.00000	0.00000	0.00027
24	0.00000	-0.01640	0.00000	0.00000	0.00000	-0.00003
25	0.00000	0.01008	0.00000	0.00000	0.00000	-0.00003
26	0.00000	-0.01356	0.00000	0.00000	0.00000	0.00005
27	0.00000	0.00392	0.00000	0.00000	0.00000	-0.00022

Estado H8=2B2+2I2+2R2

1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00041

	2	0.00000	-0.00085	0.00000	0.00000	0.00000	0.00028
	3	0.00000	0.00019	0.00000	0.00000	0.00000	-0.00003
	4	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00020
5		0.00000	-0.00050	0.00000	0.00000	0.00000	-0.00037
6		0.00000	-0.00389	0.00000	0.00000	0.00000	-0.00061
7		0.00000	-0.00357	0.00000	0.00000	0.00000	0.00059
8		0.00000	-0.00041	0.00000	0.00000	0.00000	0.00032
9		0.00000	0.00000	0.00000	0.00000	0.00000	0.00015
10		0.00000	0.00011	0.00000	0.00000	0.00000	-0.00002
11		0.00000	-0.00119	0.00000	0.00000	0.00000	-0.00032
12		0.00000	-0.00161	0.00000	0.00000	0.00000	0.00032
13		0.00000	-0.00005	0.00000	0.00000	0.00000	0.00010
14		0.00000	0.00000	0.00000	0.00000	0.00000	-0.00005
15		0.00000	-0.00021	0.00000	0.00000	0.00000	-0.00019
16		0.00000	-0.00232	0.00000	0.00000	0.00000	-0.00041
17		0.00000	-0.00227	0.00000	0.00000	0.00000	0.00041
18		0.00000	-0.00019	0.00000	0.00000	0.00000	0.00018
19		0.00000	0.00000	0.00000	0.00000	0.00000	0.00003
20		0.00000	-0.00008	0.00000	0.00000	0.00000	-0.00011
21		0.00000	-0.00174	0.00000	0.00000	0.00000	-0.00034
22		0.00000	0.00000	0.00000	0.00000	0.00000	0.00049
23		0.00000	-0.00314	0.00000	0.00000	0.00000	-0.00002
24		0.00000	-0.00822	0.00000	0.00000	0.00000	0.00001
25		0.00000	-0.00398	0.00000	0.00000	0.00000	-0.00003
26		0.00000	-0.00538	0.00000	0.00000	0.00000	0.00000
27		0.00000	-0.00402	0.00000	0.00000	0.00000	0.00007

Estado H9=2B3+2I3

1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00045
2	0.00000	0.00469	0.00000	0.00000	0.00000	-0.00031
3	0.00000	0.00140	0.00000	0.00000	0.00000	-0.00075
4	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00089
5	0.00000	-0.00163	0.00000	0.00000	0.00000	-0.00101
6	0.00000	-0.00850	0.00000	0.00000	0.00000	-0.00108
7	0.00000	-0.00944	0.00000	0.00000	0.00000	0.00110
8	0.00000	-0.00195	0.00000	0.00000	0.00000	0.00118
9	0.00000	0.00000	0.00000	0.00000	0.00000	0.00110
10	0.00000	0.00178	0.00000	0.00000	0.00000	0.00100
11	0.00000	0.00688	0.00000	0.00000	0.00000	0.00062
12	0.00000	0.00635	0.00000	0.00000	0.00000	-0.00062
13	0.00000	0.00158	0.00000	0.00000	0.00000	-0.00089
14	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00097
15	0.00000	-0.00169	0.00000	0.00000	0.00000	-0.00102
16	0.00000	-0.00796	0.00000	0.00000	0.00000	-0.00091
17	0.00000	-0.00719	0.00000	0.00000	0.00000	0.00090
18	0.00000	-0.00139	0.00000	0.00000	0.00000	0.00086
19	0.00000	0.00000	0.00000	0.00000	0.00000	0.00076
20	0.00000	0.00120	0.00000	0.00000	0.00000	0.00065
21	0.00000	0.00401	0.00000	0.00000	0.00000	0.00026
22	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00038
23	0.00000	0.00461	0.00000	0.00000	0.00000	0.00026
24	0.00000	-0.01641	0.00000	0.00000	0.00000	-0.00005
25	0.00000	0.01034	0.00000	0.00000	0.00000	-0.00003
26	0.00000	-0.01363	0.00000	0.00000	0.00000	0.00005
27	0.00000	0.00394	0.00000	0.00000	0.00000	-0.00022

Estado H0=2B3+2I3+2R2

1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00043
2	0.00000	-0.00105	0.00000	0.00000	0.00000	0.00029
3	0.00000	0.00013	0.00000	0.00000	0.00000	0.00000
4	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00017
5	0.00000	-0.00043	0.00000	0.00000	0.00000	-0.00033
6	0.00000	-0.00361	0.00000	0.00000	0.00000	-0.00060
7	0.00000	-0.00386	0.00000	0.00000	0.00000	0.00061
8	0.00000	-0.00048	0.00000	0.00000	0.00000	0.00037
9	0.00000	0.00000	0.00000	0.00000	0.00000	0.00019
10	0.00000	0.00017	0.00000	0.00000	0.00000	0.00002
11	0.00000	-0.00097	0.00000	0.00000	0.00000	-0.00030

	12	0.00000	-0.00150	0.00000	0.00000	0.00000	0.00031
	13	0.00000	-0.00003	0.00000	0.00000	0.00000	0.00009
	14	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00006
15		0.00000	-0.00022	0.00000	0.00000	0.00000	-0.00020
16		0.00000	-0.00238	0.00000	0.00000	0.00000	-0.00041
17		0.00000	-0.00230	0.00000	0.00000	0.00000	0.00041
18		0.00000	-0.00019	0.00000	0.00000	0.00000	0.00018
19		0.00000	0.00000	0.00000	0.00000	0.00000	0.00004
20		0.00000	-0.00007	0.00000	0.00000	0.00000	-0.00011
21		0.00000	-0.00173	0.00000	0.00000	0.00000	-0.00034
22		0.00000	0.00000	0.00000	0.00000	0.00000	0.00049
23		0.00000	-0.00334	0.00000	0.00000	0.00000	-0.00003
24		0.00000	-0.00823	0.00000	0.00000	0.00000	-0.00001
25		0.00000	-0.00373	0.00000	0.00000	0.00000	-0.00003
26		0.00000	-0.00545	0.00000	0.00000	0.00000	0.00001
27		0.00000	-0.00401	0.00000	0.00000	0.00000	0.00007

R E A C C I O N E S

Nudo	FUERZAS [Ton] FX	FY	FZ	MOMENTOS [Ton*M] MX	MY	MZ
Estado ma=cargas muertas maximo						
1	0.00000	182.25000	0.00000	0.00000	0.00000	0.00000
4	0.00000	612.19800	0.00000	0.00000	0.00000	0.00000
9	0.00000	613.15200	0.00000	0.00000	0.00000	0.00000
14	0.00000	613.15200	0.00000	0.00000	0.00000	0.00000
19	0.00000	612.19800	0.00000	0.00000	0.00000	0.00000
22	0.00000	182.25000	0.00000	0.00000	0.00000	0.00000
SUM	0.00000	2815.20000	0.00000	0.00000	0.00000	0.00000
Estado mi=cargas muertas minimo						
1	0.00000	117.21176	0.00000	0.00000	0.00000	0.00000
4	0.00000	393.72734	0.00000	0.00000	0.00000	0.00000
9	0.00000	394.34089	0.00000	0.00000	0.00000	0.00000
14	0.00000	394.34089	0.00000	0.00000	0.00000	0.00000
19	0.00000	393.72734	0.00000	0.00000	0.00000	0.00000
22	0.00000	117.21176	0.00000	0.00000	0.00000	0.00000
SUM	0.00000	1810.56000	0.00000	0.00000	0.00000	0.00000
Estado SC=SOBRECARGAS PASEOS						
1	0.00000	13.10294	0.00000	0.00000	0.00000	0.00000
4	0.00000	44.01424	0.00000	0.00000	0.00000	0.00000
9	0.00000	44.08282	0.00000	0.00000	0.00000	0.00000
14	0.00000	44.08282	0.00000	0.00000	0.00000	0.00000
19	0.00000	44.01424	0.00000	0.00000	0.00000	0.00000
22	0.00000	13.10294	0.00000	0.00000	0.00000	0.00000
SUM	0.00000	202.40000	0.00000	0.00000	0.00000	0.00000
Estado S1=SOBRECARGA PASEOS VANOS ALTERNOS						
1	0.00000	-3.23529	0.00000	0.00000	0.00000	0.00000
4	0.00000	26.14118	0.00000	0.00000	0.00000	0.00000
9	0.00000	21.09412	0.00000	0.00000	0.00000	0.00000
14	0.00000	21.09412	0.00000	0.00000	0.00000	0.00000
19	0.00000	26.14118	0.00000	0.00000	0.00000	0.00000
22	0.00000	-3.23529	0.00000	0.00000	0.00000	0.00000
SUM	0.00000	88.00000	0.00000	0.00000	0.00000	0.00000
Estado H1=2V1+2G1						
1	0.00000	277.29832	0.00000	0.00000	0.00000	0.00000
4	0.00000	327.20099	0.00000	0.00000	0.00000	0.00000
9	0.00000	322.61224	0.00000	0.00000	0.00000	0.00000
14	0.00000	337.54298	0.00000	0.00000	0.00000	0.00000

19	0.00000	259.11544	0.00000	0.00000	0.00000	0.00000
22	0.00000	237.83003	0.00000	0.00000	0.00000	0.00000
SUM	0.00000	1761.60000	0.00000	0.00000	0.00000	0.00000

Estado H2=2V1+2G1+2R1

1	0.00000	230.23950	0.00000	0.00000	0.00000	0.00000
4	0.00000	707.43628	0.00000	0.00000	0.00000	0.00000
9	0.00000	629.43577	0.00000	0.00000	0.00000	0.00000
14	0.00000	644.36651	0.00000	0.00000	0.00000	0.00000
19	0.00000	639.35074	0.00000	0.00000	0.00000	0.00000
22	0.00000	190.77121	0.00000	0.00000	0.00000	0.00000
SUM	0.00000	3041.60000	0.00000	0.00000	0.00000	0.00000

Estado H3=2B1+2I1

1	0.00000	260.89431	0.00000	0.00000	0.00000	0.00000
4	0.00000	342.91927	0.00000	0.00000	0.00000	0.00000
9	0.00000	323.48183	0.00000	0.00000	0.00000	0.00000
14	0.00000	337.30936	0.00000	0.00000	0.00000	0.00000
19	0.00000	259.17872	0.00000	0.00000	0.00000	0.00000
22	0.00000	237.81651	0.00000	0.00000	0.00000	0.00000
SUM	0.00000	1761.60000	0.00000	0.00000	0.00000	0.00000

Estado H4=2B1+2I1+2R1

1	0.00000	213.83549	0.00000	0.00000	0.00000	0.00000
4	0.00000	723.15456	0.00000	0.00000	0.00000	0.00000
9	0.00000	630.30536	0.00000	0.00000	0.00000	0.00000
14	0.00000	644.13289	0.00000	0.00000	0.00000	0.00000
19	0.00000	639.41401	0.00000	0.00000	0.00000	0.00000
22	0.00000	190.75769	0.00000	0.00000	0.00000	0.00000
SUM	0.00000	3041.60000	0.00000	0.00000	0.00000	0.00000

Estado H5=2V2+2G2

1	0.00000	-57.03476	0.00000	0.00000	0.00000	0.00000
4	0.00000	439.39501	0.00000	0.00000	0.00000	0.00000
9	0.00000	364.87771	0.00000	0.00000	0.00000	0.00000
14	0.00000	294.57766	0.00000	0.00000	0.00000	0.00000
19	0.00000	383.55188	0.00000	0.00000	0.00000	0.00000
22	0.00000	-47.76750	0.00000	0.00000	0.00000	0.00000
SUM	0.00000	1377.60000	0.00000	0.00000	0.00000	0.00000

Estado H6=2V2+2G2+2R2

1	0.00000	180.61230	0.00000	0.00000	0.00000	0.00000
4	0.00000	699.36677	0.00000	0.00000	0.00000	0.00000
9	0.00000	699.25889	0.00000	0.00000	0.00000	0.00000
14	0.00000	628.95883	0.00000	0.00000	0.00000	0.00000
19	0.00000	643.52365	0.00000	0.00000	0.00000	0.00000
22	0.00000	189.87956	0.00000	0.00000	0.00000	0.00000
SUM	0.00000	3041.60000	0.00000	0.00000	0.00000	0.00000

Estado H7=2B2+2I2

1	0.00000	-58.39794	0.00000	0.00000	0.00000	0.00000
4	0.00000	458.76237	0.00000	0.00000	0.00000	0.00000
9	0.00000	345.84637	0.00000	0.00000	0.00000	0.00000
14	0.00000	295.88275	0.00000	0.00000	0.00000	0.00000
19	0.00000	383.19842	0.00000	0.00000	0.00000	0.00000
22	0.00000	-47.69197	0.00000	0.00000	0.00000	0.00000
SUM	0.00000	1377.60000	0.00000	0.00000	0.00000	0.00000

Estado H8=2B2+2I2+2R2

1	0.00000	179.24912	0.00000	0.00000	0.00000	0.00000
4	0.00000	718.73413	0.00000	0.00000	0.00000	0.00000

9	0.00000	680.22754	0.00000	0.00000	0.00000	0.00000
14	0.00000	630.26393	0.00000	0.00000	0.00000	0.00000
19	0.00000	643.17019	0.00000	0.00000	0.00000	0.00000
22	0.00000	189.95509	0.00000	0.00000	0.00000	0.00000
SUM	0.00000	3041.60000	0.00000	0.00000	0.00000	0.00000

Estado H9=2B3+2I3

1	0.00000	-55.99722	0.00000	0.00000	0.00000	0.00000
4	0.00000	420.36580	0.00000	0.00000	0.00000	0.00000
9	0.00000	384.21113	0.00000	0.00000	0.00000	0.00000
14	0.00000	292.87283	0.00000	0.00000	0.00000	0.00000
19	0.00000	384.01361	0.00000	0.00000	0.00000	0.00000
22	0.00000	-47.86616	0.00000	0.00000	0.00000	0.00000
SUM	0.00000	1377.60000	0.00000	0.00000	0.00000	0.00000

Estado H0=2B3+2I3+2R2

1	0.00000	181.64984	0.00000	0.00000	0.00000	0.00000
4	0.00000	680.33757	0.00000	0.00000	0.00000	0.00000
9	0.00000	718.59230	0.00000	0.00000	0.00000	0.00000
14	0.00000	627.25401	0.00000	0.00000	0.00000	0.00000
19	0.00000	643.98537	0.00000	0.00000	0.00000	0.00000
22	0.00000	189.78090	0.00000	0.00000	0.00000	0.00000
SUM	0.00000	3041.60000	0.00000	0.00000	0.00000	0.00000

PILAS, ESTRIBOS Y MUROS

Memoria de cálculo de pilas, estribos y muros

Pilas

A partir de los esfuerzos de cálculo suministrados por el calculista del tablero, se ha procedido a calcular las pilas y estribos del viaducto.

En el apartado de acciones de cálculo sobre las pilas se incluyen todas las hipótesis de cálculo consideradas, así como la combinación de las mismas, buscando obtener las máximas solicitaciones tanto en pilas como en cimentaciones.

Una vez obtenidos los esfuerzos de todas las combinaciones pésimas para las pilas, se ha utilizado un programa realizado internamente por la empresa Intecsa-Inarsa, que permite obtener los esfuerzos en cimentación a partir de los esfuerzos en cabeza de pilas.

El programa en particular utiliza los esfuerzos verticales y horizontales existentes en el extremo de un elemento de hormigón armado, y comienza a iterar para tener en cuenta los esfuerzos adicionales que, sobre un cálculo lineal de primer orden, saldrían al surgir efectos de segundo orden debido a las cargas axiales. Se van realizando diversas iteraciones hasta que se obtiene una situación de equilibrio, en la cual obtendremos los esfuerzos mayorados por el segundo orden en las cimentaciones.

Obviamente, si en el transcurso de estas iteraciones se produjera la no convergencia del método esto implicaría el pandeo de la pila bajo los esfuerzos solicitantes, por lo que se repetiría el cálculo modificando las dimensiones o armaduras de las pilas.

Al calcularse los esfuerzos en la cabeza inferior de la pila, se obtiene una terna de esfuerzos Nd, Mxd, Myd para cada hipótesis, la cual se comprueba mediante el programa de cálculo del Prontuario Informático del Hormigón Estructural 3.0 para la EHE en flexión esviada. De esta manera se verifica que la sección de la pila no llega al agotamiento ante los esfuerzos hallados con anterioridad.

Una vez obtenidos mediante este programa los esfuerzos en cimentación se procede a calcular las cimentaciones. Para ello, a partir de los datos suministrados por el informe geotécnico se ha procedido a diseñar las cimentaciones con micropilotes, pilotes o cimentación directa, según el caso de cada pila.

Para las pilas sustentadas por micropilotes o pilotes se ha efectuado un cálculo matricial mediante el programa Staad V22.3, que ha permitido obtener los esfuerzos en los pilotes o micropilotes a partir de las cargas de cimentación.

Para las pilas sustentadas mediante cimentación directa, se ha realizado un cálculo para obtener las tensiones máximas en las zapatas, verificando que estas fueran inferiores a las tensiones admisibles permitidas por el informe geotécnico. Una vez obtenidas las tensiones, se integran para obtener los esfuerzos de flexión y cortante en la zapata en hipótesis de cargas mayoradas, con lo cual se obtienen los esfuerzos de armado de las zapatas.

Estribos

Para el cálculo del alzado del estribo 1, se ha utilizado un programa de cálculo de estribos realizado internamente por la empresa Intecsa-Inarsa, el cual permite, a partir de los esfuerzos suministrados por el calculista del tablero, y de los esfuerzos transmitidos por las sobrecargas en trasdós de muro, así como las del terreno, obtener los esfuerzos en el muro, y verificar el mismo a flexión y cortante, disponiendo para ello las armaduras necesarias.

Una vez obtenidos los esfuerzos en base de cimentación, y dado que se trata de un estribo cimentado sobre micropilotes, se ha realizado un modelo matricial con el programa Staad V22.3 que ha permitido obtener los esfuerzos en los micropilotes, permitiendo así su verificación tanto en cargas admisibles como en esfuerzos de armado para la camisa de armaduras. Las armaduras del encepado se han obtenido mediante el Prontuario de la EHE, a partir de los esfuerzos de cálculo obtenidos mediante el método matricial.

También se han dimensionado las conexiones de unión de los micropilotes al encepado a partir de los criterios de cálculo de conectadores expuestos en la RPX-95.

Para el cálculo del estribo 2, dada la irregular forma geométrica del mismo, así como el hecho de que va anclado a la ladera, se ha realizado un cálculo por elementos finitos con el programa Staad V22.3, el cual ha permitido verificar las tensiones máximas en todos los puntos de la cimentación , y conocer los esfuerzos en la puntera del estribo así como los coeficientes a vuelco y deslizamiento. De esta manera se han podido conocer con exactitud los esfuerzos de armado, así

como el comportamiento del estribo ante las distintas hipótesis de esfuerzos a las que iba a estar sometido.

Muros

Para el cálculo de los muros que acompañan al estribo 1 se ha utilizado un programa realizado por la empresa Intecsa-Inarsa que tiene en cuenta tanto los esfuerzos de empuje del terreno, como las sobrecargas superiores existentes sobre el muro , así como el talud que las tierras pudieran tener sobre el muro. A partir de los esfuerzos obtenidos el programa arma las distintas secciones, obteniéndose así las armaduras de flexión y cortante necesarias.

Para la aleta en vuelta del estribo 1 se ha utilizado un programa que, suponiendo una placa empotrada en dos extremos y libre en los otros dos, calcula los esfuerzos de flexión y cortante que surgen en ambas direcciones de armado.

Por el cálculo de pilas, estribos y muros:

Fdo.: Jorge Manuel Fernández Martín

Ing. de Caminos

ACCIONES EN CABEZA DE PILAS

U.T.E. ALT CAMP
L.A.V. MADRID-BARCELONA
SUBTRAMO V
VIADUCTO RIO FRANCOLI

REACCIONES VERTICALES (EN CABEZA DE PILA)

	PILAS 1,2,3 Y 4				
	APOYO 1	APOYO 2	N (t)	M (m·t)	
VIGA (T)	202,680	202,680	405,36	0	
PRELOSAS (T)	56,000	56,000	112,00	0	
LOSA FASE 1 (T)	92,770	92,770	185,54	0	
LOSA FASE 2 (T)	47,740	47,740	95,48	0	
CARGAS MUERTAS MAX (T)	306,235	306,235	612,47	0	
CARGAS MUERTAS MIN (T)	196,952	196,952	393,90	0	
SOBRECARGA PASEOS (T)	54,480	-32,480	22,00	139,14	
HIPOTESIS 1 (T)	685,890	-179,390	506,50	1384,45	418,60
TREN 1 VIA RIPADA					
VELOCIDAD 120 Km/h					
COEFICIENTE DE IMPACTO= 1					
COEFICIENTE DE CLASIFICACIÓN= 1.21					
COEFICIENTE DE REDUCCION= 1					
HIPOTESIS 2 (T)	506,510	506,510	1013,02	0,00	837,21
TREN 2 VIAS RIPADAS					
VELOCIDAD 120 Km/h					
COEFICIENTE DE IMPACTO= 1					
COEFICIENTE DE CLASIFICACIÓN= 1.21					
COEFICIENTE DE REDUCCION= 1					
HIPOTESIS 3 (T)	239,380	-62,610	176,77	483,18	390,22
TREN 1 VIA RIPADA					
VELOCIDAD 350 Km/h					
COEFICIENTE DE IMPACTO= 1					
COEFICIENTE DE CLASIFICACIÓN= 1					
COEFICIENTE DE REDUCCION= 0.453					
HIPOTESIS 4 (T)	176,770	176,770	353,54	0,00	780,44
TREN 2 VIAS RIPADAS					
VELOCIDAD 350 Km/h					
COEFICIENTE DE IMPACTO= 1					
COEFICIENTE DE CLASIFICACIÓN= 1					
COEFICIENTE DE REDUCCION= 0.453					
MAX (Tn)	1445,795	1445,795			
MIN (Tn)	384,272	384,272			

REACCIONES HORIZONTALES (EN CABEZA DE PILA)

RADIO CONSIDERADO= 7250 m

TRANSVERSALES	PILAS 1,2,3 Y 4
VIENTO (CON SOBRECARGA) (T)	53,4
LAZO (T)	10
HIPOTESIS 1 CENTRIFUGA (T)	7,92
TREN 1 VIA RIPADA	
VELOCIDAD 120 Km/h	
COEFICIENTE DE IMPACTO= 1	
COEFICIENTE DE CLASIFICACIÓN= 1.21	
COEFICIENTE DE REDUCCION= 1	
HIPOTESIS 2 CENTRIFUGA (T)	15,84
TREN 2 VIAS RIPADAS	
VELOCIDAD 120 Km/h	
COEFICIENTE DE IMPACTO= 1	
COEFICIENTE DE CLASIFICACIÓN= 1.21	
COEFICIENTE DE REDUCCION= 1	
HIPOTESIS 3 CENTRIFUGA (T)	23,52
TREN 1 VIA RIPADA	
VELOCIDAD 350 Km/h	
COEFICIENTE DE IMPACTO= 1	
COEFICIENTE DE CLASIFICACIÓN= 1	
COEFICIENTE DE REDUCCION= 0.453	
HIPOTESIS 4 CENTRIFUGA (T)	47,04
TREN 2 VIAS RIPADAS	
VELOCIDAD 350 Km/h	
COEFICIENTE DE IMPACTO= 1	
COEFICIENTE DE CLASIFICACIÓN= 1	
COEFICIENTE DE REDUCCION= 0.453	

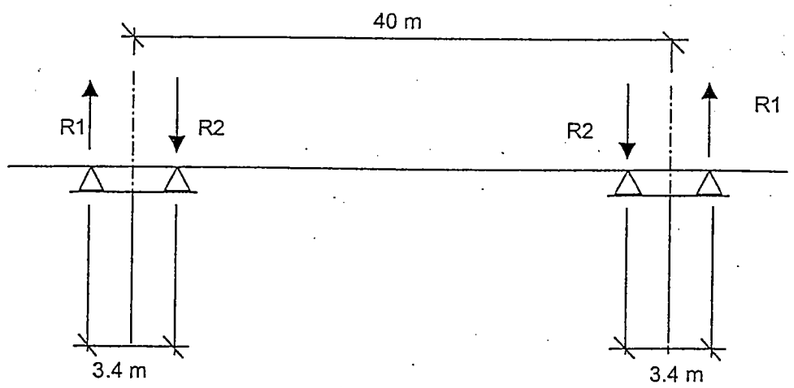
LONGITUDINALES

ROZAMIENTO CONSIDERADO EN TEFLÓN: 0.05 DE CARGAS PERMANENTES

U.T.E. ALT CAMP
L.A.V. MADRID-BARCELONA
SUBTRAMO V
VIADUCTO RIO FRANCOLI

ACCIONES SOBRE CABEZA DE PILAS 1,2,3 Y 4

	R1	R2
P.P. VIGA (Tn)	-135,890	422,602



Acciones sobre cabeza de pila en el momento en que se encuentra montada la viga "sombrero" sobre pila (Lv= 16 m) y la viga de cierre en vano de 40 m (Lv= 24 m)

Combinaciones

1. Servicio . Característica
   - 1.1. Puente vacío. Temperatura predominante
   - 1.2. Puente vacío. Viento predominante
   - 1.3. Puente cargado (v = 120 km/h). Longitudinal
   - 1.4. Puente cargado (v = 120 km/h). Transversal
   - 1.5. Puente cargado. Acompañamiento (v = 120 km/h)
   - 1.6. Puente cargado. Acompañamiento (v = 120 km/h)
   - 1.7. Puente cargado (v = v proy km/h). Longitudinal
   - 1.8. Puente cargado (v = v proy km/h). Transversal
   - 1.9. Puente cargado. Acompañamiento (v = v proy km/h)
   - 1.10. Puente cargado. Acompañamiento (v = v proy km/h)

2. Servicio. Frecuente
   - 2.1. Puente vacío. Temperatura predominante
   - 2.2. Puente vacío. Viento predominante
   - 2.3. Puente cargado (v = 120 km/h). Longitudinal
   - 2.4. Puente cargado (v = 120 km/h). Transversal
   - 2.7. Puente cargado (v = v proy km/h). Longitudinal
   - 2.8. Puente cargado (v = v proy km/h). Transversal

3. Rotura
   - 3.1. Puente vacío. Temperatura predominante
   - 3.2. Puente vacío. Viento predominante
   - 3.3. Puente cargado (v = 120 km/h). Longitudinal
   - 3.4. Puente cargado (v = 120 km/h). Transversal
   - 3.5. Puente cargado. Acompañamiento (v = 120 km/h)
   - 3.6. Puente cargado. Acompañamiento (v = 120 km/h)
   - 3.7. Puente cargado (v = v proy km/h). Longitudinal
   - 3.8. Puente cargado (v = v proy km/h). Transversal
   - 3.9. Puente cargado. Acompañamiento (v = v proy km/h)
   - 3.10. Puente cargado. Acompañamiento (v = v proy km/h)

		Fuerza centrífuga	Fuerza de lazo	Viento (Tablero vacío)	Viento (Con sobrecarga)	Longitudinales
En servicio	1.1			0,60		1,00
Característica	1.2			1,00		0,60
	1.3	0,61	1,00		0,60	0,60
	1.4	1,21	1,00		0,60	0,60
	1.5	0,48	0,80		0,60	1,00
	1.6	0,97	0,80		1,00	0,60
	1.7	0,23	1,00		0,60	0,60
	1.8	0,45	1,00		0,60	0,60
	1.9	0,18	0,80		0,60	1,00
	1.10	0,36	0,80		1,00	0,60
En servicio	2.1			0,20		0,50
Frecuente	2.2			0,50		0,20
	2.3	0,36	0,60		0,20	0,20
	2.4	0,73	0,60		0,20	0,20
	2.7	0,14	0,60		0,20	0,20
	2.8	0,27	0,60		0,20	0,20

Rotura										
	3.1					0,90				1,50
	3.2						1,50			0,90
	3.3	0,91	1,50							0,90
	3.4	1,82	1,50							0,90
	3.5	0,73	1,20							0,90
	3.6	1,45	1,20							0,90
	3.7	0,34	1,50							0,90
	3.8	0,68	1,50							0,90
	3.9	0,27	1,20							1,50
	3.10	0,54	1,20							0,90
Coef. May										
	3.1	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50
	3.2	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50
	3.3	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50
	3.4	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50
	3.5	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50
	3.6	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50
	3.7	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50
	3.8	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50
	3.9	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50
	3.10	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50

Fuerza centrífuga

Fuerza de lazo

Viento (Tablero vacío)

Viento (Con sobrecarga)

Longitudinales

ACCIONES EN CABEZA DE PILAS

			Reacciones del tablero (t)						Pila (t)	
	Altura (m)		Pptablero	CP Máx	CP Mín	SC Paseo	SC 1 Tren	SC 2 Trenes	Pp cabecero	
Pila 1:	20,50		798,38	612,47	393,90	44,00	418,60	837,21	106,56	
Pila 2:	44,50		798,38	612,47	393,90	44,00	418,60	837,21	106,56	
Pila 3:	48,50		798,38	612,47	393,90	44,00	418,60	837,21	106,56	
Pila 4:	27,00		798,38	612,47	393,90	44,00	418,60	837,21	106,56	
	1	2	3	4	5	6	7	8	9	10
α	-	-	1,210	1,210	1,210	1,210	1,210	1,210	1,210	1,210
ϕ	-	-	1,015	1,015	1,015	1,015	1,015	1,015	1,015	1,015
f	-	-	1,000	1,000	1,000	1,000	0,453	0,453	0,453	0,453
En servicio					N (t)					
	1	2	3,1	4,1	5,1	6,1	7,1	8,1	9,1	10,1
Pila 1:	1299	1299	2067	2067	1964	1964	1786	1786	1739	1739
Pila 2:	1299	1299	2067	2067	1964	1964	1786	1786	1739	1739
Pila 3:	1299	1299	2067	2067	1964	1964	1786	1786	1739	1739
Pila 4:	1299	1299	2067	2067	1964	1964	1786	1786	1739	1739
			3,2	4,2	5,2	6,2	7,2	8,2	9,2	10,2
Pila 1:			2581	2581	2375	2375	2018	2018	1925	1925
Pila 2:			2581	2581	2375	2375	2018	2018	1925	1925
Pila 3:			2581	2581	2375	2375	2018	2018	1925	1925
Pila 4:			2581	2581	2375	2375	2018	2018	1925	1925
Mayoradas					N_d (t)					
	1	2	3,1	4,1	5,1	6,1	7,1	8,1	9,1	10,1
Pila 1:	1753	1753	2872	2872	2718	2718	2451	2451	2381	2381
Pila 2:	1753	1753	2872	2872	2718	2718	2451	2451	2381	2381
Pila 3:	1753	1753	2872	2872	2718	2718	2451	2451	2381	2381
Pila 4:	1753	1753	2872	2872	2718	2718	2451	2451	2381	2381
			3,2	4,2	5,2	6,2	7,2	8,2	9,2	10,2
Pila 1:			3644	3644	3335	3335	2800	2800	2660	2660
Pila 2:			3644	3644	3335	3335	2800	2800	2660	2660
Pila 3:			3644	3644	3335	3335	2800	2800	2660	2660
Pila 4:			3644	3644	3335	3335	2800	2800	2660	2660

ACCIONES EN CABEZA DE PILAS

			Momentos del tablero (m·t)						Pila (m·t)	
	Altura (m)		Pptablero	CP Máx	CP Mín	SC Paseo	SC 1 Tren	SC 2 Trenes	Pp pila	
Pila 1:	20,50		0,00	0,00	0,00	139,14	1144,17	0	0,00	
Pila 2:	44,50		0,00	0,00	0,00	139,14	1144,17	0	0,00	
Pila 3:	48,50		0,00	0,00	0,00	139,14	1144,17	0	0,00	
Pila 4:	27,00		0,00	0,00	0,00	139,14	1144,17	0	0,00	
	1	2	3	4	5	6	7	8	9	10
α	-	-	1,210	1,210	1,210	1,210	1,210	1,210	1,210	1,210
ϕ	-	-	1,015	1,015	1,015	1,015	1,015	1,015	1,015	1,015
f	-	-	1,000	1,000	1,000	1,000	0,453	0,453	0,453	0,453

En servicio

M_x (m·t)

	1	2	3,1	4,1	5,1	6,1	7,1	8,1	9,1	10,1
Pila 1:	0	0	1517	1517	1235	1235	748	748	621	621
Pila 2:	0	0	1517	1517	1235	1235	748	748	621	621
Pila 3:	0	0	1517	1517	1235	1235	748	748	621	621
Pila 4:	0	0	1517	1517	1235	1235	748	748	621	621

	3,2	4,2	5,2	6,2	7,2	8,2	9,2	10,2
Pila 1:	111	111	111	111	111	111	111	111
Pila 2:	111	111	111	111	111	111	111	111
Pila 3:	111	111	111	111	111	111	111	111
Pila 4:	111	111	111	111	111	111	111	111

Mayoradas

$M_{x,d}$ (m·t)

	1	2	3,1	4,1	5,1	6,1	7,1	8,1	9,1	10,1
Pila 1:	0	0	2275	2275	1853	1853	1122	1122	931	931
Pila 2:	0	0	2275	2275	1853	1853	1122	1122	931	931
Pila 3:	0	0	2275	2275	1853	1853	1122	1122	931	931
Pila 4:	0	0	2275	2275	1853	1853	1122	1122	931	931

	3,2	4,2	5,2	6,2	7,2	8,2	9,2	10,2
Pila 1:	167	167	167	167	167	167	167	167
Pila 2:	167	167	167	167	167	167	167	167
Pila 3:	167	167	167	167	167	167	167	167
Pila 4:	167	167	167	167	167	167	167	167

ACCIONES EN CABEZA DE PILAS

	Fz (t)				Fx (t)	h sobre cabeza de pila (m)	Mx (m·t)				Mz (m·t)
	Fuerza centrífuga	Fuerza de lazo	Viento (Tablero vacío)	Viento (Con sobrecarga)	Longitudinales		Fuerza centrífuga	Fuerza de lazo	Viento (Tablero vacío)	Viento (Con sobrecarga)	Longitudinales
			Viento vacio		5% de cargas verticales Longitudinal Vacio		5,35	3,55	2,4 Viento vacio	3,775	0% Longitudinal Vacio
Pila 1:			28,38		70,54		0,00	0,00	68,11	0,00	0,00
Pila 2:			28,38		70,54		0,00	0,00	68,11	0,00	0,00
Pila 3:			28,38		70,54		0,00	0,00	68,11	0,00	0,00
Pila 4:			28,38		70,54		0,00	0,00	68,11	0,00	0,00
	Fc 1 tren v=120 km/h	Lazo		Viento Servicio	1 tren v=120 km/h		Fc 1 tren v=120 km/h	Lazo		Viento Servicio	1 tren v=120 km/h
Pila 1:	6,55	10,00		53,40	70,54		35,04	35,50	0,00	201,59	0,00
Pila 2:	6,55	10,00		53,40	70,54		35,04	35,50	0,00	201,59	0,00
Pila 3:	6,55	10,00		53,40	70,54		35,04	35,50	0,00	201,59	0,00
Pila 4:	6,55	10,00		53,40	70,54		35,04	35,50	0,00	201,59	0,00
	Fc 1 Tren v=350 km/h	Lazo		Viento Servicio	1 tren v=350 km/h		Fc 1 Tren v=350 km/h	Lazo		Viento Servicio	1 tren v=350 km/h
Pila 1:	51,92	10,00		53,40	70,54		277,772	35,50	0,00	201,59	0,00
Pila 2:	51,92	10,00		53,40	70,54		277,772	35,50	0,00	201,59	0,00
Pila 3:	51,92	10,00		53,40	70,54		277,772	35,50	0,00	201,59	0,00
Pila 4:	51,92	10,00		53,40	70,54		277,772	35,50	0,00	201,59	0,00

ACCIONES EN CABEZA DE PILAS

	Fuerza centrífuga	Fuerza de lazo	Viento (Tablero vacío)	Viento (Con sobrecarga)	Longitudinales
	Fz (t)				Fx (t)
			Viento vacio		5% de cargas verticales Longitudinal Vacio
Pila 1:			28,38		70,54
Pila 2:			28,38		70,54
Pila 3:			28,38		70,54
Pila 4:			28,38		70,54
	Fc 2 trenes v=120 km/h	Lazo		Viento Servicio	2 trenes v=120 km/h
Pila 1:	13,09	10,00		53,40	70,54
Pila 2:	13,09	10,00		53,40	70,54
Pila 3:	13,09	10,00		53,40	70,54
Pila 4:	13,09	10,00		53,40	70,54
	Fc 2 trenes v=350 km/h	Lazo		Viento Servicio	2 trenes v=350 km/h
Pila 1:	103,84	10,00		53,40	70,54
Pila 2:	103,84	10,00		53,40	70,54
Pila 3:	103,84	10,00		53,40	70,54
Pila 4:	103,84	10,00		53,40	70,54

h sobre cabeza de pila (m)

	Fuerza centrífuga	Fuerza de lazo	Viento (Tablero vacío)	Viento (Con sobrecarga)	Longitudinales
	Mx (m·t)				Mz (m·t)
	5,35	3,55	2,4 Viento vacio	3,775	0% Longitudinal Vacio
Pila 1:	0,00	0,00	68,11	0,00	0,00
Pila 2:	0,00	0,00	68,11	0,00	0,00
Pila 3:	0,00	0,00	68,11	0,00	0,00
Pila 4:	0,00	0,00	68,11	0,00	0,00
	Fc 2 trenes v=120 km/h	Lazo		Viento Servicio	2 trenes v=120 km/h
Pila 1:	70,03	35,50	0,00	201,59	0,00
Pila 2:	70,03	35,50	0,00	201,59	0,00
Pila 3:	70,03	35,50	0,00	201,59	0,00
Pila 4:	70,03	35,50	0,00	201,59	0,00
	Fc 2 trenes v=350 km/h	Lazo		Viento Servicio	2 trenes v=350 km/h
Pila 1:	555,544	35,50	0,00	201,59	0,00
Pila 2:	555,544	35,50	0,00	201,59	0,00
Pila 3:	555,544	35,50	0,00	201,59	0,00
Pila 4:	555,544	35,50	0,00	201,59	0,00

HIPÓTESIS DE CARGAS EN CABEZA DE PILAS PARA CARGAS EN ROTURA

1,1	N	Fx	Fz	Mx	Mz
PILA 1	1298,84	70,54	17,03	40,87	0,00
PILA 2	1298,84	70,54	17,03	40,87	0,00
PILA 3	1298,84	70,54	17,03	40,87	0,00
PILA 4	1298,84	70,54	17,03	40,87	0,00

1,2	N	Fx	Fz	Mx	Mz
PILA 1	1298,84	42,33	28,38	40,87	0,00
PILA 2	1298,84	42,33	28,38	40,87	0,00
PILA 3	1298,84	42,33	28,38	40,87	0,00
PILA 4	1298,84	42,33	28,38	40,87	0,00

1,3,1	N	Fx	Fz	Mx	Mz
PILA 1	2066,72	42,33	46,00	1694,18	0,00
PILA 2	2066,72	42,33	46,00	1694,18	0,00
PILA 3	2066,72	42,33	46,00	1694,18	0,00
PILA 4	2066,72	42,33	46,00	1694,18	0,00

1,3,2	N	Fx	Fz	Mx	Mz
PILA 1	2580,83	42,33	49,96	310,13	0,00
PILA 2	2580,83	42,33	49,96	310,13	0,00
PILA 3	2580,83	42,33	49,96	310,13	0,00
PILA 4	2580,83	42,33	49,96	310,13	0,00

1,4,1	N	Fx	Fz	Mx	Mz
PILA 1	2066,72	42,33	49,97	1694,18	0,00
PILA 2	2066,72	42,33	49,97	1694,18	0,00
PILA 3	2066,72	42,33	49,97	1694,18	0,00
PILA 4	2066,72	42,33	49,97	1694,18	0,00

1,4,2	N	Fx	Fz	Mx	Mz
PILA 1	2580,83	42,33	57,88	352,50	0,00
PILA 2	2580,83	42,33	57,88	352,50	0,00
PILA 3	2580,83	42,33	57,88	352,50	0,00
PILA 4	2580,83	42,33	57,88	352,50	0,00

1,5,1	N	Fx	Fz	Mx	Mz
PILA 1	1963,90	70,54	43,21	1401,79	0,00
PILA 2	1963,90	70,54	43,21	1401,79	0,00
PILA 3	1963,90	70,54	43,21	1401,79	0,00
PILA 4	1963,90	70,54	43,21	1401,79	0,00

1,5,2	N	Fx	Fz	Mx	Mz
PILA 1	2375,19	70,54	46,38	294,56	0,00
PILA 2	2375,19	70,54	46,38	294,56	0,00
PILA 3	2375,19	70,54	46,38	294,56	0,00
PILA 4	2375,19	70,54	46,38	294,56	0,00

HIPÓTESIS DE CARGAS EN CABEZA DE PILAS
PARA CARGAS EN ROTURA

1,6,1	N	Fx	Fz	Mx	Mz
PILA 1	1963,90	42,33	67,74	1499,39	0,00
PILA 2	1963,90	42,33	67,74	1499,39	0,00
PILA 3	1963,90	42,33	67,74	1499,39	0,00
PILA 4	1963,90	42,33	67,74	1499,39	0,00

1,6,2	N	Fx	Fz	Mx	Mz
PILA 1	2375,19	42,33	74,07	409,09	0,00
PILA 2	2375,19	42,33	74,07	409,09	0,00
PILA 3	2375,19	42,33	74,07	409,09	0,00
PILA 4	2375,19	42,33	74,07	409,09	0,00

1,7,1	N	Fx	Fz	Mx	Mz
PILA 1	1785,50	42,33	53,80	967,24	0,00
PILA 2	1785,50	42,33	53,80	967,24	0,00
PILA 3	1785,50	42,33	53,80	967,24	0,00
PILA 4	1785,50	42,33	53,80	967,24	0,00

1,7,2	N	Fx	Fz	Mx	Mz
PILA 1	2018,40	42,33	65,56	393,59	0,00
PILA 2	2018,40	42,33	65,56	393,59	0,00
PILA 3	2018,40	42,33	65,56	393,59	0,00
PILA 4	2018,40	42,33	65,56	393,59	0,00

1,8,1	N	Fx	Fz	Mx	Mz
PILA 1	1785,50	42,33	65,56	1030,15	0,00
PILA 2	1785,50	42,33	65,56	1030,15	0,00
PILA 3	1785,50	42,33	65,56	1030,15	0,00
PILA 4	1785,50	42,33	65,56	1030,15	0,00

1,8,2	N	Fx	Fz	Mx	Mz
PILA 1	2018,40	42,33	89,08	519,42	0,00
PILA 2	2018,40	42,33	89,08	519,42	0,00
PILA 3	2018,40	42,33	89,08	519,42	0,00
PILA 4	2018,40	42,33	89,08	519,42	0,00

1,9,1	N	Fx	Fz	Mx	Mz
PILA 1	1738,92	70,54	49,45	820,24	0,00
PILA 2	1738,92	70,54	49,45	820,24	0,00
PILA 3	1738,92	70,54	49,45	820,24	0,00
PILA 4	1738,92	70,54	49,45	820,24	0,00

1,9,2	N	Fx	Fz	Mx	Mz
PILA 1	1925,24	70,54	58,86	361,33	0,00
PILA 2	1925,24	70,54	58,86	361,33	0,00
PILA 3	1925,24	70,54	58,86	361,33	0,00
PILA 4	1925,24	70,54	58,86	361,33	0,00

1,10,1	N	Fx	Fz	Mx	Mz
PILA 1	1738,92	42,33	80,22	951,21	0,00
PILA 2	1738,92	42,33	80,22	951,21	0,00
PILA 3	1738,92	42,33	80,22	951,21	0,00
PILA 4	1738,92	42,33	80,22	951,21	0,00

1,10,2	N	Fx	Fz	Mx	Mz
PILA 1	1925,24	42,33	99,03	542,63	0,00
PILA 2	1925,24	42,33	99,03	542,63	0,00
PILA 3	1925,24	42,33	99,03	542,63	0,00
PILA 4	1925,24	42,33	99,03	542,63	0,00

HIPÓTESIS DE CARGAS EN CABEZA DE PILAS
PARA CARGAS EN ROTURA

2,1	N	Fx	Fz	Mx	Mz
PILA 1	1298,84	35,27	5,68	13,62	0,00
PILA 2	1298,84	35,27	5,68	13,62	0,00
PILA 3	1298,84	35,27	5,68	13,62	0,00
PILA 4	1298,84	35,27	5,68	13,62	0,00

2,2	N	Fx	Fz	Mx	Mz
PILA 1	1298,84	14,11	14,19	34,06	0,00
PILA 2	1298,84	14,11	14,19	34,06	0,00
PILA 3	1298,84	14,11	14,19	34,06	0,00
PILA 4	1298,84	14,11	14,19	34,06	0,00

2,3,1	N	Fx	Fz	Mx	Mz
PILA 1	2066,72	14,11	19,06	1590,86	0,00
PILA 2	2066,72	14,11	19,06	1590,86	0,00
PILA 3	2066,72	14,11	19,06	1590,86	0,00
PILA 4	2066,72	14,11	19,06	1590,86	0,00

2,3,2	N	Fx	Fz	Mx	Mz
PILA 1	2375,19	14,11	21,43	198,35	0,00
PILA 2	2375,19	14,11	21,43	198,35	0,00
PILA 3	2375,19	14,11	21,43	198,35	0,00
PILA 4	2375,19	14,11	21,43	198,35	0,00

2,4,1	N	Fx	Fz	Mx	Mz
PILA 1	2066,72	14,11	21,44	1603,58	0,00
PILA 2	2066,72	14,11	21,44	1603,58	0,00
PILA 3	2066,72	14,11	21,44	1603,58	0,00
PILA 4	2066,72	14,11	21,44	1603,58	0,00

2,4,2	N	Fx	Fz	Mx	Mz
PILA 1	2375,19	14,11	26,18	223,77	0,00
PILA 2	2375,19	14,11	26,18	223,77	0,00
PILA 3	2375,19	14,11	26,18	223,77	0,00
PILA 4	2375,19	14,11	26,18	223,77	0,00

2,7,1	N	Fx	Fz	Mx	Mz
PILA 1	1785,50	14,11	23,74	847,24	0,00
PILA 2	1785,50	14,11	23,74	847,24	0,00
PILA 3	1785,50	14,11	23,74	847,24	0,00
PILA 4	1785,50	14,11	23,74	847,24	0,00

2,7,2	N	Fx	Fz	Mx	Mz
PILA 1	2018,40	14,11	30,79	248,43	0,00
PILA 2	2018,40	14,11	30,79	248,43	0,00
PILA 3	2018,40	14,11	30,79	248,43	0,00
PILA 4	2018,40	14,11	30,79	248,43	0,00

HIPÓTESIS DE CARGAS EN CABEZA DE PILAS
PARA CARGAS EN ROTURA

2,8,1	N	Fx	Fz	Mx	Mz
PILA 1	1785,50	14,11	30,79	884,99	0,00
PILA 2	1785,50	14,11	30,79	884,99	0,00
PILA 3	1785,50	14,11	30,79	884,99	0,00
PILA 4	1785,50	14,11	30,79	884,99	0,00

2,8,2	N	Fx	Fz	Mx	Mz
PILA 1	2018,40	14,11	44,90	323,93	0,00
PILA 2	2018,40	14,11	44,90	323,93	0,00
PILA 3	2018,40	14,11	44,90	323,93	0,00
PILA 4	2018,40	14,11	44,90	323,93	0,00

HIPÓTESIS DE CARGAS EN CABEZA DE PILAS
PARA CARGAS EN ROTURA

3,1	N	Fx	Fz	Mx	Mz
PILA 1	1753,44	105,81	25,54	61,30	0,00
PILA 2	1753,44	105,81	25,54	61,30	0,00
PILA 3	1753,44	105,81	25,54	61,30	0,00
PILA 4	1753,44	105,81	25,54	61,30	0,00

3,2	N	Fx	Fz	Mx	Mz
PILA 1	1753,44	63,49	42,57	102,17	0,00
PILA 2	1753,44	63,49	42,57	102,17	0,00
PILA 3	1753,44	63,49	42,57	102,17	0,00
PILA 4	1753,44	63,49	42,57	102,17	0,00

3,3,1	N	Fx	Fz	Mx	Mz
PILA 1	2872,46	63,49	69,00	2541,26	0,00
PILA 2	2872,46	63,49	69,00	2541,26	0,00
PILA 3	2872,46	63,49	69,00	2541,26	0,00
PILA 4	2872,46	63,49	69,00	2541,26	0,00

3,3,2	N	Fx	Fz	Mx	Mz
PILA 1	3643,64	63,49	74,94	465,20	0,00
PILA 2	3643,64	63,49	74,94	465,20	0,00
PILA 3	3643,64	63,49	74,94	465,20	0,00
PILA 4	3643,64	63,49	74,94	465,20	0,00

3,4,1	N	Fx	Fz	Mx	Mz
PILA 1	2872,46	63,49	74,95	2573,07	0,00
PILA 2	2872,46	63,49	74,95	2573,07	0,00
PILA 3	2872,46	63,49	74,95	2573,07	0,00
PILA 4	2872,46	63,49	74,95	2573,07	0,00

3,4,2	N	Fx	Fz	Mx	Mz
PILA 1	3643,64	63,49	86,82	528,75	0,00
PILA 2	3643,64	63,49	86,82	528,75	0,00
PILA 3	3643,64	63,49	86,82	528,75	0,00
PILA 4	3643,64	63,49	86,82	528,75	0,00

3,5,1	N	Fx	Fz	Mx	Mz
PILA 1	2718,23	105,81	64,82	2102,69	0,00
PILA 2	2718,23	105,81	64,82	2102,69	0,00
PILA 3	2718,23	105,81	64,82	2102,69	0,00
PILA 4	2718,23	105,81	64,82	2102,69	0,00

3,5,2	N	Fx	Fz	Mx	Mz
PILA 1	3335,17	105,81	69,56	441,84	0,00
PILA 2	3335,17	105,81	69,56	441,84	0,00
PILA 3	3335,17	105,81	69,56	441,84	0,00
PILA 4	3335,17	105,81	69,56	441,84	0,00

HIPÓTESIS DE CARGAS EN CABEZA DE PIL
PARA CARGAS EN ROTURA

3,6,1	N	Fx	Fz	Mx	Mz
PILA 1	2718,23	63,49	101,61	2249,08	0,00
PILA 2	2718,23	63,49	101,61	2249,08	0,00
PILA 3	2718,23	63,49	101,61	2249,08	0,00
PILA 4	2718,23	63,49	101,61	2249,08	0,00

3,7,1	N	Fx	Fz	Mx	Mz
PILA 1	2450,64	63,49	80,70	1450,86	0,00
PILA 2	2450,64	63,49	80,70	1450,86	0,00
PILA 3	2450,64	63,49	80,70	1450,86	0,00
PILA 4	2450,64	63,49	80,70	1450,86	0,00

3,8,1	N	Fx	Fz	Mx	Mz
PILA 1	2450,64	63,49	98,34	1545,23	0,00
PILA 2	2450,64	63,49	98,34	1545,23	0,00
PILA 3	2450,64	63,49	98,34	1545,23	0,00
PILA 4	2450,64	63,49	98,34	1545,23	0,00

3,9,1	N	Fx	Fz	Mx	Mz
PILA 1	2380,77	105,81	74,17	1230,37	0,00
PILA 2	2380,77	105,81	74,17	1230,37	0,00
PILA 3	2380,77	105,81	74,17	1230,37	0,00
PILA 4	2380,77	105,81	74,17	1230,37	0,00

3.10,1	N	Fx	Fz	Mx	Mz
PILA 1	2380,77	63,49	120,32	1426,82	0,00
PILA 2	2380,77	63,49	120,32	1426,82	0,00
PILA 3	2380,77	63,49	120,32	1426,82	0,00
PILA 4	2380,77	63,49	120,32	1426,82	0,00

3,6,2	N	Fx	Fz	Mx	Mz
PILA 1	3335,17	63,49	111,11	613,63	0,00
PILA 2	3335,17	63,49	111,11	613,63	0,00
PILA 3	3335,17	63,49	111,11	613,63	0,00
PILA 4	3335,17	63,49	111,11	613,63	0,00

3,7,2	N	Fx	Fz	Mx	Mz
PILA 1	2799,98	63,49	98,34	590,39	0,00
PILA 2	2799,98	63,49	98,34	590,39	0,00
PILA 3	2799,98	63,49	98,34	590,39	0,00
PILA 4	2799,98	63,49	98,34	590,39	0,00

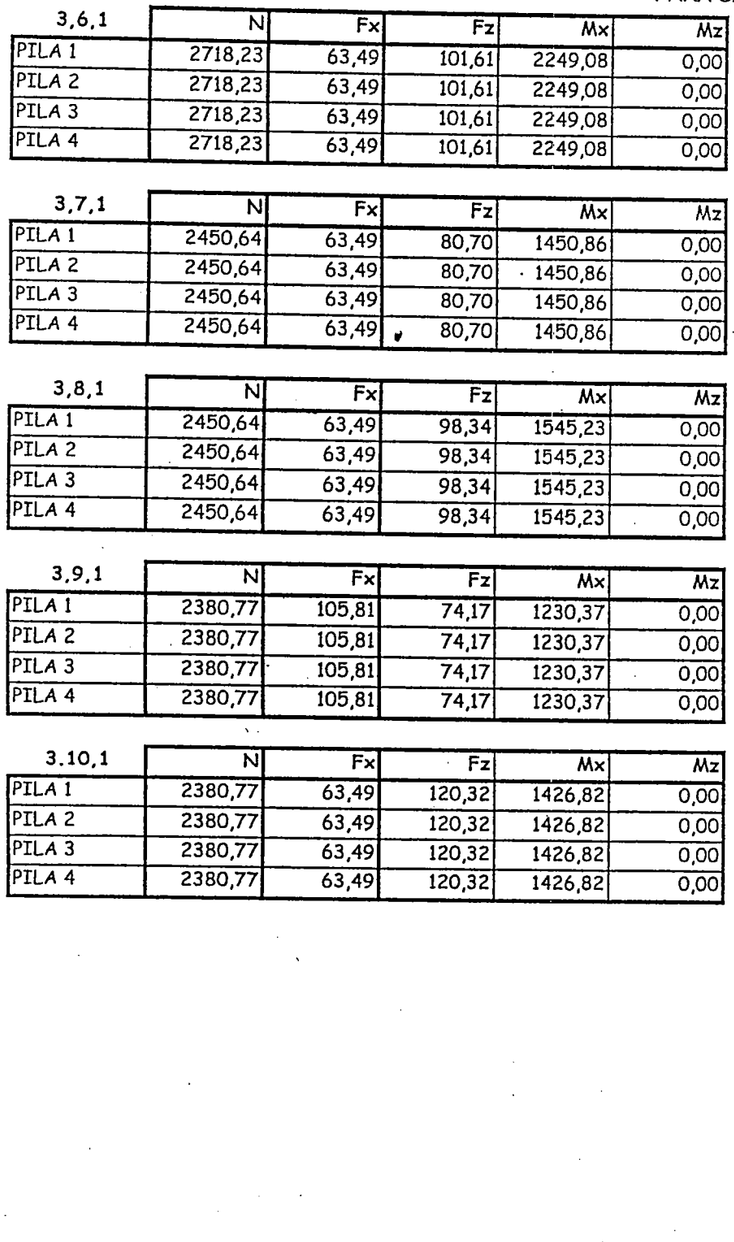
3,8,2	N	Fx	Fz	Mx	Mz
PILA 1	2799,98	63,49	133,62	779,14	0,00
PILA 2	2799,98	63,49	133,62	779,14	0,00
PILA 3	2799,98	63,49	133,62	779,14	0,00
PILA 4	2799,98	63,49	133,62	779,14	0,00

3,9,2	N	Fx	Fz	Mx	Mz
PILA 1	2660,25	105,81	88,28	541,99	0,00
PILA 2	2660,25	105,81	88,28	541,99	0,00
PILA 3	2660,25	105,81	88,28	541,99	0,00
PILA 4	2660,25	105,81	88,28	541,99	0,00

3.10,2	N	Fx	Fz	Mx	Mz
PILA 1	2660,25	63,49	148,55	813,94	0,00
PILA 2	2660,25	63,49	148,55	813,94	0,00
PILA 3	2660,25	63,49	148,55	813,94	0,00
PILA 4	2660,25	63,49	148,55	813,94	0,00

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PILAS CABECERO



* $d \geq \frac{a}{0,35}$ sobre $\Rightarrow$ $d \geq \frac{0,7}{0,35} = 1,4$ $\quad d \geq 1,15$ m $\Rightarrow$ OK

* Armadura principal:

$T_d = R_d \left(\frac{1,4}{1,4} + \frac{1}{1,4}\right) = 635 \cdot \frac{1}{1,4} = 95 = 540$ t

$A_s = \frac{540}{4000}$. 10^2 = 13,2 cm² $\Rightarrow$ 12 ϕ 25

ϕ 25 / 12,5

* Armadura de cortante:

$T_{2d} = 0,20$ $R_d = 0,80 \cdot 635 = 1271$ t

$A_{se} = \frac{127}{4000} \cdot 10^2 = 31,75$ cm² $\Rightarrow$ 30 ϕ 12

$\frac{2}{3}$ ϕ

44 ϕ 12

41,625 cm² $\Rightarrow$

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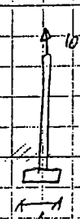
intecsa-inarsa

Proyecto: Hoja de

Ejecutante: PILAS ARMADURA Fecha

BARRAS DE ANCLAJE DEL TABLERO

$N_d = 105\ t$



$$T_{ad} = 0'25 \cdot 105 \cdot \left(\frac{0'4 - 0'15}{0'4}\right) = 16'41\ t$$

$$A_s = \frac{16'41}{40000} \cdot 100^2 = 4'10\ cm^2$$

$\Rightarrow$ # 4 Ø 12

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Proyecto: Hoja de

Ejecutante: Fecha

PILAS APARATOS DE APOYO Y ARMADURA EN APOYOS

Pilas:

* Reacción máxima: $N = 1446\ t \Rightarrow$ BBE 20

$N_d = 2063\ t$

		Ø (mm)	H (mm)
Aparato de apoyo	multidireccional	771	144
Aparato de apoyo	unidireccional	787	167

$$T_{ad} = 0'25 \cdot N_d \cdot \left(\frac{a - a_1}{a}\right)$$

$$T_{ad} = 0'25 \cdot 2063 \cdot \left(\frac{2'75 - 0'771}{2'75}\right) = 371\ t$$

$$A_s = \frac{371}{40000} \cdot 100^2 = 92'79\ cm^2 \Rightarrow 20\ \emptyset\ 25$$

PILA 1

1

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-1 DE 22.6 M V FRANCOLÍ (SER) XH2

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	22.6000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	2.9000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	2.1000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	300.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	22.600	10.0500	10.0500

DATOS ACCIONES EXTERIORES

1

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	36.0000 T
REACCION VERTICAL TABLERO	=	1299.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

FASE ELASTICA

REACCION DEL TABLERO = 36.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.77195548E-03	.10721535E-01
2	.60377832E-05	.76854413E-03	.98505101E-02
3	.11427117E-04	.75867646E-03	.89870570E-02
4	.16241786E-04	.74304353E-03	.81380729E-02
5	.20546006E-04	.72225843E-03	.73097193E-02
6	.24395831E-04	.69686629E-03	.65075042E-02
7	.27840329E-04	.66735286E-03	.57363538E-02
8	.30922570E-04	.63415182E-03	.50006757E-02
9	.33680454E-04	.59765111E-03	.43044136E-02
10	.36147415E-04	.55819837E-03	.36510961E-02
11	.38353015E-04	.51610563E-03	.30438796E-02
12	.40323453E-04	.47165342E-03	.24855861E-02
13	.42081996E-04	.42509434E-03	.19787365E-02
14	.43649349E-04	.37665613E-03	.15255807E-02
15	.45043973E-04	.32654440E-03	.11281240E-02
16	.46282361E-04	.27494503E-03	.78815071E-03
17	.47379272E-04	.22202620E-03	.50724524E-03
18	.48347936E-04	.16794033E-03	.28681108E-03
19	.49200235E-04	.11282561E-03	.12808763E-03
20	.49946852E-04	.56807509E-04	.32165467E-04
21	.50597411E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1299.0000	36.0000	.0000
2	1314.1929	36.0000	40.6800
3	1329.4874	36.0000	81.3600

4	1344.8837	36.0000	122.0400
5	1360.3816	36.0000	162.7200
6	1375.9813	36.0000	203.4000
7	1391.6826	36.0000	244.0800
8	1407.4857	36.0000	284.7600
9	1423.3904	36.0000	325.4400
10	1439.3969	36.0000	366.1200
11	1455.5050	36.0000	406.8000
12	1471.7149	36.0000	447.4800
13	1488.0264	36.0000	488.1600
14	1504.4397	36.0000	528.8400
15	1520.9546	36.0000	569.5200
16	1537.5713	36.0000	610.2000
17	1554.2896	36.0000	650.8800
18	1571.1097	36.0000	691.5600
19	1588.0314	36.0000	732.2400
20	1605.0549	36.0000	772.9200
21	1622.1800	36.0000	813.6000

FASE FINAL EN ITERACION NUMERO 2

REACCION DEL TABLERO = 36.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.75374557E-03	.10468293E-01
2	.58827905E-05	.75042179E-03	.96178129E-02
3	.11140328E-04	.74080373E-03	.87747110E-02
4	.15842013E-04	.72555871E-03	.79457159E-02
5	.20048800E-04	.70528040E-03	.71368442E-02
6	.23813997E-04	.68049792E-03	.63534788E-02
7	.27184383E-04	.65168384E-03	.56004375E-02
8	.30201121E-04	.61926102E-03	.48820326E-02
9	.32900520E-04	.58360860E-03	.42021241E-02
10	.35314687E-04	.54506701E-03	.35641655E-02
11	.37472079E-04	.50394248E-03	.29712455E-02
12	.39397971E-04	.46051091E-03	.24261244E-02
13	.41114863E-04	.41502115E-03	.19312661E-02
14	.42642818E-04	.36769806E-03	.14888672E-02
15	.43999766E-04	.31874500E-03	.11008825E-02
16	.45201757E-04	.26834614E-03	.76904806E-03
17	.46263185E-04	.21666845E-03	.49490186E-03
18	.47196978E-04	.16386346E-03	.27980197E-03
19	.48014767E-04	.11006882E-03	.12494321E-03
20	.48727035E-04	.55409705E-04	.31372053E-04
21	.49343239E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.11380728E-03	-.11380728E-03	-.11380728E-03
2	-.10390942E-03	-.10992457E-03	-.98188408E-04
3	-.10446895E-03	-.11611060E-03	-.93384327E-04
4	-.10504242E-03	-.12195377E-03	-.88923170E-04
5	-.10562753E-03	-.12748072E-03	-.84776774E-04
6	-.10622233E-03	-.13271540E-03	-.80919957E-04
7	-.10682517E-03	-.13767944E-03	-.77330113E-04
8	-.10743464E-03	-.14239243E-03	-.73986895E-04
9	-.10804953E-03	-.14687214E-03	-.70871940E-04
10	-.10866882E-03	-.15113473E-03	-.67968642E-04
11	-.10929163E-03	-.15519493E-03	-.65261941E-04
12	-.10991723E-03	-.15906620E-03	-.62738159E-04
13	-.11054497E-03	-.16276085E-03	-.60384840E-04
14	-.11117432E-03	-.16629016E-03	-.58190620E-04
15	-.11180482E-03	-.16966451E-03	-.56145115E-04
16	-.11243608E-03	-.17289343E-03	-.54238813E-04
17	-.11306776E-03	-.17598569E-03	-.52462990E-04
18	-.11369960E-03	-.17894942E-03	-.50809630E-04
19	-.11433136E-03	-.18179211E-03	-.49271354E-04
20	-.11496285E-03	-.18452069E-03	-.47841360E-04
21	-.11559390E-03	-.18714160E-03	-.46513367E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1299.0000	37.0028	.0000
2	1314.1929	37.0100	41.7940
3	1329.4874	37.0086	83.5922
4	1344.8837	36.9992	125.3853
5	1360.3816	36.9825	167.1644
6	1375.9813	36.9588	208.9212
7	1391.6826	36.9286	250.6480
8	1407.4857	36.8924	292.3376
9	1423.3904	36.8505	333.9833
10	1439.3969	36.8033	375.5787
11	1455.5050	36.7510	417.1178
12	1471.7149	36.6940	458.5948
13	1488.0264	36.6324	500.0045
14	1504.4397	36.5665	541.3417
15	1520.9546	36.4964	582.6016
16	1537.5713	36.4225	623.7796
17	1554.2896	36.3449	664.8712
18	1571.1097	36.2636	705.8722
19	1588.0314	36.1789	746.7785
20	1605.0549	36.0909	787.5863
21	1622.1800	35.9998	828.2919

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.63668726E+07
2	-.27669818E-02	.71038551E+07
3	-.66330778E-02	.75031536E+07
4	-.11293491E-01	.79140614E+07
5	-.16374522E-01	.83367724E+07
6	-.21533544E-01	.87713703E+07
7	-.26449822E-01	.92179264E+07
8	-.30821703E-01	.96765093E+07
9	-.34364456E-01	.10147187E+08
10	-.36808310E-01	.10630025E+08
11	-.37896677E-01	.11125092E+08
12	-.37384480E-01	.11632453E+08
13	-.35036536E-01	.12152175E+08
14	-.30626147E-01	.12684324E+08
15	-.23933708E-01	.13228965E+08
16	-.14745527E-01	.13786163E+08
17	-.28526736E-02	.14355985E+08
18	.11950009E-01	.14938494E+08
19	.29864849E-01	.15533755E+08
20	.51092157E-01	.16141833E+08
21	.75830981E-01	.16762792E+08

1

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-1 DE 22.6 M V FRANCOLÍ (SER) ZH2

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	22.6000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	2.9000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	2.1000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	300.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	22.600	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE = .0000 T/M
CARGA HORIZONTAL UNIFORME = .0450 T/M2
REACCION HORIZONTAL TABLERO = 28.0000 T
REACCION VERTICAL TABLERO = 1299.0000 T
MOMENTO EXTERIOR EN CABEZA = 41.0000 TXM
COEFICIENTE MAYORACION (GS) = 1.0000

1

FASE ELASTICA

REACCION DEL TABLERO = 28.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.11099118E-05	.19101709E-03	.27433419E-02
2	.19417491E-05	.18929291E-03	.25283782E-02
3	.27547793E-05	.18663937E-03	.23158900E-02
4	.35498029E-05	.18307728E-03	.21069155E-02
5	.43275793E-05	.17862656E-03	.19024700E-02
6	.50888293E-05	.17330629E-03	.17035470E-02
7	.58342379E-05	.16713475E-03	.15111185E-02
8	.65644561E-05	.16012949E-03	.13261365E-02
9	.72801031E-05	.15230731E-03	.11495335E-02
10	.79817683E-05	.14368436E-03	.98222358E-03
11	.86700129E-05	.13427610E-03	.82510269E-03
12	.93453720E-05	.12409741E-03	.67904979E-03
13	.10008355E-04	.11316255E-03	.54492737E-03
14	.10659450E-04	.10148524E-03	.42358208E-03
15	.11299119E-04	.89078652E-04	.31584541E-03
16	.11927807E-04	.75955438E-04	.22253425E-03
17	.12545938E-04	.62127772E-04	.14445147E-03
18	.13153916E-04	.47607355E-04	.82386425E-04
19	.13752130E-04	.32405439E-04	.37115541E-04
20	.14340949E-04	.16532849E-04	.94027532E-05
21	.14920730E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1299.0000	28.0000	41.0000
2	1314.1929	28.1028	72.6979
3	1329.4874	28.2080	104.5133
4	1344.8837	28.3154	136.4488
5	1360.3816	28.4251	168.5069
6	1375.9813	28.5371	200.6904
7	1391.6826	28.6514	233.0017
8	1407.4857	28.7680	265.4434
9	1423.3904	28.8868	298.0181
10	1439.3969	29.0080	330.7285
11	1455.5050	29.1314	363.5770
12	1471.7149	29.2571	396.5663
13	1488.0264	29.3852	429.6990
14	1504.4397	29.5155	462.9776
15	1520.9546	29.6480	496.4048
16	1537.5713	29.7829	529.9831
17	1554.2896	29.9201	563.7151
18	1571.1097	30.0596	597.6034
19	1588.0314	30.2013	631.6505
20	1605.0549	30.3453	665.8592
21	1622.1800	30.4917	700.2318

1

FASE FINAL EN ITERACION NUMERO 2

REACCION DEL TABLERO = 28.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.10523892E-05	.18344826E-03	.26369654E-02
2	.18493615E-05	.18180877E-03	.24305104E-02
3	.26289795E-05	.17927851E-03	.22264131E-02
4	.33919903E-05	.17587666E-03	.20256693E-02
5	.41390775E-05	.17162161E-03	.18292532E-02
6	.48708844E-05	.16653098E-03	.16381192E-02
7	.55880199E-05	.16062170E-03	.14532016E-02
8	.62910620E-05	.15391002E-03	.12754164E-02
9	.69805595E-05	.14641155E-03	.11056613E-02
10	.76570342E-05	.13814131E-03	.94481696E-03
11	.83209824E-05	.12911373E-03	.79374721E-03
12	.89728767E-05	.11934270E-03	.65329995E-03
13	.96131668E-05	.10884159E-03	.52430770E-03
14	.10242282E-04	.97623259E-04	.40758812E-03
15	.10860630E-04	.85700114E-04	.30394461E-03
16	.11468602E-04	.73084098E-04	.21416684E-03
17	.12066569E-04	.59786727E-04	.13903120E-03
18	.12654886E-04	.45819105E-04	.79301299E-04
19	.13233893E-04	.31191945E-04	.35728445E-04
20	.13803914E-04	.15915583E-04	.90520363E-05
21	.14365259E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.10336804E-03	-.10626211E-03	-.10052659E-03
2	-.10390556E-03	-.10899130E-03	-.98912280E-04
3	-.10444625E-03	-.11167595E-03	-.97348009E-04
4	-.10499003E-03	-.11431801E-03	-.95831661E-04
5	-.10553681E-03	-.11691927E-03	-.94361296E-04
6	-.10608648E-03	-.11948141E-03	-.92935091E-04
7	-.10663897E-03	-.12200603E-03	-.91551318E-04
8	-.10719420E-03	-.12449462E-03	-.90208337E-04
9	-.10775210E-03	-.12694864E-03	-.88904590E-04
10	-.10831259E-03	-.12936943E-03	-.87638598E-04
11	-.10887560E-03	-.13175831E-03	-.86408952E-04
12	-.10944108E-03	-.13411649E-03	-.85214311E-04
13	-.11000895E-03	-.13644516E-03	-.84053400E-04
14	-.11057916E-03	-.13874544E-03	-.82925001E-04
15	-.11115166E-03	-.14101839E-03	-.81827955E-04
16	-.11172638E-03	-.14326503E-03	-.80761155E-04
17	-.11230328E-03	-.14548635E-03	-.79723547E-04
18	-.11288231E-03	-.14768325E-03	-.78714122E-04
19	-.11346343E-03	-.14985664E-03	-.77731918E-04
20	-.11404658E-03	-.15200735E-03	-.76776015E-04
21	-.11463173E-03	-.15413620E-03	-.75845534E-04

1

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1299.0000	28.2481	40.9866
2	1314.1929	28.3516	72.9560
3	1329.4874	28.4561	105.0434
4	1344.8837	28.5616	137.2496
5	1360.3816	28.6681	169.5758
6	1375.9813	28.7756	202.0231
7	1391.6826	28.8840	234.5925
8	1407.4857	28.9933	267.2851
9	1423.3904	29.1036	300.1019
10	1439.3969	29.2148	333.0440
11	1455.5050	29.3268	366.1124
12	1471.7149	29.4397	399.3080
13	1488.0264	29.5535	432.6319
14	1504.4397	29.6681	466.0849
15	1520.9546	29.7835	499.6679
16	1537.5713	29.8997	533.3819
17	1554.2896	30.0166	567.2277
18	1571.1097	30.1343	601.2062
19	1588.0314	30.2527	635.3181
20	1605.0549	30.3718	669.5643
21	1622.1800	30.4916	703.9456

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.13388394E-01	.38930289E+08
2	.11603407E-01	.39443890E+08
3	.94243961E-02	.39952956E+08
4	.70951224E-02	.40460639E+08
5	.47168482E-02	.40967452E+08
6	.23657518E-02	.41473540E+08
7	.11041824E-03	.41978957E+08
8	-.19835520E-02	.42483724E+08
9	-.38514141E-02	.42987853E+08
10	-.54289514E-02	.43491349E+08
11	-.66521040E-02	.43994214E+08
12	-.74564900E-02	.44496450E+08
13	-.77778280E-02	.44998057E+08
14	-.75513518E-02	.45499035E+08
15	-.67120406E-02	.45999385E+08
16	-.51944132E-02	.46499105E+08
17	-.29326231E-02	.46998196E+08
18	.13984928E-03	.47496655E+08
19	.40899199E-02	.47994483E+08
20	.89851702E-02	.48491679E+08
21	.14893922E-01	.48988242E+08

1

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-1 DE 22.6 M V FRANCOLÍ (SER) XH3

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	22.6000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	2.9000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	2.1000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	300.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	22.600	10.0500	10.0500

DATOS ACCIONES EXTERIORES

1

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	50.0000 T
REACCION VERTICAL TABLERO	=	2581.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

FASE ELASTICA

REACCION DEL TABLERO = 50.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.10721604E-02	.14891021E-01
2	.83858100E-05	.10674224E-02	.13681264E-01
3	.15870996E-04	.10537173E-02	.12482024E-01
4	.22558036E-04	.10320049E-02	.11302879E-01
5	.28536119E-04	.10031367E-02	.10152388E-01
6	.33883098E-04	.96786985E-03	.90382002E-02
7	.38667124E-04	.92687897E-03	.79671581E-02
8	.42948014E-04	.88076642E-03	.69453829E-02
9	.46778409E-04	.83007099E-03	.59783522E-02
10	.50204743E-04	.77527551E-03	.50709668E-02
11	.53268077E-04	.71681337E-03	.42276106E-02
12	.56004796E-04	.65507420E-03	.34522029E-02
13	.58447217E-04	.59040881E-03	.27482451E-02
14	.60624096E-04	.52313352E-03	.21188621E-02
15	.62561074E-04	.45353389E-03	.15668389E-02
16	.64281057E-04	.38186809E-03	.10946538E-02
17	.65804544E-04	.30836973E-03	.70450728E-03
18	.67149912E-04	.23325046E-03	.39834872E-03
19	.68333659E-04	.15670224E-03	.17789948E-03
20	.69370628E-04	.78899318E-04	.44674260E-04
21	.70274183E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2581.0000	50.0000	.0000
2	2596.1929	50.0000	56.5000
3	2611.4874	50.0000	113.0000

4	2626.8837	50.0000	169.5000
5	2642.3816	50.0000	226.0000
6	2657.9813	50.0000	282.5000
7	2673.6826	50.0000	339.0000
8	2689.4857	50.0000	395.5000
9	2705.3904	50.0000	452.0000
10	2721.3969	50.0000	508.5000
11	2737.5050	50.0000	565.0000
12	2753.7149	50.0000	621.5000
13	2770.0264	50.0000	678.0000
14	2786.4397	50.0000	734.5000
15	2802.9546	50.0000	791.0000
16	2819.5713	50.0000	847.5000
17	2836.2896	50.0000	904.0000
18	2853.1096	50.0000	960.5000
19	2870.0314	50.0000	1017.0000
20	2887.0549	50.0000	1073.5000
21	2904.1800	50.0000	1130.0000

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 50.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.11740450E-02	.16267834E-01
2	.92679070E-05	.11688087E-02	.14943136E-01
3	.17538583E-04	.11536630E-02	.13630059E-01
4	.24921248E-04	.11296732E-02	.12339189E-01
5	.31512633E-04	.10977880E-02	.11079972E-01
6	.37397462E-04	.10588538E-02	.98608431E-02
7	.42650220E-04	.10136269E-02	.86893325E-02
8	.47336569E-04	.96278436E-03	.75721615E-02
9	.51514530E-04	.90693349E-03	.65153263E-02
10	.55235493E-04	.84661972E-03	.55241728E-02
11	.58545077E-04	.78233370E-03	.46034620E-02
12	.61483856E-04	.71451735E-03	.37574284E-02
13	.64087995E-04	.64356926E-03	.29898324E-02
14	.66389784E-04	.56984931E-03	.23040060E-02
15	.68418110E-04	.49368285E-03	.17028945E-02
16	.70198856E-04	.41536427E-03	.11890934E-02
17	.71755256E-04	.33516019E-03	.76488143E-03
18	.73108194E-04	.25331234E-03	.43225049E-03
19	.74276472E-04	.17004001E-03	.19293209E-03
20	.75277042E-04	.85542272E-04	.48421636E-04
21	.76125209E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.22612516E-03	-.22612516E-03	-.22612516E-03
2	-.21491012E-03	-.22438655E-03	-.20589708E-03
3	-.21478672E-03	-.23311454E-03	-.19733583E-03
4	-.21470580E-03	-.24130923E-03	-.18934843E-03
5	-.21466129E-03	-.24901006E-03	-.18188815E-03
6	-.21464799E-03	-.25625266E-03	-.17491318E-03
7	-.21466146E-03	-.26306946E-03	-.16838597E-03
8	-.21469791E-03	-.26948999E-03	-.16227266E-03
9	-.21475409E-03	-.27554124E-03	-.15654267E-03
10	-.21482721E-03	-.28124789E-03	-.15116831E-03
11	-.21491489E-03	-.28663261E-03	-.14612442E-03
12	-.21501508E-03	-.29171619E-03	-.14138816E-03
13	-.21512603E-03	-.29651778E-03	-.13693867E-03
14	-.21524624E-03	-.30105503E-03	-.13275693E-03
15	-.21537443E-03	-.30534425E-03	-.12882553E-03
16	-.21550952E-03	-.30940049E-03	-.12512849E-03
17	-.21565056E-03	-.31323771E-03	-.12165118E-03
18	-.21579676E-03	-.31686884E-03	-.11838010E-03
19	-.21594746E-03	-.32030590E-03	-.11530284E-03
20	-.21610207E-03	-.32356005E-03	-.11240794E-03
21	-.21626012E-03	-.32664167E-03	-.10968482E-03

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2581.0000	53.0298	.0000
2	2596.1929	53.0340	59.9288
3	2611.4874	53.0123	119.8474
4	2626.8837	52.9671	179.7280
5	2642.3816	52.9003	239.5452
6	2657.9813	52.8140	299.2756
7	2673.6826	52.7097	358.8982
8	2689.4857	52.5890	418.3935
9	2705.3904	52.4533	477.7438
10	2721.3969	52.3037	536.9327
11	2737.5050	52.1414	595.9453
12	2753.7149	51.9673	654.7677
13	2770.0264	51.7825	713.3872
14	2786.4397	51.5876	771.7921
15	2802.9546	51.3836	829.9715
16	2819.5713	51.1710	887.9153
17	2836.2896	50.9504	945.6143
18	2853.1096	50.7225	1003.0598
19	2870.0314	50.4878	1060.2439
20	2887.0549	50.2467	1117.1589
21	2904.1800	49.9996	1173.7981

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.63668726E+07
2	.29105779E-03	.64651771E+07
3	.57938803E-03	.68325677E+07
4	.84626671E-03	.72105398E+07
5	.10886361E-02	.75994178E+07
6	.13031440E-02	.79993117E+07
7	.14876787E-02	.84103075E+07
8	.16416556E-02	.88324863E+07
9	.17660948E-02	.92659270E+07
10	.18637049E-02	.97107077E+07
11	.19389745E-02	.10166906E+08
12	.19981615E-02	.10634598E+08
13	.20492685E-02	.11113862E+08
14	.21020356E-02	.11604772E+08
15	.21678897E-02	.12107406E+08
16	.22598842E-02	.12621837E+08
17	.23926330E-02	.13148141E+08
18	.25822190E-02	.13686391E+08
19	.28460989E-02	.14236663E+08
20	.32030206E-02	.14799029E+08
21	.36729062E-02	.15373562E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-1 DE 22.6 M V FRANCOLÍ (SER) ZH3

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	22.6000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	2.9000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	2.1000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	300.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	22.600	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE = .0000 T/M
CARGA HORIZONTAL UNIFORME = .0270 T/M2
REACCION HORIZONTAL TABLERO = 50.0000 T
REACCION VERTICAL TABLERO = 2581.0000 T
MOMENTO EXTERIOR EN CABEZA = 353.0000 TXM
COEFICIENTE MAYORACION (GS) = 1.0000

1

FASE ELASTICA

REACCION DEL TABLERO = 50.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.95560701E-05	.48745913E-03	.64557676E-02
2	.10938608E-04	.47587964E-03	.59113341E-02
3	.12286598E-04	.46275739E-03	.53808607E-02
4	.13601428E-04	.44813066E-03	.48660691E-02
5	.14884414E-04	.43203616E-03	.43686383E-02
6	.16136805E-04	.41450917E-03	.38902069E-02
7	.17359789E-04	.39558359E-03	.34323744E-02
8	.18554492E-04	.37529203E-03	.29967025E-02
9	.19721989E-04	.35366581E-03	.25847171E-02
10	.20863301E-04	.33073512E-03	.21979091E-02
11	.21979401E-04	.30652900E-03	.18377361E-02
12	.23071215E-04	.28107540E-03	.15056235E-02
13	.24139627E-04	.25440127E-03	.12029655E-02
14	.25185480E-04	.22653259E-03	.93112655E-03
15	.26209580E-04	.19749438E-03	.69144234E-03
16	.27212694E-04	.16731079E-03	.48522068E-03
17	.28195558E-04	.13600513E-03	.31374259E-03
18	.29158873E-04	.10359988E-03	.17826326E-03
19	.30103310E-04	.70116745E-04	.80012869E-04
20	.31029513E-04	.35576700E-04	.20197516E-04
21	.31938097E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2581.0000	50.0000	353.0000
2	2596.1929	50.0617	409.5347
3	2611.4874	50.1248	466.1400
4	2626.8837	50.1892	522.8173
5	2642.3816	50.2551	579.5682
6	2657.9813	50.3223	636.3942
7	2673.6826	50.3908	693.2970
8	2689.4857	50.4608	750.2780
9	2705.3904	50.5321	807.3389
10	2721.3969	50.6048	864.4811
11	2737.5050	50.6788	921.7062
12	2753.7149	50.7543	979.0158
13	2770.0264	50.8311	1036.4114
14	2786.4397	50.9093	1093.8946
15	2802.9546	50.9888	1151.4669
16	2819.5713	51.0698	1209.1298
17	2836.2896	51.1521	1266.8850
18	2853.1096	51.2357	1324.7340
19	2870.0314	51.3208	1382.6783
20	2887.0549	51.4072	1440.7195
21	2904.1800	51.4950	1498.8591

1

FASE FINAL EN ITERACION NUMERO 2

REACCION DEL TABLERO = 50.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.99738539E-05	.51446546E-03	.68178339E-02
2	.11455023E-04	.50235814E-03	.62431709E-02
3	.12898038E-04	.48859866E-03	.56831268E-02
4	.14304348E-04	.47322931E-03	.51395444E-02
5	.15675327E-04	.45629080E-03	.46142196E-02
6	.17012279E-04	.43782230E-03	.41089034E-02
7	.18316440E-04	.41786157E-03	.36253033E-02
8	.19588986E-04	.39644501E-03	.31650847E-02
9	.20831034E-04	.37360770E-03	.27298727E-02
10	.22043645E-04	.34938350E-03	.23212537E-02
11	.23227829E-04	.32380512E-03	.19407761E-02
12	.24384549E-04	.29690413E-03	.15899523E-02
13	.25514721E-04	.26871104E-03	.12702594E-02
14	.26619218E-04	.23925536E-03	.98314089E-03
15	.27698873E-04	.20856564E-03	.73000714E-03
16	.28754480E-04	.17666950E-03	.51223696E-03
17	.29786797E-04	.14359368E-03	.33117842E-03
18	.30796549E-04	.10936408E-03	.18814984E-03
19	.31784426E-04	.74005834E-04	.84440721E-04
20	.32751090E-04	.37543268E-04	.21312617E-04
21	.33697172E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.21522059E-03	-.24264869E-03	-.18829119E-03
2	-.21507116E-03	-.24657247E-03	-.18414259E-03
3	-.21493884E-03	-.25040844E-03	-.18011414E-03
4	-.21482307E-03	-.25416003E-03	-.17620133E-03
5	-.21472332E-03	-.25783047E-03	-.17239994E-03
6	-.21463907E-03	-.26142283E-03	-.16870591E-03
7	-.21456983E-03	-.26494004E-03	-.16511544E-03
8	-.21451512E-03	-.26838484E-03	-.16162486E-03
9	-.21447451E-03	-.27175986E-03	-.15823072E-03
10	-.21444756E-03	-.27506758E-03	-.15492972E-03
11	-.21443386E-03	-.27831039E-03	-.15171872E-03
12	-.21443301E-03	-.28149052E-03	-.14859472E-03
13	-.21444463E-03	-.28461011E-03	-.14555488E-03
14	-.21446836E-03	-.28767121E-03	-.14259647E-03
15	-.21450384E-03	-.29067575E-03	-.13971689E-03
16	-.21455075E-03	-.29362557E-03	-.13691366E-03
17	-.21460876E-03	-.29652246E-03	-.13418441E-03
18	-.21467756E-03	-.29936807E-03	-.13152688E-03
19	-.21475684E-03	-.30216401E-03	-.12893889E-03
20	-.21484632E-03	-.30491182E-03	-.12641838E-03
21	-.21494572E-03	-.30761295E-03	-.12396336E-03

1

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2581.0000	51.2581	353.2055
2	2596.1929	51.2972	411.2009
3	2611.4874	51.3333	469.2378
4	2626.8837	51.3664	527.3128
5	2642.3816	51.3966	585.4226
6	2657.9813	51.4240	643.5637
7	2673.6826	51.4485	701.7330
8	2689.4857	51.4701	759.9269
9	2705.3904	51.4889	818.1424
10	2721.3969	51.5048	876.3760
11	2737.5050	51.5179	934.6246
12	2753.7149	51.5282	992.8849
13	2770.0264	51.5357	1051.1536
14	2786.4397	51.5404	1109.4277
15	2802.9546	51.5423	1167.7038
16	2819.5713	51.5414	1225.9788
17	2836.2896	51.5377	1284.2495
18	2853.1096	51.5312	1342.5126
19	2870.0314	51.5219	1400.7650
20	2887.0549	51.5098	1459.0035
21	2904.1800	51.4949	1517.2248

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	-.20547907E+00	.35408233E+08
2	-.17857602E+00	.35890861E+08
3	-.15202337E+00	.36372937E+08
4	-.12606946E+00	.36854467E+08
5	-.10096210E+00	.37335456E+08
6	-.76947734E-01	.37815903E+08
7	-.54270785E-01	.38295806E+08
8	-.33173743E-01	.38775164E+08
9	-.13896793E-01	.39253974E+08
10	.33223348E-02	.39732233E+08
11	.18248541E-01	.40209939E+08
12	.30649596E-01	.40687089E+08
13	.40296197E-01	.41163680E+08
14	.46962272E-01	.41639711E+08
15	.50425109E-01	.42115178E+08
16	.50465606E-01	.42590078E+08
17	.46868403E-01	.43064411E+08
18	.39422142E-01	.43538173E+08
19	.27919650E-01	.44011363E+08
20	.12158209E-01	.44483978E+08
21	-.80603067E-02	.44956016E+08

1

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-1 DE 22.6 M V FRANCOLÍ (SER) XH4

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	22.6000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	2.9000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	2.1000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	300.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	22.600	10.0500	10.0500

DATOS ACCIONES EXTERIORES

1

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	59.0000 T
REACCION VERTICAL TABLERO	=	2067.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

FASE ELASTICA

REACCION DEL TABLERO = 59.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.12651493E-02	.17571404E-01
2	.98952557E-05	.12595584E-02	.16143892E-01
3	.18727775E-04	.12433864E-02	.14728788E-01
4	.26618482E-04	.12177658E-02	.13337397E-01
5	.33672620E-04	.11837013E-02	.11979818E-01
6	.39982056E-04	.11420864E-02	.10665076E-01
7	.45627206E-04	.10937172E-02	.94012465E-02
8	.50678657E-04	.10393044E-02	.81955518E-02
9	.55198522E-04	.97948377E-03	.70544556E-02
10	.59241597E-04	.91482510E-03	.59837408E-02
11	.62856330E-04	.84583977E-03	.49885805E-02
12	.66085660E-04	.77298755E-03	.40735995E-02
13	.68967716E-04	.69668239E-03	.32429293E-02
14	.71536433E-04	.61729755E-03	.25002573E-02
15	.73822067E-04	.53517000E-03	.18488699E-02
16	.75851648E-04	.45060435E-03	.12916914E-02
17	.77649362E-04	.36387628E-03	.83131859E-03
18	.79236896E-04	.27523554E-03	.47005149E-03
19	.80633718E-04	.18490864E-03	.20992139E-03
20	.81857341E-04	.93101195E-04	.52715627E-04
21	.82923535E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2067.0000	59.0000	.0000
2	2082.1929	59.0000	66.6700
3	2097.4874	59.0000	133.3400

4	2112.8837	59.0000	200.0100
5	2128.3816	59.0000	266.6800
6	2143.9813	59.0000	333.3500
7	2159.6826	59.0000	400.0200
8	2175.4857	59.0000	466.6900
9	2191.3904	59.0000	533.3600
10	2207.3969	59.0000	600.0300
11	2223.5050	59.0000	666.7000
12	2239.7149	59.0000	733.3700
13	2256.0264	59.0000	800.0400
14	2272.4397	59.0000	866.7100
15	2288.9546	59.0000	933.3800
16	2305.5713	59.0000	1000.0500
17	2322.2896	59.0000	1066.7200
18	2339.1096	59.0000	1133.3900
19	2356.0314	59.0000	1200.0600
20	2373.0549	59.0000	1266.7300
21	2390.1800	59.0000	1333.4000

FASE FINAL EN ITERACION NUMERO 2

REACCION DEL TABLERO = 59.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.13214857E-02	.18331102E-01
2	.10376054E-04	.13156232E-02	.16840031E-01
3	.19641481E-04	.12986633E-02	.15361973E-01
4	.27919161E-04	.12717916E-02	.13908785E-01
5	.35317123E-04	.12360631E-02	.12491060E-01
6	.41929907E-04	.11924185E-02	.11118265E-01
7	.47840527E-04	.11416982E-02	.97988597E-02
8	.53122074E-04	.10846543E-02	.85404085E-02
9	.57839068E-04	.10219613E-02	.73496687E-02
10	.62048598E-04	.95422476E-03	.62326757E-02
11	.65801293E-04	.88198957E-03	.51948153E-02
12	.69142151E-04	.80574652E-03	.42408889E-02
13	.72111248E-04	.72593835E-03	.33751710E-02
14	.74744343E-04	.64296494E-03	.26014604E-02
15	.77073410E-04	.55718791E-03	.19231263E-02
16	.79127081E-04	.46893463E-03	.13431485E-02
17	.80931048E-04	.37850179E-03	.86415495E-03
18	.82508395E-04	.28615851E-03	.48845404E-03
19	.83879898E-04	.19214912E-03	.21806429E-03
20	.85064287E-04	.96695656E-04	.54740963E-04
21	.86078466E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.18109287E-03	-.18109287E-03	-.18109287E-03
2	-.16915244E-03	-.17976196E-03	-.15906173E-03
3	-.16934823E-03	-.18987358E-03	-.14980496E-03
4	-.16958995E-03	-.19939366E-03	-.14118221E-03
5	-.16987027E-03	-.20836593E-03	-.13314046E-03
6	-.17018293E-03	-.21682995E-03	-.12563241E-03
7	-.17052262E-03	-.22482161E-03	-.11861565E-03
8	-.17088478E-03	-.23237358E-03	-.11205208E-03
9	-.17126555E-03	-.23951565E-03	-.10590740E-03
10	-.17166162E-03	-.24627506E-03	-.10015061E-03
11	-.17207016E-03	-.25267675E-03	-.94753645E-04
12	-.17248878E-03	-.25874361E-03	-.89691051E-04
13	-.17291540E-03	-.26449669E-03	-.84939682E-04
14	-.17334830E-03	-.26995536E-03	-.80478450E-04
15	-.17378597E-03	-.27513750E-03	-.76288103E-04
16	-.17422715E-03	-.28005962E-03	-.72351036E-04
17	-.17467079E-03	-.28473701E-03	-.68651113E-04
18	-.17511596E-03	-.28918382E-03	-.65173528E-04
19	-.17556193E-03	-.29341319E-03	-.61904666E-04
20	-.17600804E-03	-.29743731E-03	-.58831988E-04
21	-.17645378E-03	-.30126756E-03	-.55943931E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2067.0000	61.6151	.0000
2	2082.1929	61.6226	69.7557
3	2097.4874	61.6079	139.5079
4	2112.8837	61.5729	209.2310
5	2128.3816	61.5192	278.9018
6	2143.9813	61.4484	348.4994
7	2159.6826	61.3619	418.0043
8	2175.4857	61.2608	487.3989
9	2191.3904	61.1462	556.6667
10	2207.3969	61.0191	625.7926
11	2223.5050	60.8804	694.7625
12	2239.7149	60.7310	763.5635
13	2256.0264	60.5714	832.1834
14	2272.4397	60.4024	900.6111
15	2288.9546	60.2246	968.8360
16	2305.5713	60.0385	1036.8482
17	2322.2896	59.8447	1104.6386
18	2339.1096	59.6434	1172.1985
19	2356.0314	59.4353	1239.5196
20	2373.0549	59.2205	1306.5944
21	2390.1800	58.9996	1373.4154

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.63668726E+07
2	.76423390E-02	.67221132E+07
3	.14184372E-01	.71018680E+07
4	.20225820E-01	.74924926E+07
5	.25647520E-01	.78941805E+07
6	.30349204E-01	.83070251E+07
7	.34208119E-01	.87311087E+07
8	.37081160E-01	.91665112E+07
9	.38811690E-01	.96133114E+07
10	.39236687E-01	.10071588E+08
11	.38193430E-01	.10541418E+08
12	.35525419E-01	.11022879E+08
13	.31087504E-01	.11516049E+08
14	.24750317E-01	.12021004E+08
15	.16403930E-01	.12537821E+08
16	.59609339E-02	.13066575E+08
17	-.66410538E-02	.13607342E+08
18	-.21437435E-01	.14160196E+08
19	-.38435093E-01	.14725213E+08
20	-.57611229E-01	.15302466E+08
21	-.78912570E-01	.15892030E+08

1

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-1 DE 22.6 M V FRANCOLÍ (SER) ZH4

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	22.6000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	2.9000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	2.1000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	300.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	22.600	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE = .0000 T/M
CARGA HORIZONTAL UNIFORME = .0270 T/M2
REACCION HORIZONTAL TABLERO = 50.0000 T
REACCION VERTICAL TABLERO = 2067.0000 T
MOMENTO EXTERIOR EN CABEZA = 1694.0000 TXM
COEFICIENTE MAYORACION (GS) = 1.0000

1

FASE ELASTICA

REACCION DEL TABLERO = 50.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.45858308E-04	.12136283E-02	.14334411E-01
2	.46756505E-04	.11613010E-02	.12992481E-01
3	.47632907E-04	.11079709E-02	.11710249E-01
4	.48488407E-04	.10536624E-02	.10488835E-01
5	.49323847E-04	.99839848E-03	.93293317E-02
6	.50140030E-04	.94220139E-03	.82328059E-02
7	.50937717E-04	.88509246E-03	.72003000E-02
8	.51717631E-04	.82709219E-03	.62328327E-02
9	.52480461E-04	.76822027E-03	.53314000E-02
10	.53226864E-04	.70849563E-03	.44969760E-02
11	.53957461E-04	.64793649E-03	.37305142E-02
12	.54672849E-04	.58656036E-03	.30329473E-02
13	.55373594E-04	.52438412E-03	.24051891E-02
14	.56060237E-04	.46142401E-03	.18481345E-02
15	.56733295E-04	.39769566E-03	.13626602E-02
16	.57393260E-04	.33321416E-03	.94962595E-03
17	.58040604E-04	.26799402E-03	.60987445E-03
18	.58675778E-04	.20204927E-03	.34423240E-03
19	.59299211E-04	.13539340E-03	.15351095E-03
20	.59911317E-04	.68039451E-04	.38506260E-04
21	.60512490E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2067.0000	50.0000	1694.0000
2	2082.1929	50.0617	1750.5347
3	2097.4874	50.1248	1807.1400
4	2112.8837	50.1892	1863.8173
5	2128.3816	50.2551	1920.5682
6	2143.9813	50.3223	1977.3942
7	2159.6826	50.3908	2034.2970
8	2175.4857	50.4608	2091.2780
9	2191.3904	50.5321	2148.3389
10	2207.3969	50.6048	2205.4811
11	2223.5050	50.6788	2262.7062
12	2239.7149	50.7543	2320.0158
13	2256.0264	50.8311	2377.4114
14	2272.4397	50.9093	2434.8946
15	2288.9546	50.9888	2492.4669
16	2305.5713	51.0698	2550.1298
17	2322.2896	51.1521	2607.8850
18	2339.1096	51.2357	2665.7340
19	2356.0314	51.3208	2723.6783
20	2373.0549	51.4072	2781.7195
21	2390.1800	51.4950	2839.8591

1

FASE FINAL EN ITERACION NUMERO 2

REACCION DEL TABLERO = 50.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.46054171E-04	.12323129E-02	.14588499E-01
2	.47039857E-04	.11797148E-02	.13225599E-01
3	.47999504E-04	.11260176E-02	.11922758E-01
4	.48934086E-04	.10712501E-02	.10681202E-01
5	.49844523E-04	.10154402E-02	.95021253E-02
6	.50731688E-04	.95861463E-03	.83866899E-02
7	.51596410E-04	.90079925E-03	.73360290E-02
8	.52439475E-04	.84201898E-03	.63512470E-02
9	.53261630E-04	.78229785E-03	.54334205E-02
10	.54063585E-04	.72165911E-03	.45835995E-02
11	.54846015E-04	.66012518E-03	.38028081E-02
12	.55609562E-04	.59771778E-03	.30920456E-02
13	.56354838E-04	.53445790E-03	.24522870E-02
14	.57082424E-04	.47036584E-03	.18844842E-02
15	.57792867E-04	.40546130E-03	.13895663E-02
16	.58486712E-04	.33976334E-03	.96844051E-03
17	.59164454E-04	.27329043E-03	.62199301E-03
18	.59826574E-04	.20606050E-03	.35108928E-03
19	.60473531E-04	.13809094E-03	.15657487E-03
20	.61105763E-04	.69398641E-04	.39275984E-04
21	.61723689E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.17192748E-03	-.29857645E-03	-.47581219E-04
2	-.17218859E-03	-.30154820E-03	-.45180977E-04
3	-.17245766E-03	-.30445630E-03	-.42859001E-04
4	-.17273444E-03	-.30730317E-03	-.40612404E-04
5	-.17301866E-03	-.31009110E-03	-.38438449E-04
6	-.17331010E-03	-.31282224E-03	-.36334540E-04
7	-.17360851E-03	-.31549864E-03	-.34298209E-04
8	-.17391370E-03	-.31812225E-03	-.32327114E-04
9	-.17422543E-03	-.32069491E-03	-.30419027E-04
10	-.17454351E-03	-.32321837E-03	-.28571831E-04
11	-.17486775E-03	-.32569429E-03	-.26783508E-04
12	-.17519796E-03	-.32812425E-03	-.25052139E-04
13	-.17553396E-03	-.33050976E-03	-.23375894E-04
14	-.17587557E-03	-.33285224E-03	-.21753030E-04
15	-.17622264E-03	-.33515303E-03	-.20181903E-04
16	-.17657501E-03	-.33741347E-03	-.18660887E-04
17	-.17693251E-03	-.33963476E-03	-.17188488E-04
18	-.17729501E-03	-.34181809E-03	-.15763259E-04
19	-.17766235E-03	-.34396456E-03	-.14383819E-04
20	-.17803441E-03	-.34607526E-03	-.13048847E-04
21	-.17841104E-03	-.34815118E-03	-.11757079E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2067.0000	52.5086	1694.0878
2	2082.1929	52.4798	1753.4459
3	2097.4874	52.4487	1812.7684
4	2112.8837	52.4155	1872.0527
5	2128.3816	52.3800	1931.2963
6	2143.9813	52.3423	1990.4968
7	2159.6826	52.3023	2049.6515
8	2175.4857	52.2601	2108.7578
9	2191.3904	52.2155	2167.8132
10	2207.3969	52.1687	2226.8152
11	2223.5050	52.1195	2285.7609
12	2239.7149	52.0680	2344.6479
13	2256.0264	52.0141	2403.4735
14	2272.4397	51.9578	2462.2350
15	2288.9546	51.8991	2520.9293
16	2305.5713	51.8379	2579.5544
17	2322.2896	51.7743	2638.1073
18	2339.1096	51.7083	2696.5851
19	2356.0314	51.6397	2754.9851
20	2373.0549	51.5686	2813.3043
21	2390.1800	51.4949	2871.5401

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	-.87794637E-01	.36690611E+08
2	-.83772904E-01	.37175575E+08
3	-.78371116E-01	.37659943E+08
4	-.71803976E-01	.38143712E+08
5	-.64283131E-01	.38626881E+08
6	-.56016989E-01	.39109450E+08
7	-.47210600E-01	.39591417E+08
8	-.38065436E-01	.40072780E+08
9	-.28779260E-01	.40553539E+08
10	-.19545902E-01	.41033693E+08
11	-.10555110E-01	.41513241E+08
12	-.19923339E-02	.41992182E+08
13	.59614676E-02	.42470516E+08
14	.13130018E-01	.42948243E+08
15	.19685370E-01	.43425045E+08
16	.24761952E-01	.43901575E+08
17	.28555123E-01	.44377492E+08
18	.30909544E-01	.44852798E+08
19	.31675684E-01	.45327492E+08
20	.30710062E-01	.45801574E+08
21	.27875467E-01	.46275045E+08

1

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-1 DE 22.6 M V FRANCOLÍ (SER) XH51

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	22.6000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	2.9000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	2.1000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	300.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	22.600	10.0500	10.0500

DATOS ACCIONES EXTERIORES

1

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	98.0000 T
REACCION VERTICAL TABLERO	=	1964.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

FASE ELASTICA

REACCION DEL TABLERO = 98.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.21014344E-02	.29186400E-01
2	.16436188E-04	.20921479E-02	.26815278E-01
3	.31107152E-04	.20652859E-02	.24464766E-01
4	.44213750E-04	.20227296E-02	.22153643E-01
5	.55930793E-04	.19661479E-02	.19898680E-01
6	.66410873E-04	.18970249E-02	.17714872E-01
7	.75787563E-04	.18166828E-02	.15615630E-01
8	.84178108E-04	.17263022E-02	.13612950E-01
9	.91685681E-04	.16269391E-02	.11717570E-01
10	.98401296E-04	.15195400E-02	.99390949E-02
11	.10440543E-03	.14049542E-02	.82861168E-02
12	.10976940E-03	.12839454E-02	.67663178E-02
13	.11455655E-03	.11572013E-02	.53865605E-02
14	.11882323E-03	.10253417E-02	.41529697E-02
15	.12261971E-03	.88892643E-03	.30710042E-02
16	.12599087E-03	.74846146E-03	.21455214E-02
17	.12897691E-03	.60440466E-03	.13808343E-02
18	.13161383E-03	.45717090E-03	.78076349E-03
19	.13393397E-03	.30713639E-03	.34868299E-03
20	.13596643E-03	.15464266E-03	.87561550E-04
21	.13773740E-03	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1964.0000	98.0000	.0000
2	1979.1929	98.0000	110.7400
3	1994.4874	98.0000	221.4800

4	2009.8837	98.0000	332.2200
5	2025.3816	98.0000	442.9600
6	2040.9813	98.0000	553.7000
7	2056.6826	98.0000	664.4400
8	2072.4857	98.0000	775.1800
9	2088.3904	98.0000	885.9200
10	2104.3969	98.0000	996.6600
11	2120.5050	98.0000	1107.4000
12	2136.7149	98.0000	1218.1400
13	2153.0264	98.0000	1328.8800
14	2169.4397	98.0000	1439.6200
15	2185.9546	98.0000	1550.3600
16	2202.5713	98.0000	1661.1000
17	2219.2896	98.0000	1771.8400
18	2236.1097	98.0000	1882.5800
19	2253.0314	98.0000	1993.3200
20	2270.0549	98.0000	2104.0600
21	2287.1800	98.0000	2214.8000

FASE FINAL EN ITERACION NUMERO 4

REACCION DEL TABLERO = 98.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.21960083E-02	.30593572E-01
2	.17070006E-04	.21863638E-02	.28115715E-01
3	.32316259E-04	.21584605E-02	.25659267E-01
4	.45943044E-04	.21142440E-02	.23243739E-01
5	.58128529E-04	.20554436E-02	.20886569E-01
6	.69028291E-04	.19836000E-02	.18603349E-01
7	.78778641E-04	.19000891E-02	.16408027E-01
8	.87499370E-04	.18061420E-02	.14313079E-01
9	.95296051E-04	.17028626E-02	.12329662E-01
10	.10226198E-03	.15912423E-02	.10467751E-01
11	.10847980E-03	.14721732E-02	.87362599E-02
12	.11402291E-03	.13464592E-02	.71431427E-02
13	.11895664E-03	.12148257E-02	.56954918E-02
14	.12333927E-03	.10779285E-02	.43996193E-02
15	.12722289E-03	.93636090E-03	.32611325E-02
16	.13072807E-03	.79061861E-03	.22850161E-02
17	.13420884E-03	.64092926E-03	.14758212E-02
18	.13776209E-03	.48726569E-03	.83801294E-03
19	.14149178E-03	.32948725E-03	.37615066E-03
20	.14559061E-03	.16728570E-03	.95037788E-04
21	.15049028E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.17206889E-03	-.17206889E-03	-.17206889E-03
2	-.16023826E-03	-.17769234E-03	-.14363768E-03
3	-.16061859E-03	-.19438908E-03	-.12846391E-03
4	-.16111027E-03	-.21015447E-03	-.11436322E-03
5	-.16169383E-03	-.22505393E-03	-.10124016E-03
6	-.16235277E-03	-.23914674E-03	-.89010209E-04
7	-.16307302E-03	-.25248678E-03	-.77598198E-04
8	-.16384265E-03	-.26512317E-03	-.66937095E-04
9	-.16465146E-03	-.27710080E-03	-.56966919E-04
10	-.16549078E-03	-.28846080E-03	-.47633849E-04
11	-.16635322E-03	-.29924097E-03	-.38889457E-04
12	-.16723248E-03	-.30947606E-03	-.30690051E-04
13	-.16812322E-03	-.31919816E-03	-.22996117E-04
14	-.16902088E-03	-.32843689E-03	-.15771831E-04
15	-.16992160E-03	-.33721970E-03	-.89846421E-05
16	-.17076529E-03	-.34561408E-03	-.24528990E-05
17	-.17130657E-03	-.35383059E-03	.45070118E-05
18	-.17146807E-03	-.36192415E-03	.12099910E-04
19	-.17115403E-03	-.36994997E-03	.20567330E-04
20	-.17017675E-03	-.37800735E-03	.30374315E-04
21	-.16808908E-03	-.38629998E-03	.42597316E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1964.0000	102.3106	.0000
2	1979.1929	102.3248	115.6279
3	1994.4874	102.3025	231.2510
4	2009.8837	102.2469	346.8300
5	2025.3816	102.1606	462.3285
6	2040.9813	102.0460	577.7135
7	2056.6826	101.9055	692.9541
8	2072.4857	101.7409	808.0222
9	2088.3904	101.5540	922.8915
10	2104.3969	101.3465	1037.5378
11	2120.5050	101.1198	1151.9387
12	2136.7149	100.8752	1266.0730
13	2153.0264	100.6139	1379.9213
14	2169.4397	100.3370	1493.4654
15	2185.9546	100.0456	1606.6882
16	2202.5713	99.7403	1719.5427
17	2219.2896	99.4214	1832.0370
18	2236.1097	99.0885	1944.1701
19	2253.0314	98.7412	2055.9333
20	2270.0549	98.3786	2167.3230
21	2287.1800	97.9993	2278.2003

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.63668726E+07
2	-.26223020E-02	.67730612E+07
3	-.53768853E-02	.71537060E+07
4	-.82639682E-02	.75443596E+07
5	-.11288763E-01	.79451575E+07
6	-.14453910E-01	.83563243E+07
7	-.17760597E-01	.87777744E+07
8	-.21209043E-01	.92096868E+07
9	-.24798716E-01	.96521633E+07
10	-.28528498E-01	.10105306E+08
11	-.32396789E-01	.10569218E+08
12	-.36401355E-01	.11044001E+08
13	-.40539570E-01	.11529758E+08
14	-.44808190E-01	.12026589E+08
15	-.49203338E-01	.12534598E+08
16	-.22792438E-01	.12451203E+08
17	.11044956E-01	.11877759E+08
18	.37821368E-01	.11222900E+08
19	.50324186E-01	.10410286E+08
20	.35300732E-01	.93749616E+07
21	.11346968E+00	.72288206E+07

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ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-1 DE 22.6 M V FRANCOLÍ (SER) ZH51

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	22.6000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	2.9000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	2.1000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	300.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	22.600	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE = .0000 T/M
CARGA HORIZONTAL UNIFORME = .0450 T/M2
REACCION HORIZONTAL TABLERO = 43.0000 T
REACCION VERTICAL TABLERO = 1964.0000 T
MOMENTO EXTERIOR EN CABEZA = 1402.0000 TXM
COEFICIENTE MAYORACION (GS) = 1.0000

1

FASE ELASTICA

REACCION DEL TABLERO = 43.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.37953570E-04	.10161262E-02	.12040851E-01
2	.38746575E-04	.97279059E-03	.10917029E-01
3	.39521794E-04	.92856896E-03	.98426781E-02
4	.40279990E-04	.88348095E-03	.88187892E-02
5	.41021883E-04	.83754540E-03	.78463304E-02
6	.41748160E-04	.79078032E-03	.69262491E-02
7	.42459469E-04	.74320301E-03	.60594728E-02
8	.43156431E-04	.69483003E-03	.52469100E-02
9	.43839633E-04	.64567725E-03	.44894507E-02
10	.44509635E-04	.59575991E-03	.37879674E-02
11	.45166971E-04	.54509263E-03	.31433157E-02
12	.45812150E-04	.49368943E-03	.25563352E-02
13	.46445655E-04	.44156377E-03	.20278498E-02
14	.47067948E-04	.38872858E-03	.15586684E-02
15	.47679472E-04	.33519629E-03	.11495857E-02
16	.48280648E-04	.28097882E-03	.80138282E-03
17	.48871877E-04	.22608765E-03	.51482735E-03
18	.49453546E-04	.17053378E-03	.29067435E-03
19	.50026023E-04	.11432783E-03	.12966663E-03
20	.50589659E-04	.57479965E-04	.32535251E-04
21	.51144792E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1964.0000	43.0000	1402.0000
2	1979.1929	43.1028	1450.6479
3	1994.4874	43.2080	1499.4133
4	2009.8837	43.3154	1548.2988
5	2025.3816	43.4251	1597.3069
6	2040.9813	43.5371	1646.4404
7	2056.6826	43.6514	1695.7017
8	2072.4857	43.7680	1745.0934
9	2088.3904	43.8868	1794.6181
10	2104.3969	44.0080	1844.2785
11	2120.5050	44.1314	1894.0770
12	2136.7149	44.2571	1944.0163
13	2153.0264	44.3852	1994.0990
14	2169.4397	44.5155	2044.3276
15	2185.9546	44.6480	2094.7048
16	2202.5713	44.7829	2145.2331
17	2219.2896	44.9201	2195.9151
18	2236.1097	45.0596	2246.7534
19	2253.0314	45.2013	2297.7505
20	2270.0549	45.3453	2348.9092
21	2287.1800	45.4917	2400.2318

1

FASE FINAL EN ITERACION NUMERO 2

REACCION DEL TABLERO = 43.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.37805257E-04	.10232466E-02	.12152777E-01
2	.38662575E-04	.98004225E-03	.11020828E-01
3	.39499018E-04	.93588095E-03	.99382423E-02
4	.40315397E-04	.89078580E-03	.89060888E-02
5	.41112482E-04	.84477905E-03	.79254098E-02
6	.41891002E-04	.79788208E-03	.69972234E-02
7	.42651649E-04	.75011548E-03	.61225239E-02
8	.43395078E-04	.70149908E-03	.53022825E-02
9	.44121915E-04	.65205198E-03	.45374488E-02
10	.44832752E-04	.60179259E-03	.38289510E-02
11	.45528152E-04	.55073868E-03	.31776968E-02
12	.46208652E-04	.49890739E-03	.25845744E-02
13	.46874762E-04	.44631526E-03	.20504527E-02
14	.47526968E-04	.39297828E-03	.15761825E-02
15	.48165733E-04	.33891191E-03	.11625965E-02
16	.48791498E-04	.28413107E-03	.81051067E-03
17	.49404684E-04	.22865023E-03	.52072399E-03
18	.50005693E-04	.17248337E-03	.29401956E-03
19	.50594908E-04	.11564403E-03	.13116488E-03
20	.51172693E-04	.58145332E-04	.32912415E-04
21	.51739399E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.16195585E-03	-.26592031E-03	-.59881656E-04
2	-.16223327E-03	-.26855536E-03	-.57844323E-04
3	-.16251796E-03	-.27114026E-03	-.55870612E-04
4	-.16280970E-03	-.27367704E-03	-.53958127E-04
5	-.16310830E-03	-.27616762E-03	-.52104596E-04
6	-.16341357E-03	-.27861382E-03	-.50307862E-04
7	-.16372533E-03	-.28101736E-03	-.48565877E-04
8	-.16404341E-03	-.28337987E-03	-.46876696E-04
9	-.16436764E-03	-.28570291E-03	-.45238467E-04
10	-.16469786E-03	-.28798793E-03	-.43649432E-04
11	-.16503392E-03	-.29023634E-03	-.42107913E-04
12	-.16537568E-03	-.29244947E-03	-.40612317E-04
13	-.16572298E-03	-.29462857E-03	-.39161122E-04
14	-.16607569E-03	-.29677485E-03	-.37752880E-04
15	-.16643369E-03	-.29888945E-03	-.36386208E-04
16	-.16679683E-03	-.30097345E-03	-.35059788E-04
17	-.16716501E-03	-.30302789E-03	-.33772360E-04
18	-.16753809E-03	-.30505375E-03	-.32522722E-04
19	-.16791597E-03	-.30705197E-03	-.31309725E-04
20	-.16829854E-03	-.30902345E-03	-.30132270E-04
21	-.16868568E-03	-.31096903E-03	-.28989308E-04

1

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1964.0000	44.9957	1401.9403
2	1979.1929	45.0282	1452.8296
3	1994.4874	45.0600	1503.7542
4	2009.8837	45.0911	1554.7133
5	2025.3816	45.1214	1605.7060
6	2040.9813	45.1510	1656.7316
7	2056.6826	45.1799	1707.7891
8	2072.4857	45.2080	1758.8776
9	2088.3904	45.2352	1809.9963
10	2104.3969	45.2616	1861.1442
11	2120.5050	45.2872	1912.3203
12	2136.7149	45.3120	1963.5237
13	2153.0264	45.3358	2014.7534
14	2169.4397	45.3587	2066.0083
15	2185.9546	45.3807	2117.2875
16	2202.5713	45.4017	2168.5898
17	2219.2896	45.4218	2219.9141
18	2236.1097	45.4408	2271.2593
19	2253.0314	45.4588	2322.6243
20	2270.0549	45.4757	2374.0079
21	2287.1800	45.4916	2425.4088

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.59747582E-01	.37018805E+08
2	.50010320E-01	.37508394E+08
3	.41636810E-01	.37997420E+08
4	.34495398E-01	.38485882E+08
5	.28456938E-01	.38973775E+08
6	.23394902E-01	.39461097E+08
7	.19185475E-01	.39947846E+08
8	.15707700E-01	.40434019E+08
9	.12843589E-01	.40919614E+08
10	.10478253E-01	.41404628E+08
11	.85000162E-02	.41889059E+08
12	.68005757E-02	.42372905E+08
13	.52751448E-02	.42856164E+08
14	.38225719E-02	.43338833E+08
15	.23455181E-02	.43820912E+08
16	.75060781E-03	.44302396E+08
17	-.10514342E-02	.44783285E+08
18	-.31455815E-02	.45263577E+08
19	-.56123497E-02	.45743270E+08
20	-.85276431E-02	.46222362E+08
21	-.11962532E-01	.46700851E+08

1

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-1 DE 22.6 M V FRANCOLÍ (SER) XH52

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	22.6000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	2.9000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	2.1000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	300.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	22.600	10.0500	10.0500

DATOS ACCIONES EXTERIORES

1

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	84.0000 T
REACCION VERTICAL TABLERO	=	2375.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

FASE ELASTICA

REACCION DEL TABLERO = 84.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.18012294E-02	.25016915E-01
2	.14088161E-04	.17932696E-02	.22984524E-01
3	.26663273E-04	.17702451E-02	.20969800E-01
4	.37897500E-04	.17337682E-02	.18988837E-01
5	.47940680E-04	.16852697E-02	.17056012E-01
6	.56923605E-04	.16260213E-02	.15184176E-01
7	.64960768E-04	.15571567E-02	.13384826E-01
8	.72152664E-04	.14796876E-02	.11668243E-01
9	.78587727E-04	.13945193E-02	.10043632E-01
10	.84343968E-04	.13024629E-02	.85192242E-02
11	.89490369E-04	.12042465E-02	.71023858E-02
12	.94088058E-04	.11005246E-02	.57997009E-02
13	.98191325E-04	.99188680E-03	.46170518E-02
14	.10184848E-03	.87886431E-03	.35596883E-02
15	.10510260E-03	.76193694E-03	.26322894E-02
16	.10799218E-03	.64153839E-03	.18390183E-02
17	.11055163E-03	.51806114E-03	.11835722E-02
18	.11281185E-03	.39186077E-03	.66922585E-03
19	.11480055E-03	.26325976E-03	.29887113E-03
20	.11654265E-03	.13255085E-03	.75052757E-04
21	.11806063E-03	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2375.0000	84.0000	.0000
2	2390.1929	84.0000	94.9200
3	2405.4874	84.0000	189.8400

4	2420.8837	84.0000	284.7600
5	2436.3816	84.0000	379.6800
6	2451.9813	84.0000	474.6000
7	2467.6826	84.0000	569.5200
8	2483.4857	84.0000	664.4400
9	2499.3904	84.0000	759.3600
10	2515.3969	84.0000	854.2800
11	2531.5050	84.0000	949.2000
12	2547.7149	84.0000	1044.1200
13	2564.0264	84.0000	1139.0400
14	2580.4397	84.0000	1233.9600
15	2596.9546	84.0000	1328.8800
16	2613.5713	84.0000	1423.8000
17	2630.2896	84.0000	1518.7200
18	2647.1096	84.0000	1613.6400
19	2664.0314	84.0000	1708.5600
20	2681.0549	84.0000	1803.4800
21	2698.1800	84.0000	1898.4000

FASE FINAL EN ITERACION NUMERO 2

REACCION DEL TABLERO = 84.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.19378795E-02	.26872593E-01
2	.15241919E-04	.19292678E-02	.24686033E-01
3	.28847925E-04	.19043570E-02	.22518587E-01
4	.40999754E-04	.18648931E-02	.20387668E-01
5	.51856667E-04	.18124292E-02	.18308826E-01
6	.61557957E-04	.17483500E-02	.16295953E-01
7	.70225858E-04	.16738921E-02	.14361464E-01
8	.77967944E-04	.15901626E-02	.12516449E-01
9	.84879140E-04	.14981540E-02	.10770815E-01
10	.91043418E-04	.13987578E-02	.91334040E-02
11	.96535235E-04	.12927758E-02	.76121031E-02
12	.10142077E-03	.11809307E-02	.62139391E-02
13	.10575895E-03	.10638741E-02	.49451628E-02
14	.10960237E-03	.94219498E-03	.38113247E-02
15	.11299807E-03	.81642573E-03	.28173427E-02
16	.11598816E-03	.68704851E-03	.19675616E-02
17	.11861045E-03	.55450029E-03	.12658075E-02
18	.12089892E-03	.41917749E-03	.71543602E-03
19	.12288413E-03	.28144007E-03	.31937585E-03
20	.12459370E-03	.14161510E-03	.80167763E-04
21	.12605251E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.20807720E-03	-.20807720E-03	-.20807720E-03
2	-.19639105E-03	-.21197591E-03	-.18156829E-03
3	-.19649340E-03	-.22663949E-03	-.16778972E-03
4	-.19668920E-03	-.24045644E-03	-.15497195E-03
5	-.19696260E-03	-.25348636E-03	-.14303166E-03
6	-.19730013E-03	-.26578335E-03	-.13189480E-03
7	-.19769033E-03	-.27739668E-03	-.12149528E-03
8	-.19812346E-03	-.28837135E-03	-.11177396E-03
9	-.19859118E-03	-.29874857E-03	-.10267775E-03
10	-.19908642E-03	-.30856613E-03	-.94158884E-04
11	-.19960314E-03	-.31785881E-03	-.86174243E-04
12	-.20013621E-03	-.32665862E-03	-.78684843E-04
13	-.20068126E-03	-.33499512E-03	-.71655339E-04
14	-.20123457E-03	-.34289564E-03	-.65053621E-04
15	-.20179301E-03	-.35038548E-03	-.58850453E-04
16	-.20235393E-03	-.35748810E-03	-.53019167E-04
17	-.20291508E-03	-.36422530E-03	-.47535387E-04
18	-.20347460E-03	-.37061736E-03	-.42376791E-04
19	-.20403092E-03	-.37668312E-03	-.37522932E-04
20	-.20458276E-03	-.38244026E-03	-.32954941E-04
21	-.20512904E-03	-.38790517E-03	-.28655531E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2375.0000	88.2779	.0000
2	2390.1929	88.2862	100.1221
3	2405.4874	88.2582	200.2310
4	2420.8837	88.1971	300.2833
5	2436.3816	88.1057	400.2407
6	2451.9813	87.9867	500.0682
7	2467.6826	87.8423	599.7340
8	2483.4857	87.6745	699.2091
9	2499.3904	87.4851	798.4671
10	2515.3969	87.2758	897.4837
11	2531.5050	87.0481	996.2366
12	2547.7149	86.8034	1094.7055
13	2564.0264	86.5428	1192.8714
14	2580.4397	86.2674	1290.7170
15	2596.9546	85.9782	1388.2261
16	2613.5713	85.6762	1485.3839
17	2630.2896	85.3621	1582.1763
18	2647.1096	85.0368	1678.5904
19	2664.0314	84.7008	1774.6138
20	2681.0549	84.3548	1870.2359
21	2698.1800	83.9994	1965.4455

CONSTANTE DE MUELLE = .0000 T/M
CARGA HORIZONTAL UNIFORME = .0450 T/M2
REACCION HORIZONTAL TABLERO = 46.0000 T
REACCION VERTICAL TABLERO = 2375.0000 T
MOMENTO EXTERIOR EN CABEZA = 295.0000 TXM
COEFICIENTE MAYORACION (GS) = 1.0000

1

FASE ELASTICA

REACCION DEL TABLERO = 46.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.79859510E-05	.43429298E-03	.57972765E-02
2	.92693269E-05	.42454375E-03	.53118972E-02
3	.10522006E-04	.41336164E-03	.48383474E-02
4	.11745251E-04	.40078064E-03	.43782268E-02
5	.12940263E-04	.38683333E-03	.39330978E-02
6	.14108178E-04	.37155096E-03	.35044864E-02
7	.15250080E-04	.35496354E-03	.30938842E-02
8	.16366995E-04	.33709990E-03	.27027495E-02
9	.17459902E-04	.31798770E-03	.23325087E-02
10	.18529731E-04	.29765356E-03	.19845575E-02
11	.19577369E-04	.27612304E-03	.16602623E-02
12	.20603660E-04	.25342076E-03	.13609608E-02
13	.21609410E-04	.22957038E-03	.10879638E-02
14	.22595386E-04	.20459467E-03	.84255563E-03
15	.23562323E-04	.17851556E-03	.62599546E-03
16	.24510920E-04	.15135418E-03	.43951812E-03
17	.25441847E-04	.12313087E-03	.28433501E-03
18	.26355743E-04	.93865229E-04	.16163497E-03
19	.27253220E-04	.63576165E-04	.72585080E-04
20	.28134864E-04	.32281897E-04	.18331461E-04
21	.29001236E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2375.0000	46.0000	295.0000
2	2390.1929	46.1028	347.0379
3	2405.4874	46.2080	399.1933
4	2420.8837	46.3154	451.4688
5	2436.3816	46.4251	503.8669
6	2451.9813	46.5371	556.3904
7	2467.6826	46.6514	609.0417
8	2483.4857	46.7680	661.8234
9	2499.3904	46.8868	714.7381
10	2515.3969	47.0080	767.7885
11	2531.5050	47.1314	820.9770
12	2547.7149	47.2571	874.3063
13	2564.0264	47.3852	927.7790
14	2580.4397	47.5155	981.3976
15	2596.9546	47.6480	1035.1648
16	2613.5713	47.7829	1089.0831
17	2630.2896	47.9201	1143.1551
18	2647.1096	48.0596	1197.3834
19	2664.0314	48.2013	1251.7705
20	2681.0549	48.3453	1306.3192
21	2698.1800	48.4917	1361.0318

1

FASE FINAL EN ITERACION NUMERO 2

REACCION DEL TABLERO = 46.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.82010911E-05	.45109635E-03	.60260169E-02
2	.95508099E-05	.44106653E-03	.55218013E-02
3	.10867586E-04	.42953013E-03	.50297740E-02
4	.12152704E-04	.41652367E-03	.45516169E-02
5	.13407377E-04	.40208222E-03	.40889711E-02
6	.14632760E-04	.38623955E-03	.36434389E-02
7	.15829947E-04	.36902812E-03	.32165853E-02
8	.16999978E-04	.35047921E-03	.28099391E-02
9	.18143841E-04	.33062295E-03	.24249947E-02
10	.19262474E-04	.30948838E-03	.20632127E-02
11	.20356773E-04	.28710351E-03	.17260219E-02
12	.21427587E-04	.26349534E-03	.14148196E-02
13	.22475728E-04	.23868997E-03	.11309734E-02
14	.23501969E-04	.21271257E-03	.87582172E-03
15	.24507045E-04	.18558748E-03	.65067524E-03
16	.25491660E-04	.15733821E-03	.45681745E-03
17	.26456483E-04	.12798751E-03	.29550576E-03
18	.27402156E-04	.97557379E-04	.16797227E-03
19	.28329290E-04	.66069111E-04	.75424646E-04
20	.29238469E-04	.33543328E-04	.19046873E-04
21	.30130252E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.19649356E-03	-.21904656E-03	-.17435062E-03
2	-.19645965E-03	-.22272438E-03	-.17067247E-03
3	-.19644020E-03	-.22632606E-03	-.16709772E-03
4	-.19643475E-03	-.22985468E-03	-.16362245E-03
5	-.19644287E-03	-.23331316E-03	-.16024295E-03
6	-.19646416E-03	-.23670425E-03	-.15695571E-03
7	-.19649822E-03	-.24003058E-03	-.15375737E-03
8	-.19654469E-03	-.24329463E-03	-.15064474E-03
9	-.19660319E-03	-.24649875E-03	-.14761482E-03
10	-.19667339E-03	-.24964519E-03	-.14466471E-03
11	-.19675496E-03	-.25273608E-03	-.14179167E-03
12	-.19684758E-03	-.25577344E-03	-.13899309E-03
13	-.19695095E-03	-.25875920E-03	-.13626648E-03
14	-.19706477E-03	-.26169519E-03	-.13360946E-03
15	-.19718877E-03	-.26458315E-03	-.13101975E-03
16	-.19732268E-03	-.26742475E-03	-.12849520E-03
17	-.19746624E-03	-.27022157E-03	-.12603374E-03
18	-.19761920E-03	-.27297513E-03	-.12363338E-03
19	-.19778131E-03	-.27568686E-03	-.12129223E-03
20	-.19795236E-03	-.27835815E-03	-.11900849E-03
21	-.19813211E-03	-.28099030E-03	-.11678042E-03

1

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2375.0000	47.0314	295.0972
2	2390.1929	47.1176	348.3230
3	2405.4874	47.2023	401.6450
4	2420.8837	47.2856	455.0613
5	2436.3816	47.3676	508.5705
6	2451.9813	47.4481	562.1709
7	2467.6826	47.5273	615.8608
8	2483.4857	47.6051	669.6388
9	2499.3904	47.6816	723.5032
10	2515.3969	47.7566	777.4523
11	2531.5050	47.8304	831.4847
12	2547.7149	47.9027	885.5987
13	2564.0264	47.9737	939.7928
14	2580.4397	48.0433	994.0654
15	2596.9546	48.1116	1048.4148
16	2613.5713	48.1784	1102.8395
17	2630.2896	48.2439	1157.3379
18	2647.1096	48.3079	1211.9083
19	2664.0314	48.3706	1266.5492
20	2681.0549	48.4318	1321.2589
21	2698.1800	48.4915	1376.0358

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	-.97234785E-01	.35978842E+08
2	-.83832715E-01	.36465845E+08
3	-.70574144E-01	.36952280E+08
4	-.57603559E-01	.37438162E+08
5	-.45065913E-01	.37923494E+08
6	-.33106081E-01	.38408279E+08
7	-.21867939E-01	.38892515E+08
8	-.11494504E-01	.39376200E+08
9	-.21274233E-02	.39859332E+08
10	.60929402E-02	.40341906E+08
11	.13027807E-01	.40823921E+08
12	.18540017E-01	.41305371E+08
13	.22494199E-01	.41786256E+08
14	.24756939E-01	.42266570E+08
15	.25196961E-01	.42746311E+08
16	.23685132E-01	.43225476E+08
17	.20094827E-01	.43704061E+08
18	.14301903E-01	.44182064E+08
19	.61849750E-02	.44659481E+08
20	-.43744426E-02	.45136310E+08
21	-.17491772E-01	.45612548E+08

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ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-1 DE 22.6 M V FRANCOLÍ (SER) XH10

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	22.6000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	2.9000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	2.1000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	300.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

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DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	22.600	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	49.0000 T
REACCION VERTICAL TABLERO	=	1925.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

1

FASE ELASTICA

REACCION DEL TABLERO = 49.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.10507172E-02	.14593200E-01
2	.82180938E-05	.10460740E-02	.13407639E-01
3	.15553576E-04	.10326430E-02	.12232383E-01
4	.22106875E-04	.10113648E-02	.11076821E-01
5	.27965397E-04	.98307397E-03	.99493401E-02
6	.33205436E-04	.94851245E-03	.88574362E-02
7	.37893782E-04	.90834140E-03	.78078149E-02
8	.42089054E-04	.86315109E-03	.68064752E-02
9	.45842841E-04	.81346957E-03	.58587851E-02
10	.49200648E-04	.75977000E-03	.49695475E-02
11	.52202715E-04	.70247710E-03	.41430584E-02
12	.54884700E-04	.64197271E-03	.33831589E-02
13	.57278273E-04	.57860063E-03	.26932802E-02
14	.59411614E-04	.51267085E-03	.20764849E-02
15	.61309853E-04	.44446322E-03	.15355021E-02
16	.62995436E-04	.37423073E-03	.10727607E-02
17	.64488453E-04	.30220233E-03	.69041713E-03
18	.65806913E-04	.22858545E-03	.39038174E-03
19	.66966986E-04	.15356820E-03	.17434149E-03
20	.67983215E-04	.77321332E-04	.43780775E-04
21	.68868699E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1925.0000	49.0000	.0000
2	1940.1929	49.0000	55.3700
3	1955.4874	49.0000	110.7400

4	1970.8837	49.0000	166.1100
5	1986.3816	49.0000	221.4800
6	2001.9813	49.0000	276.8500
7	2017.6826	49.0000	332.2200
8	2033.4857	49.0000	387.5900
9	2049.3904	49.0000	442.9600
10	2065.3969	49.0000	498.3300
11	2081.5050	49.0000	553.7000
12	2097.7149	49.0000	609.0700
13	2114.0264	49.0000	664.4400
14	2130.4397	49.0000	719.8100
15	2146.9546	49.0000	775.1800
16	2163.5713	49.0000	830.5500
17	2180.2896	49.0000	885.9200
18	2197.1097	49.0000	941.2900
19	2214.0314	49.0000	996.6600
20	2231.0549	49.0000	1052.0300
21	2248.1800	49.0000	1107.4000

FASE FINAL EN ITERACION NUMERO 2

REACCION DEL TABLERO = 49.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.10832429E-02	.15029085E-01
2	.84973740E-05	.10784418E-02	.13806829E-01
3	.16086447E-04	.10645520E-02	.12595230E-01
4	.22867554E-04	.10425430E-02	.11403999E-01
5	.28929062E-04	.10132779E-02	.10241816E-01
6	.34348303E-04	.97752617E-03	.91164347E-02
7	.39193184E-04	.93597523E-03	.80347908E-02
8	.43523500E-04	.88924030E-03	.70030833E-02
9	.47392036E-04	.83787302E-03	.60268526E-02
10	.50845495E-04	.78236882E-03	.51110485E-02
11	.53925298E-04	.72317332E-03	.42600895E-02
12	.56668255E-04	.66068796E-03	.34779160E-02
13	.59107148E-04	.59527486E-03	.27680375E-02
14	.61271229E-04	.52726108E-03	.21335744E-02
15	.63186647E-04	.45694238E-03	.15772956E-02
16	.64876822E-04	.38458652E-03	.11016519E-02
17	.66362760E-04	.31043615E-03	.70880601E-03
18	.67663339E-04	.23471141E-03	.40065924E-03
19	.68795547E-04	.15761214E-03	.17887596E-03
20	.69774694E-04	.79319951E-04	.44905145E-04
21	.70614599E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.16865204E-03	-.16865204E-03	-.16865204E-03
2	-.15680882E-03	-.16549739E-03	-.14854513E-03
3	-.15706023E-03	-.17387056E-03	-.14105421E-03
4	-.15734367E-03	-.18175479E-03	-.13407594E-03
5	-.15765423E-03	-.18918691E-03	-.12756801E-03
6	-.15798770E-03	-.19620019E-03	-.12149263E-03
7	-.15834050E-03	-.20282477E-03	-.11581590E-03
8	-.15870958E-03	-.20908803E-03	-.11050730E-03
9	-.15909232E-03	-.21501493E-03	-.10553932E-03
10	-.15948650E-03	-.22062821E-03	-.10088707E-03
11	-.15989021E-03	-.22594870E-03	-.96527982E-04
12	-.16030181E-03	-.23099546E-03	-.92441575E-04
13	-.16071992E-03	-.23578600E-03	-.88609198E-04
14	-.16114334E-03	-.24033641E-03	-.85013843E-04
15	-.16157108E-03	-.24466152E-03	-.81639967E-04
16	-.16200225E-03	-.24877500E-03	-.78473341E-04
17	-.16243613E-03	-.25268948E-03	-.75500915E-04
18	-.16287210E-03	-.25641667E-03	-.72710701E-04
19	-.16330963E-03	-.25996738E-03	-.70091667E-04
20	-.16374829E-03	-.26335166E-03	-.67633645E-04
21	-.16418769E-03	-.26657886E-03	-.65327251E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1925.0000	51.0226	.0000
2	1940.1929	51.0295	57.7275
3	1955.4874	51.0193	115.4541
4	1970.8837	50.9932	173.1599
5	1986.3816	50.9526	230.8273
6	2001.9813	50.8988	288.4398
7	2017.6826	50.8326	345.9826
8	2033.4857	50.7550	403.4419
9	2049.3904	50.6669	460.8047
10	2065.3969	50.5690	518.0593
11	2081.5050	50.4620	575.1947
12	2097.7149	50.3464	632.2006
13	2114.0264	50.2229	689.0675
14	2130.4397	50.0919	745.7864
15	2146.9546	49.9540	802.3490
16	2163.5713	49.8094	858.7473
17	2180.2896	49.6586	914.9741
18	2197.1097	49.5019	971.0223
19	2214.0314	49.3397	1026.8854
20	2231.0549	49.1722	1082.5571
21	2248.1800	48.9997	1138.0315

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.63668726E+07
2	.45400947E-02	.67928630E+07
3	.78603533E-02	.71764438E+07
4	.10529105E-01	.75711046E+07
5	.12559307E-01	.79770646E+07
6	.13988207E-01	.83944167E+07
7	.14842917E-01	.88232397E+07
8	.15139760E-01	.92636091E+07
9	.14887924E-01	.97155996E+07
10	.14093330E-01	.10179285E+08
11	.12762407E-01	.10654738E+08
12	.10905464E-01	.11142033E+08
13	.85396113E-02	.11641241E+08
14	.56912798E-02	.12152435E+08
15	.23983406E-02	.12675688E+08
16	-.12881358E-02	.13211070E+08
17	-.53024163E-02	.13758653E+08
18	-.95629520E-02	.14318507E+08
19	-.13971462E-01	.14890704E+08
20	-.18412244E-01	.15475314E+08
21	-.22751645E-01	.16072405E+08

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ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-1 DE 22.6 M V FRANCOLÍ (SER) ZH10

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	22.6000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	2.9000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	2.1000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	300.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	22.600	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE = .0000 T/M
CARGA HORIZONTAL UNIFORME = .0450 T/M2
REACCION HORIZONTAL TABLERO = 99.0000 T
REACCION VERTICAL TABLERO = 1925.0000 T
MOMENTO EXTERIOR EN CABEZA = 543.0000 TXM
COEFICIENTE MAYORACION (GS) = 1.0000

1

FASE ELASTICA

REACCION DEL TABLERO = 99.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.14699564E-04	.87990888E-03	.11852470E-01
2	.17493020E-04	.86172007E-03	.10868152E-01
3	.20216014E-04	.84041446E-03	.99061566E-02
4	.22871362E-04	.81607009E-03	.89699603E-02
5	.25461732E-04	.78876190E-03	.80629546E-02
6	.27989659E-04	.75856186E-03	.71884477E-02
7	.30457551E-04	.72553919E-03	.63496680E-02
8	.32867697E-04	.68976042E-03	.55497672E-02
9	.35222274E-04	.65128959E-03	.47918234E-02
10	.37523353E-04	.61018831E-03	.40788436E-02
11	.39772909E-04	.56651592E-03	.34137663E-02
12	.41972822E-04	.52032958E-03	.27994645E-02
13	.44124885E-04	.47168438E-03	.22387476E-02
14	.46230807E-04	.42063341E-03	.17343640E-02
15	.48292223E-04	.36722790E-03	.12890030E-02
16	.50310690E-04	.31151725E-03	.90529719E-03
17	.52287700E-04	.25354916E-03	.58582430E-03
18	.54224676E-04	.19336967E-03	.33310904E-03
19	.56122980E-04	.13102325E-03	.14962505E-03
20	.57983918E-04	.66552849E-04	.37796536E-04
21	.59808736E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1925.0000	99.0000	543.0000
2	1940.1929	99.1028	654.9279
3	1955.4874	99.2080	766.9733
4	1970.8837	99.3154	879.1388
5	1986.3816	99.4251	991.4269
6	2001.9813	99.5371	1103.8404
7	2017.6826	99.6514	1216.3817
8	2033.4857	99.7680	1329.0534
9	2049.3904	99.8868	1441.8581
10	2065.3969	100.0080	1554.7985
11	2081.5050	100.1314	1667.8770
12	2097.7149	100.2571	1781.0963
13	2114.0264	100.3852	1894.4590
14	2130.4397	100.5155	2007.9676
15	2146.9546	100.6480	2121.6248
16	2163.5713	100.7829	2235.4331
17	2180.2896	100.9201	2349.3951
18	2197.1097	101.0596	2463.5134
19	2214.0314	101.2013	2577.7905
20	2231.0549	101.3453	2692.2292
21	2248.1800	101.4917	2806.8318

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FASE FINAL EN ITERACION NUMERO 2

REACCION DEL TABLERO = 99.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.14588473E-04	.88455434E-03	.11930270E-01
2	.17415883E-04	.86647188E-03	.10940640E-01
3	.20172808E-04	.84523427E-03	.99732323E-02
4	.22861987E-04	.82091961E-03	.90315692E-02
5	.25486011E-04	.79360299E-03	.81190847E-02
6	.28047335E-04	.76335665E-03	.72391300E-02
7	.30548286E-04	.73025013E-03	.63949760E-02
8	.32991073E-04	.69435039E-03	.55898168E-02
9	.35377792E-04	.65572198E-03	.48267719E-02
10	.37710434E-04	.61442713E-03	.41088895E-02
11	.39990890E-04	.57052588E-03	.34391484E-02
12	.42220960E-04	.52407619E-03	.28204609E-02
13	.44402356E-04	.47513402E-03	.22556750E-02
14	.46536708E-04	.42375344E-03	.17475765E-02
15	.48625568E-04	.36998676E-03	.12988910E-02
16	.50670416E-04	.31388453E-03	.91228614E-03
17	.52672656E-04	.25549569E-03	.59037326E-03
18	.54633645E-04	.19486763E-03	.33570932E-03
19	.56554662E-04	.13204624E-03	.15079857E-03
20	.58436932E-04	.67075986E-04	.38094223E-04
21	.60281627E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.15688760E-03	-.19700590E-03	-.11749872E-03
2	-.15721031E-03	-.20510399E-03	-.11018743E-03
3	-.15755912E-03	-.21303435E-03	-.10309254E-03
4	-.15793278E-03	-.22080324E-03	-.96205414E-04
5	-.15833009E-03	-.22841662E-03	-.89517866E-04
6	-.15874995E-03	-.23588012E-03	-.83022150E-04
7	-.15919130E-03	-.24319909E-03	-.76710926E-04
8	-.15965313E-03	-.25037858E-03	-.70577233E-04
9	-.16013450E-03	-.25742343E-03	-.64614462E-04
10	-.16063451E-03	-.26433821E-03	-.58816342E-04
11	-.16115231E-03	-.27112726E-03	-.53176911E-04
12	-.16168710E-03	-.27779474E-03	-.47690504E-04
13	-.16223809E-03	-.28434457E-03	-.42351729E-04
14	-.16280457E-03	-.29078052E-03	-.37155456E-04
15	-.16338583E-03	-.29710615E-03	-.32096800E-04
16	-.16398123E-03	-.30332487E-03	-.27171105E-04
17	-.16459012E-03	-.30943992E-03	-.22373949E-04
18	-.16521191E-03	-.31545443E-03	-.17701067E-04
19	-.16584603E-03	-.32137135E-03	-.13148437E-04
20	-.16649192E-03	-.32719349E-03	-.87122037E-05
21	-.16714907E-03	-.33292355E-03	-.43886830E-05

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ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1925.0000	100.6938	542.9493
2	1940.1929	100.7747	656.7948
3	1955.4874	100.8514	770.7295
4	1970.8837	100.9237	884.7483
5	1986.3816	100.9918	998.8465
6	2001.9813	101.0557	1113.0190
7	2017.6826	101.1152	1227.2608
8	2033.4857	101.1705	1341.5672
9	2049.3904	101.2215	1455.9330
10	2065.3969	101.2681	1570.3533
11	2081.5050	101.3105	1684.8232
12	2097.7149	101.3485	1799.3377
13	2114.0264	101.3822	1913.8918
14	2130.4397	101.4114	2028.4804
15	2146.9546	101.4363	2143.0985
16	2163.5713	101.4567	2257.7410
17	2180.2896	101.4727	2372.4027
18	2197.1097	101.4842	2487.0790
19	2214.0314	101.4912	2601.7643
20	2231.0549	101.4936	2716.4537
21	2248.1800	101.4914	2831.1419

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.50685157E-01	.37207840E+08
2	.45606630E-01	.37698244E+08
3	.40647505E-01	.38187068E+08
4	.35847101E-01	.38699527E+08
5	.31241349E-01	.39160024E+08
6	.26862808E-01	.39644162E+08
7	.22740429E-01	.40126754E+08
8	.18899083E-01	.40607804E+08
9	.15359127E-01	.41087321E+08
10	.12135976E-01	.41565308E+08
11	.92396693E-02	.42041773E+08
12	.66744621E-02	.42516723E+08
13	.44384813E-02	.42990164E+08
14	.25233728E-02	.43462103E+08
15	.91402643E-03	.43932546E+08
16	-.41174165E-03	.44401500E+08
17	-.12289499E-02	.44868322E+08
18	-.21140320E-02	.45334431E+08
19	-.28244907E-02	.45799055E+08
20	-.34126579E-02	.46262202E+08
21	-.39388544E-02	.46723882E+08

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ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-1 DE 22.6 M V FRANCOLÍ (ROT) XH2

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	22.6000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	2.9000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	2.1000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	300.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	22.600	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	36.0000 T
REACCION VERTICAL TABLERO	=	1299.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

1

FASE ELASTICA

REACCION DEL TABLERO = 51.8400 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.11116159E-02	.15439010E-01
2	.86944078E-05	.11067035E-02	.14184735E-01
3	.16455048E-04	.10924941E-02	.12941362E-01
4	.23388172E-04	.10699827E-02	.11718825E-01
5	.29586248E-04	.10400521E-02	.10525996E-01
6	.35129996E-04	.10034875E-02	.93708060E-02
7	.40090074E-04	.96098812E-03	.82603495E-02
8	.44528501E-04	.91317863E-03	.72009730E-02
9	.48499854E-04	.86061760E-03	.61983555E-02
10	.52052278E-04	.80380565E-03	.52575784E-02
11	.55228342E-04	.74319210E-03	.43831867E-02
12	.58065773E-04	.67918093E-03	.35792440E-02
13	.60598075E-04	.61213585E-03	.28493806E-02
14	.62855063E-04	.54238483E-03	.21968362E-02
15	.64863322E-04	.47022394E-03	.16244986E-02
16	.66646600E-04	.39592084E-03	.11349370E-02
17	.68226152E-04	.31971773E-03	.73043315E-03
18	.69621028E-04	.24183407E-03	.41300795E-03
19	.70848338E-04	.16246888E-03	.18444618E-03
20	.71923467E-04	.81802813E-04	.46318273E-04
21	.72860273E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1870.5600	51.8400	.0000
2	1892.4377	51.8400	58.5792
3	1914.4619	51.8400	117.1584

4	1936.6325	51.8400	175.7376
5	1958.9495	51.8400	234.3168
6	1981.4130	51.8400	292.8960
7	2004.0229	51.8400	351.4752
8	2026.7793	51.8400	410.0544
9	2049.6822	51.8400	468.6336
10	2072.7315	51.8400	527.2128
11	2095.9272	51.8400	585.7920
12	2119.2694	51.8400	644.3712
13	2142.7580	51.8400	702.9504
14	2166.3931	51.8400	761.5296
15	2190.1746	51.8400	820.1088
16	2214.1026	51.8400	878.6880
17	2238.1770	51.8400	937.2672
18	2262.3979	51.8400	995.8464
19	2286.7652	51.8400	1054.4256
20	2311.2790	51.8400	1113.0048
21	2335.9392	51.8400	1171.5840

FASE FINAL EN ITERACION NUMERO 2

REACCION DEL TABLERO = 51.8400 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.11481739E-02	.15947963E-01
2	.89475769E-05	.11431186E-02	.14652431E-01
3	.16948910E-04	.11284871E-02	.13368122E-01
4	.24108171E-04	.11052898E-02	.12105277E-01
5	.30516985E-04	.10744266E-02	.10873055E-01
6	.36255542E-04	.10367001E-02	.96796577E-02
7	.41394267E-04	.99282797E-03	.85324275E-02
8	.45995179E-04	.94345293E-03	.74379393E-02
9	.50113032E-04	.88915179E-03	.64020794E-02
10	.53796288E-04	.83044303E-03	.54301164E-02
11	.57087934E-04	.76779344E-03	.45267625E-02
12	.60026187E-04	.70162396E-03	.36962291E-02
13	.62645096E-04	.63231469E-03	.29422750E-02
14	.64975052E-04	.56020931E-03	.22682511E-02
15	.67043237E-04	.48561897E-03	.16771380E-02
16	.68874007E-04	.40882573E-03	.11715819E-02
17	.70489222E-04	.33008551E-03	.75392523E-03
18	.71908534E-04	.24963077E-03	.42623450E-03
19	.73149643E-04	.16767290E-03	.19032586E-03
20	.74228507E-04	.84404248E-04	.47787470E-04
21	.75159543E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.16388248E-03	-.16388248E-03	-.16388248E-03
2	-.15269140E-03	-.16184030E-03	-.14398988E-03
3	-.15355073E-03	-.17126234E-03	-.13668656E-03
4	-.15444148E-03	-.18017695E-03	-.12991141E-03
5	-.15535838E-03	-.18862189E-03	-.12362072E-03
6	-.15629693E-03	-.19663122E-03	-.11777542E-03
7	-.15725331E-03	-.20423580E-03	-.11234053E-03
8	-.15822423E-03	-.21146365E-03	-.10728457E-03
9	-.15920691E-03	-.21834029E-03	-.10257918E-03
10	-.16019896E-03	-.22488900E-03	-.98198740E-04
11	-.16119835E-03	-.23113107E-03	-.94120028E-04
12	-.16220334E-03	-.23708601E-03	-.90321978E-04
13	-.16321244E-03	-.24277171E-03	-.86785425E-04
14	-.16422440E-03	-.24820465E-03	-.83492899E-04
15	-.16523814E-03	-.25340000E-03	-.80428445E-04
16	-.16625275E-03	-.25837173E-03	-.77577465E-04
17	-.16726746E-03	-.26313280E-03	-.74926577E-04
18	-.16828162E-03	-.26769516E-03	-.72463494E-04
19	-.16929468E-03	-.27206993E-03	-.70176913E-04
20	-.17030619E-03	-.27626739E-03	-.68056423E-04
21	-.17131578E-03	-.28029711E-03	-.66092416E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1870.5600	53.9193	.0000
2	1892.4377	53.9343	60.9982
3	1914.4619	53.9314	122.0067
4	1936.6325	53.9120	183.0048
5	1958.9495	53.8772	243.9739
6	1981.4130	53.8281	304.8965
7	2004.0229	53.7656	365.7563
8	2026.7793	53.6905	426.5382
9	2049.6822	53.6037	487.2279
10	2072.7315	53.5057	547.8120
11	2095.9272	53.3973	608.2779
12	2119.2694	53.2790	668.6137
13	2142.7580	53.1513	728.8082
14	2166.3931	53.0146	788.8507
15	2190.1746	52.8694	848.7311
16	2214.1026	52.7162	908.4398
17	2238.1770	52.5551	967.9675
18	2262.3979	52.3866	1027.3055
19	2286.7652	52.2110	1086.4452
20	2311.2790	52.0286	1145.3787
21	2335.9392	51.8395	1204.0982

CONSTANTE DE MUELLE = .0000 T/M
CARGA HORIZONTAL UNIFORME = .0450 T/M2
REACCION HORIZONTAL TABLERO = 28.0000 T
REACCION VERTICAL TABLERO = 1299.0000 T
MOMENTO EXTERIOR EN CABEZA = 41.0000 TXM
COEFICIENTE MAYORACION (GS) = 1.4400

1

FASE ELASTICA

REACCION DEL TABLERO = 40.3200 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.15982730E-05	.27506461E-03	.39504123E-02
2	.27961187E-05	.27258178E-03	.36408646E-02
3	.39668822E-05	.26876069E-03	.33348816E-02
4	.51117162E-05	.26363128E-03	.30339583E-02
5	.62317141E-05	.25722224E-03	.27395569E-02
6	.73279142E-05	.24956105E-03	.24531077E-02
7	.84013026E-05	.24067404E-03	.21760106E-02
8	.94528168E-05	.23058647E-03	.19096365E-02
9	.10483348E-04	.21932253E-03	.16553283E-02
10	.11493746E-04	.20690547E-03	.14144020E-02
11	.12484819E-04	.19335759E-03	.11881479E-02
12	.13457336E-04	.17870027E-03	.97783170E-03
13	.14412032E-04	.16295408E-03	.78469541E-03
14	.15349607E-04	.14613875E-03	.60995819E-03
15	.16270731E-04	.12827326E-03	.45481739E-03
16	.17176042E-04	.10937583E-03	.32044933E-03
17	.18066151E-04	.89463992E-04	.20801011E-03
18	.18941639E-04	.68554591E-04	.11863645E-03
19	.19803067E-04	.46663832E-04	.53446379E-04
20	.20650967E-04	.23807303E-04	.13539965E-04
21	.21485852E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1870.5600	40.3200	59.0400
2	1892.4377	40.4681	104.6850
3	1914.4619	40.6195	150.4991
4	1936.6325	40.7742	196.4862
5	1958.9495	40.9322	242.6500
6	1981.4130	41.0934	288.9941
7	2004.0229	41.2580	335.5224
8	2026.7793	41.4259	382.2385
9	2049.6822	41.5970	429.1461
10	2072.7315	41.7715	476.2490
11	2095.9272	41.9492	523.5509
12	2119.2694	42.1303	571.0555
13	2142.7580	42.3146	618.7666
14	2166.3931	42.5023	666.6878
15	2190.1746	42.6932	714.8229
16	2214.1026	42.8874	763.1756
17	2238.1770	43.0849	811.7497
18	2262.3979	43.2858	860.5488
19	2286.7652	43.4899	909.5768
20	2311.2790	43.6973	958.8372
21	2335.9392	43.9080	1008.3338

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FASE FINAL EN ITERACION NUMERO 2

REACCION DEL TABLERO = 40.3200 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.15793139E-05	.27696601E-03	.39830820E-02
2	.27807671E-05	.27450256E-03	.36713744E-02
3	.39566048E-05	.27069595E-03	.33632122E-02
4	.51079217E-05	.26557449E-03	.30600968E-02
5	.62357154E-05	.25916533E-03	.27634988E-02
6	.73409233E-05	.25149453E-03	.24748584E-02
7	.84244320E-05	.24258711E-03	.21955870E-02
8	.94870823E-05	.23246710E-03	.19270683E-02
9	.10529673E-04	.22115764E-03	.16706594E-02
10	.11552961E-04	.20868095E-03	.14276917E-02
11	.12557669E-04	.19505844E-03	.11994720E-02
12	.13544481E-04	.18031073E-03	.98728343E-03
13	.14514051E-04	.16445766E-03	.79238613E-03
14	.15467000E-04	.14751836E-03	.61601827E-03
15	.16403920E-04	.12951129E-03	.45939682E-03
16	.17325376E-04	.11045424E-03	.32371824E-03
17	.18231905E-04	.90364378E-04	.21015926E-03
18	.19124021E-04	.69258280E-04	.11987753E-03
19	.20002214E-04	.47151958E-04	.54012296E-04
20	.20866950E-04	.24060880E-04	.13685028E-04
21	.21718678E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.15187314E-03	-.15621625E-03	-.14760899E-03
2	-.15268217E-03	-.16032928E-03	-.14517410E-03
3	-.15349749E-03	-.16437815E-03	-.14281465E-03
4	-.15431888E-03	-.16836566E-03	-.14052749E-03
5	-.15514615E-03	-.17229437E-03	-.13830972E-03
6	-.15597914E-03	-.17616668E-03	-.13615865E-03
7	-.15681767E-03	-.17998486E-03	-.13407170E-03
8	-.15766158E-03	-.18375106E-03	-.13204646E-03
9	-.15851072E-03	-.18746732E-03	-.13008061E-03
10	-.15936495E-03	-.19113559E-03	-.12817196E-03
11	-.16022413E-03	-.19475772E-03	-.12631842E-03
12	-.16108813E-03	-.19833545E-03	-.12451803E-03
13	-.16195682E-03	-.20187046E-03	-.12276888E-03
14	-.16283009E-03	-.20536434E-03	-.12106919E-03
15	-.16370783E-03	-.20881861E-03	-.11941724E-03
16	-.16458993E-03	-.21223471E-03	-.11781141E-03
17	-.16547628E-03	-.21561402E-03	-.11625013E-03
18	-.16636679E-03	-.21895785E-03	-.11473193E-03
19	-.16726137E-03	-.22226746E-03	-.11325539E-03
20	-.16815993E-03	-.22554404E-03	-.11181916E-03
21	-.16906238E-03	-.22878874E-03	-.11042195E-03

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1870.5600	40.8345	59.0342
2	1892.4377	40.9839	105.2625
3	1914.4619	41.1340	151.6606
4	1936.6325	41.2847	198.2292
5	1958.9495	41.4360	244.9689
6	1981.4130	41.5879	291.8804
7	2004.0229	41.7403	338.9643
8	2026.7793	41.8932	386.2210
9	2049.6822	42.0465	433.6512
10	2072.7315	42.2003	481.2552
11	2095.9272	42.3544	529.0336
12	2119.2694	42.5089	576.9866
13	2142.7580	42.6637	625.1146
14	2166.3931	42.8188	673.4179
15	2190.1746	42.9740	721.8968
16	2214.1026	43.1295	770.5513
17	2238.1770	43.2851	819.3818
18	2262.3979	43.4407	868.3882
19	2286.7652	43.5964	917.5706
20	2311.2790	43.7522	966.9290
21	2335.9392	43.9078	1016.4634

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.57860135E-02	.37363848E+08
2	.89655390E-02	.37853719E+08
3	.11557805E-01	.38330985E+08
4	.13684928E-01	.38808188E+08
5	.15373193E-01	.39284818E+08
6	.16633459E-01	.39760732E+08
7	.17471138E-01	.40231646E+08
8	.17887971E-01	.40705030E+08
9	.17882619E-01	.41177437E+08
10	.17451013E-01	.41648867E+08
11	.16586333E-01	.42119323E+08
12	.15279301E-01	.42588801E+08
13	.13517633E-01	.43057305E+08
14	.11286790E-01	.43524832E+08
15	.85695515E-02	.43991381E+08
16	.53462920E-02	.44456952E+08
17	.15950105E-02	.44921543E+08
18	-.27087142E-02	.45385153E+08
19	-.75914395E-02	.45847780E+08
20	-.13081971E-01	.46309423E+08
21	-.19211147E-01	.46770080E+08

1

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-1 DE 22.6 M V FRANCOLÍ (ROT) XH3

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	22.6000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	2.9000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	2.1000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	300.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	22.600	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	50.0000 T
REACCION VERTICAL TABLERO	=	2581.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

1

FASE ELASTICA

REACCION DEL TABLERO = 72.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.15439110E-02	.21443070E-01
2	.12075566E-04	.15370883E-02	.19701020E-01
3	.22854234E-04	.15173529E-02	.17974114E-01
4	.32483572E-04	.14860871E-02	.16276146E-01
5	.41092011E-04	.14445169E-02	.14619439E-01
6	.48791662E-04	.13937326E-02	.13015008E-01
7	.55680659E-04	.13347057E-02	.11472708E-01
8	.61845141E-04	.12683036E-02	.10001351E-01
9	.67360909E-04	.11953022E-02	.86088271E-02
10	.72294830E-04	.11163967E-02	.73021922E-02
11	.76706030E-04	.10322113E-02	.60877593E-02
12	.80646907E-04	.94330684E-03	.49711722E-02
13	.84163993E-04	.85018868E-03	.39574730E-02
14	.87298698E-04	.75331226E-03	.30511614E-02
15	.90087947E-04	.65308881E-03	.22562480E-02
16	.92564722E-04	.54989005E-03	.15763014E-02
17	.94758544E-04	.44405240E-03	.10144905E-02
18	.96695873E-04	.33588066E-03	.57362215E-03
19	.98400470E-04	.22565123E-03	.25617526E-03
20	.99893704E-04	.11361502E-03	.64330935E-04
21	.10119482E-03	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3716.6400	72.0000	.0000
2	3738.5177	72.0000	81.3600
3	3760.5419	72.0000	162.7200

4	3782.7125	72.0000	244.0800
5	3805.0295	72.0000	325.4400
6	3827.4930	72.0000	406.8000
7	3850.1029	72.0000	488.1600
8	3872.8593	72.0000	569.5200
9	3895.7622	72.0000	650.8800
10	3918.8115	72.0000	732.2400
11	3942.0072	72.0000	813.6000
12	3965.3494	72.0000	894.9600
13	3988.8380	72.0000	976.3200
14	4012.4731	72.0000	1057.6800
15	4036.2546	72.0000	1139.0400
16	4060.1826	72.0000	1220.4000
17	4084.2570	72.0000	1301.7600
18	4108.4779	72.0000	1383.1200
19	4132.8452	72.0000	1464.4800
20	4157.3590	72.0000	1545.8400
21	4182.0192	72.0000	1627.2000

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 72.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.19140813E-02	.26490621E-01
2	.15178399E-04	.19055055E-02	.24330940E-01
3	.28721189E-04	.18807022E-02	.22190291E-01
4	.40805564E-04	.18414196E-02	.20086007E-01
5	.51588485E-04	.17892170E-02	.18033550E-01
6	.61207617E-04	.17254872E-02	.16046718E-01
7	.69784148E-04	.16514768E-02	.14137821E-01
8	.77425067E-04	.15683036E-02	.12317832E-01
9	.84225064E-04	.14769713E-02	.10596528E-01
10	.90268141E-04	.13783826E-02	.89826101E-02
11	.95628988E-04	.12733507E-02	.74838103E-02
12	.10037415E-03	.11626090E-02	.61069881E-02
13	.10456306E-03	.10468194E-02	.48582153E-02
14	.10824884E-03	.92658072E-03	.37428521E-02
15	.11147914E-03	.80243441E-03	.27656148E-02
16	.11429671E-03	.67487106E-03	.19306374E-02
17	.11673998E-03	.54433533E-03	.12415258E-02
18	.11884357E-03	.41123063E-03	.70140717E-03
19	.12063871E-03	.27592314E-03	.31297427E-03
20	.12215358E-03	.13874550E-03	.78525294E-04
21	.12341368E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.32562022E-03	-.32562022E-03	-.32562022E-03
2	-.32356714E-03	-.33908705E-03	-.30880614E-03
3	-.32343954E-03	-.35345318E-03	-.29486195E-03
4	-.32341418E-03	-.36697412E-03	-.28189452E-03
5	-.32347465E-03	-.37970610E-03	-.26982263E-03
6	-.32360693E-03	-.39170040E-03	-.25857383E-03
7	-.32379900E-03	-.40300401E-03	-.24808320E-03
8	-.32404060E-03	-.41366012E-03	-.23829234E-03
9	-.32432295E-03	-.42370853E-03	-.22914863E-03
10	-.32463852E-03	-.43318596E-03	-.22060449E-03
11	-.32498090E-03	-.44212641E-03	-.21261684E-03
12	-.32534460E-03	-.45056136E-03	-.20514655E-03
13	-.32572495E-03	-.45852003E-03	-.19815803E-03
14	-.32611798E-03	-.46602961E-03	-.19161879E-03
15	-.32652031E-03	-.47311538E-03	-.18549920E-03
16	-.32692910E-03	-.47980095E-03	-.17977209E-03
17	-.32734195E-03	-.48610832E-03	-.17441258E-03
18	-.32775684E-03	-.49205808E-03	-.16939778E-03
19	-.32817211E-03	-.49766949E-03	-.16470666E-03
20	-.32858636E-03	-.50296060E-03	-.16031981E-03
21	-.32899849E-03	-.50794832E-03	-.15621933E-03

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3716.6400	79.1098	.0000
2	3738.5177	79.1195	89.4074
3	3760.5419	79.0683	178.7907
4	3782.7125	78.9615	268.0842
5	3805.0295	78.8043	357.2280
6	3827.4930	78.6009	446.1675
7	3850.1029	78.3553	534.8527
8	3872.8593	78.0712	623.2381
9	3895.7622	77.7518	711.2819
10	3918.8115	77.4000	798.9458
11	3942.0072	77.0185	886.1947
12	3965.3494	76.6095	972.9962
13	3988.8380	76.1754	1059.3208
14	4012.4731	75.7180	1145.1410
15	4036.2546	75.2392	1230.4315
16	4060.1826	74.7406	1315.1692
17	4084.2570	74.2238	1399.3326
18	4108.4779	73.6900	1482.9016
19	4132.8452	73.1405	1565.8579
20	4157.3590	72.5766	1648.1845
21	4182.0192	71.9991	1729.8655

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.63668726E+07
2	.29273089E-02	.58892857E+07
3	.57989900E-02	.62236945E+07
4	.84846278E-02	.65662542E+07
5	.10959292E-01	.69184151E+07
6	.13198853E-01	.72799008E+07
7	.15188425E-01	.76508034E+07
8	.16924372E-01	.80312106E+07
9	.18415703E-01	.84212055E+07
10	.19685208E-01	.88208654E+07
11	.20770514E-01	.92302568E+07
12	.21725080E-01	.96494238E+07
13	.22619079E-01	.10078360E+08
14	.23540130E-01	.10516918E+08
15	.24593908E-01	.10964441E+08
16	.25904567E-01	.11450113E+08
17	.27615038E-01	.11922948E+08
18	.29887123E-01	.12406296E+08
19	.32901464E-01	.12880315E+08
20	.36857345E-01	.13380565E+08
21	.41972385E-01	.13892456E+08

1

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-1 DE 22.6 M V FRANCOLÍ (ROT) ZH3

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	22.6000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	2.9000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	2.1000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	300.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	22.600	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0270 T/M2
REACCION HORIZONTAL TABLERO	=	50.0000 T
REACCION VERTICAL TABLERO	=	2581.0000 T
MOMENTO EXTERIOR EN CABEZA	=	353.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

1

FASE ELASTICA

REACCION DEL TABLERO = 72.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.13760741E-04	.70194115E-03	.92963053E-02
2	.15751595E-04	.68526668E-03	.85123211E-02
3	.17692701E-04	.66637065E-03	.77484394E-02
4	.19586056E-04	.64530815E-03	.70071395E-02
5	.21433556E-04	.62213207E-03	.62908391E-02
6	.23237000E-04	.59689321E-03	.56018980E-02
7	.24998096E-04	.56964038E-03	.49426191E-02
8	.26718469E-04	.54042052E-03	.43152516E-02
9	.28399665E-04	.50927877E-03	.37219926E-02
10	.30043154E-04	.47625858E-03	.31649892E-02
11	.31650337E-04	.44140176E-03	.26463400E-02
12	.33222549E-04	.40474858E-03	.21680978E-02
13	.34761063E-04	.36633784E-03	.17322703E-02
14	.36267092E-04	.32620693E-03	.13408222E-02
15	.37741795E-04	.28439191E-03	.99567697E-03
16	.39186280E-04	.24092754E-03	.69871777E-03
17	.40601603E-04	.19584739E-03	.45178933E-03
18	.41988777E-04	.14918383E-03	.25669909E-03
19	.43348767E-04	.10096811E-03	.11521853E-03
20	.44682499E-04	.51230448E-04	.29084424E-04
21	.45990860E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3716.6400	72.0000	508.3200
2	3738.5177	72.0889	589.7300
3	3760.5419	72.1797	671.2416
4	3782.7125	72.2725	752.8569
5	3805.0295	72.3673	834.5782
6	3827.4930	72.4641	916.4077
7	3850.1029	72.5628	998.3477
8	3872.8593	72.6635	1080.4004
9	3895.7622	72.7662	1162.5680
10	3918.8115	72.8709	1244.8528
11	3942.0072	72.9775	1327.2569
12	3965.3494	73.0862	1409.7827
13	3988.8380	73.1968	1492.4324
14	4012.4731	73.3094	1575.2082
15	4036.2546	73.4239	1658.1123
16	4060.1826	73.5404	1741.1470
17	4084.2570	73.6590	1824.3145
18	4108.4779	73.7795	1907.6170
19	4132.8452	73.9019	1991.0568
20	4157.3590	74.0264	2074.6361
21	4182.0192	74.1528	2158.3571

1

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 72.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.15761201E-04	.81936639E-03	.10864430E-01
2	.18142192E-04	.80021097E-03	.99491153E-02
3	.20460937E-04	.77840020E-03	.90569533E-02
4	.22719732E-04	.75400312E-03	.81909050E-02
5	.24920747E-04	.72708625E-03	.73538553E-02
6	.27066041E-04	.69771372E-03	.65486151E-02
7	.29157567E-04	.66594738E-03	.57779240E-02
8	.31197174E-04	.63184695E-03	.50444532E-02
9	.33186623E-04	.59547011E-03	.43508073E-02
10	.35127582E-04	.55687258E-03	.36995272E-02
11	.37021639E-04	.51610827E-03	.30930915E-02
12	.38870304E-04	.47322932E-03	.25339190E-02
13	.40675012E-04	.42828622E-03	.20243707E-02
14	.42437131E-04	.38132786E-03	.15667512E-02
15	.44157964E-04	.33240163E-03	.11633110E-02
16	.45838751E-04	.28155349E-03	.81624747E-03
17	.47480674E-04	.22882801E-03	.52770721E-03
18	.49084864E-04	.17426848E-03	.29978700E-03
19	.50652395E-04	.11791693E-03	.13453544E-03
20	.52184295E-04	.59814201E-04	.33954343E-04
21	.53681546E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.32416416E-03	-.36750746E-03	-.28160892E-03
2	-.32397280E-03	-.37386383E-03	-.27498888E-03
3	-.32381403E-03	-.38008161E-03	-.26856950E-03
4	-.32368659E-03	-.38616586E-03	-.26234332E-03
5	-.32358930E-03	-.39212135E-03	-.25630328E-03
6	-.32352100E-03	-.39795262E-03	-.25044269E-03
7	-.32348062E-03	-.40366393E-03	-.24475519E-03
8	-.32346712E-03	-.40925935E-03	-.23923474E-03
9	-.32347950E-03	-.41474271E-03	-.23387562E-03
10	-.32351682E-03	-.42011767E-03	-.22867235E-03
11	-.32357818E-03	-.42538769E-03	-.22361976E-03
12	-.32366272E-03	-.43055605E-03	-.21871290E-03
13	-.32376959E-03	-.43562588E-03	-.21394706E-03
14	-.32389802E-03	-.44060013E-03	-.20931777E-03
15	-.32404724E-03	-.44548164E-03	-.20482074E-03
16	-.32421652E-03	-.45027309E-03	-.20045190E-03
17	-.32440516E-03	-.45497702E-03	-.19620734E-03
18	-.32461249E-03	-.45959586E-03	-.19208336E-03
19	-.32483786E-03	-.46413194E-03	-.18807639E-03
20	-.32508064E-03	-.46858746E-03	-.18418305E-03
21	-.32534025E-03	-.47296451E-03	-.18040008E-03

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.19775472E-02	.32239811E+08
2	.12375510E-02	.32678960E+08
3	.69790132E-03	.33116947E+08
4	.33437528E-03	.33553787E+08
5	.12343756E-03	.33989495E+08
6	.42260341E-04	.34431217E+08
7	.68921953E-04	.34866028E+08
8	.18255763E-03	.35299813E+08
9	.36342699E-03	.35732571E+08
10	.59314932E-03	.36164302E+08
11	.85484926E-03	.36595004E+08
12	.11332637E-02	.37024676E+08
13	.14149493E-02	.37453319E+08
14	.16884387E-02	.37880932E+08
15	.19443942E-02	.38307513E+08
16	.21758214E-02	.38733064E+08
17	.23781900E-02	.39157583E+08
18	.25496412E-02	.39581072E+08
19	.26911967E-02	.40003530E+08
20	.28069141E-02	.40424958E+08
21	.29040681E-02	.40845356E+08

1

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3716.6400	75.0458	508.3180
2	3738.5177	75.0808	593.1406
3	3760.5419	75.1070	677.9978
4	3782.7125	75.1247	762.8798
5	3805.0295	75.1337	847.7768
6	3827.4930	75.1343	932.6793
7	3850.1029	75.1264	1017.5776
8	3872.8593	75.1102	1102.4623
9	3895.7622	75.0856	1187.3238
10	3918.8115	75.0527	1272.1529
11	3942.0072	75.0116	1356.9401
12	3965.3494	74.9622	1441.6761
13	3988.8380	74.9047	1526.3518
14	4012.4731	74.8390	1610.9577
15	4036.2546	74.7652	1695.4848
16	4060.1826	74.6832	1779.9239
17	4084.2570	74.5932	1864.2658
18	4108.4779	74.4951	1948.5014
19	4132.8452	74.3890	2032.6216
20	4157.3590	74.2748	2116.6173
21	4182.0192	74.1525	2200.4794

1

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-1 DE 22.6 M V FRANCOLÍ (ROT) XH4

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	22.6000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	2.9000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	2.1000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	300.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	22.600	10.0500	10.0500

DATOS ACCIONES EXTERIORES

1

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	59.0000 T
REACCION VERTICAL TABLERO	=	2067.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

FASE ELASTICA

REACCION DEL TABLERO = 84.9600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.18218149E-02	.25302822E-01
2	.14249168E-04	.18137641E-02	.23247204E-01
3	.26967996E-04	.17904765E-02	.21209455E-01
4	.38330615E-04	.17535827E-02	.19205852E-01
5	.48488573E-04	.17045299E-02	.17250937E-01
6	.57574161E-04	.16446044E-02	.15357710E-01
7	.65703177E-04	.15749528E-02	.13537795E-01
8	.72977266E-04	.14965983E-02	.11801595E-01
9	.79485872E-04	.14104566E-02	.10158416E-01
10	.85307899E-04	.13173481E-02	.86165868E-02
11	.90513116E-04	.12180093E-02	.71835560E-02
12	.95163350E-04	.11131021E-02	.58659832E-02
13	.99313511E-04	.10032226E-02	.46698182E-02
14	.10301246E-03	.88890847E-03	.36003705E-02
15	.10630378E-03	.77064479E-03	.26623727E-02
16	.10922637E-03	.64887026E-03	.18600357E-02
17	.11181508E-03	.52398184E-03	.11970988E-02
18	.11410113E-03	.39633918E-03	.67687414E-03
19	.11611255E-03	.26626845E-03	.30228680E-03
20	.11787457E-03	.13406572E-03	.75910503E-04
21	.11940989E-03	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2976.4800	84.9600	.0000
2	2998.3577	84.9600	96.0048
3	3020.3819	84.9600	192.0096

4	3042.5525	84.9600	288.0144
5	3064.8695	84.9600	384.0192
6	3087.3330	84.9600	480.0240
7	3109.9429	84.9600	576.0288
8	3132.6993	84.9600	672.0336
9	3155.6022	84.9600	768.0384
10	3178.6515	84.9600	864.0432
11	3201.8472	84.9600	960.0480
12	3225.1894	84.9600	1056.0528
13	3248.6780	84.9600	1152.0576
14	3272.3131	84.9600	1248.0624
15	3296.0946	84.9600	1344.0672
16	3320.0226	84.9600	1440.0720
17	3344.0970	84.9600	1536.0768
18	3368.3179	84.9600	1632.0816
19	3392.6852	84.9600	1728.0864
20	3417.1990	84.9600	1824.0912
21	3441.8592	84.9600	1920.0960

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 84.9600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.20927627E-02	.29015855E-01
2	.16452242E-04	.20834672E-02	.26654534E-01
3	.31146540E-04	.20565739E-02	.24313847E-01
4	.44276149E-04	.20139600E-02	.22012599E-01
5	.56010753E-04	.19572979E-02	.19767589E-01
6	.66498878E-04	.18880800E-02	.17593835E-01
7	.75870987E-04	.18076410E-02	.15504755E-01
8	.84242015E-04	.17171772E-02	.13512342E-01
9	.91713488E-04	.16177623E-02	.11627306E-01
10	.98375322E-04	.15103621E-02	.98592071E-02
11	.10430734E-03	.13958464E-02	.82165680E-02
12	.10958056E-03	.12749998E-02	.67069788E-02
13	.11425832E-03	.11485308E-02	.53371863E-02
14	.11839721E-03	.10170804E-02	.41131755E-02
15	.12204790E-03	.88122894E-03	.30402423E-02
16	.12525583E-03	.74150233E-03	.21230578E-02
17	.12806183E-03	.59837786E-03	.13657269E-02
18	.13050266E-03	.45228892E-03	.77184042E-03
19	.13261144E-03	.30362946E-03	.34452214E-03
20	.13441809E-03	.15275777E-03	.86471112E-04
21	.13594965E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.26077373E-03	-.26077373E-03	-.26077373E-03
2	-.25205249E-03	-.26887491E-03	-.23605269E-03
3	-.25242858E-03	-.28497671E-03	-.22143777E-03
4	-.25291417E-03	-.30017896E-03	-.20786319E-03
5	-.25349076E-03	-.31454249E-03	-.19523958E-03
6	-.25414257E-03	-.32812257E-03	-.18348751E-03
7	-.25485612E-03	-.34096969E-03	-.17253610E-03
8	-.25561990E-03	-.35313003E-03	-.16232187E-03
9	-.25642407E-03	-.36464599E-03	-.15278783E-03
10	-.25726023E-03	-.37555655E-03	-.14388267E-03
11	-.25812118E-03	-.38589767E-03	-.13556006E-03
12	-.25900080E-03	-.39570255E-03	-.12777808E-03
13	-.25989386E-03	-.40500193E-03	-.12049871E-03
14	-.26079590E-03	-.41382430E-03	-.11368737E-03
15	-.26170315E-03	-.42219614E-03	-.10731256E-03
16	-.26261240E-03	-.43014207E-03	-.10134553E-03
17	-.26352096E-03	-.43768505E-03	-.95759963E-04
18	-.26442655E-03	-.44484647E-03	-.90531759E-04
19	-.26532728E-03	-.45164636E-03	-.85638782E-04
20	-.26622159E-03	-.45810341E-03	-.81060672E-04
21	-.26710818E-03	-.46423518E-03	-.76778675E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2976.4800	91.1876	.0000
2	2998.3577	91.2054	103.0579
3	3020.3819	91.1701	206.1054
4	3042.5525	91.0860	309.0850
5	3064.8695	90.9573	411.9440
6	3087.3330	90.7876	514.6341
7	3109.9429	90.5802	617.1108
8	3132.6993	90.3381	719.3331
9	3155.6022	90.0638	821.2633
10	3178.6515	89.7599	922.8665
11	3201.8472	89.4284	1024.1103
12	3225.1894	89.0714	1124.9648
13	3248.6780	88.6906	1225.4021
14	3272.3131	88.2877	1325.3963
15	3296.0946	87.8642	1424.9232
16	3320.0226	87.4214	1523.9603
17	3344.0970	86.9607	1622.4867
18	3368.3179	86.4830	1720.4825
19	3392.6852	85.9896	1817.9293
20	3417.1990	85.4813	1914.8099
21	3441.8592	84.9590	2011.1078

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.63668726E+07
2	.10485009E-02	.62632536E+07
3	.20825882E-02	.66156442E+07
4	.30564665E-02	.69773982E+07
5	.39549932E-02	.73487108E+07
6	.47665301E-02	.77296801E+07
7	.54845299E-02	.81171597E+07
8	.61075478E-02	.85165033E+07
9	.66392889E-02	.89255611E+07
10	.70887124E-02	.93444019E+07
11	.74702930E-02	.97730795E+07
12	.78043324E-02	.10211618E+08
13	.81173253E-02	.10659972E+08
14	.84423599E-02	.11135358E+08
15	.88195079E-02	.11607063E+08
16	.92962080E-02	.12089263E+08
17	.99276068E-02	.12582038E+08
18	.10776865E-01	.13085469E+08
19	.11915392E-01	.13599633E+08
20	.13423039E-01	.14108073E+08
21	.15388219E-01	.14640118E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-1 DE 22.6 M V FRANCOLÍ (ROT) ZH4

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	22.6000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	2.9000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	2.1000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	300.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	22.600	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE = .0000 T/M
CARGA HORIZONTAL UNIFORME = .0270 T/M2
REACCION HORIZONTAL TABLERO = 50.0000 T
REACCION VERTICAL TABLERO = 2067.0000 T
MOMENTO EXTERIOR EN CABEZA = 1694.0000 TXM
COEFICIENTE MAYORACION (GS) = 1.4400

1

FASE ELASTICA

REACCION DEL TABLERO = 72.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.66035964E-04	.17476248E-02	.20641552E-01
2	.67329366E-04	.16722734E-02	.18709172E-01
3	.68591387E-04	.15954782E-02	.16862758E-01
4	.69823306E-04	.15172739E-02	.15103922E-01
5	.71026340E-04	.14376938E-02	.13434238E-01
6	.72201643E-04	.13567700E-02	.11855240E-01
7	.73350312E-04	.12745331E-02	.10368432E-01
8	.74473389E-04	.11910128E-02	.89752790E-02
9	.75571865E-04	.11062372E-02	.76772159E-02
10	.76646684E-04	.10202337E-02	.64756455E-02
11	.77698744E-04	.93302854E-03	.53719404E-02
12	.78728903E-04	.84464692E-03	.43674441E-02
13	.79737976E-04	.75511314E-03	.34634723E-02
14	.80726742E-04	.66445057E-03	.26613136E-02
15	.81695945E-04	.57268175E-03	.19622307E-02
16	.82646295E-04	.47982839E-03	.13674614E-02
17	.83578470E-04	.38591139E-03	.87821920E-03
18	.84493120E-04	.29095095E-03	.49569465E-03
19	.85390864E-04	.19496649E-03	.22105577E-03
20	.86272296E-04	.97976809E-04	.55449014E-04
21	.87137985E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2976.4800	72.0000	2439.3600
2	2998.3577	72.0889	2520.7700
3	3020.3819	72.1797	2602.2816
4	3042.5525	72.2725	2683.8969
5	3064.8695	72.3673	2765.6182
6	3087.3330	72.4641	2847.4477
7	3109.9429	72.5628	2929.3877
8	3132.6993	72.6635	3011.4404
9	3155.6022	72.7662	3093.6080
10	3178.6515	72.8709	3175.8928
11	3201.8472	72.9775	3258.2969
12	3225.1894	73.0862	3340.8227
13	3248.6780	73.1968	3423.4724
14	3272.3131	73.3094	3506.2482
15	3296.0946	73.4239	3589.1523
16	3320.0226	73.5404	3672.1870
17	3344.0970	73.6590	3755.3545
18	3368.3179	73.7795	3838.6570
19	3392.6852	73.9019	3922.0968
20	3417.1990	74.0264	4005.6761
21	3441.8592	74.1528	4089.3971

1

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 72.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.71306878E-04	.19213991E-02	.22780749E-01
2	.72911174E-04	.18399159E-02	.20655435E-01
3	.74471984E-04	.17566444E-02	.18623213E-01
4	.75990847E-04	.16716329E-02	.16686074E-01
5	.77469217E-04	.15849280E-02	.14845960E-01
6	.78908471E-04	.14965746E-02	.13104758E-01
7	.80309917E-04	.14066162E-02	.11464306E-01
8	.81674791E-04	.13150948E-02	.99263942E-02
9	.83004270E-04	.12220511E-02	.84927653E-02
10	.84299467E-04	.11275245E-02	.71651172E-02
11	.85561444E-04	.10315531E-02	.59451040E-02
12	.86791205E-04	.93417387E-03	.48343374E-02
13	.87989707E-04	.83542266E-03	.38343879E-02
14	.89157861E-04	.73533428E-03	.29467859E-02
15	.90296533E-04	.63394255E-03	.21730233E-02
16	.91406545E-04	.53128031E-03	.15145543E-02
17	.92488683E-04	.42737950E-03	.97279635E-03
18	.93543695E-04	.32227121E-03	.54913144E-03
19	.94572293E-04	.21598568E-03	.24490684E-03
20	.95575156E-04	.10855237E-03	.61436132E-04
21	.96552931E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.25885964E-03	-.45495355E-03	-.66331070E-04
2	-.25940705E-03	-.45991278E-03	-.62546884E-04
3	-.25996756E-03	-.46476552E-03	-.58893201E-04
4	-.26054059E-03	-.46951542E-03	-.55365300E-04
5	-.26112559E-03	-.47416594E-03	-.51958708E-04
6	-.26172206E-03	-.47872035E-03	-.48669186E-04
7	-.26232948E-03	-.48318176E-03	-.45492710E-04
8	-.26294740E-03	-.48755307E-03	-.42425464E-04
9	-.26357535E-03	-.49183709E-03	-.39463820E-04
10	-.26421290E-03	-.49603643E-03	-.36604334E-04
11	-.26485963E-03	-.50015360E-03	-.33843729E-04
12	-.26551514E-03	-.50419095E-03	-.31178889E-04
13	-.26617906E-03	-.50815075E-03	-.28606846E-04
14	-.26685100E-03	-.51203512E-03	-.26124777E-04
15	-.26753063E-03	-.51584609E-03	-.23729989E-04
16	-.26821759E-03	-.51958559E-03	-.21419918E-04
17	-.26891156E-03	-.52325544E-03	-.19192118E-04
18	-.26961223E-03	-.52685739E-03	-.17044254E-04
19	-.27031929E-03	-.53039310E-03	-.14974099E-04
20	-.27103245E-03	-.53386413E-03	-.12979526E-04
21	-.27175142E-03	-.53727198E-03	-.11058504E-04

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.87342366E-02	.33989222E+08
2	.69423576E-02	.34425293E+08
3	.55662471E-02	.34860412E+08
4	.45664983E-02	.35294675E+08
5	.39040493E-02	.35728244E+08
6	.35403156E-02	.36161403E+08
7	.34373172E-02	.36594717E+08
8	.35578142E-02	.37029485E+08
9	.38654373E-02	.37487340E+08
10	.43248358E-02	.37917031E+08
11	.49018159E-02	.38345675E+08
12	.55634917E-02	.38773276E+08
13	.62784441E-02	.39199835E+08
14	.70168607E-02	.39625357E+08
15	.77507179E-02	.39945997E+08
16	.84539209E-02	.40368934E+08
17	.91024861E-02	.40789220E+08
18	.96747094E-02	.41207438E+08
19	.10151332E-01	.41623849E+08
20	.10515720E-01	.42038561E+08
21	.10754058E-01	.42451588E+08

1

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2976.4800	77.7198	2439.3513
2	2998.3577	77.6060	2527.1121
3	3020.3819	77.4855	2614.7405
4	3042.5525	77.3584	2702.2289
5	3064.8695	77.2245	2789.5698
6	3087.3330	77.0839	2876.7555
7	3109.9429	76.9366	2963.7785
8	3132.6993	76.7824	3050.6311
9	3155.6022	76.6216	3137.3056
10	3178.6515	76.4539	3223.7944
11	3201.8472	76.2794	3310.0898
12	3225.1894	76.0980	3396.1840
13	3248.6780	75.9097	3482.0694
14	3272.3131	75.7146	3567.7380
15	3296.0946	75.5125	3653.1822
16	3320.0226	75.3035	3738.3940
17	3344.0970	75.0874	3823.3655
18	3368.3179	74.8643	3908.0889
19	3392.6852	74.6342	3992.5562
20	3417.1990	74.3969	4076.7593
21	3441.8592	74.1526	4160.6903

1

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-1 DE 22.6 M V FRANCOLÍ (ROT) XH51

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	22.6000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	2.9000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	2.1000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	300.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	22.600	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	98.0000 T
REACCION VERTICAL TABLERO	=	1964.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

1

FASE ELASTICA

REACCION DEL TABLERO = 141.1200 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.30260655E-02	.42028417E-01
2	.23668110E-04	.30126930E-02	.38614000E-01
3	.44794298E-04	.29740117E-02	.35229263E-01
4	.63667800E-04	.29127306E-02	.31901246E-01
5	.80540342E-04	.28312530E-02	.28654100E-01
6	.95631657E-04	.27317159E-02	.25509416E-01
7	.10913409E-03	.26160232E-02	.22486507E-01
8	.12121648E-03	.24858751E-02	.19602649E-01
9	.13202738E-03	.23427924E-02	.16873301E-01
10	.14169787E-03	.21881376E-02	.14312297E-01
11	.15034382E-03	.20231341E-02	.11932008E-01
12	.15806794E-03	.18488814E-02	.97434976E-02
13	.16496143E-03	.16663698E-02	.77566471E-02
14	.17110545E-03	.14764920E-02	.59802764E-02
15	.17657238E-03	.12800541E-02	.44222461E-02
16	.18142686E-03	.10777845E-02	.30895508E-02
17	.18572675E-03	.87034271E-03	.19884013E-02
18	.18952391E-03	.65832609E-03	.11242994E-02
19	.19286492E-03	.44227640E-03	.50210350E-03
20	.19579166E-03	.22268543E-03	.12608863E-03
21	.19834185E-03	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2828.1600	141.1200	.0000
2	2850.0377	141.1200	159.4656
3	2872.0619	141.1200	318.9312

4	2894.2325	141.1200	478.3968
5	2916.5495	141.1200	637.8624
6	2939.0130	141.1200	797.3280
7	2961.6229	141.1200	956.7936
8	2984.3793	141.1200	1116.2592
9	3007.2822	141.1200	1275.7248
10	3030.3315	141.1200	1435.1904
11	3053.5272	141.1200	1594.6560
12	3076.8694	141.1200	1754.1216
13	3100.3580	141.1200	1913.5872
14	3123.9931	141.1200	2073.0528
15	3147.7746	141.1200	2232.5184
16	3171.7026	141.1200	2391.9840
17	3195.7770	141.1200	2551.4496
18	3219.9979	141.1200	2710.9152
19	3244.3652	141.1200	2870.3808
20	3268.8790	141.1200	3029.8464
21	3293.5392	141.1200	3189.3120

FASE FINAL EN ITERACION NUMERO 5

REACCION DEL TABLERO = 141.1200 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.34917524E-02	.48789233E-01
2	.26924868E-04	.34765398E-02	.44849283E-01
3	.50985667E-04	.34325204E-02	.40943103E-01
4	.72504906E-04	.33627482E-02	.37101487E-01
5	.91762552E-04	.32699371E-02	.33351970E-01
6	.10900217E-03	.31565050E-02	.29719196E-01
7	.12443655E-03	.30246122E-02	.26225223E-01
8	.13825224E-03	.28761930E-02	.22889798E-01
9	.15061338E-03	.27129839E-02	.19730597E-01
10	.16166485E-03	.25365467E-02	.16763437E-01
11	.17153492E-03	.23482889E-02	.14002454E-01
12	.18033747E-03	.21494810E-02	.11460278E-01
13	.18817387E-03	.19412721E-02	.91481682E-02
14	.19513461E-03	.17247028E-02	.70761518E-02
15	.20137514E-03	.15006747E-02	.52531494E-02
16	.20750148E-03	.12696595E-02	.36872587E-02
17	.21371321E-03	.10316732E-02	.23863448E-02
18	.22016568E-03	.78653159E-03	.13583725E-02
19	.22714448E-03	.53380135E-03	.61164180E-03
20	.23532409E-03	.27250661E-03	.15520743E-03
21	.24698850E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.24777920E-03	-.24777920E-03	-.24777920E-03
2	-.23834786E-03	-.26587853E-03	-.21216342E-03
3	-.23912777E-03	-.29240779E-03	-.18839703E-03
4	-.24018164E-03	-.31758062E-03	-.16640789E-03
5	-.24146113E-03	-.34148231E-03	-.14602808E-03
6	-.24292518E-03	-.36419010E-03	-.12711037E-03
7	-.24453880E-03	-.38577428E-03	-.10952514E-03
8	-.24627210E-03	-.40629907E-03	-.93157753E-04
9	-.24809956E-03	-.42582334E-03	-.77906443E-04
10	-.24999930E-03	-.44440128E-03	-.63680562E-04
11	-.25195261E-03	-.46208289E-03	-.50399081E-04
12	-.25394346E-03	-.47891446E-03	-.37989342E-04
13	-.25595813E-03	-.49493895E-03	-.26386002E-04
14	-.25798488E-03	-.51019636E-03	-.15530124E-04
15	-.25996216E-03	-.52477047E-03	-.52225997E-05
16	-.26149233E-03	-.53902556E-03	.56658202E-05
17	-.26242315E-03	-.55307311E-03	.17541151E-04
18	-.26261334E-03	-.56699239E-03	.30757422E-04
19	-.26178980E-03	-.58092779E-03	.45990976E-04
20	-.25929950E-03	-.59522463E-03	.64859429E-04
21	-.25285365E-03	-.61098698E-03	.92930247E-04

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ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2828.1600	150.9960	.0000
2	2850.0377	151.0289	170.6512
3	2872.0619	150.9788	341.2920
4	2894.2325	150.8528	511.8326
5	2916.5495	150.6570	682.1909
6	2939.0130	150.3968	852.2910
7	2961.6229	150.0773	1022.0632
8	2984.3793	149.7030	1191.4429
9	3007.2822	149.2778	1360.3705
10	3030.3315	148.8054	1528.7906
11	3053.5272	148.2891	1696.6517
12	3076.8694	147.7319	1863.9060
13	3100.3580	147.1365	2030.5089
14	3123.9931	146.5056	2196.4186
15	3147.7746	145.8411	2361.6011
16	3171.7026	145.1441	2526.0197
17	3195.7770	144.4141	2689.6313
18	3219.9979	143.6498	2852.3949
19	3244.3652	142.8492	3014.2501
20	3268.8790	142.0083	3175.2287
21	3293.5392	141.1183	3335.1654

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.63668726E+07
2	.14568165E-03	.63366499E+07
3	.32597066E-03	.66888043E+07
4	.56955036E-03	.70479975E+07
5	.90609084E-03	.74143934E+07
6	.13644742E-02	.77881317E+07
7	.19730538E-02	.81693524E+07
8	.27597566E-02	.85578829E+07
9	.37522121E-02	.89544090E+07
10	.49778482E-02	.93588432E+07
11	.64647179E-02	.97713354E+07
12	.82390699E-02	.10192037E+08
13	.10328378E-01	.10621099E+08
14	.12761149E-01	.11058677E+08
15	.10533028E-01	.11100577E+08
16	.32467238E-02	.10618581E+08
17	-.31483828E-02	.10019910E+08
18	-.58217726E-02	.92681736E+07
19	.15836839E-01	.82769998E+07
20	-.13188469E-01	.65900762E+07
21	.22445829E-01	.47714544E+07

1

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-1 DE 22.6 M V FRANCOLÍ (ROT) ZH51

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	22.6000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	2.9000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	2.1000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	300.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	22.600	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE = .0000 T/M
CARGA HORIZONTAL UNIFORME = .0450 T/M2
REACCION HORIZONTAL TABLERO = 43.0000 T
REACCION VERTICAL TABLERO = 1964.0000 T
MOMENTO EXTERIOR EN CABEZA = 1402.0000 TXM
COEFICIENTE MAYORACION (GS) = 1.4400

1

FASE ELASTICA

REACCION DEL TABLERO = 61.9200 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.54653141E-04	.14632217E-02	.17338826E-01
2	.55795067E-04	.14008184E-02	.15720521E-01
3	.56911384E-04	.13371393E-02	.14173456E-01
4	.58003186E-04	.12722126E-02	.12699056E-01
5	.59071512E-04	.12060654E-02	.11298716E-01
6	.60117350E-04	.11387237E-02	.99737987E-02
7	.61141636E-04	.10702123E-02	.87256408E-02
8	.62145260E-04	.10005552E-02	.75555504E-02
9	.63129071E-04	.92977524E-03	.64648090E-02
10	.64093875E-04	.85789428E-03	.54546730E-02
11	.65040439E-04	.78493339E-03	.45263747E-02
12	.65969496E-04	.71091278E-03	.36811227E-02
13	.66881743E-04	.63585183E-03	.29201036E-02
14	.67777846E-04	.55976916E-03	.22444824E-02
15	.68658440E-04	.48268266E-03	.16554035E-02
16	.69524133E-04	.40460951E-03	.11539913E-02
17	.70375504E-04	.32556621E-03	.74135139E-03
18	.71213107E-04	.24556865E-03	.41857107E-03
19	.72037473E-04	.16463207E-03	.18671994E-03
20	.72849109E-04	.82771150E-04	.46850762E-04
21	.73648501E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2828.1600	61.9200	2018.8800
2	2850.0377	62.0681	2088.9330
3	2872.0619	62.2195	2159.1551
4	2894.2325	62.3742	2229.5502
5	2916.5495	62.5322	2300.1220
6	2939.0130	62.6934	2370.8741
7	2961.6229	62.8580	2441.8104
8	2984.3793	63.0259	2512.9345
9	3007.2822	63.1970	2584.2501
10	3030.3315	63.3715	2655.7610
11	3053.5272	63.5492	2727.4709
12	3076.8694	63.7303	2799.3835
13	3100.3580	63.9146	2871.5026
14	3123.9931	64.1023	2943.8318
15	3147.7746	64.2932	3016.3749
16	3171.7026	64.4874	3089.1356
17	3195.7770	64.6849	3162.1177
18	3219.9979	64.8858	3235.3248
19	3244.3652	65.0899	3308.7608
20	3268.8790	65.2973	3382.4292
21	3293.5392	65.5080	3456.3338

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FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 61.9200 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.58253185E-04	.15869365E-02	.18873868E-01
2	.59633571E-04	.15203305E-02	.17118115E-01
3	.60979445E-04	.14521842E-02	.15438501E-01
4	.62292079E-04	.13825358E-02	.13836745E-01
5	.63572679E-04	.13114222E-02	.12314523E-01
6	.64822386E-04	.12388790E-02	.10873469E-01
7	.66042283E-04	.11649404E-02	.95151816E-02
8	.67233395E-04	.10896397E-02	.82412172E-02
9	.68396698E-04	.10130087E-02	.70530971E-02
10	.69533116E-04	.93507831E-03	.59523070E-02
11	.70643526E-04	.85587851E-03	.49402983E-02
12	.71728764E-04	.77543817E-03	.40184889E-02
13	.72789624E-04	.69378528E-03	.31882647E-02
14	.73826860E-04	.61094696E-03	.24509806E-02
15	.74841189E-04	.52694951E-03	.18079612E-02
16	.75833297E-04	.44181843E-03	.12605017E-02
17	.76803835E-04	.35557845E-03	.80986923E-03
18	.77753421E-04	.26825360E-03	.45730307E-03
19	.78682649E-04	.17986722E-03	.20401593E-03
20	.79592080E-04	.90441999E-04	.51194451E-04
21	.80482254E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.24259846E-03	-.40279472E-03	-.85314864E-04
2	-.24312410E-03	-.40711642E-03	-.82113459E-04
3	-.24366177E-03	-.41135524E-03	-.79017268E-04
4	-.24421105E-03	-.41551426E-03	-.76022434E-04
5	-.24477153E-03	-.41959640E-03	-.73125301E-04
6	-.24534285E-03	-.42360441E-03	-.70322404E-04
7	-.24592462E-03	-.42754089E-03	-.67610452E-04
8	-.24651649E-03	-.43140833E-03	-.64986324E-04
9	-.24711814E-03	-.43520906E-03	-.62447054E-04
10	-.24772923E-03	-.43894530E-03	-.59989821E-04
11	-.24834947E-03	-.44261916E-03	-.57611944E-04
12	-.24897854E-03	-.44623264E-03	-.55310874E-04
13	-.24961616E-03	-.44978763E-03	-.53084180E-04
14	-.25026207E-03	-.45328593E-03	-.50929550E-04
15	-.25091599E-03	-.45672926E-03	-.48844780E-04
16	-.25157767E-03	-.46011924E-03	-.46827768E-04
17	-.25224687E-03	-.46345741E-03	-.44876512E-04
18	-.25292334E-03	-.46674524E-03	-.42989098E-04
19	-.25360685E-03	-.46998414E-03	-.41163703E-04
20	-.25429720E-03	-.47317542E-03	-.39398582E-04
21	-.25499416E-03	-.47632036E-03	-.37692072E-04

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ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2828.1600	66.4086	2018.8757
2	2850.0377	66.4013	2093.9142
3	2872.0619	66.3903	2168.9424
4	2894.2325	66.3755	2243.9559
5	2916.5495	66.3568	2318.9505
6	2939.0130	66.3342	2393.9216
7	2961.6229	66.3077	2468.8651
8	2984.3793	66.2773	2543.7763
9	3007.2822	66.2429	2618.6509
10	3030.3315	66.2045	2693.4843
11	3053.5272	66.1621	2768.2720
12	3076.8694	66.1156	2843.0095
13	3100.3580	66.0650	2917.6921
14	3123.9931	66.0103	2992.3152
15	3147.7746	65.9513	3066.8740
16	3171.7026	65.8882	3141.3638
17	3195.7770	65.8208	3215.7799
18	3219.9979	65.7491	3290.1173
19	3244.3652	65.6731	3364.3713
20	3268.8790	65.5926	3438.5368
21	3293.5392	65.5078	3512.6089

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.42586862E-02	.34509064E+08
2	.33102271E-02	.34954675E+08
3	.25917419E-02	.35399350E+08
4	.20796550E-02	.35843133E+08
5	.17508010E-02	.36286098E+08
6	.15824877E-02	.36728383E+08
7	.15525881E-02	.37170267E+08
8	.16396182E-02	.37630404E+08
9	.18228281E-02	.38070552E+08
10	.20822717E-02	.38509719E+08
11	.23989247E-02	.38947904E+08
12	.27547528E-02	.39385104E+08
13	.31328161E-02	.39821320E+08
14	.35173523E-02	.40256548E+08
15	.38938892E-02	.40690789E+08
16	.42493256E-02	.41124042E+08
17	.45720480E-02	.41556304E+08
18	.48520143E-02	.41924022E+08
19	.50808737E-02	.42351360E+08
20	.52520612E-02	.42777254E+08
21	.53609050E-02	.43201642E+08

1

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-1 DE 22.6 M V FRANCOLÍ (ROT) XH52

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	22.6000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	2.9000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	2.1000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	300.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	22.600	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	84.0000 T
REACCION VERTICAL TABLERO	=	2375.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

1

FASE ELASTICA

REACCION DEL TABLERO = 120.9600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.25937704E-02	.36024357E-01
2	.20286951E-04	.25823083E-02	.33097714E-01
3	.38395113E-04	.25491529E-02	.30196512E-01
4	.54572400E-04	.24966263E-02	.27343925E-01
5	.69034579E-04	.24267883E-02	.24560657E-01
6	.81969991E-04	.23414707E-02	.21865214E-01
7	.93543507E-04	.22423056E-02	.19274149E-01
8	.10389984E-03	.21307501E-02	.16802270E-01
9	.11316633E-03	.20081077E-02	.14462830E-01
10	.12145531E-03	.18755465E-02	.12267683E-01
11	.12886613E-03	.17341149E-02	.10227436E-01
12	.13548680E-03	.15847555E-02	.83515693E-02
13	.14139551E-03	.14283170E-02	.66485547E-02
14	.14666181E-03	.12655646E-02	.51259512E-02
15	.15134775E-03	.10971892E-02	.37904967E-02
16	.15550873E-03	.92381528E-03	.26481864E-02
17	.15919435E-03	.74600804E-03	.17043440E-02
18	.16244907E-03	.56427951E-03	.96368522E-03
19	.16531279E-03	.37909406E-03	.43037443E-03
20	.16782142E-03	.19087323E-03	.10807597E-03
21	.17000730E-03	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3420.0000	120.9600	.0000
2	3441.8777	120.9600	136.6848
3	3463.9019	120.9600	273.3696

4	3486.0725	120.9600	410.0544
5	3508.3895	120.9600	546.7392
6	3530.8530	120.9600	683.4240
7	3553.4629	120.9600	820.1088
8	3576.2193	120.9600	956.7936
9	3599.1222	120.9600	1093.4784
10	3622.1715	120.9600	1230.1632
11	3645.3672	120.9600	1366.8480
12	3668.7094	120.9600	1503.5328
13	3692.1980	120.9600	1640.2176
14	3715.8331	120.9600	1776.9024
15	3739.6146	120.9600	1913.5872
16	3763.5426	120.9600	2050.2720
17	3787.6170	120.9600	2186.9568
18	3811.8379	120.9600	2323.6416
19	3836.2052	120.9600	2460.3264
20	3860.7190	120.9600	2597.0112
21	3885.3792	120.9600	2733.6960

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 120.9600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.31304268E-02	.43393649E-01
2	.24635546E-04	.31165077E-02	.39861509E-01
3	.46631310E-04	.30762420E-02	.36360265E-01
4	.66280866E-04	.30124466E-02	.32918065E-01
5	.83840313E-04	.29276281E-02	.29560055E-01
6	.99533060E-04	.28240222E-02	.26308702E-01
7	.11355478E-03	.27036275E-02	.23184088E-01
8	.12607743E-03	.25682353E-02	.20204153E-01
9	.13725264E-03	.24194539E-02	.17384920E-01
10	.14721451E-03	.22587299E-02	.14740686E-01
11	.15608194E-03	.20873674E-02	.12284197E-01
12	.16396068E-03	.19065433E-02	.10026799E-01
13	.17094514E-03	.17173216E-02	.79785725E-02
14	.17711929E-03	.15206652E-02	.61484530E-02
15	.18255867E-03	.13174471E-02	.45443408E-02
16	.18733096E-03	.11084595E-02	.31731958E-02
17	.19149701E-03	.89442167E-03	.20411246E-02
18	.19511166E-03	.67598777E-03	.11534586E-02
19	.19822435E-03	.45375293E-03	.51482393E-03
20	.20087982E-03	.22825907E-03	.12920459E-03
21	.20311853E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.29963116E-03	-.29963116E-03	-.29963116E-03
2	-.29446532E-03	-.31965517E-03	-.27050725E-03
3	-.29479821E-03	-.34352793E-03	-.24840006E-03
4	-.29536777E-03	-.36612259E-03	-.22792699E-03
5	-.29613237E-03	-.38751831E-03	-.20893844E-03
6	-.29705656E-03	-.40778709E-03	-.19130269E-03
7	-.29811012E-03	-.42699479E-03	-.17490318E-03
8	-.29926721E-03	-.44520183E-03	-.15963645E-03
9	-.30050575E-03	-.46246387E-03	-.14541027E-03
10	-.30180687E-03	-.47883232E-03	-.13214216E-03
11	-.30315443E-03	-.49435480E-03	-.11975815E-03
12	-.30453461E-03	-.50907556E-03	-.10819170E-03
13	-.30593568E-03	-.52303600E-03	-.97382614E-04
14	-.30734756E-03	-.53627424E-03	-.87276846E-04
15	-.30876175E-03	-.54882640E-03	-.77825036E-04
16	-.31017103E-03	-.56072618E-03	-.68982419E-04
17	-.31156930E-03	-.57200524E-03	-.60708212E-04
18	-.31295146E-03	-.58269333E-03	-.52965181E-04
19	-.31431326E-03	-.59281848E-03	-.45719263E-04
20	-.31565118E-03	-.60240713E-03	-.38939233E-04
21	-.31696236E-03	-.61148423E-03	-.32596413E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3420.0000	131.6647	.0000
2	3441.8777	131.6851	148.8011
3	3463.9019	131.6141	297.5731
4	3486.0725	131.4598	446.2175
5	3508.3895	131.2293	594.6441
6	3530.8530	130.9291	742.7706
7	3553.4629	130.5651	890.5217
8	3576.2193	130.1424	1037.8279
9	3599.1222	129.6658	1184.6256
10	3622.1715	129.1394	1330.8561
11	3645.3672	128.5673	1476.4654
12	3668.7094	127.9527	1621.4035
13	3692.1980	127.2990	1765.6258
14	3715.8331	126.6091	1909.0871
15	3739.6146	125.8854	2051.7490
16	3763.5426	125.1306	2193.5746
17	3787.6170	124.3467	2334.5300
18	3811.8379	123.5358	2474.5833
19	3836.2052	122.6997	2613.7051
20	3860.7190	121.8401	2751.8679
21	3885.3792	120.9586	2889.0460

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.63668726E+07
2	.20592151E-02	.60390485E+07
3	.38982338E-02	.63782186E+07
4	.53997447E-02	.67252394E+07
5	.65587733E-02	.70802993E+07
6	.74024275E-02	.74435258E+07
7	.79833572E-02	.78150410E+07
8	.83710740E-02	.81949664E+07
9	.86448492E-02	.85834233E+07
10	.88885656E-02	.89805331E+07
11	.91874277E-02	.93480705E+07
12	.96263329E-02	.97537447E+07
13	.88641030E-02	.10191570E+08
14	.93602746E-02	.10619276E+08
15	.10167647E-01	.11055978E+08
16	.11377689E-01	.11501823E+08
17	.13091456E-01	.12012528E+08
18	.15422564E-01	.12483123E+08
19	.18500195E-01	.12963425E+08
20	.22472004E-01	.13379508E+08
21	.27506809E-01	.13873218E+08

1

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-1 DE 22.6 M V FRANCOLÍ (ROT) ZH52

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	22.6000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	2.9000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	2.1000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	300.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	22.600	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE = .0000 T/M
CARGA HORIZONTAL UNIFORME = .0450 T/M2
REACCION HORIZONTAL TABLERO = 46.0000 T
REACCION VERTICAL TABLERO = 2375.0000 T
MOMENTO EXTERIOR EN CABEZA = 295.0000 TXM
COEFICIENTE MAYORACION (GS) = 1.4400

1

FASE ELASTICA

REACCION DEL TABLERO = 66.2400 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.11499769E-04	.62538189E-03	.83480782E-02
2	.13347831E-04	.61134300E-03	.76491320E-02
3	.15151688E-04	.59524077E-03	.69672202E-02
4	.16913162E-04	.57712413E-03	.63046466E-02
5	.18633978E-04	.55703999E-03	.56636608E-02
6	.20315777E-04	.53503338E-03	.50464604E-02
7	.21960115E-04	.51114750E-03	.44551932E-02
8	.23568473E-04	.48542385E-03	.38919592E-02
9	.25142259E-04	.45790229E-03	.33588125E-02
10	.26682813E-04	.42862112E-03	.28577628E-02
11	.28191412E-04	.39761718E-03	.23907777E-02
12	.29669271E-04	.36492590E-03	.19597836E-02
13	.31117550E-04	.33058134E-03	.15666679E-02
14	.32537357E-04	.29461632E-03	.12132801E-02
15	.33929745E-04	.25706241E-03	.90143346E-03
16	.35295725E-04	.21795002E-03	.63290609E-03
17	.36636259E-04	.17730845E-03	.40944241E-03
18	.37952270E-04	.13516593E-03	.23275435E-03
19	.39244637E-04	.91549677E-04	.10452252E-03
20	.40514205E-04	.46485932E-04	.26397304E-04
21	.41761780E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3420.0000	66.2400	424.8000
2	3441.8777	66.3881	499.7346
3	3463.9019	66.5395	574.8383
4	3486.0725	66.6942	650.1150
5	3508.3895	66.8522	725.5684
6	3530.8530	67.0134	801.2021
7	3553.4629	67.1780	877.0200
8	3576.2193	67.3459	953.0257
9	3599.1222	67.5170	1029.2229
10	3622.1715	67.6915	1105.6154
11	3645.3672	67.8692	1182.2069
12	3668.7094	68.0503	1259.0011
13	3692.1980	68.2346	1336.0018
14	3715.8331	68.4223	1413.2126
15	3739.6146	68.6132	1490.6373
16	3763.5426	68.8074	1568.2796
17	3787.6170	69.0049	1646.1433
18	3811.8379	69.2058	1724.2320
19	3836.2052	69.4099	1802.5496
20	3860.7190	69.6173	1881.0996
21	3885.3792	69.8280	1959.8858

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FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 66.2400 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.12840629E-04	.71148288E-03	.95094851E-02
2	.14984917E-04	.69576145E-03	.87141639E-02
3	.17076388E-04	.67764681E-03	.79379657E-02
4	.19117040E-04	.65719753E-03	.71835615E-02
5	.21108763E-04	.63446995E-03	.64535574E-02
6	.23053349E-04	.60951835E-03	.57504971E-02
7	.24952498E-04	.58239505E-03	.50768639E-02
8	.26807821E-04	.55315047E-03	.44350833E-02
9	.28620850E-04	.52183327E-03	.38275246E-02
10	.30393040E-04	.48849042E-03	.32565031E-02
11	.32125773E-04	.45316729E-03	.27242821E-02
12	.33820365E-04	.41590772E-03	.22330744E-02
13	.35478066E-04	.37675411E-03	.17850441E-02
14	.37100069E-04	.33574746E-03	.13823081E-02
15	.38687509E-04	.29292748E-03	.10269378E-02
16	.40241466E-04	.24833261E-03	.72096053E-03
17	.41762972E-04	.20200011E-03	.46636065E-03
18	.43253010E-04	.15396608E-03	.26508120E-03
19	.44712519E-04	.10426555E-03	.11902503E-03
20	.46142394E-04	.52932525E-04	.30055965E-04
21	.47543491E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.29464813E-03	-.32995986E-03	-.25997843E-03
2	-.29462730E-03	-.33583582E-03	-.25416803E-03
3	-.29463356E-03	-.34159363E-03	-.24852731E-03
4	-.29466594E-03	-.34723780E-03	-.24304993E-03
5	-.29472353E-03	-.35277263E-03	-.23772987E-03
6	-.29480546E-03	-.35820217E-03	-.23256142E-03
7	-.29491088E-03	-.36353025E-03	-.22753914E-03
8	-.29503901E-03	-.36876052E-03	-.22265789E-03
9	-.29518908E-03	-.37389642E-03	-.21791279E-03
10	-.29536037E-03	-.37894123E-03	-.21329916E-03
11	-.29555217E-03	-.38389805E-03	-.20881258E-03
12	-.29576383E-03	-.38876983E-03	-.20444884E-03
13	-.29599470E-03	-.39355938E-03	-.20020392E-03
14	-.29624417E-03	-.39826936E-03	-.19607399E-03
15	-.29651167E-03	-.40290231E-03	-.19205539E-03
16	-.29679661E-03	-.40746064E-03	-.18814465E-03
17	-.29709847E-03	-.41194664E-03	-.18433845E-03
18	-.29741672E-03	-.41636250E-03	-.18063359E-03
19	-.29775086E-03	-.42071029E-03	-.17702706E-03
20	-.29810042E-03	-.42499200E-03	-.17351595E-03
21	-.29846492E-03	-.42920952E-03	-.17009749E-03

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3420.0000	68.6735	424.7991
2	3441.8777	68.7830	502.4627
3	3463.9019	68.8868	580.2468
4	3486.0725	68.9852	658.1451
5	3508.3895	69.0780	736.1514
6	3530.8530	69.1654	814.2596
7	3553.4629	69.2473	892.4633
8	3576.2193	69.3238	970.7566
9	3599.1222	69.3949	1049.1333
10	3622.1715	69.4606	1127.5872
11	3645.3672	69.5209	1206.1123
12	3668.7094	69.5758	1284.7025
13	3692.1980	69.6254	1363.3517
14	3715.8331	69.6696	1442.0538
15	3739.6146	69.7084	1520.8029
16	3763.5426	69.7418	1599.5927
17	3787.6170	69.7698	1678.4172
18	3811.8379	69.7924	1757.2703
19	3836.2052	69.8096	1836.1459
20	3860.7190	69.8214	1915.0379
21	3885.3792	69.8277	1993.9401

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.92114020E-03	.33074356E+08
2	.54983811E-03	.33520580E+08
3	.28671151E-03	.33967928E+08
4	.11745813E-03	.34412665E+08
5	.28434881E-04	.34856410E+08
6	.64152779E-05	.35299162E+08
7	.38801165E-04	.35740919E+08
8	.11368740E-03	.36181681E+08
9	.22001785E-03	.36621442E+08
10	.34756831E-03	.37060201E+08
11	.48718744E-03	.37497954E+08
12	.63077009E-03	.37934698E+08
13	.77144740E-03	.38370430E+08
14	.90366398E-03	.38805145E+08
15	.10232962E-02	.39238842E+08
16	.11277600E-02	.39671517E+08
17	.12161035E-02	.40103168E+08
18	.12891471E-02	.40533792E+08
19	.13495812E-02	.40963386E+08
20	.14021222E-02	.41391949E+08
21	.14535907E-02	.41819476E+08

1

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-1 DE 22.6 M V FRANCOLÍ (ROT) XH10

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	22.6000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	2.9000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	2.1000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	300.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	22.600	10.0500	10.0500

DATOS ACCIONES EXTERIORES

1

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	49.0000 T
REACCION VERTICAL TABLERO	=	1925.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

FASE ELASTICA

REACCION DEL TABLERO = 70.5600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.15130327E-02	.21014208E-01
2	.11834055E-04	.15063465E-02	.19307000E-01
3	.22397149E-04	.14870059E-02	.17614632E-01
4	.31833900E-04	.14563653E-02	.15950623E-01
5	.40270171E-04	.14156265E-02	.14327050E-01
6	.47815828E-04	.13658579E-02	.12754708E-01
7	.54567046E-04	.13080116E-02	.11243253E-01
8	.60608238E-04	.12429376E-02	.98013243E-02
9	.66013690E-04	.11713962E-02	.84366506E-02
10	.70848933E-04	.10940688E-02	.71561484E-02
11	.75171910E-04	.10115670E-02	.59660041E-02
12	.79033969E-04	.92444070E-03	.48717488E-02
13	.82480713E-04	.83318491E-03	.38783236E-02
14	.85552724E-04	.73824602E-03	.29901382E-02
15	.88286188E-04	.64002703E-03	.22111231E-02
16	.90713428E-04	.53889225E-03	.15447754E-02
17	.92863373E-04	.43517136E-03	.99420067E-03
18	.94761955E-04	.32916305E-03	.56214971E-03
19	.96432460E-04	.22113820E-03	.25105175E-03
20	.97895830E-04	.11134272E-03	.63044316E-04
21	.99170927E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2772.0000	70.5600	.0000
2	2793.8777	70.5600	79.7328
3	2815.9019	70.5600	159.4656

4	2838.0725	70.5600	239.1984
5	2860.3895	70.5600	318.9312
6	2882.8530	70.5600	398.6640
7	2905.4629	70.5600	478.3968
8	2928.2193	70.5600	558.1296
9	2951.1222	70.5600	637.8624
10	2974.1715	70.5600	717.5952
11	2997.3672	70.5600	797.3280
12	3020.7094	70.5600	877.0608
13	3044.1980	70.5600	956.7936
14	3067.8331	70.5600	1036.5264
15	3091.6146	70.5600	1116.2592
16	3115.5426	70.5600	1195.9920
17	3139.6170	70.5600	1275.7248
18	3163.8379	70.5600	1355.4576
19	3188.2052	70.5600	1435.1904
20	3212.7190	70.5600	1514.9232
21	3237.3792	70.5600	1594.6560

1

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 70.5600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.17015429E-02	.23596937E-01
2	.13362053E-04	.16939934E-02	.21677037E-01
3	.25298746E-04	.16721500E-02	.19773896E-01
4	.35966290E-04	.16375353E-02	.17902788E-01
5	.45502194E-04	.15915056E-02	.16077366E-01
6	.54026888E-04	.15352717E-02	.14309829E-01
7	.61646222E-04	.14699164E-02	.12611087E-01
8	.68453486E-04	.13964100E-02	.10990889E-01
9	.74531116E-04	.13156237E-02	.94579429E-02
10	.79952135E-04	.12283407E-02	.80200262E-02
11	.84781377E-04	.11352662E-02	.66840744E-02
12	.89076535E-04	.10370365E-02	.54562663E-02
13	.92889049E-04	.93422597E-03	.43420973E-02
14	.96264883E-04	.82735400E-03	.33464454E-02
15	.99245180E-04	.71689082E-03	.24736299E-02
16	.10186683E-03	.60326253E-03	.17274643E-02
17	.10416299E-03	.48685568E-03	.11113032E-02
18	.10616346E-03	.36802124E-03	.62808487E-03
19	.10789514E-03	.24707813E-03	.28036947E-03
20	.10938226E-03	.12431640E-03	.70373318E-04
21	.11064676E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.24285894E-03	-.24285894E-03	-.24285894E-03
2	-.23302081E-03	-.24668351E-03	-.22002621E-03
3	-.23345461E-03	-.25989180E-03	-.20828236E-03
4	-.23396259E-03	-.27235660E-03	-.19736689E-03
5	-.23453255E-03	-.28412994E-03	-.18721027E-03
6	-.23515409E-03	-.29525901E-03	-.17775053E-03
7	-.23581835E-03	-.30578681E-03	-.16893219E-03
8	-.23651771E-03	-.31575262E-03	-.16070548E-03
9	-.23724570E-03	-.32519242E-03	-.15302554E-03
10	-.23799677E-03	-.33413921E-03	-.14585194E-03
11	-.23876617E-03	-.34262336E-03	-.13914805E-03
12	-.23954986E-03	-.35067284E-03	-.13288071E-03
13	-.24034437E-03	-.35831346E-03	-.12701973E-03
14	-.24114676E-03	-.36556912E-03	-.12153764E-03
15	-.24195453E-03	-.37246194E-03	-.11640937E-03
16	-.24276554E-03	-.37901243E-03	-.11161200E-03
17	-.24357801E-03	-.38523968E-03	-.10712450E-03
18	-.24439043E-03	-.39116142E-03	-.10292761E-03
19	-.24520152E-03	-.39679419E-03	-.99003609E-04
20	-.24601023E-03	-.40215341E-03	-.95336167E-04
21	-.24681570E-03	-.40725350E-03	-.91910232E-04

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ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2772.0000	75.2756	.0000
2	2793.8777	75.2917	85.0750
3	2815.9019	75.2674	170.1449
4	2838.0725	75.2063	255.1663
5	2860.3895	75.1112	340.0991
6	2882.8530	74.9849	424.9066
7	2905.4629	74.8298	509.5547
8	2928.2193	74.6480	594.0123
9	2951.1222	74.4417	678.2504
10	2974.1715	74.2125	762.2421
11	2997.3672	73.9621	845.9627
12	3020.7094	73.6920	929.3889
13	3044.1980	73.4035	1012.4993
14	3067.8331	73.0978	1095.2736
15	3091.6146	72.7760	1177.6932
16	3115.5426	72.4391	1259.7405
17	3139.6170	72.0882	1341.3989
18	3163.8379	71.7240	1422.6530
19	3188.2052	71.3473	1503.4883
20	3212.7190	70.9588	1583.8910
21	3237.3792	70.5592	1663.8483

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.63668726E+07
2	.72016583E-03	.63660962E+07
3	.14396949E-02	.67242333E+07
4	.21229440E-02	.70921915E+07
5	.27564401E-02	.74701866E+07
6	.33292990E-02	.78583104E+07
7	.38346151E-02	.82566416E+07
8	.42695936E-02	.86652559E+07
9	.46357063E-02	.90842278E+07
10	.49387856E-02	.95136312E+07
11	.51891462E-02	.99535396E+07
12	.54016719E-02	.10404026E+08
13	.55959560E-02	.10865163E+08
14	.57963904E-02	.11337022E+08
15	.60322459E-02	.11819676E+08
16	.63377457E-02	.12313194E+08
17	.67521032E-02	.12817648E+08
18	.73195382E-02	.13333107E+08
19	.80892614E-02	.13859640E+08
20	.91154508E-02	.14385512E+08
21	.10457168E-01	.14932686E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-1 DE 22.6 M V FRANCOLÍ (ROT) ZH10

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	22.6000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	2.9000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	2.1000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	300.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	22.600	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE = .0000 T/M
CARGA HORIZONTAL UNIFORME = .0450 T/M2
REACCION HORIZONTAL TABLERO = 99.0000 T
REACCION VERTICAL TABLERO = 1925.0000 T
MOMENTO EXTERIOR EN CABEZA = 543.0000 TXM
COEFICIENTE MAYORACION (GS) = 1.4400

1

FASE ELASTICA

REACCION DEL TABLERO = 142.5600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.21167372E-04	.12670688E-02	.17067557E-01
2	.25189949E-04	.12408769E-02	.15650139E-01
3	.29111061E-04	.12101968E-02	.14264866E-01
4	.32934761E-04	.11751409E-02	.12916743E-01
5	.36664893E-04	.11358171E-02	.11610655E-01
6	.40305109E-04	.10923291E-02	.10351365E-01
7	.43858873E-04	.10447764E-02	.91435219E-02
8	.47329483E-04	.99325501E-03	.79916648E-02
9	.50720074E-04	.93785701E-03	.69002257E-02
10	.54033629E-04	.87867117E-03	.58735347E-02
11	.57272989E-04	.81578293E-03	.49158235E-02
12	.60440864E-04	.74927460E-03	.40312289E-02
13	.63539834E-04	.67922551E-03	.32237966E-02
14	.66572362E-04	.60571211E-03	.24974841E-02
15	.69540801E-04	.52880818E-03	.18561643E-02
16	.72447394E-04	.44858485E-03	.13036280E-02
17	.75294288E-04	.36511080E-03	.84358699E-03
18	.78083533E-04	.27845233E-03	.47967702E-03
19	.80817092E-04	.18867348E-03	.21546007E-03
20	.83496841E-04	.95836103E-04	.54427011E-04
21	.86124580E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2772.0000	142.5600	781.9200
2	2793.8777	142.7081	943.0962
3	2815.9019	142.8595	1104.4415
4	2838.0725	143.0142	1265.9598
5	2860.3895	143.1722	1427.6548
6	2882.8530	143.3334	1589.5301
7	2905.4629	143.4980	1751.5896
8	2928.2193	143.6659	1913.8369
9	2951.1222	143.8370	2076.2757
10	2974.1715	144.0115	2238.9098
11	2997.3672	144.1892	2401.7429
12	3020.7094	144.3703	2564.7787
13	3044.1980	144.5546	2728.0210
14	3067.8331	144.7423	2891.4734
15	3091.6146	144.9332	3055.1397
16	3115.5426	145.1274	3219.0236
17	3139.6170	145.3249	3383.1289
18	3163.8379	145.5258	3547.4592
19	3188.2052	145.7299	3712.0184
20	3212.7190	145.9373	3876.8100
21	3237.3792	146.1480	4041.8378

1

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 142.5600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.22418602E-04	.13704944E-02	.18502860E-01
2	.26810863E-04	.13426797E-02	.16969449E-01
3	.31095134E-04	.13099628E-02	.15470250E-01
4	.35275656E-04	.12724633E-02	.14010735E-01
5	.39356438E-04	.12302962E-02	.12596241E-01
6	.43341264E-04	.11835720E-02	.11231982E-01
7	.47233714E-04	.11323971E-02	.99230452E-02
8	.51037172E-04	.10768741E-02	.86744022E-02
9	.54754846E-04	.10171016E-02	.74909104E-02
10	.58389770E-04	.95317488E-03	.63773174E-02
11	.61944822E-04	.88518583E-03	.53382653E-02
12	.65422730E-04	.81322317E-03	.43782942E-02
13	.68826082E-04	.73737259E-03	.35018454E-02
14	.72157336E-04	.65771696E-03	.27132653E-02
15	.75418822E-04	.57433643E-03	.20168081E-02
16	.78612759E-04	.48730858E-03	.14166388E-02
17	.81741252E-04	.39670857E-03	.91683625E-03
18	.84806304E-04	.30260920E-03	.52139557E-03
19	.87809819E-04	.20508109E-03	.23423096E-03
20	.90753610E-04	.10419275E-03	.59177992E-04
21	.93658340E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.23337132E-03	-.29502248E-03	-.17284109E-03
2	-.23397796E-03	-.30770784E-03	-.16158863E-03
3	-.23464275E-03	-.32015436E-03	-.15068589E-03
4	-.23536279E-03	-.33237084E-03	-.14011852E-03
5	-.23613536E-03	-.34436556E-03	-.12987298E-03
6	-.23695790E-03	-.35614637E-03	-.11993648E-03
7	-.23782797E-03	-.36772068E-03	-.11029694E-03
8	-.23874328E-03	-.37909550E-03	-.10094291E-03
9	-.23970164E-03	-.39027747E-03	-.91863560E-04
10	-.24070101E-03	-.40127288E-03	-.83048630E-04
11	-.24173942E-03	-.41208768E-03	-.74488396E-04
12	-.24281500E-03	-.42272751E-03	-.66173631E-04
13	-.24392600E-03	-.43319773E-03	-.58095581E-04
14	-.24507074E-03	-.44350341E-03	-.50245929E-04
15	-.24624760E-03	-.45364936E-03	-.42616777E-04
16	-.24745506E-03	-.46364015E-03	-.35200612E-04
17	-.24869167E-03	-.47348011E-03	-.27990290E-04
18	-.24995603E-03	-.48317337E-03	-.20979012E-04
19	-.25124682E-03	-.49272382E-03	-.14160304E-04
20	-.25256275E-03	-.50213517E-03	-.75279988E-05
21	-.25386725E-03	-.51142769E-03	-.98973520E-06

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2772.0000	146.3595	781.8632
2	2793.8777	146.4598	947.3092
3	2815.9019	146.5485	1112.8622
4	2838.0725	146.6257	1278.5093
5	2860.3895	146.6914	1444.2375
6	2882.8530	146.7455	1610.0336
7	2905.4629	146.7880	1775.8848
8	2928.2193	146.8190	1941.7778
9	2951.1222	146.8383	2107.6996
10	2974.1715	146.8460	2273.6370
11	2997.3672	146.8420	2439.5769
12	3020.7094	146.8263	2605.5059
13	3044.1980	146.7988	2771.4109
14	3067.8331	146.7595	2937.2783
15	3091.6146	146.7082	3103.0948
16	3115.5426	146.6450	3268.8469
17	3139.6170	146.5698	3434.5210
18	3163.8379	146.4825	3600.1035
19	3188.2052	146.3831	3765.5805
20	3212.7190	146.2714	3930.9383
21	3237.3792	146.1475	4095.7690

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.56806221E-01	.34853383E+08
2	.54275636E-01	.35300623E+08
3	.51554757E-01	.35744481E+08
4	.48616944E-01	.36184990E+08
5	.45439895E-01	.36622193E+08
6	.42005419E-01	.37056143E+08
7	.38299420E-01	.37497904E+08
8	.34311810E-01	.37927489E+08
9	.30036511E-01	.38354017E+08
10	.25471375E-01	.38777506E+08
11	.20618204E-01	.39197974E+08
12	.15482714E-01	.39615439E+08
13	.10074521E-01	.40029921E+08
14	.44071368E-02	.40441437E+08
15	-.15020237E-02	.40850006E+08
16	-.76316564E-02	.41255649E+08
17	-.13956559E-01	.41658384E+08
18	-.20447626E-01	.42058231E+08
19	-.27071840E-01	.42455210E+08
20	-.33792255E-01	.42849340E+08
21	.35343133E+00	.31415578E+08

ESFUERZOS EN SERVICIO EN BASE DE PILA

PILA 1

	Base de pila					
	H2	H3	H4	H5.1	H5.2	H10
N (KN)	16225	29045	23905	22875	26985	22485
M_x (m·KN)	7040	14735	28715	24255	13760	28315
M_z (m·KN)	8285	11740	13735	22785	19655	11385
F_x (KN)	360	500	590	980	840	490
F_z (KN)	305	515	515	455	485	1015

	Base de pila					
	H2	H3	H4	H5.1	H5.2	H10
N (t)	1623	2905	2391	2288	2699	2249
M_x (m·t)	704	1474	2872	2426	1376	2832
M_z (m·t)	829	1174	1374	2279	1966	1139
F_x (t)	36	50	59	98	84	49
F_z (t)	31	52	52	46	49	102

ESFUERZOS EN ROTURA EN BASE DE PILA

PILA 1

	Base de pila					
	H2	H3	H4	H5.1	H5.2	H10
N_d (KN)	23360	41820	34420	32935	38855	32375
$M_{x,d}$ (m·KN)	10165	22005	41610	35130	19940	40960
$M_{z,d}$ (m·KN)	12040	17300	20115	33355	28890	16640
$F_{x,d}$ (KN)	520	720	850	1415	1210	705
$F_{z,d}$ (KN)	440	745	745	655	700	1465

	Base de pila					
	H2	H3	H4	H5.1	H5.2	H10
N_d (t)	2336	4182	3442	3294	3886	3238
$M_{x,d}$ (m·t)	1017	2201	4161	3513	1994	4096
$M_{z,d}$ (m·t)	1204	1730	2012	3336	2889	1664
$F_{x,d}$ (t)	52	72	85	142	121	71
$F_{z,d}$ (t)	44	75	75	66	70	147

PRONTUARIO INFORMÁTICO DEL HORMIGÓN ESTRUCTURAL 3.0
Cátedra de Hormigón Estructural ETSICCPM - IECA

Obra: Viaducto río Francoli
Fecha: 05/06/02
Hora: 9:50:45

Cálculo de secciones a flexión compuesta esviada

1 Datos

- Materiales

Tipo de hormigón : HA-30
Tipo de acero : B-500-S
fck [MPa] = 30.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

Sección : FRANCOLI_P1

Contorno exterior

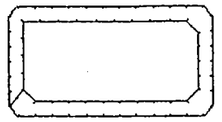
Vértice	X [m]	Y [m]	Lado	nº barras
1	0.000	0.250	1-2	2
2	0.250	0.000	2-3	12
3	5.250	0.000	3-4	2
4	5.500	0.250	4-5	7
5	5.500	2.650	5-6	2
6	5.250	2.900	6-7	12
7	0.250	2.900	7-8	2
8	0.000	2.650	8-1	7

Contorno interior

Vértice	X [m]	Y [m]	Lado	nº barras
1	0.400	0.700	1-2	2
2	0.700	0.400	2-3	10
3	4.800	0.400	3-4	2
4	5.100	0.700	4-5	5
5	5.100	2.200	5-6	2
6	4.800	2.500	6-7	10
7	0.700	2.500	7-8	2
8	0.400	2.500	8-1	5

Recubrimiento exterior [m] : 0.050

Recubrimiento interior [m] : 0.050



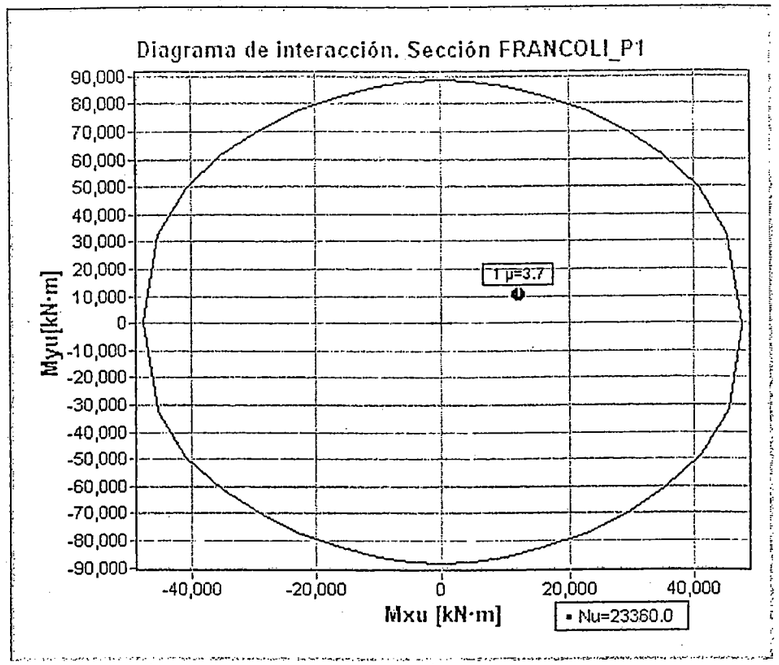
2 Diagrama

ϕ [mm] = 25

Resultados numéricos del diagrama de interacción

Nu [kN]	Mxu [kN·m]	Myu [kN·m]	x [cm]	1/r [1/m] ·1.E-3	β [º]
-23360.0	47901.2	-797.3	0.49	4.2	0.0
-23360.0	45578.6	31901.3	1.00	3.5	10.0
-23360.0	40865.9	49207.9	1.49	2.4	20.0
-23360.0	35122.9	61402.2	1.78	2.0	30.0
-23360.0	28861.7	70703.5	1.92	1.8	40.0
-23360.0	22310.6	77696.7	1.93	1.8	50.0
-23360.0	15977.5	82706.6	1.86	1.9	60.0
-23360.0	10145.9	86114.6	1.72	2.0	70.0
-23360.0	4812.3	88107.1	1.52	2.3	80.0
-23360.0	-85.5	88665.2	1.30	2.4	90.0
-23360.0	-4957.6	88109.4	1.52	2.3	100.0
-23360.0	-10315.1	86108.7	1.72	2.0	110.0
-23360.0	-16168.0	82692.3	1.86	1.9	120.0
-23360.0	-22520.1	77642.9	1.93	1.8	130.0
-23360.0	-29056.0	70616.6	1.91	1.8	140.0
-23360.0	-35253.5	61484.0	1.78	2.0	150.0
-23360.0	-40928.7	49583.8	1.48	2.4	160.0
-23360.0	-45623.1	32453.3	1.00	3.5	170.0
-23360.0	-47952.5	-2.0	0.49	4.2	180.0
-23360.0	-45688.6	-32224.0	1.00	3.5	190.0
-23360.0	-41064.7	-49205.9	1.49	2.3	200.0
-23360.0	-35073.1	-61410.3	1.78	2.0	210.0
-23360.0	-28741.2	-70645.7	1.91	1.8	220.0
-23360.0	-22316.4	-77552.7	1.93	1.8	230.0
-23360.0	-16091.6	-82504.5	1.88	1.9	240.0
-23360.0	-10319.9	-85875.7	1.74	2.0	250.0
-23360.0	-5009.4	-87844.0	1.55	2.3	260.0
-23360.0	-136.7	-88452.2	1.34	2.4	270.0
-23360.0	4733.9	-87840.1	1.55	2.3	280.0
-23360.0	10043.4	-85868.1	1.75	2.0	290.0
-23360.0	15887.3	-82456.9	1.89	1.9	300.0
-23360.0	22267.6	-77411.9	1.95	1.8	310.0
-23360.0	28909.8	-70304.8	1.94	1.8	320.0
-23360.0	35248.4	-61006.0	1.80	1.9	330.0

-23360.0	41041.7	-48926.2	1.50	2.3	340.0
-23360.0	45745.1	-31883.1	1.01	3.5	350.0



Coeficientes de seguridad de los pares de esfuerzos de cálculo

Punto	Mxd [kN·m]	Myd [kN·m]	γ
1	12040	10165	3.66

Obra: Viaducto río Francolí
Fecha: 05/06/02
Hora: 9:51:48

Cálculo de secciones a flexión compuesta esviada

1 Datos

- Materiales

Tipo de hormigón : HA-30
Tipo de acero : B-500-S
fck [MPa] = 30.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

Sección : FRANCOLI_P1

Contorno exterior

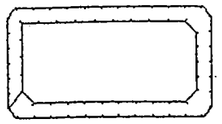
Vértice	X [m]	Y [m]	Lado	nº barras
1	0.000	0.250	1-2	2
2	0.250	0.000	2-3	12
3	5.250	0.000	3-4	2
4	5.500	0.250	4-5	7
5	5.500	2.650	5-6	2
6	5.250	2.900	6-7	12
7	0.250	2.900	7-8	2
8	0.000	2.650	8-1	7

Contorno interior

Vértice	X [m]	Y [m]	Lado	nº barras
1	0.400	0.700	1-2	2
2	0.700	0.400	2-3	10
3	4.800	0.400	3-4	2
4	5.100	0.700	4-5	5
5	5.100	2.200	5-6	2
6	4.800	2.500	6-7	10
7	0.700	2.500	7-8	2
8	0.400	2.500	8-1	5

Recubrimiento exterior [m] : 0.050

Recubrimiento interior [m] : 0.050

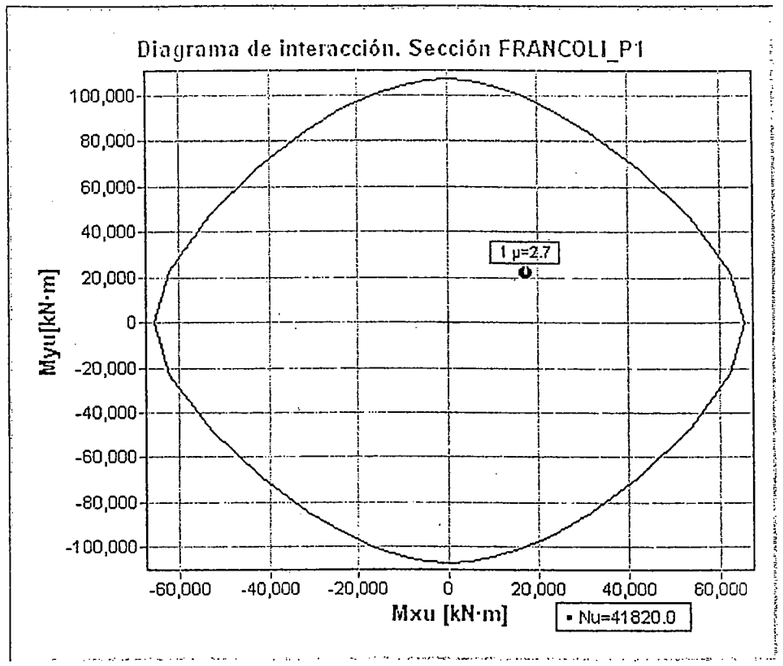


2 Diagrama

ϕ [mm] = 25

Resultados numéricos del diagrama de interacción

Nu [kN]	Mxu [kN·m]	Myu [kN·m]	x [cm]	1/r [1/m] ·1.E-3	β [º]
-41820.0	65666.0	167.2	1.06	3.3	0.0
-41820.0	62293.9	22813.3	1.63	2.1	10.0
-41820.0	53530.0	46688.9	2.16	1.6	20.0
-41820.0	42472.4	67952.8	2.54	1.4	30.0
-41820.0	31661.1	84082.5	2.75	1.3	40.0
-41820.0	22892.7	94322.5	2.86	1.2	50.0
-41820.0	15750.5	100674.3	2.91	1.2	60.0
-41820.0	9885.7	104326.3	2.87	1.2	70.0
-41820.0	4756.4	106348.3	2.75	1.3	80.0
-41820.0	-58.5	107312.7	2.54	1.4	90.0
-41820.0	-4872.4	106351.6	2.75	1.3	100.0
-41820.0	-10005.6	104325.4	2.87	1.2	110.0
-41820.0	-15841.7	100738.7	2.91	1.2	120.0
-41820.0	-22912.1	94568.7	2.86	1.2	130.0
-41820.0	-31605.3	84531.8	2.75	1.3	140.0
-41820.0	-42344.9	68589.4	2.55	1.4	150.0
-41820.0	-53384.8	47288.0	2.16	1.6	160.0
-41820.0	-62181.3	22997.2	1.62	2.2	170.0
-41820.0	-65612.2	-83.4	1.03	3.4	180.0
-41820.0	-62213.7	-23031.3	1.62	2.2	190.0
-41820.0	-53103.2	-47728.1	2.16	1.6	200.0
-41820.0	-42282.9	-68537.2	2.56	1.4	210.0
-41820.0	-31661.3	-84245.8	2.77	1.3	220.0
-41820.0	-23008.1	-94218.6	2.88	1.2	230.0
-41820.0	-15941.0	-100380.7	2.94	1.2	240.0
-41820.0	-10062.2	-104060.7	2.90	1.2	250.0
-41820.0	-4940.8	-106080.2	2.78	1.3	260.0
-41820.0	-117.9	-107062.4	2.58	1.4	270.0
-41820.0	4689.1	-106092.3	2.78	1.3	280.0
-41820.0	9810.7	-104061.9	2.91	1.2	290.0
-41820.0	15645.0	-100475.5	2.94	1.2	300.0
-41820.0	22709.7	-94322.8	2.89	1.2	310.0
-41820.0	31406.7	-84250.9	2.77	1.3	320.0
-41820.0	42220.9	-68144.1	2.57	1.4	330.0
-41820.0	53409.1	-46682.4	2.19	1.6	340.0
-41820.0	62314.8	-22482.4	1.65	2.1	350.0



Coeficientes de seguridad de los pares de esfuerzos de cálculo

Punto	Mxd [kN·m]	Myd [kN·m]	γ
1	17300	22005	2.71

PRONTUARIO INFORMÁTICO DEL HORMIGÓN ESTRUCTURAL 3.0
Cátedra de Hormigón Estructural ETSICCPM - IECA

Obra: Viaducto río Francolí
Fecha: 05/06/02
Hora: 9:53:03

Cálculo de secciones a flexión compuesta esviada

1 Datos

- Materiales

Tipo de hormigón : HA-30
Tipo de acero : B-500-S
fck [MPa] = 30.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

Sección : FRANCOLI_P1

Contorno exterior

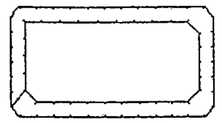
Vértice	X [m]	Y [m]	Lado	nº barras
1	0.000	0.250	1-2	2
2	0.250	0.000	2-3	12
3	5.250	0.000	3-4	2
4	5.500	0.250	4-5	7
5	5.500	2.650	5-6	2
6	5.250	2.900	6-7	12
7	0.250	2.900	7-8	2
8	0.000	2.650	8-1	7

Contorno interior

Vértice	X [m]	Y [m]	Lado	nº barras
1	0.400	0.700	1-2	2
2	0.700	0.400	2-3	10
3	4.800	0.400	3-4	2
4	5.100	0.700	4-5	5
5	5.100	2.200	5-6	2
6	4.800	2.500	6-7	10
7	0.700	2.500	7-8	2
8	0.400	2.500	8-1	5

Recubrimiento exterior [m] : 0.050

Recubrimiento interior [m] : 0.050



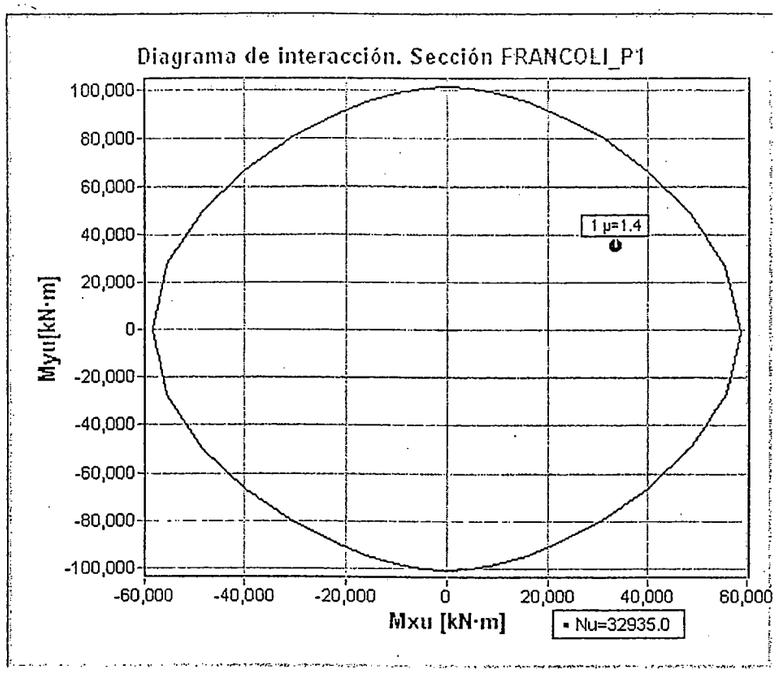
2 Diagrama

ϕ [mm] = 25

Resultados numéricos del diagrama de interacción

Nu [kN]	Mxu [kN·m]	Myu [kN·m]	x [cm]	1/r [1/m] ·1.E-3	β [º]
-32935.0	58580.9	-438.2	0.64	4.5	0.0
-32935.0	55468.3	26677.3	1.26	2.8	10.0
-32935.0	48567.2	48948.8	1.82	1.9	20.0
-32935.0	39910.9	66269.6	2.19	1.6	30.0
-32935.0	30964.5	79538.7	2.35	1.5	40.0
-32935.0	22704.9	88918.4	2.41	1.5	50.0
-32935.0	15797.8	94727.0	2.40	1.5	60.0
-32935.0	9895.4	98277.1	2.31	1.5	70.0
-32935.0	4750.7	100206.5	2.16	1.6	80.0
-32935.0	-70.1	101085.0	1.93	1.8	90.0
-32935.0	-4887.2	100212.2	2.15	1.6	100.0
-32935.0	-10036.6	98280.1	2.31	1.5	110.0
-32935.0	-15956.7	94708.4	2.39	1.5	120.0
-32935.0	-22883.0	88860.1	2.40	1.5	130.0
-32935.0	-31062.9	79700.7	2.35	1.5	140.0
-32935.0	-39905.5	66701.2	2.18	1.6	150.0
-32935.0	-48492.5	49585.3	1.82	1.9	160.0
-32935.0	-55377.8	27437.7	1.26	2.8	170.0
-32935.0	-58476.3	-86.3	0.64	4.5	180.0
-32935.0	-55461.0	-27311.0	1.27	2.8	190.0
-32935.0	-48375.9	-49655.7	1.83	1.9	200.0
-32935.0	-39610.0	-66969.7	2.18	1.6	210.0
-32935.0	-30995.7	-79631.0	2.36	1.5	220.0
-32935.0	-22922.4	-88630.5	2.42	1.4	230.0
-32935.0	-16029.1	-94408.6	2.42	1.4	240.0
-32935.0	-10120.0	-97964.5	2.34	1.5	250.0
-32935.0	-4942.3	-99942.6	2.19	1.6	260.0
-32935.0	-132.3	-100813.5	1.97	1.8	270.0
-32935.0	4691.2	-99941.9	2.19	1.6	280.0
-32935.0	9827.4	-98015.3	2.34	1.5	290.0
-32935.0	15715.4	-94473.5	2.42	1.4	300.0
-32935.0	22643.1	-88651.4	2.43	1.4	310.0
-32935.0	30857.0	-79468.9	2.37	1.5	320.0
-32935.0	39866.7	-66268.0	2.21	1.6	330.0

-32935.0	48640.4	-48884.2	1.85	1.9	340.0
-32935.0	55575.7	-26774.4	1.28	2.7	350.0



Coeficientes de seguridad de los pares de esfuerzos de cálculo

Punto	Mxd [kN·m]	Myd [kN·m]	γ
1	33355	35130	1.43

Obra: Viaducto río Francolí
Fecha: 05/06/02
Hora: 9:53:37

Cálculo de secciones a flexión compuesta esviada

1 Datos

- Materiales

Tipo de hormigón : HA-30
Tipo de acero : B-500-S
fck [MPa] = 30.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

Sección : FRANCOLI_P1

Contorno exterior

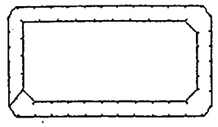
Vértice	X [m]	Y [m]	Lado	nº barras
1	0.000	0.250	1-2	2
2	0.250	0.000	2-3	12
3	5.250	0.000	3-4	2
4	5.500	0.250	4-5	7
5	5.500	2.650	5-6	2
6	5.250	2.900	6-7	12
7	0.250	2.900	7-8	2
8	0.000	2.650	8-1	7

Contorno interior

Vértice	X [m]	Y [m]	Lado	nº barras
1	0.400	0.700	1-2	2
2	0.700	0.400	2-3	10
3	4.800	0.400	3-4	2
4	5.100	0.700	4-5	5
5	5.100	2.200	5-6	2
6	4.800	2.500	6-7	10
7	0.700	2.500	7-8	2
8	0.400	2.500	8-1	5

Recubrimiento exterior [m] : 0.050

Recubrimiento interior [m] : 0.050

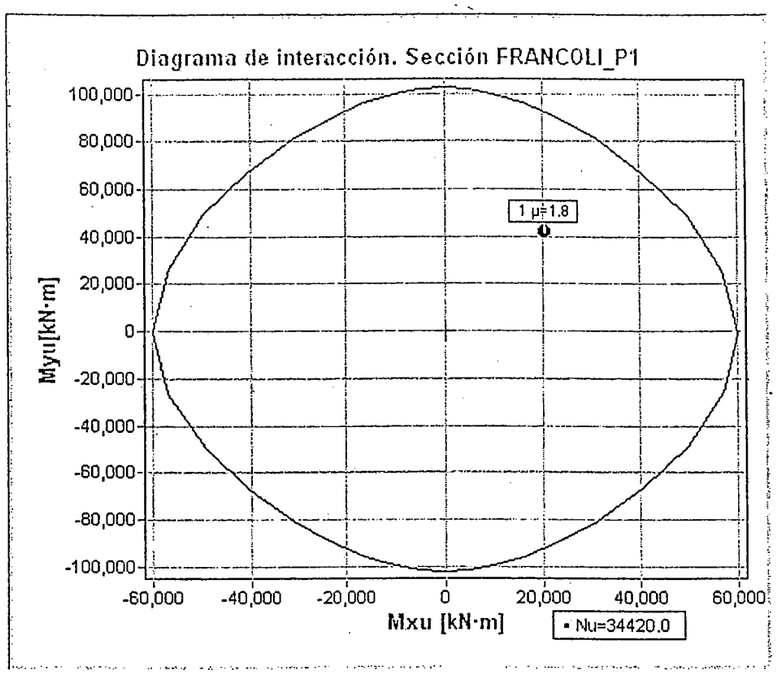


2 Diagrama

ϕ [mm] = 25

Resultados numéricos del diagrama de interacción

Nu [kN]	Mxu [kN·m]	Myu [kN·m]	x [cm]	1/r [1/m] ·1.E-3	β [°]
-34420.0	60085.7	-316.2	0.68	4.6	0.0
-34420.0	56848.6	25844.7	1.31	2.7	10.0
-34420.0	49576.1	48609.6	1.88	1.9	20.0
-34420.0	40462.7	66707.4	2.25	1.6	30.0
-34420.0	31161.4	80535.1	2.42	1.4	40.0
-34420.0	22736.8	90188.0	2.48	1.4	50.0
-34420.0	15761.5	96099.2	2.48	1.4	60.0
-34420.0	9877.4	99644.6	2.40	1.5	70.0
-34420.0	4743.9	101578.0	2.26	1.6	80.0
-34420.0	-59.9	102457.9	2.03	1.7	90.0
-34420.0	-4877.6	101558.9	2.25	1.6	100.0
-34420.0	-10019.0	99613.7	2.40	1.5	110.0
-34420.0	-15916.8	96048.4	2.48	1.4	120.0
-34420.0	-22904.2	90117.7	2.48	1.4	130.0
-34420.0	-31227.1	80764.9	2.41	1.4	140.0
-34420.0	-40444.2	67186.5	2.25	1.6	150.0
-34420.0	-49488.0	49281.6	1.88	1.9	160.0
-34420.0	-56729.5	26549.9	1.31	2.7	170.0
-34420.0	-59961.9	-80.0	0.67	4.6	180.0
-34420.0	-56804.3	-26472.4	1.32	2.7	190.0
-34420.0	-49331.6	-49431.7	1.88	1.9	200.0
-34420.0	-40168.0	-67448.6	2.25	1.6	210.0
-34420.0	-31203.2	-80679.1	2.43	1.4	220.0
-34420.0	-22961.8	-89885.2	2.50	1.4	230.0
-34420.0	-16008.9	-95757.7	2.51	1.4	240.0
-34420.0	-10108.8	-99333.0	2.43	1.4	250.0
-34420.0	-4946.0	-101319.1	2.29	1.5	260.0
-34420.0	-128.0	-102224.4	2.08	1.7	270.0
-34420.0	4689.6	-101330.4	2.29	1.5	280.0
-34420.0	9816.8	-99383.9	2.43	1.4	290.0
-34420.0	15691.7	-95831.6	2.51	1.4	300.0
-34420.0	22667.0	-89928.8	2.51	1.4	310.0
-34420.0	31027.3	-80542.9	2.44	1.4	320.0
-34420.0	40380.2	-66771.9	2.27	1.5	330.0
-34420.0	49609.0	-48606.7	1.90	1.8	340.0
-34420.0	56942.7	-25890.4	1.33	2.6	350.0



Coeficientes de seguridad de los pares de esfuerzos de cálculo

Punto	Mxd [kN·m]	Myd [kN·m]	γ
1	20115	41610	1.77

```
*************************************************
*                                               *
*           S T A A D - III                     *
*           Revision 22.3                       *
*           Proprietary Program of              *
*           Research Engineers, Inc.            *
*           Date=    JUN  5, 2002               *
*           Time=     9: 8:11                   *
*                                               *
*                                               *
*************************************************
```

```
 1. STAAD SPACE 'ENCEPADO EN SERVICIO'
 2. UNIT METER MTON
 3. JOINT COORDINATES
 4.   1  0.00 -25.00 0.00  26 0.00 0.00 0.00
 5.  REPEAT 5 0.00 0.00 1.50
 6.  REPEAT ALL 4 1.25 0.00 0.00
 7. MEMBER INCIDENCES
 8.    1   1   2  25 1 1
 9.  REPEAT ALL 29 25 26
10.  2001 26  52  2005  1  26
11.  REPEAT ALL 4 5 156
12.  2026 26 182  2029  1  156
13.  REPEAT ALL 5 4 26
14. MEMBER PROPERTY PRISMATIC
15.   1   TO  750  PRI AX 8.13E-3 IX 5.37E-5 IY 2.69E-5 IZ 2.69E-5
16.  2001 TO 2005 2021 TO 2025 PRI YD 2.00 ZD 1.125
17.  2006 TO 2020              PRI YD 2.00 ZD 1.250
18.  2026 TO 2029 2046 TO 2049 PRI YD 2.00 ZD 1.125
19.  2030 TO 2045              PRI YD 2.00 ZD 1.250
20. CONSTANT
21. E 2.64E6 MEM 2001 TO 2049
22. E 2.10E7 MEM 1 TO 750
23. POISSON .2 ALL
24. SUPPORT
25.    1  TO  339 BY 26   FIXED BUT     MX MY MZ  KFX 1250. KFZ 1250.
26.    2  TO  340 BY 26   FIXED BUT  FY MX MY MZ  KFX 2500. KFZ 2500.
27.    3  TO  341 BY 26   FIXED BUT  FY MX MY MZ  KFX 2500. KFZ 2500.
28.    4  TO  342 BY 26   FIXED BUT  FY MX MY MZ  KFX 2500. KFZ 2500.
29.    5  TO  343 BY 26   FIXED BUT  FY MX MY MZ  KFX 2500. KFZ 2500.
30.    6  TO  344 BY 26   FIXED BUT  FY MX MY MZ  KFX 1668. KFZ 1668.
31.    7  TO  345 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
32.    8  TO  346 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
33.    9  TO  347 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
34.   10  TO  348 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
35.   11  TO  349 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
36.   12  TO  350 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
37.   13  TO  351 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
38.   14  TO  352 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
39.   15  TO  353 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
40.   16  TO  354 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
41.   17  TO  355 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
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42.   18  TO  356 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
43.   19  TO  357 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
44.   20  TO  358 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
45.   21  TO  359 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
46.   22  TO  360 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
47.   23  TO  361 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
48.   24  TO  362 BY 26   FIXED BUT  FY MX MY MZ  KFX  635. KFZ  835.
50.  417  TO  755 BY 26   FIXED BUT     MX MY MZ  KFX 1250. KFZ 1250.
51.  418  TO  756 BY 26   FIXED BUT  FY MX MY MZ  KFX 2500. KFZ 2500.
52.  419  TO  757 BY 26   FIXED BUT  FY MX MY MZ  KFX 2500. KFZ 2500.
53.  420  TO  758 BY 26   FIXED BUT  FY MX MY MZ  KFX 2500. KFZ 2500.
54.  421  TO  759 BY 26   FIXED BUT  FY MX MY MZ  KFX 2500. KFZ 2500.
55.  422  TO  760 BY 26   FIXED BUT  FY MX MY MZ  KFX 1668. KFZ 1668.
56.  423  TO  761 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
57.  424  TO  762 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
58.  425  TO  763 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
59.  426  TO  764 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
60.  427  TO  765 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
61.  428  TO  766 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
62.  429  TO  767 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
63.  430  TO  768 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
64.  431  TO  769 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
65.  432  TO  770 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
66.  433  TO  771 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
67.  434  TO  772 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
68.  435  TO  773 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
69.  436  TO  774 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
70.  437  TO  775 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
71.  438  TO  776 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
72.  439  TO  777 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
73.  440  TO  778 BY 26   FIXED BUT  FY MX MY MZ  KFX  635. KFZ  835.
74. LOAD 2
75. *CARGAS SOBRE ENCEPADO H2
76. JOINT LOAD
77.  390 416 FX  18.0 FY  -811.5 FZ 15.5  MX  352.0 MZ  -414.5
78. *PESO PROPIO DEL ENCEPADO
79. MEMBER LOAD
80. 2026 TO 2029 2046 TO 2049 UNI GY  -7.500
81. 2030 TO 2045              UNI GY  -9.000
82. LOAD 3
83. *CARGAS SOBRE ENCEPADO H3
84. JOINT LOAD
85.  390 416 FX  25.0 FY -1452.5 FZ 26.0  MX  737.0 MZ  -587.0
86. *PESO PROPIO DEL ENCEPADO
87. MEMBER LOAD
88. 2026 TO 2029 2046 TO 2049 UNI GY  -7.500
89. 2030 TO 2045              UNI GY  -9.000
90. LOAD 4
91. *CARGAS SOBRE ENCEPADO H4
92. JOINT LOAD
93.  390 416 FX  29.5 FY -1195.5 FZ 26.0  MX 1436.0 MZ  -687.0
94. *PESO PROPIO DEL ENCEPADO
95. MEMBER LOAD
96. 2026 TO 2029 2046 TO 2049 UNI GY  -7.500
97. 2030 TO 2045              UNI GY  -9.000
98. LOAD 5
```



```
 99. *CARGAS SOBRE ENCEPADO H51
100. JOINT LOAD
101.  390 416 FX  49.0 FY -1144.0 FZ 23.0  MX 1213.0 MZ -1139.5
102. *PESO PROPIO DEL ENCEPADO
103. MEMBER LOAD
104. 2026 TO 2029 2046 TO 2049 UNI GY  -7.500
105. 2030 TO 2045              UNI GY  -9.000
106. LOAD 6
107. *CARGAS SOBRE ENCEPADO H52
108. JOINT LOAD
109.  390 416 FX  42.0 FY -1349.5 FZ 24.5  MX  688.0 MZ  -983.0
110. *PESO PROPIO DEL ENCEPADO
111. MEMBER LOAD
112. 2026 TO 2029 2046 TO 2049 UNI GY  -7.500
113. 2030 TO 2045              UNI GY  -9.000
114. LOAD 7
115. *CARGAS SOBRE ENCEPADO H10
116. JOINT LOAD
117.  390 416 FX  24.5 FY -1124.5 FZ 51.0  MX 1416.0 MZ  -569.5
118. *PESO PROPIO DEL ENCEPADO
119. MEMBER LOAD
120. 2026 TO 2029 2046 TO 2049 UNI GY  -7.500
121. 2030 TO 2045              UNI GY  -9.000
122. PERFORM ANALYSIS


      P R O B L E M   S T A T I S T I C S
      -----------------------------------

  NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS =   780/  799/  672
  ORIGINAL/FINAL BAND-WIDTH =  156/   29
  TOTAL PRIMARY LOAD CASES  =    6, TOTAL DEGREES OF FREEDOM =  4652
  SIZE OF STIFFNESS MATRIX =  837360 DOUBLE PREC. WORDS
  REQRD/AVAIL. DISK SPACE =  18.06/ 2047.7 MB,  EXMEM = 1951.9 MB


++ Processing Element Stiffness Matrix.          9: 8:11
++ Processing Global Stiffness Matrix.           9: 8:11
++ Processing Triangular Factorization.          9: 8:11
++ Calculating Joint Displacements.              9: 8:12
++ Calculating Member  Forces.                   9: 8:13


123. PLOT BENDING FILE
124. *PRINT ANALYSIS RESULTS
125. PRINT SUPPORT REACTIONS LIST 1 TO 339 BY 26 417 TO 755 BY 26
```


SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
1	2	.00	27.48	.00	.00	.00	.00
	3	.00	46.73	.00	.00	.00	.00
	4	.00	-2.80	.00	.00	.00	.00
	5	.00	-22.78	.00	.00	.00	.00
	6	.00	19.71	.00	.00	.00	.00
	7	.00	-1.79	.00	.00	.00	.00
27	2	.00	34.96	.00	.00	.00	.00
	3	.00	61.78	.00	.00	.00	.00
	4	.00	21.93	.00	.00	.00	.00
	5	.00	-2.02	.00	.00	.00	.00
	6	.00	33.34	.00	.00	.00	.00
	7	.00	23.12	.00	.00	.00	.00
53	2	.00	41.79	.00	.00	.00	.00
	3	.00	75.69	.00	.00	.00	.00
	4	.00	45.88	.00	.00	.00	.00
	5	.00	18.02	.00	.00	.00	.00
	6	.00	45.97	.00	.00	.00	.00
	7	.00	47.28	.00	.00	.00	.00
79	2	.00	47.51	.00	.00	.00	.00
	3	.00	87.52	.00	.00	.00	.00
	4	.00	68.38	.00	.00	.00	.00
	5	.00	37.05	.00	.00	.00	.00
	6	.00	57.01	.00	.00	.00	.00
	7	.00	70.02	.00	.00	.00	.00
105	2	.00	52.02	.00	.00	.00	.00
	3	.00	97.07	.00	.00	.00	.00
	4	.00	89.07	.00	.00	.00	.00
	5	.00	54.76	.00	.00	.00	.00
	6	.00	66.30	.00	.00	.00	.00
	7	.00	90.99	.00	.00	.00	.00
131	2	.00	55.78	.00	.00	.00	.00
	3	.00	105.26	.00	.00	.00	.00
	4	.00	108.51	.00	.00	.00	.00
	5	.00	71.37	.00	.00	.00	.00
	6	.00	74.37	.00	.00	.00	.00
	7	.00	110.78	.00	.00	.00	.00
157	2	.00	39.36	.00	.00	.00	.00
	3	.00	63.60	.00	.00	.00	.00
	4	.00	16.44	.00	.00	.00	.00
	5	.00	9.05	.00	.00	.00	.00
	6	.00	47.50	.00	.00	.00	.00
	7	.00	14.16	.00	.00	.00	.00
183	2	.00	47.46	.00	.00	.00	.00
	3	.00	79.70	.00	.00	.00	.00
	4	.00	42.08	.00	.00	.00	.00
	5	.00	30.85	.00	.00	.00	.00
	6	.00	62.26	.00	.00	.00	.00
	7	.00	39.90	.00	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
209	2	.00	55.10	.00	.00	.00	.00
	3	.00	95.04	.00	.00	.00	.00
	4	.00	67.40	.00	.00	.00	.00
	5	.00	52.26	.00	.00	.00	.00
	6	.00	76.29	.00	.00	.00	.00
	7	.00	65.35	.00	.00	.00	.00
235	2	.00	60.96	.00	.00	.00	.00
	3	.00	107.17	.00	.00	.00	.00
	4	.00	90.50	.00	.00	.00	.00
	5	.00	71.80	.00	.00	.00	.00
	6	.00	87.62	.00	.00	.00	.00
	7	.00	88.68	.00	.00	.00	.00
261	2	.00	64.80	.00	.00	.00	.00
	3	.00	115.58	.00	.00	.00	.00
	4	.00	110.37	.00	.00	.00	.00
	5	.00	88.61	.00	.00	.00	.00
	6	.00	95.77	.00	.00	.00	.00
	7	.00	108.91	.00	.00	.00	.00
287	2	.00	67.91	.00	.00	.00	.00
	3	.00	122.66	.00	.00	.00	.00
	4	.00	128.80	.00	.00	.00	.00
	5	.00	104.08	.00	.00	.00	.00
	6	.00	102.66	.00	.00	.00	.00
	7	.00	127.77	.00	.00	.00	.00
313	2	.00	50.95	.00	.00	.00	.00
	3	.00	80.00	.00	.00	.00	.00
	4	.00	35.41	.00	.00	.00	.00
	5	.00	40.56	.00	.00	.00	.00
	6	.00	74.83	.00	.00	.00	.00
	7	.00	29.88	.00	.00	.00	.00
339	2	.00	59.62	.00	.00	.00	.00
	3	.00	97.02	.00	.00	.00	.00
	4	.00	61.79	.00	.00	.00	.00
	5	.00	63.38	.00	.00	.00	.00
	6	.00	90.70	.00	.00	.00	.00
	7	.00	56.26	.00	.00	.00	.00
417	2	.00	77.21	.00	.00	.00	.00
	3	.00	133.42	.00	.00	.00	.00
	4	.00	131.12	.00	.00	.00	.00
	5	.00	122.01	.00	.00	.00	.00
	6	.00	124.70	.00	.00	.00	.00
	7	.00	126.28	.00	.00	.00	.00
443	2	.00	79.65	.00	.00	.00	.00
	3	.00	139.39	.00	.00	.00	.00
	4	.00	148.39	.00	.00	.00	.00
	5	.00	136.11	.00	.00	.00	.00
	6	.00	130.29	.00	.00	.00	.00
	7	.00	144.08	.00	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
469	2	.00	62.28	.00	.00	.00	.00
	3	.00	96.01	.00	.00	.00	.00
	4	.00	54.40	.00	.00	.00	.00
	5	.00	72.01	.00	.00	.00	.00
	6	.00	101.79	.00	.00	.00	.00
	7	.00	45.63	.00	.00	.00	.00
495	2	.00	70.87	.00	.00	.00	.00
	3	.00	112.81	.00	.00	.00	.00
	4	.00	80.84	.00	.00	.00	.00
	5	.00	95.16	.00	.00	.00	.00
	6	.00	117.72	.00	.00	.00	.00
	7	.00	72.04	.00	.00	.00	.00
521	2	.00	79.03	.00	.00	.00	.00
	3	.00	128.90	.00	.00	.00	.00
	4	.00	107.05	.00	.00	.00	.00
	5	.00	118.03	.00	.00	.00	.00
	6	.00	133.01	.00	.00	.00	.00
	7	.00	98.22	.00	.00	.00	.00
547	2	.00	84.90	.00	.00	.00	.00
	3	.00	141.03	.00	.00	.00	.00
	4	.00	130.15	.00	.00	.00	.00
	5	.00	137.57	.00	.00	.00	.00
	6	.00	144.34	.00	.00	.00	.00
	7	.00	121.56	.00	.00	.00	.00
573	2	.00	88.21	.00	.00	.00	.00
	3	.00	148.69	.00	.00	.00	.00
	4	.00	149.14	.00	.00	.00	.00
	5	.00	152.92	.00	.00	.00	.00
	6	.00	151.23	.00	.00	.00	.00
	7	.00	141.05	.00	.00	.00	.00
599	2	.00	90.83	.00	.00	.00	.00
	3	.00	155.08	.00	.00	.00	.00
	4	.00	166.76	.00	.00	.00	.00
	5	.00	167.04	.00	.00	.00	.00
	6	.00	156.96	.00	.00	.00	.00
	7	.00	159.24	.00	.00	.00	.00
625	2	.00	73.37	.00	.00	.00	.00
	3	.00	111.63	.00	.00	.00	.00
	4	.00	73.20	.00	.00	.00	.00
	5	.00	103.29	.00	.00	.00	.00
	6	.00	128.42	.00	.00	.00	.00
	7	.00	61.22	.00	.00	.00	.00
651	2	.00	81.63	.00	.00	.00	.00
	3	.00	127.79	.00	.00	.00	.00
	4	.00	99.22	.00	.00	.00	.00
	5	.00	126.20	.00	.00	.00	.00
	6	.00	143.91	.00	.00	.00	.00
	7	.00	87.20	.00	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
677	2	.00	89.14	.00	.00	.00	.00
	3	.00	142.67	.00	.00	.00	.00
	4	.00	124.30	.00	.00	.00	.00
	5	.00	148.11	.00	.00	.00	.00
	6	.00	158.15	.00	.00	.00	.00
	7	.00	112.30	.00	.00	.00	.00
703	2	.00	94.85	.00	.00	.00	.00
	3	.00	154.49	.00	.00	.00	.00
	4	.00	146.81	.00	.00	.00	.00
	5	.00	167.15	.00	.00	.00	.00
	6	.00	169.19	.00	.00	.00	.00
	7	.00	135.04	.00	.00	.00	.00
729	2	.00	98.68	.00	.00	.00	.00
	3	.00	163.08	.00	.00	.00	.00
	4	.00	166.36	.00	.00	.00	.00
	5	.00	182.98	.00	.00	.00	.00
	6	.00	176.86	.00	.00	.00	.00
	7	.00	155.07	.00	.00	.00	.00
755	2	.00	101.66	.00	.00	.00	.00
	3	.00	170.17	.00	.00	.00	.00
	4	.00	184.51	.00	.00	.00	.00
	5	.00	197.44	.00	.00	.00	.00
	6	.00	183.09	.00	.00	.00	.00
	7	.00	173.79	.00	.00	.00	.00

********** END OF LATEST ANALYSIS RESULT **********

126. PRINT MEMBER FORCES LIST 25 TO 350 BY 25 425 TO 750 BY 25

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
25	2	25	27.48	1.27	-1.04	.00	-.32	-.35
		26	-27.48	-1.27	1.04	.00	1.36	1.63
	3	25	46.73	1.77	-1.74	.00	-.49	-.48
		26	-46.73	-1.77	1.74	.00	2.23	2.25
	4	25	-2.80	2.10	-1.77	.00	-.32	-.59
		26	2.80	-2.10	1.77	.00	2.09	2.69
	5	25	-22.78	3.50	-1.58	.00	-.30	-.98
		26	22.78	-3.50	1.58	.00	1.88	4.49
	6	25	19.71	2.99	-1.66	.00	-.47	-.83
		26	-19.71	-2.99	1.66	.00	2.13	3.81
	7	25	-1.79	1.75	-3.56	.00	-1.11	-.49
		26	1.79	-1.75	3.56	.00	4.67	2.24
50	2	51	34.96	1.26	-1.06	.00	-.33	-.33
		52	-34.96	-1.26	1.06	.00	1.39	1.59
	3	51	61.78	1.74	-1.76	.00	-.51	-.44
		52	-61.78	-1.74	1.76	.00	2.27	2.18
	4	51	21.93	2.08	-1.79	.00	-.33	-.56
		52	-21.93	-2.08	1.79	.00	2.12	2.63
	5	51	-2.02	3.47	-1.59	.00	-.32	-.95
		52	2.02	-3.47	1.59	.00	1.90	4.42
	6	51	33.34	2.95	-1.67	.00	-.49	-.79
		52	-33.34	-2.95	1.67	.00	2.17	3.74
	7	51	23.12	1.72	-3.58	.00	-1.12	-.46
		52	-23.12	-1.72	3.58	.00	4.69	2.18
75	2	77	41.79	1.23	-1.09	.00	-.36	-.30
		78	-41.79	-1.23	1.09	.00	1.45	1.54
	3	77	75.69	1.69	-1.82	.00	-.56	-.40
		78	-75.69	-1.69	1.82	.00	2.38	2.09
	4	77	45.88	2.03	-1.82	.00	-.37	-.51
		78	-45.88	-2.03	1.82	.00	2.19	2.54
	5	77	18.02	3.42	-1.62	.00	-.35	-.90
		78	-18.02	-3.42	1.62	.00	1.96	4.32
	6	77	45.97	2.91	-1.72	.00	-.54	-.74
		78	-45.97	-2.91	1.72	.00	2.25	3.65
	7	77	47.28	1.68	-3.61	.00	-1.16	-.42
		78	-47.28	-1.68	3.61	.00	4.77	2.10
100	2	103	47.51	1.23	-1.13	.00	-.40	-.30
		104	-47.51	-1.23	1.13	.00	1.53	1.53
	3	103	87.52	1.68	-1.89	.00	-.64	-.39
		104	-87.52	-1.68	1.89	.00	2.53	2.07
	4	103	68.38	2.01	-1.88	.00	-.42	-.49
		104	-68.38	-2.01	1.88	.00	2.31	2.51

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	5	103	37.05	3.41	-1.66	.00	-.39	-.88
		104	-37.05	-3.41	1.66	.00	2.05	4.29
	6	103	57.01	2.90	-1.78	.00	-.60	-.73
		104	-57.01	-2.90	1.78	.00	2.37	3.63
	7	103	70.02	1.66	-3.67	.00	-1.21	-.40
		104	-70.02	-1.66	3.67	.00	4.88	2.06
125	2	129	52.02	1.25	-1.16	.00	-.44	-.32
		130	-52.02	-1.25	1.16	.00	1.60	1.57
	3	129	97.07	1.72	-1.96	.00	-.70	-.43
		130	-97.07	-1.72	1.96	.00	2.66	2.14
	4	129	89.07	2.04	-1.94	.00	-.48	-.52
		130	-89.07	-2.04	1.94	.00	2.42	2.56
	5	129	54.76	3.44	-1.71	.00	-.43	-.92
		130	-54.76	-3.44	1.71	.00	2.14	4.36
	6	129	66.30	2.94	-1.83	.00	-.65	-.77
		130	-66.30	-2.94	1.83	.00	2.48	3.71
	7	129	90.99	1.69	-3.72	.00	-1.26	-.42
		130	-90.99	-1.69	3.72	.00	4.98	2.11
150	2	155	55.78	1.27	-1.17	.00	-.45	-.34
		156	-55.78	-1.27	1.17	.00	1.62	1.61
	3	155	105.26	1.75	-1.98	.00	-.72	-.46
		156	-105.26	-1.75	1.98	.00	2.71	2.21
	4	155	108.51	2.07	-1.96	.00	-.50	-.55
		156	-108.51	-2.07	1.96	.00	2.46	2.62
	5	155	71.37	3.47	-1.73	.00	-.45	-.95
		156	-71.37	-3.47	1.73	.00	2.18	4.42
	6	155	74.37	2.97	-1.85	.00	-.67	-.81
		156	-74.37	-2.97	1.85	.00	2.52	3.78
	7	155	110.78	1.71	-3.74	.00	-1.28	-.45
		156	-110.78	-1.71	3.74	.00	5.03	2.16
175	2	181	39.36	1.28	-1.03	.00	-.30	-.36
		182	-39.36	-1.28	1.03	.00	1.33	1.64
	3	181	63.60	1.78	-1.71	.00	-.46	-.49
		182	-63.60	-1.78	1.71	.00	2.17	2.27
	4	181	16.44	2.11	-1.75	.00	-.29	-.59
		182	-16.44	-2.11	1.75	.00	2.04	2.70
	5	181	9.05	3.51	-1.55	.00	-.27	-.99
		182	-9.05	-3.51	1.55	.00	1.82	4.50
	6	181	47.50	3.00	-1.62	.00	-.44	-.84
		182	-47.50	-3.00	1.62	.00	2.07	3.83
	7	181	14.16	1.75	-3.54	.00	-1.08	-.49
		182	-14.16	-1.75	3.54	.00	4.62	2.25
200	2	207	47.46	1.26	-1.04	.00	-.31	-.34
		208	-47.46	-1.26	1.04	.00	1.35	1.60

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	3	207	79.70	1.75	-1.73	.00	-.47	-.46
		208	-79.70	-1.75	1.73	.00	2.20	2.20
	4	207	42.08	2.08	-1.75	.00	-.30	-.57
		208	-42.08	-2.08	1.75	.00	2.05	2.65
	5	207	30.85	3.47	-1.55	.00	-.28	-.96
		208	-30.85	-3.47	1.55	.00	1.83	4.43
	6	207	62.26	2.96	-1.64	.00	-.46	-.80
		208	-62.26	-2.96	1.64	.00	2.10	3.76
	7	207	39.90	1.73	-3.55	.00	-1.09	-.47
		208	-39.90	-1.73	3.55	.00	4.63	2.20
225	2	233	55.10	1.23	-1.07	.00	-.35	-.31
		234	-55.10	-1.23	1.07	.00	1.42	1.54
	3	233	95.04	1.69	-1.79	.00	-.53	-.40
		234	-95.04	-1.69	1.79	.00	2.32	2.10
	4	233	67.40	2.03	-1.79	.00	-.33	-.51
		234	-67.40	-2.03	1.79	.00	2.12	2.54
	5	233	52.26	3.42	-1.58	.00	-.31	-.89
		234	-52.26	-3.42	1.58	.00	1.90	4.31
	6	233	76.29	2.91	-1.69	.00	-.51	-.74
		234	-76.29	-2.91	1.69	.00	2.20	3.64
	7	233	65.35	1.68	-3.58	.00	-1.12	-.42
		234	-65.35	-1.68	3.58	.00	4.70	2.10
250	2	259	60.96	1.23	-1.13	.00	-.41	-.30
		260	-60.96	-1.23	1.13	.00	1.54	1.53
	3	259	107.17	1.69	-1.90	.00	-.64	-.39
		260	-107.17	-1.69	1.90	.00	2.54	2.08
	4	259	90.50	2.02	-1.88	.00	-.42	-.49
		260	-90.50	-2.02	1.88	.00	2.29	2.51
	5	259	71.80	3.40	-1.66	.00	-.39	-.88
		260	-71.80	-3.40	1.66	.00	2.05	4.28
	6	259	87.62	2.90	-1.79	.00	-.60	-.73
		260	-87.62	-2.90	1.79	.00	2.39	3.63
	7	259	88.68	1.67	-3.66	.00	-1.20	-.40
		260	-88.68	-1.67	3.66	.00	4.86	2.07
275	2	285	64.80	1.26	-1.18	.00	-.45	-.33
		286	-64.80	-1.26	1.18	.00	1.63	1.59
	3	285	115.58	1.73	-1.99	.00	-.73	-.44
		286	-115.58	-1.73	1.99	.00	2.71	2.17
	4	285	110.37	2.05	-1.96	.00	-.50	-.53
		286	-110.37	-2.05	1.96	.00	2.46	2.59
	5	285	88.61	3.45	-1.73	.00	-.46	-.93
		286	-88.61	-3.45	1.73	.00	2.19	4.38
	6	285	95.78	2.95	-1.86	.00	-.68	-.78
		286	-95.78	-2.95	1.86	.00	2.54	3.73

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	7	285	108.90	1.70	-3.74	.00	-1.28	-.44
		286	-108.90	-1.70	3.74	.00	5.03	2.14
300	2	311	67.91	1.27	-1.19	.00	-.47	-.35
		312	-67.91	-1.27	1.19	.00	1.66	1.63
	3	311	122.67	1.76	-2.01	.00	-.75	-.47
		312	-122.67	-1.76	2.01	.00	2.76	2.24
	4	311	128.80	2.08	-1.99	.00	-.53	-.57
		312	-128.80	-2.08	1.99	.00	2.51	2.65
	5	311	104.08	3.48	-1.76	.00	-.48	-.97
		312	-104.08	-3.48	1.76	.00	2.24	4.45
	6	311	102.66	2.98	-1.89	.00	-.70	-.82
		312	-102.66	-2.98	1.89	.00	2.59	3.81
	7	311	127.77	1.73	-3.77	.00	-1.31	-.47
		312	-127.77	-1.73	3.77	.00	5.07	2.19
325	2	337	50.95	1.29	-1.01	.00	-.29	-.37
		338	-50.95	-1.29	1.01	.00	1.30	1.66
	3	337	80.01	1.79	-1.69	.00	-.43	-.51
		338	-80.01	-1.79	1.69	.00	2.12	2.30
	4	337	35.41	2.12	-1.72	.00	-.27	-.60
		338	-35.41	-2.12	1.72	.00	1.99	2.72
	5	337	40.56	3.52	-1.51	.00	-.24	-1.00
		338	-40.56	-3.52	1.51	.00	1.76	4.52
	6	337	74.83	3.01	-1.59	.00	-.41	-.85
		338	-74.83	-3.01	1.59	.00	2.00	3.87
	7	337	29.88	1.76	-3.52	.00	-1.06	-.50
		338	-29.88	-1.76	3.52	.00	4.58	2.26
350	2	363	59.62	1.28	-1.01	.00	-.29	-.36
		364	-59.62	-1.28	1.01	.00	1.30	1.64
	3	363	97.02	1.78	-1.69	.00	-.43	-.49
		364	-97.02	-1.78	1.69	.00	2.12	2.27
	4	363	61.79	2.10	-1.71	.00	-.25	-.59
		364	-61.79	-2.10	1.71	.00	1.97	2.69
	5	363	63.38	3.49	-1.50	.00	-.23	-.97
		364	-63.38	-3.49	1.50	.00	1.74	4.46
	6	363	90.70	2.99	-1.59	.00	-.41	-.83
		364	-90.70	-2.99	1.59	.00	2.00	3.82
	7	363	56.26	1.75	-3.51	.00	-1.05	-.49
		364	-56.26	-1.75	3.51	.00	4.56	2.23
425	2	441	77.21	1.28	-1.20	.00	-.47	-.36
		442	-77.21	-1.28	1.20	.00	1.67	1.64
	3	441	133.42	1.78	-2.02	.00	-.76	-.49
		442	-133.42	-1.78	2.02	.00	2.78	2.27
	4	441	131.12	2.10	-1.99	.00	-.53	-.59
		442	-131.12	-2.10	1.99	.00	2.51	2.69

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	5	441	122.01	3.49	-1.77	.00	-.49	-.97
		442	-122.01	-3.49	1.77	.00	2.26	4.46
	6	441	124.70	2.99	-1.90	.00	-.72	-.83
		442	-124.70	-2.99	1.90	.00	2.62	3.82
	7	441	126.28	1.75	-3.77	.00	-1.31	-.49
		442	-126.28	-1.75	3.77	.00	5.07	2.23
450	2	467	79.65	1.29	-1.21	.00	-.48	-.37
		468	-79.65	-1.29	1.21	.00	1.69	1.66
	3	467	139.39	1.79	-2.04	.00	-.78	-.51
		468	-139.39	-1.79	2.04	.00	2.82	2.30
	4	467	148.39	2.12	-2.02	.00	-.56	-.60
		468	-148.39	-2.12	2.02	.00	2.57	2.72
	5	467	136.10	3.52	-1.79	.00	-.52	-1.00
		468	-136.10	-3.52	1.79	.00	2.31	4.52
	6	467	130.29	3.01	-1.92	.00	-.74	-.85
		468	-130.29	-3.01	1.92	.00	2.66	3.87
	7	467	144.09	1.76	-3.79	.00	-1.33	-.50
		468	-144.09	-1.76	3.79	.00	5.13	2.26
475	2	493	62.28	1.30	-1.01	.00	-.29	-.38
		494	-62.28	-1.30	1.01	.00	1.30	1.68
	3	493	96.01	1.81	-1.69	.00	-.44	-.53
		494	-96.01	-1.81	1.69	.00	2.13	2.34
	4	493	54.39	2.12	-1.72	.00	-.27	-.61
		494	-54.39	-2.12	1.72	.00	1.99	2.73
	5	493	72.01	3.52	-1.51	.00	-.23	-1.01
		494	-72.01	-3.52	1.51	.00	1.74	4.53
	6	493	101.79	3.03	-1.59	.00	-.41	-.87
		494	-101.79	-3.03	1.59	.00	2.00	3.90
	7	493	45.63	1.76	-3.52	.00	-1.06	-.51
		494	-45.63	-1.76	3.52	.00	4.58	2.27
500	2	519	70.87	1.31	-1.02	.00	-.30	-.39
		520	-70.87	-1.31	1.02	.00	1.32	1.69
	3	519	112.81	1.82	-1.71	.00	-.45	-.54
		520	-112.81	-1.82	1.71	.00	2.16	2.36
	4	519	80.84	2.13	-1.73	.00	-.27	-.61
		520	-80.84	-2.13	1.73	.00	2.00	2.74
	5	519	95.16	3.52	-1.51	.00	-.24	-1.01
		520	-95.16	-3.52	1.51	.00	1.75	4.53
	6	519	117.72	3.03	-1.60	.00	-.42	-.88
		520	-117.72	-3.03	1.60	.00	2.03	3.91
	7	519	72.04	1.77	-3.53	.00	-1.07	-.51
		520	-72.04	-1.77	3.53	.00	4.59	2.28
525	2	545	79.03	1.32	-1.06	.00	-.34	-.40
		546	-79.03	-1.32	1.06	.00	1.40	1.72

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	3	545	128.90	1.85	-1.78	.00	-.52	-.57
		546	-128.90	-1.85	1.78	.00	2.30	2.42
	4	545	107.05	2.15	-1.78	.00	-.32	-.64
		546	-107.05	-2.15	1.78	.00	2.10	2.79
	5	545	118.03	3.53	-1.57	.00	-.29	-1.02
		546	-118.03	-3.53	1.57	.00	1.86	4.55
	6	545	133.01	3.05	-1.67	.00	-.49	-.89
		546	-133.01	-3.05	1.67	.00	2.17	3.94
	7	545	98.22	1.79	-3.57	.00	-1.11	-.54
		546	-98.22	-1.79	3.57	.00	4.68	2.33
550	2	571	84.90	1.32	-1.14	.00	-.41	-.40
		572	-84.90	-1.32	1.14	.00	1.55	1.73
	3	571	141.03	1.86	-1.91	.00	-.65	-.57
		572	-141.03	-1.86	1.91	.00	2.56	2.43
	4	571	130.15	2.17	-1.89	.00	-.43	-.65
		572	-130.15	-2.17	1.89	.00	2.32	2.82
	5	571	137.57	3.55	-1.68	.00	-.41	-1.03
		572	-137.57	-3.55	1.68	.00	2.08	4.58
	6	571	144.34	3.06	-1.80	.00	-.62	-.90
		572	-144.34	-3.06	1.80	.00	2.42	3.96
	7	571	121.55	1.81	-3.67	.00	-1.21	-.55
		572	-121.55	-1.81	3.67	.00	4.88	2.36
575	2	597	88.21	1.32	-1.19	.00	-.47	-.39
		598	-88.21	-1.32	1.19	.00	1.66	1.71
	3	597	148.69	1.84	-2.01	.00	-.75	-.55
		598	-148.69	-1.84	2.01	.00	2.76	2.39
	4	597	149.14	2.16	-1.99	.00	-.53	-.65
		598	-149.14	-2.16	1.99	.00	2.51	2.81
	5	597	152.92	3.55	-1.77	.00	-.50	-1.03
		598	-152.92	-3.55	1.77	.00	2.27	4.58
	6	597	151.23	3.05	-1.90	.00	-.71	-.89
		598	-151.23	-3.05	1.90	.00	2.61	3.94
	7	597	141.05	1.80	-3.76	.00	-1.30	-.54
		598	-141.05	-1.80	3.76	.00	5.07	2.34
600	2	623	90.83	1.31	-1.21	.00	-.48	-.39
		624	-90.83	-1.31	1.21	.00	1.69	1.70
	3	623	155.08	1.83	-2.03	.00	-.77	-.54
		624	-155.08	-1.83	2.03	.00	2.81	2.37
	4	623	166.76	2.15	-2.01	.00	-.55	-.64
		624	-166.76	-2.15	2.01	.00	2.56	2.79
	5	623	167.04	3.55	-1.80	.00	-.52	-1.03
		624	-167.04	-3.55	1.80	.00	2.32	4.58
	6	623	156.96	3.04	-1.92	.00	-.74	-.88
		624	-156.96	-3.04	1.92	.00	2.66	3.93

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	7	623	159.24	1.79	-3.79	.00	-1.33	-.53
		624	-159.24	-1.79	3.79	.00	5.11	2.32
625	2	649	73.37	1.31	-1.02	.00	-.30	-.39
		650	-73.37	-1.31	1.02	.00	1.32	1.69
	3	649	111.63	1.82	-1.71	.00	-.45	-.53
		650	-111.63	-1.82	1.71	.00	2.16	2.35
	4	649	73.20	2.13	-1.73	.00	-.28	-.61
		650	-73.20	-2.13	1.73	.00	2.01	2.74
	5	649	103.30	3.53	-1.51	.00	-.24	-1.01
		650	-103.30	-3.53	1.51	.00	1.75	4.54
	6	649	128.42	3.04	-1.60	.00	-.42	-.88
		650	-128.42	-3.04	1.60	.00	2.02	3.92
	7	649	61.22	1.77	-3.53	.00	-1.07	-.51
		650	-61.22	-1.77	3.53	.00	4.60	2.28
650	2	675	81.63	1.32	-1.03	.00	-.31	-.40
		676	-81.63	-1.32	1.03	.00	1.34	1.71
	3	675	127.79	1.84	-1.73	.00	-.48	-.55
		676	-127.79	-1.84	1.73	.00	2.21	2.39
	4	675	99.22	2.14	-1.75	.00	-.29	-.63
		676	-99.22	-2.14	1.75	.00	2.05	2.77
	5	675	126.20	3.54	-1.53	.00	-.26	-1.02
		676	-126.20	-3.54	1.53	.00	1.78	4.56
	6	675	143.90	3.05	-1.62	.00	-.44	-.89
		676	-143.90	-3.05	1.62	.00	2.06	3.94
	7	675	87.20	1.78	-3.54	.00	-1.09	-.52
		676	-87.20	-1.78	3.54	.00	4.63	2.31
675	2	701	89.14	1.33	-1.08	.00	-.35	-.41
		702	-89.14	-1.33	1.08	.00	1.43	1.75
	3	701	142.67	1.87	-1.80	.00	-.55	-.59
		702	-142.67	-1.87	1.80	.00	2.35	2.46
	4	701	124.30	2.17	-1.81	.00	-.35	-.66
		702	-124.30	-2.17	1.81	.00	2.16	2.83
	5	701	148.11	3.56	-1.59	.00	-.32	-1.04
		702	-148.11	-3.56	1.59	.00	1.91	4.60
	6	701	158.15	3.08	-1.69	.00	-.51	-.92
		702	-158.15	-3.08	1.69	.00	2.21	4.00
	7	701	112.30	1.81	-3.60	.00	-1.14	-.56
		702	-112.30	-1.81	3.60	.00	4.74	2.37
700	2	727	94.85	1.34	-1.14	.00	-.41	-.42
		728	-94.85	-1.34	1.14	.00	1.55	1.76
	3	727	154.49	1.88	-1.91	.00	-.65	-.60
		728	-154.49	-1.88	1.91	.00	2.56	2.48
	4	727	146.81	2.19	-1.90	.00	-.44	-.68
		728	-146.81	-2.19	1.90	.00	2.34	2.87

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	5	727	167.15	3.57	-1.69	.00	-.42	-1.06
		728	-167.15	-3.57	1.69	.00	2.11	4.63
	6	727	169.19	3.08	-1.80	.00	-.62	-.93
		728	-169.19	-3.08	1.80	.00	2.42	4.01
	7	727	135.04	1.83	-3.68	.00	-1.22	-.57
		728	-135.04	-1.83	3.68	.00	4.91	2.40
725	2	753	98.68	1.33	-1.18	.00	-.46	-.41
		754	-98.68	-1.33	1.18	.00	1.64	1.73
	3	753	163.08	1.86	-1.99	.00	-.73	-.57
		754	-163.08	-1.86	1.99	.00	2.72	2.43
	4	753	166.37	2.18	-1.97	.00	-.51	-.66
		754	-166.37	-2.18	1.97	.00	2.49	2.84
	5	753	182.98	3.57	-1.77	.00	-.49	-1.05
		754	-182.98	-3.57	1.77	.00	2.26	4.62
	6	753	176.87	3.07	-1.88	.00	-.70	-.91
		754	-176.87	-3.07	1.88	.00	2.58	3.98
	7	753	155.07	1.82	-3.75	.00	-1.29	-.56
		754	-155.07	-1.82	3.75	.00	5.04	2.38
750	2	779	101.66	1.32	-1.20	.00	-.47	-.40
		780	-101.66	-1.32	1.20	.00	1.67	1.71
	3	779	170.17	1.84	-2.02	.00	-.76	-.55
		780	-170.17	-1.84	2.02	.00	2.77	2.39
	4	779	184.52	2.16	-2.00	.00	-.54	-.65
		780	-184.52	-2.16	2.00	.00	2.54	2.81
	5	779	197.44	3.56	-1.79	.00	-.52	-1.04
		780	-197.44	-3.56	1.79	.00	2.31	4.60
	6	779	183.09	3.05	-1.91	.00	-.73	-.90
		780	-183.09	-3.05	1.91	.00	2.64	3.95
	7	779	173.79	1.80	-3.77	.00	-1.32	-.55
		780	-173.79	-1.80	3.77	.00	5.09	2.35

********** END OF LATEST ANALYSIS RESULT **********

127. SECTION 0.5 MEMB 25 TO 350 BY 25 425 TO 750 BY 25
128. PRINT SECTION FORCES

MEMBER FORCES AT INTERMEDIATE SECTIONS

ALL UNITS ARE -- MTON METE

MEMB	LOAD	SEC	SHEAR-Y	SHEAR-Z	MOM-Y	MOM-Z
25	2	.50	1.27	-1.04	-.84	-.99
	3	.50	1.77	-1.74	-1.36	-1.36
	4	.50	2.10	-1.77	-1.20	-1.64
	5	.50	3.50	-1.58	-1.09	-2.74
	6	.50	2.99	-1.66	-1.30	-2.32
	7	.50	1.75	-3.56	-2.89	-1.16
50	2	.50	1.26	-1.06	-.86	-.96
	3	.50	1.74	-1.76	-1.39	-1.31
	4	.50	2.08	-1.79	-1.22	-1.60
	5	.50	3.47	-1.59	-1.11	-2.68
	6	.50	2.95	-1.67	-1.33	-2.27
	7	.50	1.72	-3.58	-2.91	-1.32
75	2	.50	1.23	-1.09	-.90	-.92
	3	.50	1.69	-1.82	-1.47	-1.24
	4	.50	2.03	-1.82	-1.28	-1.53
	5	.50	3.42	-1.62	-1.15	-2.61
	6	.50	2.91	-1.72	-1.40	-2.19
	7	.50	1.68	-3.61	-2.96	-1.26
100	2	.50	1.23	-1.13	-.97	-.91
	3	.50	1.68	-1.89	-1.58	-1.23
	4	.50	2.01	-1.88	-1.37	-1.50
	5	.50	3.41	-1.66	-1.22	-2.59
	6	.50	2.90	-1.78	-1.49	-2.18
	7	.50	1.66	-3.67	-3.05	-1.23
125	2	.50	1.25	-1.16	-1.02	-.95
	3	.50	1.72	-1.96	-1.68	-1.28
	4	.50	2.04	-1.94	-1.45	-1.54
	5	.50	3.44	-1.71	-1.29	-2.64
	6	.50	2.94	-1.83	-1.56	-2.24
	7	.50	1.69	-3.72	-3.12	-1.27
150	2	.50	1.27	-1.17	-1.04	-.98
	3	.50	1.75	-1.98	-1.71	-1.33
	4	.50	2.07	-1.96	-1.48	-1.59
	5	.50	3.47	-1.73	-1.32	-2.69
	6	.50	2.97	-1.85	-1.60	-2.29
	7	.50	1.71	-3.74	-3.15	-1.31
175	2	.50	1.28	-1.03	-.82	-1.00
	3	.50	1.78	-1.71	-1.32	-1.38
	4	.50	2.11	-1.75	-1.17	-1.65
	5	.50	3.51	-1.55	-1.05	-2.75
	6	.50	3.00	-1.62	-1.26	-2.34

MEMBER FORCES AT INTERMEDIATE SECTIONS

ALL UNITS ARE -- MTON METE

MEMB	LOAD	SEC	SHEAR-Y	SHEAR-Z	MOM-Y	MOM-Z
	7	.50	1.75	-3.54	-2.85	-1.37
200	2	.50	1.26	-1.04	-.83	-.97
	3	.50	1.75	-1.73	-1.34	-1.33
	4	.50	2.08	-1.75	-1.18	-1.61
	5	.50	3.47	-1.55	-1.06	-2.69
	6	.50	2.96	-1.64	-1.28	-2.28
	7	.50	1.73	-3.55	-2.86	-1.33
225	2	.50	1.23	-1.07	-.88	-.92
	3	.50	1.69	-1.79	-1.43	-1.25
	4	.50	2.03	-1.79	-1.23	-1.53
	5	.50	3.42	-1.58	-1.10	-2.60
	6	.50	2.91	-1.69	-1.36	-2.19
	7	.50	1.68	-3.58	-2.91	-1.26
250	2	.50	1.23	-1.13	-.97	-.92
	3	.50	1.69	-1.90	-1.59	-1.24
	4	.50	2.02	-1.88	-1.36	-1.50
	5	.50	3.40	-1.66	-1.22	-2.58
	6	.50	2.90	-1.79	-1.50	-2.18
	7	.50	1.67	-3.66	-3.03	-1.23
275	2	.50	1.26	-1.18	-1.04	-.96
	3	.50	1.73	-1.99	-1.72	-1.31
	4	.50	2.05	-1.96	-1.48	-1.56
	5	.50	3.45	-1.73	-1.33	-2.65
	6	.50	2.95	-1.86	-1.61	-2.26
	7	.50	1.70	-3.74	-3.15	-1.29
300	2	.50	1.27	-1.19	-1.06	-.99
	3	.50	1.76	-2.01	-1.76	-1.36
	4	.50	2.08	-1.99	-1.52	-1.61
	5	.50	3.48	-1.76	-1.36	-2.71
	6	.50	2.98	-1.89	-1.64	-2.32
	7	.50	1.73	-3.77	-3.19	-1.33
325	2	.50	1.29	-1.01	-.79	-1.02
	3	.50	1.79	-1.69	-1.28	-1.40
	4	.50	2.12	-1.72	-1.13	-1.66
	5	.50	3.52	-1.51	-1.00	-2.76
	6	.50	3.01	-1.59	-1.21	-2.36
	7	.50	1.76	-3.52	-2.82	-1.38
350	2	.50	1.28	-1.01	-.79	-1.00
	3	.50	1.78	-1.69	-1.27	-1.38
	4	.50	2.10	-1.71	-1.11	-1.64
	5	.50	3.49	-1.50	-.98	-2.72

MEMBER FORCES AT INTERMEDIATE SECTIONS

ALL UNITS ARE -- MTON METE

MEMB	LOAD	SEC	SHEAR-Y	SHEAR-Z	MOM-Y	MOM-Z
	6	.50	2.99	-1.59	-1.21	-2.33
	7	.50	1.75	-3.51	-2.80	-1.36
425	2	.50	1.28	-1.20	-1.07	-1.00
	3	.50	1.78	-2.02	-1.77	-1.38
	4	.50	2.10	-1.99	-1.52	-1.64
	5	.50	3.49	-1.77	-1.38	-2.72
	6	.50	2.99	-1.90	-1.67	-2.33
	7	.50	1.75	-3.77	-3.19	-1.36
450	2	.50	1.29	-1.21	-1.09	-1.02
	3	.50	1.79	-2.04	-1.80	-1.40
	4	.50	2.12	-2.02	-1.56	-1.66
	5	.50	3.52	-1.79	-1.41	-2.76
	6	.50	3.01	-1.92	-1.70	-2.36
	7	.50	1.76	-3.79	-3.23	-1.38
475	2	.50	1.30	-1.01	-.80	-1.03
	3	.50	1.81	-1.69	-1.28	-1.43
	4	.50	2.12	-1.72	-1.13	-1.67
	5	.50	3.52	-1.51	-.99	-2.77
	6	.50	3.03	-1.59	-1.20	-2.39
	7	.50	1.76	-3.52	-2.82	-1.39
500	2	.50	1.31	-1.02	-.81	-1.04
	3	.50	1.82	-1.71	-1.31	-1.45
	4	.50	2.13	-1.73	-1.14	-1.68
	5	.50	3.52	-1.51	-1.00	-2.77
	6	.50	3.03	-1.60	-1.22	-2.39
	7	.50	1.77	-3.53	-2.83	-1.40
525	2	.50	1.32	-1.06	-.87	-1.06
	3	.50	1.85	-1.78	-1.41	-1.49
	4	.50	2.15	-1.78	-1.21	-1.71
	5	.50	3.53	-1.57	-1.07	-2.78
	6	.50	3.05	-1.67	-1.33	-2.42
	7	.50	1.79	-3.57	-2.90	-1.43
550	2	.50	1.32	-1.14	-.98	-1.07
	3	.50	1.86	-1.91	-1.61	-1.50
	4	.50	2.17	-1.89	-1.37	-1.74
	5	.50	3.55	-1.68	-1.24	-2.80
	6	.50	3.06	-1.80	-1.52	-2.43
	7	.50	1.81	-3.67	-3.05	-1.46
575	2	.50	1.32	-1.19	-1.06	-1.05
	3	.50	1.84	-2.01	-1.75	-1.47
	4	.50	2.16	-1.99	-1.52	-1.73

MEMBER FORCES AT INTERMEDIATE SECTIONS

ALL UNITS ARE -- MTON METE

MEMB	LOAD	SEC	SHEAR-Y	SHEAR-Z	MOM-Y	MOM-Z
	5	.50	3.55	-1.77	-1.39	-2.81
	6	.50	3.05	-1.90	-1.66	-2.41
	7	.50	1.80	-3.76	-3.18	-1.44
600	2	.50	1.31	-1.21	-1.08	-1.04
	3	.50	1.83	-2.03	-1.79	-1.45
	4	.50	2.15	-2.01	-1.56	-1.71
	5	.50	3.55	-1.80	-1.42	-2.81
	6	.50	3.04	-1.92	-1.70	-2.41
	7	.50	1.79	-3.79	-3.22	-1.43
625	2	.50	1.31	-1.02	-.81	-1.04
	3	.50	1.82	-1.71	-1.31	-1.44
	4	.50	2.13	-1.73	-1.14	-1.68
	5	.50	3.53	-1.51	-.99	-2.78
	6	.50	3.04	-1.60	-1.22	-2.40
	7	.50	1.77	-3.53	-2.84	-1.39
650	2	.50	1.32	-1.03	-.83	-1.06
	3	.50	1.84	-1.73	-1.34	-1.47
	4	.50	2.14	-1.75	-1.17	-1.70
	5	.50	3.54	-1.53	-1.02	-2.79
	6	.50	3.05	-1.62	-1.25	-2.42
	7	.50	1.78	-3.54	-2.86	-1.42
675	2	.50	1.33	-1.08	-.89	-1.08
	3	.50	1.87	-1.80	-1.45	-1.52
	4	.50	2.17	-1.81	-1.26	-1.74
	5	.50	3.56	-1.59	-1.11	-2.82
	6	.50	3.08	-1.69	-1.36	-2.46
	7	.50	1.81	-3.60	-2.94	-1.46
700	2	.50	1.34	-1.14	-.98	-1.09
	3	.50	1.88	-1.91	-1.60	-1.54
	4	.50	2.19	-1.90	-1.39	-1.77
	5	.50	3.57	-1.69	-1.26	-2.85
	6	.50	3.08	-1.80	-1.52	-2.47
	7	.50	1.83	-3.68	-3.07	-1.49
725	2	.50	1.33	-1.18	-1.05	-1.07
	3	.50	1.86	-1.99	-1.72	-1.50
	4	.50	2.18	-1.97	-1.50	-1.75
	5	.50	3.57	-1.77	-1.38	-2.84
	6	.50	3.07	-1.88	-1.64	-2.44
	7	.50	1.82	-3.75	-3.17	-1.47
750	2	.50	1.32	-1.20	-1.07	-1.05
	3	.50	1.84	-2.02	-1.76	-1.47

MEMBER FORCES AT INTERMEDIATE SECTIONS

ALL UNITS ARE -- MTON METE

MEMB	LOAD	SEC	SHEAR-Y	SHEAR-Z	MOM-Y	MOM-Z
	4	.50	2.16	-2.00	-1.54	-1.73
	5	.50	3.56	-1.79	-1.41	-2.82
	6	.50	3.05	-1.91	-1.68	-2.42
	7	.50	1.80	-3.77	-3.20	-1.45

********** END OF LATEST ANALYSIS RESULT **********

129. FINISH

********** END OF STAAD-III **********

**** DATE= JUN 5,2002 TIME= 9: 8:13 ****

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*************************************************
*                                               *
*          S T A A D - III                      *
*          Revision 22.3                        *
*          Proprietary Program of               *
*          Research Engineers, Inc.             *
*          Date=    JUN 17, 2002                *
*          Time=    11:34:14                    *
*                                               *
*                                               *
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 1. STAAD SPACE 'ENCEPADO EN ROTURA'
 2. UNIT METER MTON
 3. JOINT COORDINATES
 4.   1  0.00 -25.00 0.00  26 0.00 0.00 0.00
 5.  REPEAT 5 0.00 0.00 1.50
 6.  REPEAT ALL 4 1.25 0.00 0.00
 7. MEMBER INCIDENCES
 8.    1   1   2  25 1 1
 9.  REPEAT ALL 29 25 26
10.  2001 26  52  2005  1  26
11.  REPEAT ALL 4 5 156
12.  2026 26 182  2029  1  156
13.  REPEAT ALL 5 4 26
14. MEMBER PROPERTY PRISMATIC
15.   1   TO  750  PRI AX 8.13E-3 IX 5.37E-5 IY 2.69E-5 IZ 2.69E-5
16.  2001 TO 2005 2021 TO 2025 PRI YD 2.00 ZD 1.125
17.  2006 TO 2020              PRI YD 2.00 ZD 1.250
18.  2026 TO 2029 2046 TO 2049 PRI YD 2.00 ZD 1.125
19.  2030 TO 2045              PRI YD 2.00 ZD 1.250
20. CONSTANT
21. E 2.64E6 MEM 2001 TO 2049
22. E 2.10E7 MEM 1 TO 750
23. POISSON .2 ALL
24. SUPPORT
25.    1  TO  339 BY 26   FIXED BUT     MX MY MZ  KFX 1250. KFZ 1250.
26.    2  TO  340 BY 26   FIXED BUT  FY MX MY MZ  KFX 2500. KFZ 2500.
27.    3  TO  341 BY 26   FIXED BUT  FY MX MY MZ  KFX 2500. KFZ 2500.
28.    4  TO  342 BY 26   FIXED BUT  FY MX MY MZ  KFX 2500. KFZ 2500.
29.    5  TO  343 BY 26   FIXED BUT  FY MX MY MZ  KFX 2500. KFZ 2500.
30.    6  TO  344 BY 26   FIXED BUT  FY MX MY MZ  KFX 1668. KFZ 1668.
31.    7  TO  345 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
32.    8  TO  346 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
33.    9  TO  347 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
34.   10  TO  348 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
35.   11  TO  349 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
36.   12  TO  350 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
37.   13  TO  351 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
38.   14  TO  352 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
39.   15  TO  353 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
40.   16  TO  354 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
41.   17  TO  355 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
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42.   18  TO  356 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
43.   19  TO  357 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
44.   20  TO  358 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
45.   21  TO  359 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
46.   22  TO  360 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
47.   23  TO  361 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
48.   24  TO  362 BY 26   FIXED BUT  FY MX MY MZ  KFX  635. KFZ  835.
50.  417  TO  755 BY 26   FIXED BUT     MX MY MZ  KFX 1250. KFZ 1250.
51.  418  TO  756 BY 26   FIXED BUT  FY MX MY MZ  KFX 2500. KFZ 2500.
52.  419  TO  757 BY 26   FIXED BUT  FY MX MY MZ  KFX 2500. KFZ 2500.
53.  420  TO  758 BY 26   FIXED BUT  FY MX MY MZ  KFX 2500. KFZ 2500.
54.  421  TO  759 BY 26   FIXED BUT  FY MX MY MZ  KFX 2500. KFZ 2500.
55.  422  TO  760 BY 26   FIXED BUT  FY MX MY MZ  KFX 1668. KFZ 1668.
56.  423  TO  761 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
57.  424  TO  762 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
58.  425  TO  763 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
59.  426  TO  764 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
60.  427  TO  765 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
61.  428  TO  766 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
62.  429  TO  767 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
63.  430  TO  768 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
64.  431  TO  769 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
65.  432  TO  770 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
66.  433  TO  771 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
67.  434  TO  772 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
68.  435  TO  773 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
69.  436  TO  774 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
70.  437  TO  775 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
71.  438  TO  776 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
72.  439  TO  777 BY 26   FIXED BUT  FY MX MY MZ  KFX  835. KFZ  835.
73.  440  TO  778 BY 26   FIXED BUT  FY MX MY MZ  KFX  635. KFZ  835.
74. LOAD 2
75. *CARGAS SOBRE ENCEPADO H2
76. JOINT LOAD
77.  390 416 FX  26.0 FY -1168.0 FZ 22.0  MX  508.5 MZ  -602.0
78. *PESO PROPIO DEL ENCEPADO
79. MEMBER LOAD
80. 2026 TO 2029 2046 TO 2049 UNI GY  -10.125
81. 2030 TO 2045              UNI GY  -12.150
82. LOAD 3
83. *CARGAS SOBRE ENCEPADO H3
84. JOINT LOAD
85.  390 416 FX  36.0 FY -2091.0 FZ 37.5  MX 1100.5 MZ  -865.0
86. *PESO PROPIO DEL ENCEPADO
87. MEMBER LOAD
88. 2026 TO 2029 2046 TO 2049 UNI GY  -10.125
89. 2030 TO 2045              UNI GY  -12.150
90. LOAD 4
91. *CARGAS SOBRE ENCEPADO H4
92. JOINT LOAD
93.  390 416 FX  42.5 FY -1721.0 FZ 37.5  MX 2080.5 MZ -1006.0
94. *PESO PROPIO DEL ENCEPADO
95. MEMBER LOAD
96. 2026 TO 2029 2046 TO 2049 UNI GY  -10.125
97. 2030 TO 2045              UNI GY  -12.150
98. LOAD 5
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 99. *CARGAS SOBRE ENCEPADO H51
100. JOINT LOAD
101.  390 416 FX  71.0 FY -1647.0 FZ 33.0  MX 1756.5 MZ -1668.0
102. *PESO PROPIO DEL ENCEPADO
103. MEMBER LOAD
104. 2026 TO 2029 2046 TO 2049 UNI GY  -10.125
105. 2030 TO 2045              UNI GY  -12.150
106. LOAD 6
107. *CARGAS SOBRE ENCEPADO H52
108. JOINT LOAD
109.  390 416 FX  60.5 FY -1943.0 FZ 35.0  MX  997.0 MZ -1444.5
110. *PESO PROPIO DEL ENCEPADO
111. MEMBER LOAD
112. 2026 TO 2029 2046 TO 2049 UNI GY  -10.125
113. 2030 TO 2045              UNI GY  -12.150
114. LOAD 7
115. *CARGAS SOBRE ENCEPADO H10
116. JOINT LOAD
117.  390 416 FX  35.5 FY -1619.0 FZ 73.5  MX 2048.0 MZ  -832.0
118. *PESO PROPIO DEL ENCEPADO
119. MEMBER LOAD
120. 2026 TO 2029 2046 TO 2049 UNI GY  -10.125
121. 2030 TO 2045              UNI GY  -12.150
122. PERFORM ANALYSIS


      P R O B L E M   S T A T I S T I C S
      -----------------------------------

  NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS =   780/  799/  672
  ORIGINAL/FINAL BAND-WIDTH =  156/   29
  TOTAL PRIMARY LOAD CASES  =    6, TOTAL DEGREES OF FREEDOM =  4552
  SIZE OF STIFFNESS MATRIX =  837360 DOUBLE PREC. WORDS
  REQRD/AVAIL. DISK SPACE =  18.06/ 2047.7 MB,  EXMEM = 1951.9 MB


++ Processing Element Stiffness Matrix.          11:34:14
++ Processing Global Stiffness Matrix.           11:34:14
++ Processing Triangular Factorization.          11:34:14
++ Calculating Joint Displacements.              11:34:15
++ Calculating Member  Forces.                   11:34:16


123. PLOT BENDING FILE
124. *PRINT ANALYSIS RESULTS
125. PRINT SUPPORT REACTIONS LIST 1 TO 339 BY 26 417 TO 755 BY 26
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SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
1	2	.00	38.41	.00	.00	.00	.00
	3	.00	63.93	.00	.00	.00	.00
	4	.00	-6.24	.00	.00	.00	.00
	5	.00	-35.44	.00	.00	.00	.00
	6	.00	25.82	.00	.00	.00	.00
	7	.00	-4.39	.00	.00	.00	.00
27	2	.00	49.18	.00	.00	.00	.00
	3	.00	86.17	.00	.00	.00	.00
	4	.00	29.54	.00	.00	.00	.00
	5	.00	-5.44	.00	.00	.00	.00
	6	.00	45.51	.00	.00	.00	.00
	7	.00	31.60	.00	.00	.00	.00
53	2	.00	59.03	.00	.00	.00	.00
	3	.00	106.77	.00	.00	.00	.00
	4	.00	64.21	.00	.00	.00	.00
	5	.00	23.54	.00	.00	.00	.00
	6	.00	83.75	.00	.00	.00	.00
	7	.00	66.52	.00	.00	.00	.00
79	2	.00	67.27	.00	.00	.00	.00
	3	.00	124.40	.00	.00	.00	.00
	4	.00	96.81	.00	.00	.00	.00
	5	.00	51.09	.00	.00	.00	.00
	6	.00	79.74	.00	.00	.00	.00
	7	.00	99.40	.00	.00	.00	.00
105	2	.00	73.80	.00	.00	.00	.00
	3	.00	138.77	.00	.00	.00	.00
	4	.00	126.81	.00	.00	.00	.00
	5	.00	76.77	.00	.00	.00	.00
	6	.00	93.23	.00	.00	.00	.00
	7	.00	129.74	.00	.00	.00	.00
131	2	.00	79.24	.00	.00	.00	.00
	3	.00	151.18	.00	.00	.00	.00
	4	.00	155.02	.00	.00	.00	.00
	5	.00	100.85	.00	.00	.00	.00
	6	.00	104.98	.00	.00	.00	.00
	7	.00	158.39	.00	.00	.00	.00
157	2	.00	55.64	.00	.00	.00	.00
	3	.00	88.71	.00	.00	.00	.00
	4	.00	21.89	.00	.00	.00	.00
	5	.00	11.10	.00	.00	.00	.00
	6	.00	66.58	.00	.00	.00	.00
	7	.00	18.89	.00	.00	.00	.00
183	2	.00	67.31	.00	.00	.00	.00
	3	.00	112.47	.00	.00	.00	.00
	4	.00	58.99	.00	.00	.00	.00
	5	.00	42.62	.00	.00	.00	.00
	6	.00	87.91	.00	.00	.00	.00
	7	.00	56.08	.00	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
209	2	.00	78.32	.00	.00	.00	.00
	3	.00	135.14	.00	.00	.00	.00
	4	.00	95.63	.00	.00	.00	.00
	5	.00	73.57	.00	.00	.00	.00
	6	.00	108.18	.00	.00	.00	.00
	7	.00	92.85	.00	.00	.00	.00
235	2	.00	86.78	.00	.00	.00	.00
	3	.00	153.22	.00	.00	.00	.00
	4	.00	129.10	.00	.00	.00	.00
	5	.00	101.85	.00	.00	.00	.00
	6	.00	124.58	.00	.00	.00	.00
	7	.00	126.59	.00	.00	.00	.00
261	2	.00	92.34	.00	.00	.00	.00
	3	.00	165.96	.00	.00	.00	.00
	4	.00	157.93	.00	.00	.00	.00
	5	.00	126.23	.00	.00	.00	.00
	6	.00	136.44	.00	.00	.00	.00
	7	.00	155.87	.00	.00	.00	.00
287	2	.00	96.85	.00	.00	.00	.00
	3	.00	176.77	.00	.00	.00	.00
	4	.00	184.68	.00	.00	.00	.00
	5	.00	148.68	.00	.00	.00	.00
	6	.00	146.47	.00	.00	.00	.00
	7	.00	183.17	.00	.00	.00	.00
313	2	.00	72.47	.00	.00	.00	.00
	3	.00	112.84	.00	.00	.00	.00
	4	.00	49.64	.00	.00	.00	.00
	5	.00	57.19	.00	.00	.00	.00
	6	.00	106.70	.00	.00	.00	.00
	7	.00	41.84	.00	.00	.00	.00
339	2	.00	84.96	.00	.00	.00	.00
	3	.00	137.91	.00	.00	.00	.00
	4	.00	87.82	.00	.00	.00	.00
	5	.00	90.19	.00	.00	.00	.00
	6	.00	129.62	.00	.00	.00	.00
	7	.00	79.96	.00	.00	.00	.00
417	2	.00	110.35	.00	.00	.00	.00
	3	.00	192.19	.00	.00	.00	.00
	4	.00	188.24	.00	.00	.00	.00
	5	.00	175.07	.00	.00	.00	.00
	6	.00	178.86	.00	.00	.00	.00
	7	.00	181.21	.00	.00	.00	.00
443	2	.00	113.89	.00	.00	.00	.00
	3	.00	201.37	.00	.00	.00	.00
	4	.00	213.31	.00	.00	.00	.00
	5	.00	195.52	.00	.00	.00	.00
	6	.00	187.01	.00	.00	.00	.00
	7	.00	206.99	.00	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
469	2	.00	88.91	.00	.00	.00	.00
	3	.00	136.41	.00	.00	.00	.00
	4	.00	77.42	.00	.00	.00	.00
	5	.00	103.21	.00	.00	.00	.00
	6	.00	146.28	.00	.00	.00	.00
	7	.00	64.84	.00	.00	.00	.00
495	2	.00	101.30	.00	.00	.00	.00
	3	.00	161.19	.00	.00	.00	.00
	4	.00	115.70	.00	.00	.00	.00
	5	.00	136.69	.00	.00	.00	.00
	6	.00	169.31	.00	.00	.00	.00
	7	.00	103.01	.00	.00	.00	.00
521	2	.00	113.07	.00	.00	.00	.00
	3	.00	184.97	.00	.00	.00	.00
	4	.00	153.64	.00	.00	.00	.00
	5	.00	169.79	.00	.00	.00	.00
	6	.00	191.43	.00	.00	.00	.00
	7	.00	140.86	.00	.00	.00	.00
547	2	.00	121.53	.00	.00	.00	.00
	3	.00	203.06	.00	.00	.00	.00
	4	.00	187.11	.00	.00	.00	.00
	5	.00	198.08	.00	.00	.00	.00
	6	.00	207.84	.00	.00	.00	.00
	7	.00	174.60	.00	.00	.00	.00
573	2	.00	126.32	.00	.00	.00	.00
	3	.00	214.68	.00	.00	.00	.00
	4	.00	214.64	.00	.00	.00	.00
	5	.00	220.31	.00	.00	.00	.00
	6	.00	217.83	.00	.00	.00	.00
	7	.00	202.80	.00	.00	.00	.00
599	2	.00	130.12	.00	.00	.00	.00
	3	.00	224.47	.00	.00	.00	.00
	4	.00	240.21	.00	.00	.00	.00
	5	.00	240.79	.00	.00	.00	.00
	6	.00	226.17	.00	.00	.00	.00
	7	.00	229.13	.00	.00	.00	.00
625	2	.00	105.03	.00	.00	.00	.00
	3	.00	159.44	.00	.00	.00	.00
	4	.00	104.95	.00	.00	.00	.00
	5	.00	148.99	.00	.00	.00	.00
	6	.00	185.38	.00	.00	.00	.00
	7	.00	87.61	.00	.00	.00	.00
651	2	.00	116.94	.00	.00	.00	.00
	3	.00	183.31	.00	.00	.00	.00
	4	.00	142.62	.00	.00	.00	.00
	5	.00	182.13	.00	.00	.00	.00
	6	.00	207.79	.00	.00	.00	.00
	7	.00	125.17	.00	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
677	2	.00	127.77	.00	.00	.00	.00
	3	.00	205.34	.00	.00	.00	.00
	4	.00	178.94	.00	.00	.00	.00
	5	.00	213.85	.00	.00	.00	.00
	6	.00	228.40	.00	.00	.00	.00
	7	.00	161.46	.00	.00	.00	.00
703	2	.00	136.02	.00	.00	.00	.00
	3	.00	222.97	.00	.00	.00	.00
	4	.00	211.54	.00	.00	.00	.00
	5	.00	241.41	.00	.00	.00	.00
	6	.00	244.40	.00	.00	.00	.00
	7	.00	194.34	.00	.00	.00	.00
729	2	.00	141.55	.00	.00	.00	.00
	3	.00	235.92	.00	.00	.00	.00
	4	.00	239.89	.00	.00	.00	.00
	5	.00	264.34	.00	.00	.00	.00
	6	.00	255.52	.00	.00	.00	.00
	7	.00	223.32	.00	.00	.00	.00
755	2	.00	145.86	.00	.00	.00	.00
	3	.00	246.69	.00	.00	.00	.00
	4	.00	266.20	.00	.00	.00	.00
	5	.00	285.28	.00	.00	.00	.00
	6	.00	264.54	.00	.00	.00	.00
	7	.00	250.40	.00	.00	.00	.00

********** END OF LATEST ANALYSIS RESULT **********

126. PRINT MEMBER FORCES LIST 25 TO 350 BY 25 425 TO 750 BY 25

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
25	2	25	38.41	1.84	-1.48	.00	-.45	-.51
		26	-38.41	-1.84	1.48	.00	1.93	2.35
	3	25	63.93	2.54	-2.51	.00	-.69	-.68
		26	-63.93	-2.54	2.51	.00	3.21	3.22
	4	25	-6.24	3.03	-2.56	.00	-.45	-.84
		26	6.24	-3.03	2.56	.00	3.01	3.87
	5	25	-35.44	5.07	-2.26	.00	-.43	-1.42
		26	35.44	-5.07	2.26	.00	2.69	6.49
	6	25	25.82	4.30	-2.36	.00	-.67	-1.17
		26	-25.82	-4.30	2.36	.00	3.04	5.48
	7	25	-4.39	2.53	-5.13	.00	-1.59	-.70
		26	4.39	-2.53	5.13	.00	6.73	3.24
50	2	51	49.18	1.81	-1.50	.00	-.47	-.48
		52	-49.18	-1.81	1.50	.00	1.97	2.29
	3	51	86.17	2.50	-2.54	.00	-.72	-.63
		52	-86.17	-2.50	2.54	.00	3.26	3.13
	4	51	29.54	2.99	-2.58	.00	-.47	-.79
		52	-29.54	-2.99	2.58	.00	3.05	3.79
	5	51	-5.44	5.03	-2.28	.00	-.45	-1.37
		52	5.44	-5.03	2.28	.00	2.73	6.39
	6	51	45.51	4.26	-2.39	.00	-.70	-1.12
		52	-45.51	-4.26	2.39	.00	3.09	5.38
	7	51	31.60	2.49	-5.15	.00	-1.61	-.66
		52	-31.60	-2.49	5.15	.00	6.77	3.16
75	2	77	59.03	1.78	-1.54	.00	-.51	-.44
		78	-59.03	-1.78	1.54	.00	2.05	2.22
	3	77	106.77	2.44	-2.62	.00	-.80	-.56
		78	-106.77	-2.44	2.62	.00	3.42	3.00
	4	77	64.21	2.93	-2.63	.00	-.53	-.73
		78	-64.21	-2.93	2.63	.00	3.16	3.65
	5	77	23.54	4.96	-2.32	.00	-.49	-1.30
		78	-23.54	-4.96	2.32	.00	2.81	6.26
	6	77	63.75	4.19	-2.45	.00	-.76	-1.05
		78	-63.75	-4.19	2.45	.00	3.22	5.24
	7	77	66.52	2.44	-5.20	.00	-1.66	-.60
		78	-66.52	-2.44	5.20	.00	6.87	3.04
100	2	103	67.27	1.77	-1.60	.00	-.57	-.43
		104	-67.27	-1.77	1.60	.00	2.17	2.20
	3	103	124.40	2.42	-2.73	.00	-.91	-.55
		104	-124.40	-2.42	2.73	.00	3.64	2.97
	4	103	96.81	2.90	-2.72	.00	-.61	-.70
		104	-96.81	-2.90	2.72	.00	3.33	3.60

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	5	103	51.09	4.94	-2.38	.00	-.55	-1.27
		104	-51.09	-4.94	2.38	.00	2.94	6.21
	6	103	79.74	4.18	-2.54	.00	-.85	-1.04
		104	-79.74	-4.18	2.54	.00	3.39	5.21
	7	103	99.40	2.41	-5.29	.00	-1.74	-.57
		104	-99.40	-2.41	5.29	.00	7.03	2.99
125	2	129	73.80	1.80	-1.65	.00	-.62	-.46
		130	-73.80	-1.80	1.65	.00	2.27	2.27
	3	129	138.77	2.47	-2.82	.00	-1.00	-.60
		130	-138.77	-2.47	2.82	.00	3.82	3.07
	4	129	126.81	2.94	-2.79	.00	-.69	-.74
		130	-126.81	-2.94	2.79	.00	3.48	3.68
	5	129	76.77	4.98	-2.45	.00	-.62	-1.32
		130	-76.77	-4.98	2.45	.00	3.06	6.30
	6	129	93.23	4.23	-2.62	.00	-.92	-1.10
		130	-93.23	-4.23	2.62	.00	3.54	5.33
	7	129	129.74	2.44	-5.36	.00	-1.82	-.61
		130	-129.74	-2.44	5.36	.00	7.18	3.05
150	2	155	79.24	1.83	-1.67	.00	-.64	-.49
		156	-79.24	-1.83	1.67	.00	2.30	2.32
	3	155	151.18	2.52	-2.86	.00	-1.03	-.65
		156	-151.18	-2.52	2.86	.00	3.89	3.17
	4	155	155.02	2.98	-2.83	.00	-.72	-.78
		156	-155.02	-2.98	2.83	.00	3.55	3.76
	5	155	100.85	5.03	-2.48	.00	-.64	-1.37
		156	-100.85	-5.03	2.48	.00	3.12	6.40
	6	155	104.98	4.28	-2.65	.00	-.95	-1.15
		156	-104.98	-4.28	2.65	.00	3.60	5.43
	7	155	158.39	2.48	-5.39	.00	-1.85	-.65
		156	-158.39	-2.48	5.39	.00	7.24	3.13
175	2	181	55.64	1.85	-1.46	.00	-.43	-.52
		182	-55.64	-1.85	1.46	.00	1.88	2.37
	3	181	88.71	2.56	-2.47	.00	-.65	-.69
		182	-88.71	-2.56	2.47	.00	3.12	3.25
	4	181	21.89	3.04	-2.52	.00	-.42	-.85
		182	-21.89	-3.04	2.52	.00	2.94	3.89
	5	181	11.10	5.08	-2.22	.00	-.39	-1.43
		182	-11.10	-5.08	2.22	.00	2.61	6.51
	6	181	66.58	4.32	-2.32	.00	-.63	-1.19
		182	-66.58	-4.32	2.32	.00	2.95	5.51
	7	181	18.89	2.54	-5.10	.00	-1.56	-.71
		182	-18.89	-2.54	5.10	.00	6.66	3.25
200	2	207	67.31	1.82	-1.47	.00	-.44	-.49
		208	-67.31	-1.82	1.47	.00	1.91	2.31

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	3	207	112.47	2.52	-2.49	.00	-.67	-.65
		208	-112.47	-2.52	2.49	.00	3.17	3.16
	4	207	58.99	3.00	-2.53	.00	-.43	-.81
		208	-58.99	-3.00	2.53	.00	2.96	3.81
	5	207	42.62	5.04	-2.23	.00	-.40	-1.38
		208	-42.62	-5.04	2.23	.00	2.63	6.41
	6	207	87.91	4.27	-2.34	.00	-.65	-1.14
		208	-87.91	-4.27	2.34	.00	2.99	5.40
	7	207	56.08	2.50	-5.11	.00	-1.57	-.68
		208	-56.08	-2.50	5.11	.00	6.68	3.18
225	2	233	78.32	1.78	-1.52	.00	-.49	-.44
		234	-78.32	-1.78	1.52	.00	2.01	2.22
	3	233	135.14	2.44	-2.58	.00	-.76	-.57
		234	-135.14	-2.44	2.58	.00	3.34	3.01
	4	233	95.63	2.93	-2.58	.00	-.48	-.73
		234	-95.63	-2.93	2.58	.00	3.06	3.65
	5	233	73.57	4.95	-2.27	.00	-.44	-1.28
		234	-73.57	-4.95	2.27	.00	2.72	6.23
	6	233	108.18	4.18	-2.42	.00	-.72	-1.04
		234	-108.18	-4.18	2.42	.00	3.14	5.23
	7	233	92.85	2.44	-5.16	.00	-1.61	-.60
		234	-92.85	-2.44	5.16	.00	6.77	3.04
250	2	259	86.78	1.77	-1.61	.00	-.58	-.43
		260	-86.78	-1.77	1.61	.00	2.18	2.21
	3	259	153.22	2.43	-2.74	.00	-.91	-.55
		260	-153.22	-2.43	2.74	.00	3.65	2.98
	4	259	129.10	2.90	-2.71	.00	-.60	-.70
		260	-129.10	-2.90	2.71	.00	3.30	3.61
	5	259	101.85	4.93	-2.38	.00	-.55	-1.26
		260	-101.85	-4.93	2.38	.00	2.93	6.19
	6	259	124.59	4.17	-2.55	.00	-.86	-1.03
		260	-124.59	-4.17	2.55	.00	3.41	5.21
	7	259	126.59	2.41	-5.28	.00	-1.73	-.58
		260	-126.59	-2.41	5.28	.00	7.01	2.99
275	2	285	92.34	1.81	-1.67	.00	-.64	-.48
		286	-92.34	-1.81	1.67	.00	2.32	2.29
	3	285	165.96	2.49	-2.86	.00	-1.04	-.62
		286	-165.96	-2.49	2.86	.00	3.90	3.11
	4	285	157.93	2.96	-2.83	.00	-.72	-.76
		286	-157.93	-2.96	2.83	.00	3.55	3.72
	5	285	126.24	5.00	-2.49	.00	-.65	-1.34
		286	-126.24	-5.00	2.49	.00	3.14	6.34
	6	285	136.44	4.25	-2.66	.00	-.97	-1.11
		286	-136.44	-4.25	2.66	.00	3.63	5.36

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	7	285	155.87	2.46	-5.39	.00	-1.85	-.63
		286	-155.87	-2.46	5.39	.00	7.24	3.09
300	2	311	96.85	1.84	-1.69	.00	-.66	-.51
		312	-96.85	-1.84	1.69	.00	2.35	2.35
	3	311	176.77	2.54	-2.90	.00	-1.07	-.67
		312	-176.77	-2.54	2.90	.00	3.97	3.21
	4	311	184.68	3.00	-2.86	.00	-.76	-.81
		312	-184.68	-3.00	2.86	.00	3.62	3.81
	5	311	148.68	5.05	-2.52	.00	-.69	-1.39
		312	-148.68	-5.05	2.52	.00	3.21	6.44
	6	311	146.47	4.30	-2.69	.00	-1.00	-1.17
		312	-146.47	-4.30	2.69	.00	3.69	5.47
	7	311	183.17	2.50	-5.43	.00	-1.88	-.67
		312	-183.17	-2.50	5.43	.00	7.31	3.17
325	2	337	72.47	1.87	-1.43	.00	-.40	-.53
		338	-72.47	-1.87	1.43	.00	1.84	2.40
	3	337	112.84	2.58	-2.43	.00	-.61	-.72
		338	-112.84	-2.58	2.43	.00	3.05	3.30
	4	337	49.64	3.05	-2.49	.00	-.38	-.86
		338	-49.64	-3.05	2.49	.00	2.87	3.91
	5	337	57.19	5.09	-2.17	.00	-.34	-1.44
		338	-57.19	-5.09	2.17	.00	2.51	6.53
	6	337	106.69	4.34	-2.27	.00	-.58	-1.21
		338	-106.69	-4.34	2.27	.00	2.85	5.56
	7	337	41.83	2.55	-5.07	.00	-1.53	-.72
		338	-41.83	-2.55	5.07	.00	6.60	3.27
350	2	363	84.96	1.85	-1.43	.00	-.40	-.52
		364	-84.96	-1.85	1.43	.00	1.84	2.37
	3	363	137.91	2.56	-2.43	.00	-.61	-.70
		364	-137.91	-2.56	2.43	.00	3.04	3.26
	4	363	87.82	3.03	-2.47	.00	-.36	-.83
		364	-87.82	-3.03	2.47	.00	2.83	3.86
	5	363	90.19	5.06	-2.16	.00	-.33	-1.40
		364	-90.19	-5.06	2.16	.00	2.48	6.46
	6	363	129.62	4.31	-2.27	.00	-.58	-1.18
		364	-129.62	-4.31	2.27	.00	2.85	5.49
	7	363	79.96	2.53	-5.05	.00	-1.51	-.70
		364	-79.96	-2.53	5.05	.00	6.56	3.23
425	2	441	110.35	1.85	-1.70	.00	-.67	-.52
		442	-110.35	-1.85	1.70	.00	2.38	2.37
	3	441	192.18	2.56	-2.91	.00	-1.09	-.70
		442	-192.18	-2.56	2.91	.00	4.00	3.26
	4	441	188.25	3.03	-2.87	.00	-.76	-.83
		442	-188.25	-3.03	2.87	.00	3.62	3.86

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	5	441	175.06	5.06	-2.54	.00	-.70	-1.40
		442	-175.06	-5.06	2.54	.00	3.24	6.46
	6	441	178.86	4.31	-2.72	.00	-1.02	-1.18
		442	-178.86	-4.31	2.72	.00	3.74	5.49
	7	441	181.21	2.53	-5.43	.00	-1.88	-.70
		442	-181.21	-2.53	5.43	.00	7.31	3.23
450	2	467	113.89	1.87	-1.72	.00	-.69	-.53
		468	-113.89	-1.87	1.72	.00	2.41	2.40
	3	467	201.36	2.58	-2.94	.00	-1.12	-.72
		468	-201.36	-2.58	2.94	.00	4.06	3.30
	4	467	213.31	3.05	-2.91	.00	-.80	-.86
		468	-213.31	-3.05	2.91	.00	3.70	3.91
	5	467	195.52	5.09	-2.57	.00	-.74	-1.44
		468	-195.52	-5.09	2.57	.00	3.31	6.53
	6	467	187.01	4.34	-2.74	.00	-1.05	-1.21
		468	-187.01	-4.34	2.74	.00	3.79	5.56
	7	467	206.99	2.55	-5.47	.00	-1.92	-.72
		468	-206.99	-2.55	5.47	.00	7.38	3.27
475	2	493	88.91	1.88	-1.44	.00	-.41	-.55
		494	-88.91	-1.88	1.44	.00	1.84	2.43
	3	493	136.41	2.61	-2.44	.00	-.62	-.75
		494	-136.41	-2.61	2.44	.00	3.06	3.35
	4	493	77.42	3.06	-2.49	.00	-.38	-.87
		494	-77.42	-3.06	2.49	.00	2.87	3.93
	5	493	103.21	5.11	-2.16	.00	-.33	-1.45
		494	-103.21	-5.11	2.16	.00	2.49	6.56
	6	493	146.27	4.36	-2.27	.00	-.58	-1.24
		494	-146.27	-4.36	2.27	.00	2.84	5.60
	7	493	64.84	2.56	-5.07	.00	-1.53	-.73
		494	-64.84	-2.56	5.07	.00	6.60	3.29
500	2	519	101.30	1.89	-1.45	.00	-.42	-.56
		520	-101.30	-1.89	1.45	.00	1.87	2.45
	3	519	161.19	2.62	-2.46	.00	-.64	-.76
		520	-161.19	-2.62	2.46	.00	3.10	3.39
	4	519	115.70	3.07	-2.50	.00	-.39	-.88
		520	-115.70	-3.07	2.50	.00	2.89	3.94
	5	519	136.69	5.10	-2.17	.00	-.34	-1.45
		520	-136.69	-5.10	2.17	.00	2.51	6.55
	6	519	169.30	4.37	-2.29	.00	-.60	-1.24
		520	-169.30	-4.37	2.29	.00	2.88	5.61
	7	519	103.01	2.56	-5.08	.00	-1.54	-.74
		520	-103.01	-2.56	5.08	.00	6.62	3.30
525	2	545	113.07	1.91	-1.51	.00	-.48	-.58
		546	-113.07	-1.91	1.51	.00	1.99	2.48

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	3	545	184.97	2.66	-2.57	.00	-.74	-.80
		546	-184.97	-2.66	2.57	.00	3.31	3.46
	4	545	153.64	3.10	-2.56	.00	-.46	-.91
		546	-153.64	-3.10	2.56	.00	3.02	4.01
	5	545	169.79	5.12	-2.24	.00	-.41	-1.46
		546	-169.79	-5.12	2.24	.00	2.66	6.58
	6	545	191.43	4.39	-2.39	.00	-.70	-1.26
		546	-191.43	-4.39	2.39	.00	3.09	5.66
	7	545	140.86	2.60	-5.14	.00	-1.60	-.77
		546	-140.86	-2.60	5.14	.00	6.74	3.37
550	2	571	121.53	1.91	-1.62	.00	-.59	-.58
		572	-121.53	-1.91	1.62	.00	2.20	2.49
	3	571	203.06	2.68	-2.75	.00	-.93	-.81
		572	-203.06	-2.68	2.75	.00	3.68	3.49
	4	571	187.11	3.12	-2.72	.00	-.62	-.93
		572	-187.11	-3.12	2.72	.00	3.34	4.05
	5	571	198.08	5.14	-2.41	.00	-.58	-1.48
		572	-198.08	-5.14	2.41	.00	2.99	6.62
	6	571	207.84	4.40	-2.58	.00	-.88	-1.28
		572	-207.84	-4.40	2.58	.00	3.46	5.68
	7	571	174.60	2.62	-5.29	.00	-1.75	-.80
		572	-174.60	-2.62	5.29	.00	7.04	3.42
575	2	597	126.32	1.90	-1.70	.00	-.66	-.57
		598	-126.32	-1.90	1.70	.00	2.36	2.47
	3	597	214.68	2.65	-2.90	.00	-1.07	-.79
		598	-214.68	-2.65	2.90	.00	3.96	3.43
	4	597	214.64	3.11	-2.86	.00	-.75	-.92
		598	-214.64	-3.11	2.86	.00	3.62	4.03
	5	597	220.31	5.14	-2.55	.00	-.71	-1.49
		598	-220.31	-5.14	2.55	.00	3.26	6.63
	6	597	217.83	4.39	-2.71	.00	-1.02	-1.27
		598	-217.83	-4.39	2.71	.00	3.73	5.66
	7	597	202.80	2.61	-5.42	.00	-1.88	-.78
		598	-202.80	-2.61	5.42	.00	7.30	3.39
600	2	623	130.12	1.89	-1.71	.00	-.68	-.56
		624	-130.12	-1.89	1.71	.00	2.40	2.45
	3	623	224.47	2.63	-2.93	.00	-1.10	-.77
		624	-224.47	-2.63	2.93	.00	4.04	3.40
	4	623	240.21	3.10	-2.90	.00	-.79	-.91
		624	-240.21	-3.10	2.90	.00	3.69	4.01
	5	623	240.79	5.14	-2.58	.00	-.75	-1.49
		624	-240.79	-5.14	2.58	.00	3.33	6.63
	6	623	226.17	4.38	-2.75	.00	-1.05	-1.26
		624	-226.17	-4.38	2.75	.00	3.80	5.64

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	7	623	229.13	2.59	-5.46	.00	-1.91	-.77
		624	-229.13	-2.59	5.46	.00	7.37	3.36
625	2	649	105.03	1.89	-1.45	.00	-.42	-.56
		650	-105.03	-1.89	1.45	.00	1.86	2.44
	3	649	159.44	2.62	-2.46	.00	-.64	-.76
		650	-159.44	-2.62	2.46	.00	3.11	3.38
	4	649	104.94	3.07	-2.50	.00	-.40	-.87
		650	-104.94	-3.07	2.50	.00	2.90	3.94
	5	649	148.99	5.11	-2.16	.00	-.34	-1.46
		650	-148.99	-5.11	2.16	.00	2.50	6.57
	6	649	185.38	4.37	-2.28	.00	-.59	-1.25
		650	-185.38	-4.37	2.28	.00	2.87	5.62
	7	649	87.61	2.56	-5.09	.00	-1.55	-.74
		650	-87.61	-2.56	5.09	.00	6.63	3.30
650	2	675	116.94	1.90	-1.47	.00	-.44	-.57
		676	-116.94	-1.90	1.47	.00	1.90	2.47
	3	675	183.31	2.65	-2.50	.00	-.68	-.79
		676	-183.31	-2.65	2.50	.00	3.17	3.43
	4	675	142.62	3.08	-2.53	.00	-.42	-.89
		676	-142.62	-3.08	2.53	.00	2.95	3.98
	5	675	182.13	5.12	-2.19	.00	-.36	-1.47
		676	-182.13	-5.12	2.19	.00	2.55	6.59
	6	675	207.78	4.39	-2.31	.00	-.62	-1.27
		676	-207.78	-4.39	2.31	.00	2.94	5.66
	7	675	125.17	2.58	-5.11	.00	-1.57	-.76
		676	-125.17	-2.58	5.11	.00	6.68	3.34
675	2	701	127.77	1.93	-1.53	.00	-.50	-.60
		702	-127.77	-1.93	1.53	.00	2.02	2.52
	3	701	205.34	2.69	-2.60	.00	-.78	-.83
		702	-205.34	-2.69	2.60	.00	3.38	3.53
	4	701	178.94	3.13	-2.61	.00	-.50	-.94
		702	-178.94	-3.13	2.61	.00	3.11	4.07
	5	701	213.85	5.16	-2.28	.00	-.45	-1.50
		702	-213.85	-5.16	2.28	.00	2.73	6.66
	6	701	228.40	4.43	-2.42	.00	-.73	-1.31
		702	-228.40	-4.43	2.42	.00	3.15	5.74
	7	701	161.46	2.62	-5.18	.00	-1.64	-.80
		702	-161.46	-2.62	5.18	.00	6.83	3.42
700	2	727	136.02	1.93	-1.61	.00	-.58	-.60
		728	-136.02	-1.93	1.61	.00	2.20	2.54
	3	727	222.96	2.71	-2.75	.00	-.93	-.85
		728	-222.96	-2.71	2.75	.00	3.68	3.56
	4	727	211.54	3.15	-2.74	.00	-.63	-.97
		728	-211.54	-3.15	2.74	.00	3.37	4.12

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	5	727	241.40	5.18	-2.42	.00	-.59	-1.52
		728	-241.40	-5.18	2.42	.00	3.02	6.70
	6	727	244.40	4.44	-2.58	.00	-.88	-1.32
		728	-244.40	-4.44	2.58	.00	3.46	5.76
	7	727	194.34	2.65	-5.31	.00	-1.76	-.83
		728	-194.34	-2.65	5.31	.00	7.07	3.47
725	2	753	141.55	1.91	-1.68	.00	-.65	-.58
		754	-141.55	-1.91	1.68	.00	2.33	2.50
	3	753	235.91	2.67	-2.87	.00	-1.04	-.81
		754	-235.91	-2.67	2.87	.00	3.91	3.49
	4	753	239.89	3.14	-2.85	.00	-.74	-.95
		754	-239.89	-3.14	2.85	.00	3.59	4.08
	5	753	264.34	5.17	-2.54	.00	-.70	-1.51
		754	-264.34	-5.17	2.54	.00	3.24	6.68
	6	753	255.52	4.42	-2.69	.00	-1.00	-1.29
		754	-255.52	-4.42	2.69	.00	3.69	5.71
	7	753	223.32	2.63	-5.41	.00	-1.86	-.81
		754	-223.32	-2.63	5.41	.00	7.27	3.44
750	2	779	145.86	1.90	-1.70	.00	-.67	-.57
		780	-145.86	-1.90	1.70	.00	2.37	2.47
	3	779	246.69	2.65	-2.91	.00	-1.08	-.79
		780	-246.69	-2.65	2.91	.00	3.99	3.43
	4	779	266.20	3.12	-2.88	.00	-.78	-.93
		780	-266.20	-3.12	2.88	.00	3.66	4.04
	5	779	285.28	5.15	-2.57	.00	-.74	-1.50
		780	-285.28	-5.15	2.57	.00	3.31	6.66
	6	779	264.54	4.40	-2.73	.00	-1.04	-1.28
		780	-264.54	-4.40	2.73	.00	3.77	5.67
	7	779	250.40	2.61	-5.44	.00	-1.90	-.79
		780	-250.40	-2.61	5.44	.00	7.33	3.40

********** END OF LATEST ANALYSIS RESULT **********

127. SECTION 0.5 MEMB 25 TO 350 BY 25 425 TO 750 BY 25
128. PRINT SECTION FORCES

MEMBER FORCES AT INTERMEDIATE SECTIONS

ALL UNITS ARE -- MTON METE

MEMB	LOAD	SEC	SHEAR-Y	SHEAR-Z	MOM-Y	MOM-Z
25	2	.50	1.84	-1.48	-1.19	-1.43
	3	.50	2.54	-2.51	-1.95	-1.95
	4	.50	3.03	-2.56	-1.73	-2.35
	5	.50	5.07	-2.26	-1.56	-3.95
	6	.50	4.30	-2.36	-1.86	-3.33
	7	.50	2.53	-5.13	-4.16	-1.97
50	2	.50	1.81	-1.50	-1.22	-1.39
	3	.50	2.50	-2.54	-1.99	-1.88
	4	.50	2.99	-2.58	-1.76	-2.29
	5	.50	5.03	-2.28	-1.59	-3.88
	6	.50	4.26	-2.39	-1.89	-3.25
	7	.50	2.49	-5.15	-4.19	-1.91
75	2	.50	1.78	-1.54	-1.28	-1.33
	3	.50	2.44	-2.62	-2.11	-1.78
	4	.50	2.93	-2.63	-1.84	-2.19
	5	.50	4.96	-2.32	-1.65	-3.78
	6	.50	4.19	-2.45	-1.99	-3.14
	7	.50	2.44	-5.20	-4.27	-1.82
100	2	.50	1.77	-1.60	-1.37	-1.32
	3	.50	2.42	-2.73	-2.27	-1.76
	4	.50	2.90	-2.72	-1.97	-2.15
	5	.50	4.94	-2.38	-1.75	-3.74
	6	.50	4.18	-2.54	-2.12	-3.13
	7	.50	2.41	-5.29	-4.39	-1.78
125	2	.50	1.80	-1.65	-1.44	-1.37
	3	.50	2.47	-2.82	-2.41	-1.84
	4	.50	2.94	-2.79	-2.08	-2.21
	5	.50	4.98	-2.45	-1.84	-3.81
	6	.50	4.23	-2.62	-2.23	-3.21
	7	.50	2.44	-5.36	-4.50	-1.83
150	2	.50	1.83	-1.67	-1.47	-1.41
	3	.50	2.52	-2.86	-2.46	-1.91
	4	.50	2.98	-2.83	-2.13	-2.27
	5	.50	5.03	-2.48	-1.88	-3.89
	6	.50	4.28	-2.65	-2.28	-3.29
	7	.50	2.48	-5.39	-4.54	-1.89
175	2	.50	1.85	-1.46	-1.16	-1.44
	3	.50	2.56	-2.47	-1.89	-1.97
	4	.50	3.04	-2.52	-1.68	-2.37
	5	.50	5.08	-2.22	-1.50	-3.97
	6	.50	4.32	-2.32	-1.79	-3.35

MEMBER FORCES AT INTERMEDIATE SECTIONS

ALL UNITS ARE -- MTON METE

MEMB	LOAD	SEC	SHEAR-Y	SHEAR-Z	MOM-Y	MOM-Z
	7	.50	2.54	-5.10	-4.11	-1.98
200	2	.50	1.82	-1.47	-1.17	-1.40
	3	.50	2.52	-2.49	-1.92	-1.90
	4	.50	3.00	-2.53	-1.69	-2.31
	5	.50	5.04	-2.23	-1.51	-3.89
	6	.50	4.27	-2.34	-1.82	-3.27
	7	.50	2.50	-5.11	-4.12	-1.93
225	2	.50	1.78	-1.52	-1.25	-1.33
	3	.50	2.44	-2.58	-2.05	-1.79
	4	.50	2.93	-2.58	-1.77	-2.19
	5	.50	4.95	-2.27	-1.58	-3.76
	6	.50	4.18	-2.42	-1.93	-3.14
	7	.50	2.44	-5.16	-4.19	-1.82
250	2	.50	1.77	-1.61	-1.38	-1.32
	3	.50	2.43	-2.74	-2.28	-1.77
	4	.50	2.90	-2.71	-1.95	-2.15
	5	.50	4.93	-2.38	-1.74	-3.73
	6	.50	4.17	-2.55	-2.13	-3.12
	7	.50	2.41	-5.28	-4.37	-1.79
275	2	.50	1.81	-1.67	-1.48	-1.38
	3	.50	2.49	-2.86	-2.47	-1.87
	4	.50	2.96	-2.83	-2.13	-2.24
	5	.50	5.00	-2.49	-1.90	-3.84
	6	.50	4.25	-2.66	-2.30	-3.24
	7	.50	2.46	-5.39	-4.54	-1.86
300	2	.50	1.84	-1.69	-1.51	-1.43
	3	.50	2.54	-2.90	-2.52	-1.94
	4	.50	3.00	-2.86	-2.19	-2.31
	5	.50	5.05	-2.52	-1.95	-3.92
	6	.50	4.30	-2.69	-2.35	-3.32
	7	.50	2.50	-5.43	-4.60	-1.92
325	2	.50	1.87	-1.43	-1.12	-1.47
	3	.50	2.58	-2.43	-1.83	-2.01
	4	.50	3.05	-2.49	-1.63	-2.38
	5	.50	5.09	-2.17	-1.43	-3.99
	6	.50	4.34	-2.27	-1.72	-3.38
	7	.50	2.55	-5.07	-4.06	-1.99
350	2	.50	1.85	-1.43	-1.12	-1.44
	3	.50	2.56	-2.43	-1.83	-1.98
	4	.50	3.03	-2.47	-1.60	-2.35
	5	.50	5.06	-2.16	-1.41	-3.93

MEMBER FORCES AT INTERMEDIATE SECTIONS

ALL UNITS ARE -- MTON METE

MEMB	LOAD	SEC	SHEAR-Y	SHEAR-Z	MOM-Y	MOM-Z
	6	.50	4.31	-2.27	-1.72	-3.33
	7	.50	2.53	-5.05	-4.04	-1.97
425	2	.50	1.85	-1.70	-1.52	-1.44
	3	.50	2.56	-2.91	-2.54	-1.98
	4	.50	3.03	-2.87	-2.19	-2.35
	5	.50	5.06	-2.54	-1.97	-3.93
	6	.50	4.31	-2.72	-2.38	-3.33
	7	.50	2.53	-5.43	-4.59	-1.97
450	2	.50	1.87	-1.72	-1.55	-1.47
	3	.50	2.58	-2.94	-2.59	-2.01
	4	.50	3.05	-2.91	-2.25	-2.38
	5	.50	5.09	-2.57	-2.03	-3.99
	6	.50	4.34	-2.74	-2.42	-3.38
	7	.50	2.55	-5.47	-4.65	-1.99
475	2	.50	1.88	-1.44	-1.12	-1.49
	3	.50	2.61	-2.44	-1.84	-2.05
	4	.50	3.06	-2.49	-1.63	-2.40
	5	.50	5.11	-2.16	-1.41	-4.00
	6	.50	4.36	-2.27	-1.71	-3.42
	7	.50	2.56	-5.07	-4.07	-2.01
500	2	.50	1.89	-1.45	-1.14	-1.50
	3	.50	2.62	-2.46	-1.87	-2.07
	4	.50	3.07	-2.50	-1.64	-2.41
	5	.50	5.10	-2.17	-1.42	-4.00
	6	.50	4.37	-2.29	-1.74	-3.43
	7	.50	2.56	-5.08	-4.08	-2.02
525	2	.50	1.91	-1.51	-1.23	-1.53
	3	.50	2.66	-2.57	-2.03	-2.13
	4	.50	3.10	-2.56	-1.74	-2.46
	5	.50	5.12	-2.24	-1.54	-4.02
	6	.50	4.39	-2.39	-1.89	-3.46
	7	.50	2.60	-5.14	-4.17	-2.07
550	2	.50	1.91	-1.62	-1.39	-1.54
	3	.50	2.68	-2.75	-2.31	-2.15
	4	.50	3.12	-2.72	-1.98	-2.49
	5	.50	5.14	-2.41	-1.78	-4.05
	6	.50	4.40	-2.58	-2.17	-3.48
	7	.50	2.62	-5.29	-4.39	-2.11
575	2	.50	1.90	-1.70	-1.51	-1.52
	3	.50	2.65	-2.90	-2.52	-2.11
	4	.50	3.11	-2.86	-2.19	-2.48

MEMBER FORCES AT INTERMEDIATE SECTIONS

ALL UNITS ARE -- MTON METE

MEMB	LOAD	SEC	SHEAR-Y	SHEAR-Z	MOM-Y	MOM-Z
	5	.50	5.14	-2.55	-1.99	-4.06
	6	.50	4.39	-2.71	-2.37	-3.46
	7	.50	2.61	-5.42	-4.59	-2.09
600	2	.50	1.89	-1.71	-1.54	-1.50
	3	.50	2.63	-2.93	-2.57	-2.08
	4	.50	3.10	-2.90	-2.24	-2.46
	5	.50	5.14	-2.58	-2.04	-4.06
	6	.50	4.38	-2.75	-2.42	-3.45
	7	.50	2.59	-5.46	-4.64	-2.07
625	2	.50	1.89	-1.45	-1.14	-1.50
	3	.50	2.62	-2.46	-1.87	-2.07
	4	.50	3.07	-2.50	-1.65	-2.41
	5	.50	5.11	-2.16	-1.42	-4.01
	6	.50	4.37	-2.28	-1.73	-3.44
	7	.50	2.56	-5.09	-4.09	-2.02
650	2	.50	1.90	-1.47	-1.17	-1.52
	3	.50	2.65	-2.50	-1.92	-2.11
	4	.50	3.08	-2.53	-1.68	-2.44
	5	.50	5.12	-2.19	-1.46	-4.03
	6	.50	4.39	-2.31	-1.78	-3.46
	7	.50	2.58	-5.11	-4.12	-2.05
675	2	.50	1.93	-1.53	-1.26	-1.56
	3	.50	2.69	-2.60	-2.08	-2.18
	4	.50	3.13	-2.61	-1.81	-2.50
	5	.50	5.16	-2.28	-1.59	-4.08
	6	.50	4.43	-2.42	-1.94	-3.52
	7	.50	2.62	-5.18	-4.24	-2.11
700	2	.50	1.93	-1.61	-1.39	-1.57
	3	.50	2.71	-2.75	-2.30	-2.20
	4	.50	3.15	-2.74	-2.00	-2.54
	5	.50	5.18	-2.42	-1.80	-4.11
	6	.50	4.44	-2.58	-2.17	-3.54
	7	.50	2.65	-5.31	-4.42	-2.15
725	2	.50	1.91	-1.68	-1.49	-1.54
	3	.50	2.67	-2.87	-2.48	-2.15
	4	.50	3.14	-2.85	-2.16	-2.52
	5	.50	5.17	-2.54	-1.97	-4.10
	6	.50	4.42	-2.69	-2.34	-3.50
	7	.50	2.63	-5.41	-4.56	-2.12
750	2	.50	1.90	-1.70	-1.52	-1.52
	3	.50	2.65	-2.91	-2.54	-2.11

MEMBER FORCES AT INTERMEDIATE SECTIONS

ALL UNITS ARE -- MTON METE

MEMB	LOAD	SEC	SHEAR-Y	SHEAR-Z	MOM-Y	MOM-Z
	4	.50	3.12	-2.88	-2.22	-2.49
	5	.50	5.15	-2.57	-2.02	-4.08
	6	.50	4.40	-2.73	-2.40	-3.48
	7	.50	2.61	-5.44	-4.61	-2.10

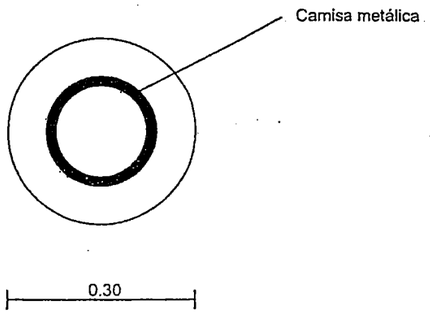
********** END OF LATEST ANALYSIS RESULT **********

129. FINISH

********** END OF STAAD-III **********

**** DATE= JUN 17,2002 TIME= 11:34:17 ****

MICROPILOTES PILA 1



NOTA:

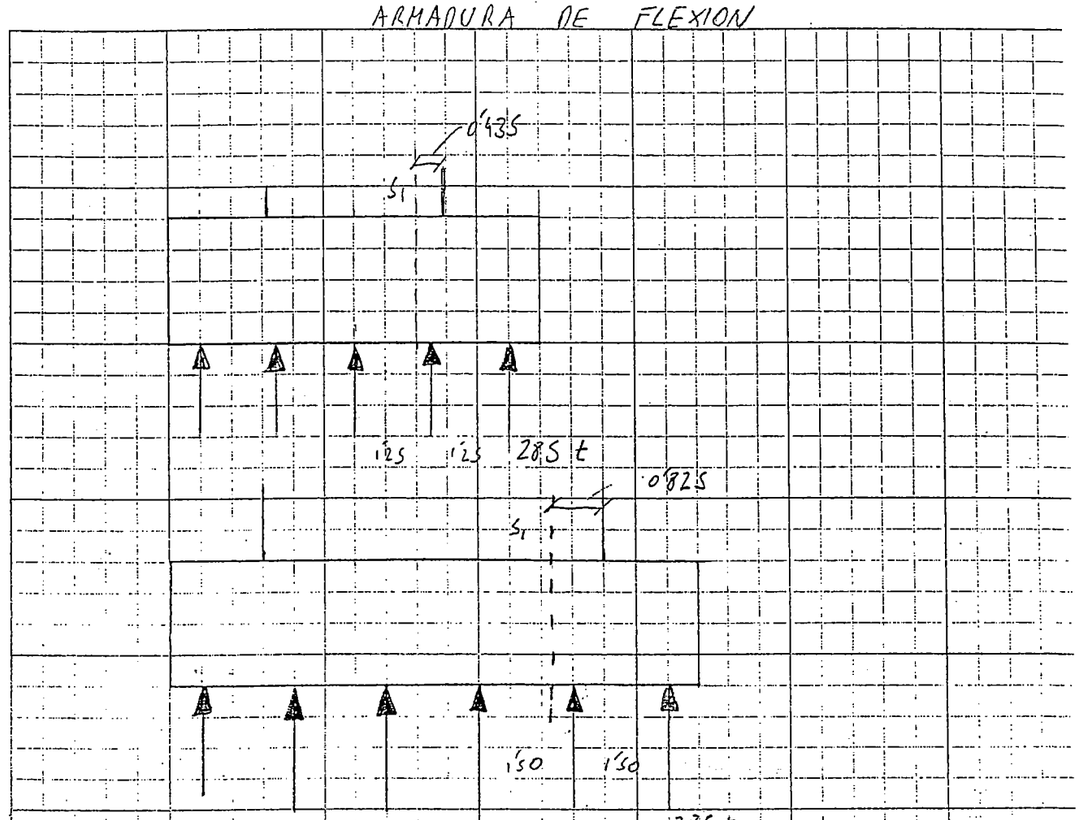
- Camisa metálica de ϕ 17.78 cm exterior y de ϕ 14.58 cm interior
- Longitud total de los micropilotes 22.00 m

intecsa-inarsa

Proyecto: Hoja de

Ejecutante: Pila - 1 ENCEPADO Fecha

ARMADURA DE FLEXION



① $M_d = (28'5 \cdot 1'925 + 28'5 \cdot 0'325) \cdot 5 + 10 \cdot 7'5 = 313'9$ m·t

$= 3138'8$ m·KN

$A_s = 39'76$ cm²

② $M_d = (28'5 \cdot 1'485 + 28'5 \cdot 0'235) \cdot 6 + 12 \cdot 7'5 = 303'1$ m·t

$= 303'12$ m·KN

$A_s = 38'33$ cm² → 50Ø32

PRONTUARIO INFORMÁTICO DEL HORMIGÓN ESTRUCTURAL 3.0
Cátedra de Hormigón Estructural ETSICCPM - IECA

Obra: Viaducto río Francoli
Fecha: 23/07/02
Hora: 11:11:02

Dimensionamiento de secciones a flexión simple

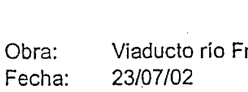
1 Datos

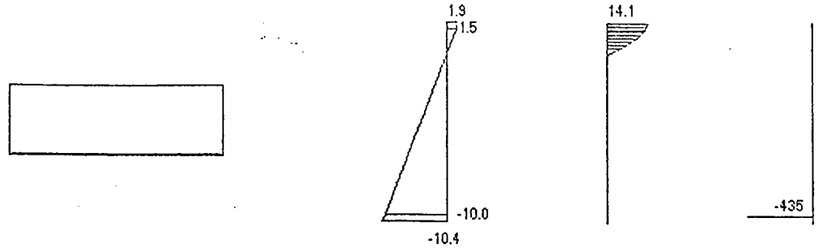
- Materiales

Tipo de hormigón : HA-25
Tipo de acero : B-500-S
fck [MPa] = 25.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

Sección : ZAPA_P11
b [m] = 6.00
h [m] = 2.00
ri [m] = 0.068
rs [m] = 0.065





Plano de deformación de agotamiento

x [m] = 0.312
1/r [1/m]·1.E-3 = 6.2
εs ·1.E-3 = 1.9
εi ·1.E-3 = -10.4

Deformación y tensión de armaduras

Profundidad [m]	Armadura [cm²]	Deformación ·1.E-3	Tensión [MPa]
0.065	0.0	1.5	0.0
1.932	397.6	-10.0	434.8

At_est [cm²] = 397.6

ϕ [mm]	12	14	16	20	25
n°ϕ	----	----	198	127	81
n° capas	----	----	2	2	1
At [cm²]	----	----	398.1	399.0	397.6
wk [mm]	----	----	0.39	0.42	0.47

2 Dimensionamiento

Md [kN·m] = 31388

PRONTUARIO INFORMÁTICO DEL HORMIGÓN ESTRUCTURAL 3.0
Cátedra de Hormigón Estructural ETSICCPM - IECA

Obra: Viaducto río Francolí
Fecha: 23/07/02
Hora: 11:10:49

Comprobación de secciones a flexión simple

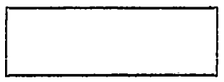
1 Datos

- Materiales

Tipo de hormigón : HA-25
Tipo de acero : B-500-S
fck [MPa] = 25.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

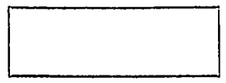
Sección : ZAPA_P11
b [m] = 6.00
h [m] = 2.00
ri [m] = 0.068
rs [m] = 0.065

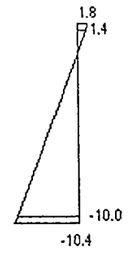


2 Comprobación

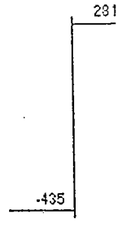
At [cm²] = 450.4
Ac [cm²] = 137.4

Mu [kN·m] = 35876.0









Plano de deformación de agotamiento

x [m] = 0.295
1/r [1/m]·1.E-3 = 6.1
εs ·1.E-3 = 1.8
εi ·1.E-3 = -10.4

Deformación y tensión de armaduras

Profundidad [m]	Armadura [cm²]	Deformación ·1.E-3	Tensión [MPa]
0.065	137.4	1.4	-280.7
1.932	450.4	-10.0	434.8

PRONTUARIO INFORMÁTICO DEL HORMIGÓN ESTRUCTURAL 3.0
Cátedra de Hormigón Estructural ETSICCPM - IECA

Obra: Viaducto rio Francolí
Fecha: 23/07/02
Hora: 11:14:18

Dimensionamiento de secciones a flexión simple

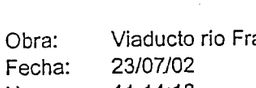
1 Datos

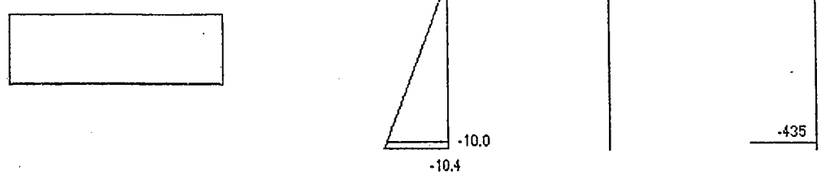
- Materiales

Tipo de hormigón : HA-25
Tipo de acero : B-500-S
fck [MPa] = 25.00
fyk [MPa] = 500.00
γ_c = 1.50
γ_s = 1.15

- Sección

Sección : ZAPA_P11
b [m] = 6.00
h [m] = 2.00
ri [m] = 0.068
rs [m] = 0.065





Plano de deformación de agotamiento

x [m] = 0.305
1/r [1/m]·1.E-3 = 6.1
ε_s ·1.E-3 = 1.9
ε_i ·1.E-3 = -10.4

Deformación y tensión de armaduras

Profundidad [m]	Armadura [cm²]	Deformación ·1.E-3	Tensión [MPa]
0.065	0.0	1.5	0.0
1.932	383.3	-10.0	434.8

At_est [cm²] = 383.3

ϕ [mm]	12	14	16	20	25
n°ϕ	----	----	191	123	79
n° capas	----	----	2	2	1
At [cm²]	----	----	384.0	386.4	387.8
wk [mm]	----	----	0.39	0.41	0.47

2 Dimensionamiento

Md [kN·m] = 30312

Obra: Viaducto río Francolí
Fecha: 23/07/02
Hora: 11:14:10

Comprobación de secciones a flexión simple

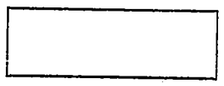
1 Datos

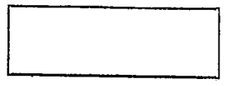
- Materiales

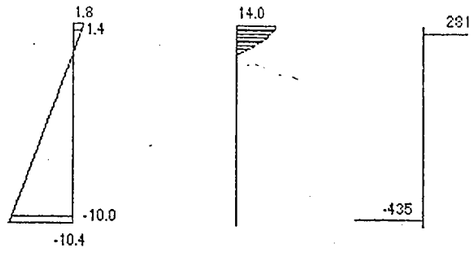
Tipo de hormigón : HA-25
Tipo de acero : B-500-S
fck [MPa] = 25.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

Sección : ZAPA_P11
b [m] = 6.00
h [m] = 2.00
ri [m] = 0.068
rs [m] = 0.065







Plano de deformación de agotamiento

x [m] = 0.295
1/r [1/m]·1.E-3 = 6.1
εs ·1.E-3 = 1.8
εi ·1.E-3 = -10.4

Deformación y tensión de armaduras

Profundidad [m]	Armadura [cm²]	Deformación ·1.E-3	Tensión [MPa]
0.065	137.4	1.4	-280.7
1.932	450.4	-10.0	434.8

2 Comprobación

At [cm²] = 450.4
Ac [cm²] = 137.4

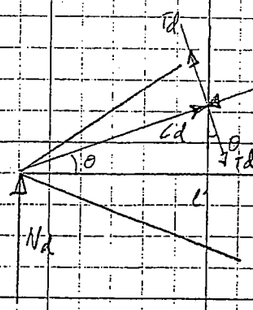
Mu [kN·m] = 35876.0

intecsa-inarsa

Proyecto: Hoja de

Ejecutante: P/LA-1 Fecha

ARMADURA DE CORTANTE



$Td = As \cdot f_{yTd} \cos\theta$

$Nd = Cd \operatorname{sen}\theta$

$Td = 0'30 \cdot Cd$

$As \cdot f_{yd} \cdot \cos\theta = 0'30 \cdot \dfrac{Nd}{\operatorname{sen}\theta}$

$As = \dfrac{0'30 \cdot Nd}{\operatorname{sen}\theta \cdot \cos\theta \cdot f_{yTd}}$

$Nd = 285\ t$

$tg\,\theta = \dfrac{0'85 \cdot d}{l'}$

$l' = \left[(3'75 - 0'25 \cdot 5'50)^2 + (2'50 - 0'25 \cdot 2'90)^2\right]^{1/2} = 2'965$

$tg\,\theta = \dfrac{0'85 \cdot 1'90}{2'965} = 0'545$

$\operatorname{sen}\theta = 0'478$

$\cos\theta = 0'878$

$As = \dfrac{0'30 \cdot 285}{0'478 \cdot 0'878 \cdot 40000} \cdot 100^2 = 50'89\ cm^2$

20

PILA 2

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-2 DE 47.0 M V FRANCOLÍ (SER) XH2

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	47.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	3.8800 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	3.0800 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	32.500	10.0500	10.0500
2	14.500	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	36.0000 T
REACCION VERTICAL TABLERO	=	1299.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

1

FASE ELASTICA

REACCION DEL TABLERO = 36.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.19664353E-02	.53064054E-01
2	.11347462E-04	.19531020E-02	.48453376E-01
3	.20313560E-04	.19159003E-02	.43903172E-01
4	.27415802E-04	.18598183E-02	.39463434E-01
5	.33046172E-04	.17887755E-02	.35173745E-01
6	.37504992E-04	.17058779E-02	.31065475E-01
7	.41024766E-04	.16136054E-02	.27163463E-01
8	.43787197E-04	.15139514E-02	.23487312E-01
9	.45935516E-04	.14085272E-02	.20052411E-01
10	.47583514E-04	.12986423E-02	.16870729E-01
11	.48822245E-04	.11853655E-02	.13951449E-01
12	.49725048E-04	.10695725E-02	.11301482E-01
13	.50351349E-04	.95198271E-03	.89258660E-02
14	.50749567E-04	.83318914E-03	.68281058E-02
15	.50959351E-04	.71368116E-03	.50104366E-02
16	.51013317E-04	.59386327E-03	.34740471E-02
17	.50938409E-04	.47407000E-03	.22192600E-02
18	.50756973E-04	.35457792E-03	.12456822E-02
19	.50487603E-04	.23561555E-03	.55232883E-03
20	.50145822E-04	.11737127E-03	.13772661E-03
21	.49744623E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1299.0000	36.0000	.0000
2	1330.7109	36.0000	84.6000
3	1362.8636	36.0000	169.2000
4	1395.4581	36.0000	253.8000
5	1428.4944	36.0000	338.4000
6	1461.9725	36.0000	423.0000
7	1495.8924	36.0000	507.6000
8	1530.2541	36.0000	592.2000
9	1565.0576	36.0000	676.8000
10	1600.3029	36.0000	761.4000
11	1635.9900	36.0000	846.0000
12	1672.1189	36.0000	930.6000
13	1708.6896	36.0000	1015.2000
14	1745.7021	36.0000	1099.8000
15	1783.1564	36.0000	1184.4000
16	1821.0525	36.0000	1269.0000
17	1859.3904	36.0000	1353.6000
18	1898.1701	36.0000	1438.2000
19	1937.3916	36.0000	1522.8000
20	1977.0549	36.0000	1607.4000
21	2017.1600	36.0000	1692.0000

1

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 36.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.19029579E-02	.50673135E-01
2	.11266771E-04	.18897195E-02	.46211555E-01
3	.20192215E-04	.18527551E-02	.41810039E-01
4	.27276060E-04	.17969799E-02	.37518341E-01
5	.32899099E-04	.17262741E-02	.33375929E-01
6	.37354478E-04	.16437262E-02	.29414129E-01
7	.40870186E-04	.15518122E-02	.25657753E-01
8	.43625187E-04	.14525301E-02	.22126383E-01
9	.45761127E-04	.13475012E-02	.18835363E-01
10	.47391001E-04	.12380474E-02	.15796594E-01
11	.48605567E-04	.11252515E-02	.13019158E-01
12	.49478191E-04	.10100031E-02	.10509833E-01
13	.50068529E-04	.89303566E-03	.82734905E-02
14	.50425349E-04	.77495535E-03	.63134369E-02
15	.47300600E-04	.66012736E-03	.46286527E-02
16	.47301132E-04	.54897033E-03	.32079627E-02
17	.47178302E-04	.43795699E-03	.20483796E-02
18	.46953288E-04	.32735237E-03	.11492446E-02
19	.46643761E-04	.21737584E-03	.50933144E-03
20	.46264508E-04	.10820863E-03	.12694422E-03
21	.45827940E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.10921319E-03	-.10921319E-03	-.10921319E-03
2	-.99287776E-04	-.11108408E-03	-.88054805E-04
3	-.10039803E-03	-.12248832E-03	-.79317361E-04
4	-.10153990E-03	-.13266189E-03	-.71781722E-04
5	-.10270338E-03	-.14178751E-03	-.65264205E-04
6	-.10388129E-03	-.15001407E-03	-.59616232E-04
7	-.10506848E-03	-.15746406E-03	-.54716409E-04
8	-.10626126E-03	-.16423913E-03	-.50464642E-04
9	-.10745699E-03	-.17042430E-03	-.46777736E-04
10	-.10865382E-03	-.17609121E-03	-.43585971E-04
11	-.10985044E-03	-.18130062E-03	-.40830532E-04
12	-.11104597E-03	-.18610439E-03	-.38461464E-04
13	-.11223984E-03	-.19054702E-03	-.36436087E-04
14	-.11343169E-03	-.19466693E-03	-.34717722E-04
15	-.10754531E-03	-.18596970E-03	-.31485941E-04
16	-.10864672E-03	-.18929515E-03	-.30363349E-04
17	-.10974668E-03	-.19240307E-03	-.29449210E-04
18	-.11084523E-03	-.19531420E-03	-.28723932E-04
19	-.11194247E-03	-.19804685E-03	-.28170277E-04
20	-.11303851E-03	-.20061722E-03	-.27773021E-04
21	-.11413347E-03	-.20303968E-03	-.27518667E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1299.0000	38.4755	.0000
2	1330.7109	38.5180	90.4685
3	1362.8636	38.5282	180.9976
4	1395.4581	38.5106	271.5169
5	1428.4944	38.4687	361.9654
6	1461.9725	38.4055	452.2897
7	1495.8924	38.3235	542.4429
8	1530.2541	38.2245	632.3830
9	1565.0576	38.1103	722.0724
10	1600.3029	37.9823	811.4768
11	1635.9900	37.8415	900.5651
12	1672.1189	37.6890	989.3088
13	1708.6896	37.5256	1077.6812
14	1745.7021	37.3521	1165.6576
15	1783.1564	37.1761	1253.3039
16	1821.0525	36.9987	1340.4614
17	1859.3904	36.8132	1427.1939
18	1898.1701	36.6202	1513.4830
19	1937.3916	36.4200	1599.3117
20	1977.0549	36.2128	1684.6632
21	2017.1600	35.9989	1769.5217

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	-.26212828E-02	.80291664E+07
3	-.49351112E-02	.89628237E+07
4	-.68664111E-02	.99525595E+07
5	-.83385058E-02	.10999109E+08
6	-.92774161E-02	.12103170E+08
7	-.96126384E-02	.13265426E+08
8	-.93525833E-02	.14486555E+08
9	-.82850675E-02	.15767232E+08
10	-.64268656E-02	.17108128E+08
11	-.37333672E-02	.18509911E+08
12	-.16413842E-03	.19973244E+08
13	.43166963E-02	.21498790E+08
14	.97397059E-02	.23087205E+08
15	-.67308350E-01	.26466579E+08
16	-.67921998E-01	.28304916E+08
17	-.69827268E-01	.30212933E+08
18	-.73137387E-01	.32191332E+08
19	-.77979008E-01	.34240815E+08
20	-.84492452E-01	.36362077E+08
21	-.92831255E-01	.38555813E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-2 DE 47.0 M V FRANCOLÍ (SER) ZH2

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	47.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	3.8800 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	3.0800 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	32.500	10.0500	10.0500
2	14.500	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0650 T/M2
REACCION HORIZONTAL TABLERO	=	28.0000 T
REACCION VERTICAL TABLERO	=	1299.0000 T
MOMENTO EXTERIOR EN CABEZA	=	41.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

1

FASE ELASTICA

REACCION DEL TABLERO = 28.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.10651078E-05	.67986493E-03	.20433237E-01
2	.27074702E-05	.67543215E-03	.18840007E-01
3	.42804943E-05	.66722129E-03	.17261665E-01
4	.57904050E-05	.65538799E-03	.15706905E-01
5	.72427950E-05	.64007398E-03	.14184068E-01
6	.86427036E-05	.62140852E-03	.12701182E-01
7	.99946831E-05	.59950959E-03	.11265981E-01
8	.11302856E-04	.57448498E-03	.98859357E-02
9	.12570966E-04	.54643324E-03	.85682732E-02
10	.13802418E-04	.51544451E-03	.73200001E-02
11	.15000319E-04	.48160129E-03	.61479200E-02
12	.16167505E-04	.44497910E-03	.50586509E-02
13	.17306576E-04	.40564706E-03	.40586410E-02
14	.18419915E-04	.36366843E-03	.31541829E-02
15	.19509713E-04	.31910111E-03	.23514272E-02
16	.20577988E-04	.27199807E-03	.16563940E-02
17	.21626597E-04	.22240768E-03	.10749847E-02
18	.22657261E-04	.17037414E-03	.61299170E-03
19	.23671568E-04	.11593777E-03	.27610841E-03
20	.24670990E-04	.59135264E-04	.69937656E-04
21	.25656894E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1299.0000	28.0000	41.0000
2	1330.7109	28.3127	107.1646
3	1362.8636	28.6397	174.0808
4	1395.4581	28.9811	241.7825
5	1428.4944	29.3369	310.3033
6	1461.9725	29.7070	379.6770
7	1495.8924	30.0915	449.9374
8	1530.2541	30.4903	521.1181
9	1565.0576	30.9035	593.2530
10	1600.3029	31.3310	666.3757
11	1635.9900	31.7729	740.5200
12	1672.1189	32.2292	815.7197
13	1708.6896	32.6998	892.0084
14	1745.7021	33.1848	969.4200
15	1783.1564	33.6841	1047.9882
16	1821.0525	34.1978	1127.7467
17	1859.3904	34.7259	1208.7293
18	1898.1701	35.2683	1290.9696
19	1937.3916	35.8251	1374.5015
20	1977.0549	36.3962	1459.3587
21	2017.1600	36.9817	1545.5750

1

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 28.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.98849024E-06	.63072392E-03	.18765189E-01
2	.25610173E-05	.62655325E-03	.17287164E-01
3	.40692691E-05	.61876266E-03	.15823224E-01
4	.55189781E-05	.60749647E-03	.14381702E-01
5	.69151542E-05	.59288636E-03	.12970610E-01
6	.82622899E-05	.57505287E-03	.11597662E-01
7	.95644321E-05	.55410647E-03	.10270300E-01
8	.10825237E-04	.53014861E-03	.89957201E-02
9	.12048016E-04	.50327253E-03	.77808875E-02
10	.13235773E-04	.47356408E-03	.66325579E-02
11	.14391240E-04	.44110234E-03	.55572931E-02
12	.15516903E-04	.40596027E-03	.45614765E-02
13	.16615033E-04	.36820525E-03	.36513266E-02
14	.17687703E-04	.32789953E-03	.28329098E-02
15	.17524166E-04	.28652559E-03	.21110356E-02
16	.18483477E-04	.24421661E-03	.14869720E-02
17	.19423884E-04	.19967546E-03	.96496606E-03
18	.20346768E-04	.15294494E-03	.55021237E-03
19	.21253396E-04	.10406475E-03	.24780874E-03
20	.22144939E-04	.53071707E-04	.62763103E-04
21	.23022471E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.98224183E-04	-.10094253E-03	-.95555260E-04
2	-.99269074E-04	-.10631187E-03	-.92354327E-04
3	-.10032489E-03	-.11151538E-03	-.89337859E-04
4	-.10139103E-03	-.11656822E-03	-.86489789E-04
5	-.10246698E-03	-.12148365E-03	-.83796061E-04
6	-.10355225E-03	-.12627355E-03	-.81244071E-04
7	-.10464643E-03	-.13094862E-03	-.78822464E-04
8	-.10574912E-03	-.13551852E-03	-.76520979E-04
9	-.10685997E-03	-.13999202E-03	-.74330327E-04
10	-.10797866E-03	-.14437704E-03	-.72242076E-04
11	-.10910491E-03	-.14868082E-03	-.70248563E-04
12	-.11023844E-03	-.15290993E-03	-.68342806E-04
13	-.11137903E-03	-.15707037E-03	-.66518438E-04
14	-.11252644E-03	-.16116762E-03	-.64769639E-04
15	-.10677383E-03	-.15496529E-03	-.59458584E-04
16	-.10785331E-03	-.15868287E-03	-.57947922E-04
17	-.10893828E-03	-.16235396E-03	-.56493792E-04
18	-.11002860E-03	-.16598221E-03	-.55092325E-04
19	-.11112414E-03	-.16957098E-03	-.53739966E-04
20	-.11222478E-03	-.17312336E-03	-.52433441E-04
21	-.11333041E-03	-.17664220E-03	-.51169733E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1299.0000	28.8198	41.0004
2	1330.7109	29.1469	109.1087
3	1362.8636	29.4834	177.9968
4	1395.4581	29.8292	247.6866
5	1428.4944	30.1842	318.1998
6	1461.9725	30.5480	389.5576
7	1495.8924	30.9206	461.7807
8	1530.2541	31.3017	534.8895
9	1565.0576	31.6912	608.9038
10	1600.3029	32.0889	683.8431
11	1635.9900	32.4945	759.7263
12	1672.1189	32.9078	836.5718
13	1708.6896	33.3287	914.3976
14	1745.7021	33.7568	993.2209
15	1783.1564	34.1946	1073.0708
16	1821.0525	34.6421	1153.9527
17	1859.3904	35.0967	1235.8948
18	1898.1701	35.5581	1318.9133
19	1937.3916	36.0262	1403.0243
20	1977.0549	36.5006	1488.2430
21	2017.1600	36.9812	1574.5841

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	-.39654017E-03	.41441811E+08
2	-.83363965E-03	.42597774E+08
3	-.12520289E-02	.43738654E+08
4	-.16493281E-02	.44876342E+08
5	-.20110704E-02	.46011657E+08
6	-.23224263E-02	.47144766E+08
7	-.25700160E-02	.48275716E+08
8	-.27376017E-02	.49404518E+08
9	-.28095969E-02	.50531171E+08
10	-.27692593E-02	.51655671E+08
11	-.26002374E-02	.52778805E+08
12	-.22862444E-02	.53899119E+08
13	-.18106216E-02	.55017275E+08
14	-.11577544E-02	.56133243E+08
15	-.10354688E-01	.61212134E+08
16	-.10392026E-01	.62406786E+08
17	-.10586727E-01	.63599383E+08
18	-.10964473E-01	.64789916E+08
19	-.11555585E-01	.65978373E+08
20	-.12396321E-01	.67164742E+08
21	-.13528466E-01	.68349013E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-2 DE 47.0 M V FRANCOLÍ (SER) XH3

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	47.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	3.8800 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	3.0800 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	32.500	10.0500	10.0500
2	14.500	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	50.0000 T
REACCION VERTICAL TABLERO	=	2581.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

1

FASE ELASTICA

REACCION DEL TABLERO = 50.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.27311601E-02	.73700075E-01
2	.15760364E-04	.27126417E-02	.67296355E-01
3	.28213277E-04	.26609727E-02	.60976627E-01
4	.38077503E-04	.25830810E-02	.54810325E-01
5	.45897461E-04	.24844104E-02	.48852424E-01
6	.52090267E-04	.23692748E-02	.43146493E-01
7	.56978842E-04	.22411186E-02	.37727031E-01
8	.60815552E-04	.21027102E-02	.32621267E-01
9	.63799328E-04	.19562877E-02	.27850571E-01
10	.66088213E-04	.18036699E-02	.23431567E-01
11	.67808673E-04	.16463410E-02	.19377013E-01
12	.69062566E-04	.14855173E-02	.15696502E-01
13	.69932429E-04	.13221982E-02	.12397036E-01
14	.70485510E-04	.11572071E-02	.94834803E-02
15	.70776876E-04	.99122383E-03	.69589398E-02
16	.70851828E-04	.82481010E-03	.48250654E-02
17	.70747790E-04	.65843055E-03	.30823055E-02
18	.70495796E-04	.49246934E-03	.17301141E-02
19	.70121671E-04	.32724381E-03	.76712337E-03
20	.69646974E-04	.16301566E-03	.19128696E-03
21	.69089754E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2581.0000	50.0000	.0000
2	2612.7109	50.0000	117.5000
3	2644.8636	50.0000	235.0000
4	2677.4581	50.0000	352.5000
5	2710.4944	50.0000	470.0000
6	2743.9725	50.0000	587.5000
7	2777.8924	50.0000	705.0000
8	2812.2541	50.0000	822.5000
9	2847.0576	50.0000	940.0000
10	2882.3029	50.0000	1057.5000
11	2917.9900	50.0000	1175.0000
12	2954.1189	50.0000	1292.5000
13	2990.6896	50.0000	1410.0000
14	3027.7021	50.0000	1527.5000
15	3065.1564	50.0000	1645.0000
16	3103.0525	50.0000	1762.5000
17	3141.3904	50.0000	1880.0000
18	3180.1701	50.0000	1997.5000
19	3219.3916	50.0000	2115.0000
20	3259.0549	50.0000	2232.5000
21	3299.1600	50.0000	2350.0000

1

FASE FINAL EN ITERACION NUMERO 4

REACCION DEL TABLERO = 50.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.29805051E-02	.78821032E-01
2	.18080538E-04	.29592604E-02	.71833487E-01
3	.32362225E-04	.28999902E-02	.64942295E-01
4	.43649460E-04	.28106764E-02	.58227067E-01
5	.52558232E-04	.26976324E-02	.51750704E-01
6	.59564505E-04	.25658882E-02	.45562843E-01
7	.65039660E-04	.24194783E-02	.39702518E-01
8	.69276023E-04	.22616574E-02	.34200234E-01
9	.72505515E-04	.20950641E-02	.29079600E-01
10	.74913473E-04	.19218468E-02	.24358621E-01
11	.76648975E-04	.17437609E-02	.20050734E-01
12	.77832651E-04	.15622450E-02	.16165632E-01
13	.78562642E-04	.13784805E-02	.12709944E-01
14	.78919189E-04	.11934394E-02	.96877738E-02
15	.73261488E-04	.10146271E-02	.70958995E-02
16	.73074906E-04	.84268179E-03	.49136474E-02
17	.72697961E-04	.67139867E-03	.31347764E-02
18	.72164809E-04	.50118492E-03	.17572360E-02
19	.71503892E-04	.33237420E-03	.77810819E-03
20	.70738953E-04	.16523885E-03	.19376489E-03
21	.69889859E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.21699711E-03	-.21699711E-03	-.21699711E-03
2	-.20150026E-03	-.22043058E-03	-.18347396E-03
3	-.20134768E-03	-.23675195E-03	-.16756151E-03
4	-.20130621E-03	-.25111025E-03	-.15368465E-03
5	-.20134742E-03	-.26378660E-03	-.14153616E-03
6	-.20145065E-03	-.27501282E-03	-.13086672E-03
7	-.20160087E-03	-.28498171E-03	-.12147201E-03
8	-.20178712E-03	-.29385496E-03	-.11318309E-03
9	-.20200144E-03	-.30176903E-03	-.10585913E-03
10	-.20223804E-03	-.30883991E-03	-.99381842E-04
11	-.20249275E-03	-.31516675E-03	-.93651208E-04
12	-.20276260E-03	-.32083473E-03	-.88582098E-04
13	-.20304547E-03	-.32591744E-03	-.84101631E-04
14	-.20333992E-03	-.33047874E-03	-.80147067E-04
15	-.19024694E-03	-.31171449E-03	-.72442468E-04
16	-.19051711E-03	-.31510983E-03	-.69578141E-04
17	-.19079863E-03	-.31816546E-03	-.67066701E-04
18	-.19109122E-03	-.32091571E-03	-.64874968E-04
19	-.19139470E-03	-.32339088E-03	-.62973709E-04
20	-.19170897E-03	-.32561780E-03	-.61337077E-04
21	-.19203397E-03	-.32762030E-03	-.59942138E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2581.0000	57.6915	.0000
2	2612.7109	57.7301	135.6439
3	2644.8636	57.6682	271.2568
4	2677.4581	57.5234	406.6238
5	2710.4944	57.3097	541.5673
6	2743.9725	57.0385	675.9391
7	2777.8924	56.7187	809.6150
8	2812.2541	56.3580	942.4903
9	2847.0576	55.9624	1074.4760
10	2882.3029	55.5371	1205.4965
11	2917.9900	55.0860	1335.4867
12	2954.1189	54.6129	1464.3907
13	2990.6896	54.1206	1592.1601
14	3027.7021	53.6115	1718.7527
15	3065.1564	53.1083	1844.1100
16	3103.0525	52.6132	1968.3364
17	3141.3904	52.1074	2091.3858
18	3180.1701	51.5922	2213.2346
19	3219.3916	51.0684	2333.8616
20	3259.0549	50.5369	2453.2477
21	3299.1600	49.9983	2571.3756

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	.92579572E-03	.75012716E+07
3	.17868475E-02	.83800554E+07
4	.25211366E-02	.93118513E+07
5	.30608979E-02	.10297545E+08
6	.33437774E-02	.11337911E+08
7	.33112518E-02	.12433703E+08
8	.28485353E-02	.13581778E+08
9	.19983538E-02	.14789668E+08
10	.66764232E-03	.16055135E+08
11	-.11942023E-02	.17378926E+08
12	-.36367631E-02	.18761779E+08
13	-.67087199E-02	.20204427E+08
14	-.10457937E-01	.21707598E+08
15	.22834249E-01	.25108097E+08
16	.21596402E-01	.26864402E+08
17	.21006433E-01	.28688454E+08
18	.21082855E-01	.30581003E+08
19	.21854461E-01	.32542793E+08
20	.23359980E-01	.34574565E+08
21	.25650022E-01	.36677053E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-2 DE 47.0 M V FRANCOLÍ (SER) ZH3

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	47.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	3.8800 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	3.0800 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

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DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	32.500	10.0500	10.0500
2	14.500	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0390 T/M2
REACCION HORIZONTAL TABLERO	=	50.0000 T
REACCION VERTICAL TABLERO	=	2581.0000 T
MOMENTO EXTERIOR EN CABEZA	=	310.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

1

1

FASE ELASTICA

REACCION DEL TABLERO = 50.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.80532537E-05	.13829383E-02	.39364860E-01
2	.10806142E-04	.13607786E-02	.36139725E-01
3	.13422917E-04	.13323094E-02	.32974143E-01
4	.15914696E-04	.12978377E-02	.29882573E-01
5	.18291468E-04	.12576455E-02	.26878786E-01
6	.20562234E-04	.12119924E-02	.23975917E-01
7	.22735125E-04	.11611180E-02	.21186512E-01
8	.24817504E-04	.11052436E-02	.18522579E-01
9	.26816058E-04	.10445742E-02	.15995623E-01
10	.28736868E-04	.97929952E-03	.13616688E-01
11	.30585482E-04	.90959575E-03	.11396385E-01
12	.32366969E-04	.83562662E-03	.93449290E-02
13	.34085970E-04	.75754442E-03	.74721619E-02
14	.35746742E-04	.67549098E-03	.57875810E-02
15	.37353199E-04	.58959855E-03	.43003615E-02
16	.38908942E-04	.49999054E-03	.30193783E-02
17	.40417294E-04	.40678221E-03	.19532262E-02
18	.41881323E-04	.31008133E-03	.11102378E-02
19	.43303868E-04	.20998874E-03	.49850078E-03
20	.44687558E-04	.10659881E-03	.12587363E-03
21	.46034834E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2581.0000	50.0000	310.0000
2	2612.7109	50.1876	427.7188
3	2644.8636	50.3838	545.8885
4	2677.4581	50.5887	664.5295
5	2710.4944	50.8021	783.6620
6	2743.9725	51.0242	903.3062
7	2777.8924	51.2549	1023.4824
8	2812.2541	51.4942	1144.2109
9	2847.0576	51.7421	1265.5118
10	2882.3029	51.9986	1387.4054
11	2917.9900	52.2638	1509.9120
12	2954.1189	52.5375	1633.0518
13	2990.6896	52.8199	1756.8451
14	3027.7021	53.1109	1881.3120
15	3065.1564	53.4105	2006.4729
16	3103.0525	53.7187	2132.3480
17	3141.3904	54.0355	2258.9576
18	3180.1701	54.3610	2386.3218
19	3219.3916	54.6950	2514.4609
20	3259.0549	55.0377	2643.3952
21	3299.1600	55.3890	2773.1450

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 50.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.80107275E-05	.13907122E-02	.39090179E-01
2	.10958574E-04	.13684233E-02	.35846838E-01
3	.13757648E-04	.13393817E-02	.32663879E-01
4	.16419338E-04	.13039238E-02	.29556770E-01
5	.18953858E-04	.12623603E-02	.26540220E-01
6	.21370398E-04	.12149793E-02	.23628234E-01
7	.23677250E-04	.11620483E-02	.20834165E-01
8	.25881913E-04	.11038163E-02	.18170760E-01
9	.27991185E-04	.10405154E-02	.15650199E-01
10	.30011242E-04	.97236251E-03	.13284138E-01
11	.31947703E-04	.89956075E-03	.11083737E-01
12	.33805696E-04	.82230051E-03	.90596950E-02
13	.35589903E-04	.74076068E-03	.72222770E-02
14	.37304610E-04	.65510962E-03	.55813403E-02
15	.36156609E-04	.56879269E-03	.41437834E-02
16	.37629468E-04	.48209405E-03	.29083136E-02
17	.39048520E-04	.39199742E-03	.18806031E-02
18	.40416602E-04	.29862590E-03	.10684911E-02
19	.41736330E-04	.20209620E-03	.47953528E-03
20	.43010119E-04	.10251912E-03	.12102606E-03
21	.44240200E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.20187338E-03	-.22390288E-03	-.18024441E-03
2	-.20156504E-03	-.23170112E-03	-.17197689E-03
3	-.20131937E-03	-.23915290E-03	-.16417372E-03
4	-.20113257E-03	-.24628575E-03	-.15680035E-03
5	-.20100116E-03	-.25312427E-03	-.14982575E-03
6	-.20092197E-03	-.25969057E-03	-.14322190E-03
7	-.20089207E-03	-.26600451E-03	-.13696349E-03
8	-.20090875E-03	-.27208401E-03	-.13102759E-03
9	-.20096953E-03	-.27794529E-03	-.12539333E-03
10	-.20107210E-03	-.28360301E-03	-.12004175E-03
11	-.20121431E-03	-.28907050E-03	-.11495552E-03
12	-.20139418E-03	-.29435985E-03	-.11011880E-03
13	-.20160985E-03	-.29948209E-03	-.10551711E-03
14	-.20185959E-03	-.30444727E-03	-.10113714E-03
15	-.18904087E-03	-.28847155E-03	-.91418027E-04
16	-.18930942E-03	-.29279045E-03	-.87709852E-04
17	-.18960511E-03	-.29698854E-03	-.84174107E-04
18	-.18992678E-03	-.30107243E-03	-.80801951E-04
19	-.19027330E-03	-.30504821E-03	-.77585210E-04
20	-.19064363E-03	-.30892146E-03	-.74516312E-04
21	-.19103678E-03	-.31269733E-03	-.71588239E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2581.0000	53.5898	310.0004
2	2612.7109	53.7633	436.1422
3	2644.8636	53.9266	562.6797
4	2677.4581	54.0801	689.5895
5	2710.4944	54.2240	816.8484
6	2743.9725	54.3582	944.4338
7	2777.8924	54.4830	1072.3233
8	2812.2541	54.5984	1200.4948
9	2847.0576	54.7045	1328.9259
10	2882.3029	54.8012	1457.5949
11	2917.9900	54.8885	1586.4795
12	2954.1189	54.9665	1715.5576
13	2990.6896	55.0349	1844.8072
14	3027.7021	55.0939	1974.2057
15	3065.1564	55.1534	2103.7652
16	3103.0525	55.2141	2233.4448
17	3141.3904	55.2664	2363.2578
18	3180.1701	55.3100	2493.1843
19	3219.3916	55.3449	2623.2040
20	3259.0549	55.3710	2753.2964
21	3299.1600	55.3881	2883.4406

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	-.35900634E-03	.38693214E+08
2	-.12948713E-02	.39793128E+08
3	-.22405628E-02	.40890867E+08
4	-.31257318E-02	.41986674E+08
5	-.38757131E-02	.43080579E+08
6	-.44147174E-02	.44172580E+08
7	-.46656941E-02	.45262667E+08
8	-.45501447E-02	.46350824E+08
9	-.39870168E-02	.47437035E+08
10	-.28935843E-02	.48521283E+08
11	-.11837882E-02	.49603551E+08
12	.12312234E-02	.50683823E+08
13	.44441150E-02	.51762085E+08
14	.85511946E-02	.52838321E+08
15	-.12795584E-01	.58103048E+08
16	-.92642057E-02	.59262188E+08
17	-.64240075E-02	.60419469E+08
18	-.43129869E-02	.61574878E+08
19	-.29823656E-02	.62728404E+08
20	-.24969330E-02	.63880034E+08
21	-.29368117E-02	.65029758E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-2 DE 47.0 M V FRANCOLÍ (SER) XH4

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	47.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	3.8800 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	3.0800 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	32.500	10.0500	10.0500
2	14.500	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	59.0000 T
REACCION VERTICAL TABLERO	=	2067.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

1

1

FASE ELASTICA

REACCION DEL TABLERO = 59.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.32227689E-02	.86966089E-01
2	.18597230E-04	.32009172E-02	.79409699E-01
3	.33291667E-04	.31399477E-02	.71952420E-01
4	.44931454E-04	.30480356E-02	.64676183E-01
5	.54159004E-04	.29316043E-02	.57645860E-01
6	.61466515E-04	.27957443E-02	.50912862E-01
7	.67235033E-04	.26445200E-02	.44517897E-01
8	.71762351E-04	.24811981E-02	.38493095E-01
9	.75283207E-04	.23084195E-02	.32863674E-01
10	.77984092E-04	.21283305E-02	.27649250E-01
11	.80014234E-04	.19426824E-02	.22864875E-01
12	.81493828E-04	.17529105E-02	.18521873E-01
13	.82520266E-04	.15601939E-02	.14628503E-01
14	.83172902E-04	.13655044E-02	.11190507E-01
15	.83516714E-04	.11696441E-02	.82115490E-02
16	.83605158E-04	.97327592E-03	.56935772E-02
17	.83482392E-04	.77694805E-03	.36371205E-02
18	.83185039E-04	.58111382E-03	.20415347E-02
19	.82743572E-04	.38614770E-03	.90520558E-03
20	.82183430E-04	.19235847E-03	.22571861E-03
21	.81525909E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2067.0000	59.0000	.0000
2	2098.7109	59.0000	138.6500
3	2130.8636	59.0000	277.3000
4	2163.4581	59.0000	415.9500
5	2196.4944	59.0000	554.6000
6	2229.9725	59.0000	693.2500
7	2263.8924	59.0000	831.9000
8	2298.2541	59.0000	970.5500
9	2333.0576	59.0000	1109.2000
10	2368.3029	59.0000	1247.8500
11	2403.9900	59.0000	1386.5000
12	2440.1189	59.0000	1525.1500
13	2476.6896	59.0000	1663.8000
14	2513.7021	59.0000	1802.4500
15	2551.1564	59.0000	1941.1000
16	2589.0525	59.0000	2079.7500
17	2627.3904	59.0000	2218.4000
18	2666.1701	59.0000	2357.0500
19	2705.3916	59.0000	2495.7000
20	2745.0549	59.0000	2634.3500
21	2785.1600	59.0000	2773.0000

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 59.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.33472508E-02	.88784633E-01
2	.20089427E-04	.33236458E-02	.80937085E-01
3	.35978597E-04	.32577658E-02	.73196614E-01
4	.48560739E-04	.31584321E-02	.65651791E-01
5	.58517639E-04	.30326150E-02	.58372728E-01
6	.66375077E-04	.28858661E-02	.51414897E-01
7	.72542644E-04	.27226378E-02	.44822066E-01
8	.77342329E-04	.25465229E-02	.38628594E-01
9	.81029344E-04	.23604362E-02	.32861220E-01
10	.83807495E-04	.21667529E-02	.27540494E-01
11	.85840648E-04	.19674163E-02	.22681910E-01
12	.87261365E-04	.17640215E-02	.18296816E-01
13	.88177508E-04	.15578808E-02	.14393160E-01
14	.88677281E-04	.13500764E-02	.10976080E-01
15	.82673745E-04	.11487390E-02	.80427347E-02
16	.82553675E-04	.95459675E-03	.55713705E-02
17	.82218246E-04	.76098974E-03	.35557108E-02
18	.81705337E-04	.56837953E-03	.19939379E-02
19	.81046522E-04	.37714610E-03	.88324852E-03
20	.80268197E-04	.18760130E-03	.22002852E-03
21	.79392484E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.17378265E-03	-.17378265E-03	-.17378265E-03
2	-.15971300E-03	-.18074663E-03	-.13968384E-03
3	-.16017041E-03	-.19953100E-03	-.12260876E-03
4	-.16073822E-03	-.21614602E-03	-.10775845E-03
5	-.16138317E-03	-.23090212E-03	-.94790096E-04
6	-.16208132E-03	-.24405454E-03	-.83426851E-04
7	-.16281541E-03	-.25581508E-03	-.73442870E-04
8	-.16357302E-03	-.26636097E-03	-.64652181E-04
9	-.16434525E-03	-.27584163E-03	-.56900339E-04
10	-.16512577E-03	-.28438384E-03	-.50058081E-04
11	-.16591015E-03	-.29209590E-03	-.44016431E-04
12	-.16669534E-03	-.29907083E-03	-.38682919E-04
13	-.16747933E-03	-.30538895E-03	-.33978578E-04
14	-.16826083E-03	-.31111993E-03	-.29835597E-04
15	-.15797639E-03	-.29504946E-03	-.25037013E-04
16	-.15866926E-03	-.29942328E-03	-.22042928E-04
17	-.15936159E-03	-.30340796E-03	-.19426139E-04
18	-.16005347E-03	-.30704137E-03	-.17150832E-04
19	-.16074506E-03	-.31035694E-03	-.15185505E-04
20	-.16143663E-03	-.31338433E-03	-.13502346E-04
21	-.16212850E-03	-.31614992E-03	-.12076708E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2067.0000	65.9054	.0000
2	2098.7109	65.9616	154.9937
3	2130.8636	65.9279	310.0101
4	2163.4581	65.8192	464.8554
5	2196.4944	65.6475	619.3672
6	2229.9725	65.4221	773.4082
7	2263.8924	65.1510	926.8613
8	2298.2541	64.8404	1079.6262
9	2333.0576	64.4955	1231.6157
10	2368.3029	64.1206	1382.7544
11	2403.9900	63.7194	1532.9757
12	2440.1189	63.2948	1682.2212
13	2476.6896	62.8494	1830.4388
14	2513.7021	62.3852	1977.5819
15	2551.1564	61.9230	2123.8386
16	2589.0525	61.4649	2268.8207
17	2627.3904	60.9938	2412.7135
18	2666.1701	60.5107	2555.4879
19	2705.3916	60.0166	2697.1172
20	2745.0549	59.5122	2837.5768
21	2785.1600	58.9981	2976.8437

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	.68876504E-03	.77143664E+07
3	.18629114E-02	.86139092E+07
4	.37113051E-02	.95669963E+07
5	.65587471E-02	.10574396E+08
6	.10754678E-01	.11636882E+08
7	.16659797E-01	.12755221E+08
8	.24633088E-01	.13930172E+08
9	.35023175E-01	.15162490E+08
10	.48162308E-01	.16452923E+08
11	.64327692E-01	.17802215E+08
12	.83883160E-01	.19211103E+08
13	.10705596E+00	.20680314E+08
14	.13408902E+00	.22210571E+08
15	-.50179147E-01	.25608097E+08
16	-.36521777E-01	.27391286E+08
17	-.27874826E-01	.29242748E+08
18	-.24494325E-01	.31163232E+08
19	-.26681895E-01	.33153483E+08
20	-.34782957E-01	.35214242E+08
21	-.49185239E-01	.37346244E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-2 DE 47.0 M V FRANCOLÍ (SER) ZH4

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	47.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	3.8800 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	3.0800 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	32.500	10.0500	10.0500
2	14.500	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0390 T/M2
REACCION HORIZONTAL TABLERO	=	50.0000 T
REACCION VERTICAL TABLERO	=	2067.0000 T
MOMENTO EXTERIOR EN CABEZA	=	1694.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

1

1

FASE ELASTICA

REACCION DEL TABLERO = 50.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.44007135E-04	.27226480E-02	.68505532E-01
2	.45772346E-04	.26171571E-02	.62230449E-01
3	.47454256E-04	.25076158E-02	.56208067E-01
4	.49059858E-04	.23942117E-02	.50447680E-01
5	.50595435E-04	.22771168E-02	.44958163E-01
6	.52066646E-04	.21564888E-02	.39747999E-01
7	.53478606E-04	.20324731E-02	.34825319E-01
8	.54835945E-04	.19052035E-02	.30197924E-01
9	.56142869E-04	.17748034E-02	.25873315E-01
10	.57403202E-04	.16413868E-02	.21858711E-01
11	.58620433E-04	.15050590E-02	.18161077E-01
12	.59797750E-04	.13659177E-02	.14787138E-01
13	.60938072E-04	.12240531E-02	.11743397E-01
14	.62044077E-04	.10795491E-02	.90361556E-02
15	.63118225E-04	.93248335E-03	.66715232E-02
16	.64162782E-04	.78292816E-03	.46554340E-02
17	.65179837E-04	.63095059E-03	.29936584E-02
18	.66171321E-04	.47661298E-03	.16918149E-02
19	.67139017E-04	.31997333E-03	.75538066E-03
20	.68084581E-04	.16108560E-03	.18970126E-03
21	.69009547E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2067.0000	50.0000	1694.0000
2	2098.7109	50.1876	1811.7188
3	2130.8636	50.3838	1929.8885
4	2163.4581	50.5887	2048.5295
5	2196.4944	50.8021	2167.6620
6	2229.9725	51.0242	2287.3062
7	2263.8924	51.2549	2407.4824
8	2298.2541	51.4942	2528.2109
9	2333.0576	51.7421	2649.5118
10	2368.3029	51.9986	2771.4054
11	2403.9900	52.2638	2893.9120
12	2440.1189	52.5375	3017.0518
13	2476.6896	52.8199	3140.8451
14	2513.7021	53.1109	3265.3120
15	2551.1564	53.4105	3390.4729
16	2589.0525	53.7187	3516.3480
17	2627.3904	54.0355	3642.9576
18	2666.1701	54.3610	3770.3218
19	2705.3916	54.6950	3898.4609
20	2745.0549	55.0377	4027.3952
21	2785.1600	55.3890	4157.1450

1

FASE FINAL EN ITERACION NUMERO 4

REACCION DEL TABLERO = 50.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.42584944E-04	.26680436E-02	.66624330E-01
2	.44617661E-04	.25655805E-02	.60473886E-01
3	.46547257E-04	.24584618E-02	.54569748E-01
4	.48381562E-04	.23469204E-02	.48922580E-01
5	.50127598E-04	.22311721E-02	.43542518E-01
6	.51791676E-04	.21114170E-02	.38439210E-01
7	.53379485E-04	.19878409E-02	.33621851E-01
8	.54896161E-04	.18606170E-02	.29099215E-01
9	.56346357E-04	.17299070E-02	.24879682E-01
10	.57734289E-04	.15958623E-02	.20971265E-01
11	.59063791E-04	.14586245E-02	.17381631E-01
12	.60338350E-04	.13183270E-02	.14118126E-01
13	.61563548E-04	.11750923E-02	.11187795E-01
14	.62772564E-04	.10289973E-02	.85974328E-02
15	.59516444E-04	.88530777E-03	.63496228E-02
16	.60611634E-04	.74415727E-03	.44344974E-02
17	.61701829E-04	.60043895E-03	.28540951E-02
18	.62789493E-04	.45416165E-03	.16144388E-02
19	.63875602E-04	.30533016E-03	.72153613E-03
20	.64962881E-04	.15394495E-03	.18138750E-03
21	.66054094E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.16137013E-03	-.27847873E-03	-.46390787E-04
2	-.16180918E-03	-.28450775E-03	-.41341498E-04
3	-.16228030E-03	-.29028526E-03	-.36602707E-04
4	-.16278161E-03	-.29583090E-03	-.32151390E-04
5	-.16331138E-03	-.30116227E-03	-.27966864E-04
6	-.16386802E-03	-.30629513E-03	-.24030498E-04
7	-.16445007E-03	-.31124366E-03	-.20325466E-04
8	-.16505618E-03	-.31602062E-03	-.16836540E-04
9	-.16568507E-03	-.32063755E-03	-.13549906E-04
10	-.16633559E-03	-.32510488E-03	-.10453005E-04
11	-.16700663E-03	-.32943206E-03	-.75343997E-05
12	-.16769720E-03	-.33362766E-03	-.47836530E-05
13	-.16840320E-03	-.33770296E-03	-.21816241E-05
14	-.16908473E-03	-.34170928E-03	.40119472E-06
15	-.15855300E-03	-.32222322E-03	.21413992E-05
16	-.15911191E-03	-.32579390E-03	.45395068E-05
17	-.15963758E-03	-.32931760E-03	.69573625E-05
18	-.16012795E-03	-.33279906E-03	.94036820E-05
19	-.16058059E-03	-.33623849E-03	.11883539E-04
20	-.16099214E-03	-.33964007E-03	.14407636E-04
21	-.16135831E-03	-.34300706E-03	.16987748E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2067.0000	55.5147	1694.0000
2	2098.7109	55.5719	1824.5281
3	2130.8636	55.6223	1955.1825
4	2163.4581	55.6659	2085.9473
5	2196.4944	55.7026	2216.8066
6	2229.9725	55.7322	2347.7438
7	2263.8924	55.7547	2478.7423
8	2298.2541	55.7698	2609.7851
9	2333.0576	55.7775	2740.8546
10	2368.3029	55.7775	2871.9332
11	2403.9900	55.7696	3003.0025
12	2440.1189	55.7536	3134.0438
13	2476.6896	55.7294	3265.0355
14	2513.7021	55.6965	3395.9622
15	2551.1564	55.6680	3526.8274
16	2589.0525	55.6441	3657.6062
17	2627.3904	55.6117	3788.3127
18	2666.1701	55.5704	3918.9696
19	2705.3916	55.5197	4049.5068
20	2745.0549	55.4592	4179.9220
21	2785.1600	55.3882	4310.1839

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.80410632E-06	.39710432E+08
2	.26502378E-03	.40813097E+08
3	.54064220E-03	.41913664E+08
4	.83169492E-03	.43012129E+08
5	.11435245E-02	.44108489E+08
6	.14819434E-02	.45202740E+08
7	.18427907E-02	.46298853E+08
8	.22644573E-02	.47384938E+08
9	.27222287E-02	.48472875E+08
10	.32333599E-02	.49558711E+08
11	.38043978E-02	.50642451E+08
12	.44415544E-02	.51724098E+08
13	.76251735E-02	.51761771E+08
14	.88568731E-02	.50565122E+08
15	-.55110256E-02	.54278207E+08
16	.10452699E-01	.53052973E+08
17	.33066610E-01	.47108298E+08
18	.18789162E-01	.50917796E+08
19	.16107473E-01	.48727543E+08
20	.44340049E-02	.46989536E+08
21	-.92135787E-02	.45037264E+08

ÉSTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-2 DE 47.0 M V FRANCOLÍ (SER) XH51

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	47.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	3.8800 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	3.0800 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	300.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	32.500	10.0500	10.0500
2	14.500	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	71.0000 T
REACCION VERTICAL TABLERO	=	1964.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

1

1

FASE ELASTICA

REACCION DEL TABLERO = 71.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.40413870E-02	.10905641E+00
2	.23321127E-04	.40139847E-02	.99580619E-01
3	.41748110E-04	.39375283E-02	.90229111E-01
4	.56344528E-04	.38222695E-02	.81104631E-01
5	.67915975E-04	.36762634E-02	.72288530E-01
6	.77079672E-04	.35058935E-02	.63845278E-01
7	.84313457E-04	.33162566E-02	.55825923E-01
8	.89990762E-04	.31114491E-02	.48270756E-01
9	.94405953E-04	.28947830E-02	.41211401E-01
10	.97792892E-04	.26689494E-02	.34672457E-01
11	.10033871E-03	.24361447E-02	.28672800E-01
12	.10219414E-03	.21981686E-02	.23226628E-01
13	.10348130E-03	.19565000E-02	.18344300E-01
14	.10429972E-03	.17123573E-02	.14033016E-01
15	.10473086E-03	.14667463E-02	.10297371E-01
16	.10484177E-03	.12204985E-02	.71398072E-02
17	.10468782E-03	.97430123E-03	.45609884E-02
18	.10431494E-03	.72872299E-03	.25601065E-02
19	.10376133E-03	.48423338E-03	.11351376E-02
20	.10305891E-03	.24121960E-03	.28305357E-03
21	.10223437E-03	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1964.0000	71.0000	.0000
2	1995.7109	71.0000	166.8500
3	2027.8636	71.0000	333.7000
4	2060.4581	71.0000	500.5500
5	2093.4944	71.0000	667.4000
6	2126.9725	71.0000	834.2500
7	2160.8924	71.0000	1001.1000
8	2195.2541	71.0000	1167.9500
9	2230.0576	71.0000	1334.8000
10	2265.3029	71.0000	1501.6500
11	2300.9900	71.0000	1668.5000
12	2337.1189	71.0000	1835.3500
13	2373.6896	71.0000	2002.2000
14	2410.7021	71.0000	2169.0500
15	2448.1564	71.0000	2335.9000
16	2486.0525	71.0000	2502.7500
17	2524.3904	71.0000	2669.6000
18	2563.1701	71.0000	2836.4500
19	2602.3916	71.0000	3003.3000
20	2642.0549	71.0000	3170.1500
21	2682.1600	71.0000	3337.0000

FASE FINAL EN ITERACION NUMERO 5

REACCION DEL TABLERO = 71.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.44029954E-02	.11759595E+00
2	.26044770E-04	.43723928E-02	.10727288E+00
3	.46660765E-04	.42869638E-02	.97088651E-01
4	.63004478E-04	.41581071E-02	.87158172E-01
5	.75956322E-04	.39948282E-02	.77572512E-01
6	.86194367E-04	.38043011E-02	.68403824E-01
7	.94246436E-04	.35922831E-02	.59709132E-01
8	.10052733E-03	.33634240E-02	.51533285E-01
9	.10536587E-03	.31214995E-02	.43911274E-01
10	.10902470E-03	.28695905E-02	.36870059E-01
11	.11171516E-03	.26102212E-02	.30430042E-01
12	.11360841E-03	.23454660E-02	.24606238E-01
13	.11498978E-03	.20768631E-02	.19409366E-01
14	.11612588E-03	.18053022E-02	.14847299E-01
15	.10786229E-03	.15421161E-02	.10917885E-01
16	.10846106E-03	.12879362E-02	.75922978E-02
17	.10894737E-03	.10324813E-02	.48655834E-02
18	.10937875E-03	.77594812E-03	.27404803E-02
19	.10984618E-03	.51835882E-03	.12194546E-02
20	.11037587E-03	.25959792E-03	.30511162E-03
21	.11055853E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.17206889E-03	-.17206889E-03	-.17206889E-03
2	-.16052787E-03	-.18779674E-03	-.13456123E-03
3	-.16136496E-03	-.21241183E-03	-.11265112E-03
4	-.16240618E-03	-.23429429E-03	-.93668299E-04
5	-.16358201E-03	-.25381812E-03	-.77143712E-04
6	-.16484256E-03	-.27129260E-03	-.62702234E-04
7	-.16615208E-03	-.28697601E-03	-.50040472E-04
8	-.16748501E-03	-.30108583E-03	-.38910545E-04
9	-.16882318E-03	-.31380661E-03	-.29108039E-04
10	-.17015387E-03	-.32529602E-03	-.20462960E-04
11	-.17146836E-03	-.33568964E-03	-.12832834E-04
12	-.17276084E-03	-.34510480E-03	-.60973050E-05
13	-.17389941E-03	-.35374342E-03	.19511579E-06
14	-.17472554E-03	-.36180434E-03	.65469678E-05
15	-.16250703E-03	-.34134270E-03	.10935525E-04
16	-.16276315E-03	-.34768925E-03	.16739902E-04
17	-.16276786E-03	-.35364364E-03	.22660559E-04
18	-.16249088E-03	-.35926326E-03	.28812558E-04
19	-.16185459E-03	-.36463064E-03	.35429143E-04
20	-.16083613E-03	-.36977764E-03	.42586598E-04
21	-.15999028E-03	-.37447383E-03	.48965344E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1964.0000	79.6470	.0000
2	1995.7109	79.7251	187.2859
3	2027.8636	79.6920	374.6207
4	2060.4581	79.5659	561.7654
5	2093.4944	79.3612	748.5187
6	2126.9725	79.0894	934.7101
7	2160.8924	78.7601	1120.1934
8	2195.2541	78.3810	1304.8430
9	2230.0576	77.9584	1488.5492
10	2265.3029	77.4976	1671.2165
11	2300.9900	77.0031	1852.7604
12	2337.1189	76.4786	2033.1073
13	2373.6896	75.9267	2212.1914
14	2410.7021	75.3489	2389.9541
15	2448.1564	74.7724	2566.3383
16	2486.0525	74.1990	2741.3829
17	2524.3904	73.6035	2915.0527
18	2563.1701	72.9861	3087.2949
19	2602.3916	72.3462	3258.1320
20	2642.0549	71.6832	3427.3117
21	2682.1600	70.9974	3594.9662

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.63668726E+07
2	.11126852E-02	.71894688E+07
3	.22687769E-02	.80231403E+07
4	.34820626E-02	.89041876E+07
5	.47683391E-02	.98334226E+07
6	.61447003E-02	.10811637E+08
7	.76294078E-02	.11839620E+08
8	.92418153E-02	.12918157E+08
9	.11002189E-01	.14048026E+08
10	.12931973E-01	.15229999E+08
11	.15053224E-01	.16464838E+08
12	.16139342E-01	.17753316E+08
13	.14921558E-01	.17751396E+08
14	.75135942E-02	.17490078E+08
15	.11657058E-01	.19366751E+08
16	.14007893E-01	.18993340E+08
17	.17411137E-01	.18410006E+08
18	.23112519E-01	.17566552E+08
19	-.43468540E-01	.13427061E+08
20	.16358430E-01	.14240738E+08
21	.15984798E-01	.15038499E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-2 DE 47.0 M V FRANCOLÍ (SER) ZH51

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	47.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	3.8800 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	3.0800 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	300.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	32.500	10.0500	10.0500
2	14.500	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0390 T/M2
REACCION HORIZONTAL TABLERO	=	43.0000 T
REACCION VERTICAL TABLERO	=	1964.0000 T
MOMENTO EXTERIOR EN CABEZA	=	1402.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

1

1

FASE ELASTICA

REACCION DEL TABLERO = 43.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.37953570E-04	.23891067E-02	.60345445E-01
2	.39577099E-04	.22980082E-02	.54837337E-01
3	.41125369E-04	.22031828E-02	.49547725E-01
4	.42604767E-04	.21047999E-02	.44485165E-01
5	.44021027E-04	.20030146E-02	.39657831E-01
6	.45379318E-04	.18979692E-02	.35073550E-01
7	.46684309E-04	.17897944E-02	.30739827E-01
8	.47940229E-04	.16786106E-02	.26663874E-01
9	.49150917E-04	.15645285E-02	.22852628E-01
10	.50319866E-04	.14476503E-02	.19312780E-01
11	.51450261E-04	.13280704E-02	.16050788E-01
12	.52545012E-04	.12058760E-02	.13072897E-01
13	.53606785E-04	.10811476E-02	.10385156E-01
14	.54638025E-04	.95395996E-03	.79934297E-02
15	.55640979E-04	.82438213E-03	.59034161E-02
16	.56617715E-04	.69247816E-03	.41206558E-02
17	.57570140E-04	.55830743E-03	.26505444E-02
18	.58500018E-04	.42192500E-03	.14983434E-02
19	.59408977E-04	.28338193E-03	.66918942E-03
20	.60298529E-04	.14272561E-03	.16810368E-03
21	.61170074E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1964.0000	43.0000	1402.0000
2	1995.7109	43.1876	1503.2688
3	2027.8636	43.3838	1604.9885
4	2060.4581	43.5887	1707.1795
5	2093.4944	43.8021	1809.8620
6	2126.9725	44.0242	1913.0562
7	2160.8924	44.2549	2016.7824
8	2195.2541	44.4942	2121.0609
9	2230.0576	44.7421	2225.9118
10	2265.3029	44.9986	2331.3554
11	2300.9900	45.2638	2437.4120
12	2337.1189	45.5375	2544.1018
13	2373.6896	45.8199	2651.4451
14	2410.7021	46.1109	2759.4620
15	2448.1564	46.4105	2868.1729
16	2486.0525	46.7187	2977.5980
17	2524.3904	47.0355	3087.7576
18	2563.1701	47.3610	3198.6718
19	2602.3916	47.6950	3310.3609
20	2642.0549	48.0377	3422.8452
21	2682.1600	48.3890	3536.1450

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 43.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.37806872E-04	.24033884E-02	.60081204E-01
2	.39728594E-04	.23122842E-02	.54539405E-01
3	.41555839E-04	.22167750E-02	.49216919E-01
4	.43295861E-04	.21170742E-02	.44123845E-01
5	.44955161E-04	.20133793E-02	.39269799E-01
6	.46539577E-04	.19058730E-02	.34663948E-01
7	.48054372E-04	.17947251E-02	.30315048E-01
8	.49504291E-04	.16800937E-02	.26231469E-01
9	.50893629E-04	.15621261E-02	.22421222E-01
10	.52226278E-04	.14409602E-02	.18891982E-01
11	.53505770E-04	.13167251E-02	.15651113E-01
12	.54735318E-04	.11895418E-02	.12705683E-01
13	.55917850E-04	.10595243E-02	.10062487E-01
14	.57056034E-04	.92678000E-03	.77280552E-02
15	.53732028E-04	.79660402E-03	.57046087E-02
16	.54703309E-04	.66919250E-03	.39818508E-02
17	.55640546E-04	.53953847E-03	.25611606E-02
18	.56545475E-04	.40771990E-03	.14477155E-02
19	.57419687E-04	.27381083E-03	.64651461E-03
20	.58264644E-04	.13788174E-03	.16238698E-03
21	.59081520E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.16195602E-03	-.26592492E-03	-.59877463E-04
2	-.16254873E-03	-.27180237E-03	-.55281530E-04
3	-.16317347E-03	-.27745203E-03	-.50972706E-04
4	-.16382834E-03	-.28289196E-03	-.46929511E-04
5	-.16451159E-03	-.28813828E-03	-.43132658E-04
6	-.16522164E-03	-.29320548E-03	-.39564785E-04
7	-.16595703E-03	-.29810655E-03	-.36210223E-04
8	-.16671638E-03	-.30285318E-03	-.33054798E-04
9	-.16749846E-03	-.30745594E-03	-.30085663E-04
10	-.16830210E-03	-.31192436E-03	-.27291148E-04
11	-.16912621E-03	-.31626708E-03	-.24660631E-04
12	-.16996979E-03	-.32049191E-03	-.22184427E-04
13	-.17083189E-03	-.32460597E-03	-.19853692E-04
14	-.17171163E-03	-.32861572E-03	-.17660335E-04
15	-.16038740E-03	-.30815047E-03	-.15310921E-04
16	-.16119887E-03	-.31163297E-03	-.13499934E-04
17	-.16202469E-03	-.31503619E-03	-.11795217E-04
18	-.16286425E-03	-.31836431E-03	-.10191471E-04
19	-.16371697E-03	-.32162111E-03	-.86838167E-05
20	-.16458230E-03	-.32481007E-03	-.72677597E-05
21	-.16545967E-03	-.32793385E-03	-.59395695E-05

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1964.0000	47.7204	1402.0000
2	1995.7109	47.8024	1514.2403
3	2027.8636	47.8792	1626.6672
4	2060.4581	47.9509	1739.2686
5	2093.4944	48.0171	1852.0320
6	2126.9725	48.0779	1964.9448
7	2160.8924	48.1330	2077.9937
8	2195.2541	48.1823	2191.1653
9	2230.0576	48.2256	2304.4457
10	2265.3029	48.2626	2417.8205
11	2300.9900	48.2933	2531.2749
12	2337.1189	48.3173	2644.7936
13	2373.6896	48.3345	2758.3607
14	2410.7021	48.3446	2871.9599
15	2448.1564	48.3603	2985.5855
16	2486.0525	48.3819	3099.2586
17	2524.3904	48.3971	3212.9750
18	2563.1701	48.4055	3326.7192
19	2602.3916	48.4071	3440.4753
20	2642.0549	48.4014	3554.2264
21	2682.1600	48.3883	3667.9448

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	-.49087306E-04	.37018803E+08
2	-.42522583E-03	.38040857E+08
3	-.82317039E-03	.39060411E+08
4	-.12378882E-02	.40077442E+08
5	-.16652808E-02	.41091931E+08
6	-.21013522E-02	.42103856E+08
7	-.25414112E-02	.43113200E+08
8	-.29792754E-02	.44119945E+08
9	-.34064301E-02	.45124075E+08
10	-.38112623E-02	.46125574E+08
11	-.41782407E-02	.47124429E+08
12	-.44866003E-02	.48120483E+08
13	-.47113600E-02	.49114022E+08
14	-.48200660E-02	.50104877E+08
15	-.59659618E-02	.55359937E+08
16	-.59229022E-02	.56430616E+08
17	-.59610250E-02	.57504838E+08
18	-.60503447E-02	.58576596E+08
19	-.61675954E-02	.59645880E+08
20	-.60321471E-02	.60677303E+08
21	.49240679E-02	.61792895E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-2 DE 47.0 M V FRANCOLÍ (SER) XH52

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	47.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	3.8800 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	3.0800 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

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DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	32.500	10.0500	10.0500
2	14.500	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	84.0000 T
REACCION VERTICAL TABLERO	=	2375.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

1

1

FASE ELASTICA

REACCION DEL TABLERO = 84.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.45883490E-02	.12381613E+00
2	.26477412E-04	.45572380E-02	.11305788E+00
3	.47398306E-04	.44704341E-02	.10244073E+00
4	.63970206E-04	.43395761E-02	.92081346E-01
5	.77107734E-04	.41738095E-02	.82072072E-01
6	.87511648E-04	.39803817E-02	.72486109E-01
7	.95724454E-04	.37650793E-02	.63381413E-01
8	.10217013E-03	.35325532E-02	.54803728E-01
9	.10718287E-03	.32865634E-02	.46788959E-01
10	.11102820E-03	.30301654E-02	.39365033E-01
11	.11391857E-03	.27658529E-02	.32553381E-01
12	.11602511E-03	.24956691E-02	.26370124E-01
13	.11748648E-03	.22212930E-02	.20827021E-01
14	.11841566E-03	.19441080E-02	.15932247E-01
15	.11890515E-03	.16652560E-02	.11691019E-01
16	.11903107E-03	.13856810E-02	.81061099E-02
17	.11885629E-03	.11061633E-02	.51782733E-02
18	.11843294E-03	.82734848E-03	.29065918E-02
19	.11780441E-03	.54976961E-03	.12887673E-02
20	.11700692E-03	.27386630E-03	.32136209E-03
21	.11607079E-03	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2375.0000	84.0000	.0000
2	2406.7109	84.0000	197.4000
3	2438.8636	84.0000	394.8000
4	2471.4581	84.0000	592.2000
5	2504.4944	84.0000	789.6000
6	2537.9725	84.0000	987.0000
7	2571.8924	84.0000	1184.4000
8	2606.2541	84.0000	1381.8000
9	2641.0576	84.0000	1579.2000
10	2676.3029	84.0000	1776.6000
11	2711.9900	84.0000	1974.0000
12	2748.1189	84.0000	2171.4000
13	2784.6896	84.0000	2368.8000
14	2821.7021	84.0000	2566.2000
15	2859.1564	84.0000	2763.6000
16	2897.0525	84.0000	2961.0000
17	2935.3904	84.0000	3158.4000
18	2974.1701	84.0000	3355.8000
19	3013.3916	84.0000	3553.2000
20	3053.0549	84.0000	3750.6000
21	3093.1600	84.0000	3948.0000

FASE FINAL EN ITERACION NUMERO 5

REACCION DEL TABLERO = 84.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.50537641E-02	.13560958E+00
2	.29750313E-04	.50188075E-02	.12376061E+00
3	.53270448E-04	.49212581E-02	.11207021E+00
4	.71885790E-04	.47741995E-02	.10066948E+00
5	.86606816E-04	.45879707E-02	.89662157E-01
6	.98212522E-04	.43708080E-02	.79130251E-01
7	.10730976E-03	.41293193E-02	.69138415E-01
8	.11437573E-03	.38688388E-02	.59737328E-01
9	.11978883E-03	.35936955E-02	.50966359E-01
10	.12385143E-03	.33074182E-02	.42855680E-01
11	.12680682E-03	.30128947E-02	.35427953E-01
12	.12888251E-03	.27124598E-02	.28699706E-01
13	.13058210E-03	.24075889E-02	.22682866E-01
14	.13210156E-03	.20989355E-02	.17387001E-01
15	.12359255E-03	.17984950E-02	.12811436E-01
16	.12472949E-03	.15067166E-02	.89272893E-02
17	.12602367E-03	.12120816E-02	.57321059E-02
18	.12779947E-03	.91383939E-03	.32333316E-02
19	.12932522E-03	.61171788E-03	.14400996E-02
20	.13028423E-03	.30667678E-03	.36054452E-03
21	.13071729E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.19967769E-03	-.19967769E-03	-.19967769E-03
2	-.18472128E-03	-.21586985E-03	-.15506021E-03
3	-.18509450E-03	-.24337237E-03	-.12948015E-03
4	-.18568680E-03	-.26770848E-03	-.10725940E-03
5	-.18642544E-03	-.28931434E-03	-.87866882E-04
6	-.18725825E-03	-.30855071E-03	-.70876411E-04
7	-.18814780E-03	-.32571892E-03	-.55942178E-04
8	-.18906734E-03	-.34107269E-03	-.42780790E-04
9	-.18999788E-03	-.35482731E-03	-.31157896E-04
10	-.19092611E-03	-.36716670E-03	-.20878092E-04
11	-.19184290E-03	-.37824892E-03	-.11777216E-04
12	-.19271649E-03	-.38823126E-03	-.36458405E-05
13	-.19323317E-03	-.39746358E-03	.44681326E-05
14	-.19328319E-03	-.40609881E-03	.12927357E-04
15	-.17978834E-03	-.38470479E-03	.18948492E-04
16	-.17897826E-03	-.39164203E-03	.27449044E-04
17	-.17751833E-03	-.39831181E-03	.36973964E-04
18	-.17502689E-03	-.40493813E-03	.48494389E-04
19	-.17240105E-03	-.41113540E-03	.59867043E-04
20	-.17009416E-03	-.41672221E-03	.70019670E-04
21	-.16812937E-03	-.42172092E-03	.78926301E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2375.0000	96.0016	.0000
2	2406.7109	96.0772	225.7251
3	2438.8636	96.0001	451.4426
4	2471.4581	95.7967	676.8260
5	2504.4944	95.4877	901.6034
6	2537.9725	95.0898	1125.5470
7	2571.8924	94.6168	1348.4646
8	2606.2541	94.0796	1570.1929
9	2641.0576	93.4873	1790.5921
10	2676.3029	92.8477	2009.5420
11	2711.9900	92.1668	2226.9387
12	2748.1189	91.4498	2442.6988
13	2784.6896	90.7000	2656.7464
14	2821.7021	89.9181	2868.9799
15	2859.1564	89.1380	3079.3893
16	2897.0525	88.3610	3287.9602
17	2935.3904	87.5540	3494.6761
18	2974.1701	86.7141	3699.4129
19	3013.3916	85.8396	3902.1661
20	3053.0549	84.9327	4102.8525
21	3093.1600	83.9969	4301.3911

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	.27885889E-02	.75857606E+07
3	.56989150E-02	.84689385E+07
4	.87963855E-02	.94029457E+07
5	.12147131E-01	.10388702E+08
6	.15815212E-01	.11427102E+08
7	.19863174E-01	.12519032E+08
8	.24351772E-01	.13665378E+08
9	.29342009E-01	.14867016E+08
10	.34892225E-01	.16124818E+08
11	.41060249E-01	.17439646E+08
12	.40710557E-01	.18282521E+08
13	.29214714E-01	.17891472E+08
14	.31839497E-01	.17239597E+08
15	.10100115E-01	.18331690E+08
16	.92972253E-02	.16987595E+08
17	.23670642E-02	.14860019E+08
18	.39727498E-01	.13063001E+08
19	.45729967E-01	.13512936E+08
20	.24305698E-01	.14370371E+08
21	-.15958334E-01	.14463955E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-2 DE 47.0 M V FRANCOLÍ (SER) ZH52

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	47.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	3.8800 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	3.0800 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	32.500	10.0500	10.0500
2	14.500	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0390 T/M2
REACCION HORIZONTAL TABLERO	=	46.0000 T
REACCION VERTICAL TABLERO	=	2375.0000 T
MOMENTO EXTERIOR EN CABEZA	=	295.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

1

FASE ELASTICA

REACCION DEL TABLERO = 46.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.76635802E-05	.12842313E-02	.36507377E-01
2	.10189686E-04	.12632537E-02	.33512920E-01
3	.12591805E-04	.12364855E-02	.30574621E-01
4	.14880107E-04	.12042060E-02	.27705755E-01
5	.17063730E-04	.11666720E-02	.24918969E-01
6	.19150909E-04	.11241198E-02	.22226328E-01
7	.21149081E-04	.10767673E-02	.19639366E-01
8	.23064983E-04	.10248157E-02	.17169124E-01
9	.24904730E-04	.96845133E-03	.14826189E-01
10	.26673886E-04	.90784646E-03	.12620725E-01
11	.28377528E-04	.84316105E-03	.10562507E-01
12	.30020290E-04	.77454361E-03	.86609479E-02
13	.31606419E-04	.70213223E-03	.69251239E-02
14	.33139810E-04	.62605541E-03	.53637977E-02
15	.34624042E-04	.54643288E-03	.39854409E-02
16	.36062411E-04	.46337630E-03	.27982532E-02
17	.37457955E-04	.37698987E-03	.18101807E-02
18	.38813482E-04	.28737093E-03	.10289329E-02
19	.40131588E-04	.19461047E-03	.46199818E-03
20	.41414680E-04	.98793609E-04	.11665789E-03
21	.42664988E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2375.0000	46.0000	295.0000
2	2406.7109	46.1876	403.3188
3	2438.8636	46.3838	512.0885
4	2471.4581	46.5887	621.3295
5	2504.4944	46.8021	731.0620
6	2537.9725	47.0242	841.3062
7	2571.8924	47.2549	952.0824
8	2606.2541	47.4942	1063.4109
9	2641.0576	47.7421	1175.3118
10	2676.3029	47.9986	1287.8054
11	2711.9900	48.2638	1400.9120
12	2748.1189	48.5375	1514.6518
13	2784.6896	48.8199	1629.0451
14	2821.7021	49.1109	1744.1120
15	2859.1564	49.4105	1859.8729
16	2897.0525	49.7187	1976.3480
17	2935.3904	50.0355	2093.5576
18	2974.1701	50.3610	2211.5218
19	3013.3916	50.6950	2330.2609
20	3053.0549	51.0377	2449.7952
21	3093.1600	51.3890	2570.1450

1

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 46.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.75357390E-05	.12744633E-02	.35792915E-01
2	.10195744E-04	.12536288E-02	.32821183E-01
3	.12723486E-04	.12266987E-02	.29905635E-01
4	.15129159E-04	.11939718E-02	.27060240E-01
5	.17421907E-04	.11557243E-02	.24298292E-01
6	.19609957E-04	.11122119E-02	.21632460E-01
7	.21700730E-04	.10636718E-02	.19074834E-01
8	.23700938E-04	.10103249E-02	.16636968E-01
9	.25616665E-04	.95237668E-03	.14329912E-01
10	.27453435E-04	.89001931E-03	.12164251E-01
11	.29216277E-04	.82343240E-03	.10150134E-01
12	.30909776E-04	.75278429E-03	.82973000E-02
13	.32538121E-04	.67823301E-03	.66151053E-02
14	.34105142E-04	.59992718E-03	.51125459E-02
15	.33101203E-04	.52095972E-03	.37959659E-02
16	.34452457E-04	.44158417E-03	.26643549E-02
17	.35756231E-04	.35908896E-03	.17229640E-02
18	.37015065E-04	.27358269E-03	.97899546E-03
19	.38231302E-04	.18516821E-03	.43940343E-03
20	.39407101E-04	.93943085E-04	.11090655E-03
21	.40544461E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.18473057E-03	-.20545385E-03	-.16438407E-03
2	-.18465211E-03	-.21269041E-03	-.15712360E-03
3	-.18462618E-03	-.21961577E-03	-.15027277E-03
4	-.18464969E-03	-.22625488E-03	-.14380096E-03
5	-.18471979E-03	-.23263003E-03	-.13768064E-03
6	-.18483388E-03	-.23876126E-03	-.13188700E-03
7	-.18498958E-03	-.24466659E-03	-.12639761E-03
8	-.18518467E-03	-.25036225E-03	-.12119213E-03
9	-.18541710E-03	-.25586293E-03	-.11625211E-03
10	-.18568499E-03	-.26118194E-03	-.11156072E-03
11	-.18598658E-03	-.26633134E-03	-.10710263E-03
12	-.18632023E-03	-.27132211E-03	-.10286383E-03
13	-.18668441E-03	-.27616424E-03	-.98831485E-04
14	-.18707770E-03	-.28086684E-03	-.94993819E-04
15	-.17547803E-03	-.26650633E-03	-.86104778E-04
16	-.17587586E-03	-.27062012E-03	-.82854227E-04
17	-.17629701E-03	-.27462665E-03	-.79755189E-04
18	-.17674050E-03	-.27853193E-03	-.76799825E-04
19	-.17720540E-03	-.28234148E-03	-.73980887E-04
20	-.17769084E-03	-.28606037E-03	-.71291668E-04
21	-.17819599E-03	-.28969326E-03	-.68725949E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2375.0000	49.0284	295.0020
2	2406.7109	49.2063	410.4253
3	2438.8636	49.3771	526.2583
4	2471.4581	49.5410	642.4844
5	2504.4944	49.6980	759.0875
6	2537.9725	49.8482	876.0516
7	2571.8924	49.9917	993.3606
8	2606.2541	50.1284	1110.9985
9	2641.0576	50.2583	1228.9495
10	2676.3029	50.3813	1347.1974
11	2711.9900	50.4975	1465.7260
12	2748.1189	50.6066	1584.5191
13	2784.6896	50.7087	1703.5600
14	2821.7021	50.8036	1822.8319
15	2859.1564	50.8998	1942.3768
16	2897.0525	50.9977	2062.1042
17	2935.3904	51.0892	2182.0552
18	2974.1701	51.1742	2302.2146
19	3013.3916	51.2524	2422.5669
20	3053.0549	51.3238	2543.0963
21	3093.1600	51.3882	2663.7865

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	-.20244951E-02	.39142550E+08
2	-.18939980E-02	.40254577E+08
3	-.17856239E-02	.41353625E+08
4	-.16453774E-02	.42456203E+08
5	-.13864905E-02	.43556899E+08
6	-.92859409E-03	.44655710E+08
7	-.19192904E-03	.45752625E+08
8	.90448162E-03	.46847630E+08
9	.24413290E-02	.47940706E+08
10	.45007040E-02	.49030024E+08
11	.71653879E-02	.50118879E+08
12	.10518911E-01	.51205747E+08
13	.14646233E-01	.52290623E+08
14	.19633346E-01	.53373495E+08
15	-.26720098E-01	.58610077E+08
16	-.24240820E-01	.59775501E+08
17	-.22570595E-01	.60939074E+08
18	-.21769537E-01	.62100781E+08
19	-.21911032E-01	.63260612E+08
20	-.23083078E-01	.64418555E+08
21	-.25413246E-01	.65574903E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-2 DE 47.0 M V FRANCOLÍ (SER) XH10

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	47.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	3.8800 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	3.0800 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	32.500	10.0500	10.0500
2	14.500	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	49.0000 T
REACCION VERTICAL TABLERO	=	1925.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

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FASE ELASTICA

REACCION DEL TABLERO = 49.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.26765369E-02	.72226074E-01
2	.15445157E-04	.26583889E-02	.65950428E-01
3	.27649012E-04	.26077532E-02	.59757095E-01
4	.37315953E-04	.25314194E-02	.53714118E-01
5	.44979512E-04	.24347222E-02	.47875375E-01
6	.51048461E-04	.23218893E-02	.42283564E-01
7	.55839265E-04	.21962963E-02	.36972491E-01
8	.59599241E-04	.20606560E-02	.31968841E-01
9	.62523341E-04	.19171620E-02	.27293560E-01
10	.64766449E-04	.17675965E-02	.22962936E-01
11	.66452499E-04	.16134142E-02	.18989473E-01
12	.67681315E-04	.14558070E-02	.15382572E-01
13	.68533781E-04	.12957542E-02	.12149095E-01
14	.69075800E-04	.11340630E-02	.92938107E-02
15	.69361339E-04	.97139935E-03	.68197610E-02
16	.69434792E-04	.80831390E-03	.47285641E-02
17	.69332834E-04	.64526194E-03	.30206594E-02
18	.69085880E-04	.48261995E-03	.16955119E-02
19	.68719237E-04	.32069894E-03	.75178091E-03
20	.68254035E-04	.15975534E-03	.18746122E-03
21	.67707958E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1925.0000	49.0000	.0000
2	1956.7109	49.0000	115.1500
3	1988.8636	49.0000	230.3000
4	2021.4581	49.0000	345.4500
5	2054.4944	49.0000	460.6000
6	2087.9725	49.0000	575.7500
7	2121.8924	49.0000	690.9000
8	2156.2541	49.0000	806.0500
9	2191.0576	49.0000	921.2000
10	2226.3029	49.0000	1036.3500
11	2261.9900	49.0000	1151.5000
12	2298.1189	49.0000	1266.6500
13	2334.6896	49.0000	1381.8000
14	2371.7021	49.0000	1496.9500
15	2409.1564	49.0000	1612.1000
16	2447.0525	49.0000	1727.2500
17	2485.3904	49.0000	1842.4000
18	2524.1701	49.0000	1957.5500
19	2563.3916	49.0000	2072.7000
20	2603.0549	49.0000	2187.8500
21	2643.1600	49.0000	2303.0000

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 49.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.27418526E-02	.72777231E-01
2	.16418134E-04	.27225613E-02	.66348989E-01
3	.29407060E-04	.26687167E-02	.60008259E-01
4	.39696148E-04	.25875204E-02	.53827446E-01
5	.47842241E-04	.24846628E-02	.47863882E-01
6	.54274725E-04	.23646754E-02	.42162949E-01
7	.59328043E-04	.22311921E-02	.36760479E-01
8	.63265054E-04	.20871452E-02	.31684621E-01
9	.66294060E-04	.19349133E-02	.26957308E-01
10	.68581362E-04	.17764346E-02	.22595422E-01
11	.70260637E-04	.16132953E-02	.18611716E-01
12	.71440007E-04	.14467970E-02	.15015565E-01
13	.72207419E-04	.12780113E-02	.11813562E-01
14	.72634785E-04	.11078217E-02	.90100117E-02
15	.67799510E-04	.94281141E-03	.66027430E-02
16	.67718816E-04	.78357738E-03	.45742733E-02
17	.67461552E-04	.62474045E-03	.29196183E-02
18	.67058652E-04	.46667921E-03	.16373856E-02
19	.66535903E-04	.30970560E-03	.72537404E-03
20	.65914864E-04	.15407595E-03	.18071652E-03
21	.65213605E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.16184403E-03	-.16184403E-03	-.16184403E-03
2	-.14833984E-03	-.16552963E-03	-.13197096E-03
3	-.14887926E-03	-.18105058E-03	-.11817829E-03
4	-.14949733E-03	-.19479063E-03	-.10618883E-03
5	-.15017176E-03	-.20700834E-03	-.95727291E-04
6	-.15088647E-03	-.21791576E-03	-.86570924E-04
7	-.15162983E-03	-.22768838E-03	-.78537677E-04
8	-.15239340E-03	-.23647266E-03	-.71477395E-04
9	-.15317112E-03	-.24439175E-03	-.65265195E-04
10	-.15395863E-03	-.25154991E-03	-.59796418E-04
11	-.15475283E-03	-.25803596E-03	-.54982723E-04
12	-.15555155E-03	-.26392604E-03	-.50749058E-04
13	-.15635331E-03	-.26928571E-03	-.47031274E-04
14	-.15715713E-03	-.27417177E-03	-.43774226E-04
15	-.14783201E-03	-.26024360E-03	-.38810402E-04
16	-.14856445E-03	-.26402504E-03	-.36489814E-04
17	-.14929957E-03	-.26749221E-03	-.34480010E-04
18	-.15003731E-03	-.27067583E-03	-.32751727E-04
19	-.15077769E-03	-.27360297E-03	-.31279207E-04
20	-.15152079E-03	-.27629763E-03	-.30039694E-04
21	-.15226672E-03	-.27878112E-03	-.29013010E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1925.0000	54.2721	.0000
2	1956.7109	54.3210	127.6314
3	1988.8636	54.3013	255.2941
4	2021.4581	54.2242	382.8402
5	2054.4944	54.0984	510.1447
6	2087.9725	53.9313	637.1019
7	2121.8924	53.7285	763.6210
8	2156.2541	53.4949	889.6237
9	2191.0576	53.2343	1015.0419
10	2226.3029	52.9501	1139.8160
11	2261.9900	52.6448	1263.8933
12	2298.1189	52.3207	1387.2269
13	2334.6896	51.9799	1509.7752
14	2371.7021	51.6238	1631.5002
15	2409.1564	51.2682	1752.4505
16	2447.0525	50.9146	1872.5069
17	2485.3904	50.5501	1991.7218
18	2524.1701	50.1757	2110.0710
19	2563.3916	49.7918	2227.5319
20	2603.0549	49.3993	2344.0835
21	2643.1600	48.9985	2459.7063

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	-.58079786E-02	.77730915E+07
3	-.11247094E-01	.86796035E+07
4	-.16059111E-01	.96404544E+07
5	-.19917521E-01	.10656433E+08
6	-.22503690E-01	.11728281E+08
7	-.23509611E-01	.12856729E+08
8	-.22642360E-01	.14042506E+08
9	-.19626643E-01	.15286333E+08
10	-.14206475E-01	.16588928E+08
11	-.61459379E-02	.17951000E+08
12	.47382758E-02	.19373256E+08
13	.18707942E-01	.20856397E+08
14	.35904220E-01	.22401115E+08
15	-.14865665E-01	.25792677E+08
16	-.78396816E-03	.27589291E+08
17	.10209590E-01	.29454554E+08
18	.17924646E-01	.31389196E+08
19	.22136671E-01	.33393943E+08
20	.22588396E-01	.35469520E+08
21	.18990899E-01	.37616649E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-2 DE 47.0 M V FRANCOLÍ (SER) ZH10

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	47.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	3.8800 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	3.0800 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	32.500	10.0500	10.0500
2	14.500	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0390 T/M2
REACCION HORIZONTAL TABLERO	=	99.0000 T
REACCION VERTICAL TABLERO	=	1925.0000 T
MOMENTO EXTERIOR EN CABEZA	=	543.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

1

1

FASE ELASTICA

REACCION DEL TABLERO = 99.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.14106183E-04	.26397735E-02	.75405997E-01
2	.19602012E-04	.26001664E-02	.69246538E-01
3	.24815055E-04	.25479764E-02	.63195071E-01
4	.29767889E-04	.24838414E-02	.57280406E-01
5	.34480797E-04	.24083492E-02	.51529913E-01
6	.38972056E-04	.23220421E-02	.45969636E-01
7	.43258176E-04	.22254216E-02	.40624394E-01
8	.47354109E-04	.21189521E-02	.35517870E-01
9	.51273431E-04	.20030648E-02	.30672696E-01
10	.55028494E-04	.18781600E-02	.26110529E-01
11	.58630561E-04	.17446106E-02	.21852116E-01
12	.62089924E-04	.16027641E-02	.17917359E-01
13	.65416009E-04	.14529446E-02	.14325370E-01
14	.68617460E-04	.12954553E-02	.11094527E-01
15	.71702223E-04	.11305796E-02	.82425165E-02
16	.74677612E-04	.95858333E-03	.57863807E-02
17	.77550374E-04	.77971544E-03	.37425576E-02
18	.80326738E-04	.59420984E-03	.21269177E-02
19	.83012469E-04	.40228627E-03	.95479879E-03
20	.85612908E-04	.20415145E-03	.24103772E-03
21	.88133007E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1925.0000	99.0000	543.0000
2	1956.7109	99.1876	775.8688
3	1988.8636	99.3838	1009.1885
4	2021.4581	99.5887	1242.9795
5	2054.4944	99.8021	1477.2620
6	2087.9725	100.0242	1712.0562
7	2121.8924	100.2549	1947.3824
8	2156.2541	100.4942	2183.2609
9	2191.0576	100.7421	2419.7118
10	2226.3029	100.9986	2656.7554
11	2261.9900	101.2638	2894.4120
12	2298.1189	101.5375	3132.7018
13	2334.6896	101.8199	3371.6451
14	2371.7021	102.1109	3611.2620
15	2409.1564	102.4105	3851.5729
16	2447.0525	102.7187	4092.5980
17	2485.3904	103.0355	4334.3576
18	2524.1701	103.3610	4576.8718
19	2563.3916	103.6950	4820.1609
20	2603.0549	104.0377	5064.2452
21	2643.1600	104.3890	5309.1450

FASE FINAL EN ITERACION NUMERO 4

REACCION DEL TABLERO = 99.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.13533933E-04	.28313936E-02	.83237954E-01
2	.19125265E-04	.27930190E-02	.76626696E-01
3	.24433399E-04	.27418376E-02	.70120797E-01
4	.29480136E-04	.26784892E-02	.63749590E-01
5	.34284994E-04	.26035651E-02	.57540965E-01
6	.38865501E-04	.25176133E-02	.51521473E-01
7	.43237438E-04	.24211424E-02	.45716423E-01
8	.47415047E-04	.23146257E-02	.40149973E-01
9	.51411232E-04	.21985048E-02	.34845205E-01
10	.55237611E-04	.20731924E-02	.29824200E-01
11	.58998158E-04	.19389654E-02	.25108184E-01
12	.63236913E-04	.17953392E-02	.20718426E-01
13	.68525707E-04	.16405181E-02	.16678859E-01
14	.74552581E-04	.14724011E-02	.13018406E-01
15	.74022375E-04	.12978255E-02	.97636334E-02
16	.79731595E-04	.11171646E-02	.69233925E-02
17	.85668722E-04	.92281925E-03	.45236792E-02
18	.91801710E-04	.71429150E-03	.25972516E-02
19	.98087994E-04	.49117109E-03	.11779400E-02
20	.10448695E-03	.25314554E-03	.30042315E-03
21	.11095606E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.14810724E-03	-.18532555E-03	-.11156562E-03
2	-.14868366E-03	-.20127814E-03	-.97045445E-04
3	-.14934375E-03	-.21653560E-03	-.83373575E-04
4	-.15007977E-03	-.23115015E-03	-.70483408E-04
5	-.15088481E-03	-.24516855E-03	-.58315332E-04
6	-.15175269E-03	-.25863282E-03	-.46815839E-04
7	-.15267785E-03	-.27158081E-03	-.35936771E-04
8	-.15365530E-03	-.28404668E-03	-.25634671E-04
9	-.15468051E-03	-.29606140E-03	-.15870188E-04
10	-.15574940E-03	-.30765283E-03	-.66078500E-05
11	-.15674047E-03	-.31898540E-03	.25545594E-05
12	-.15694181E-03	-.33084332E-03	.13797852E-04
13	-.15549842E-03	-.34394411E-03	.29520989E-04
14	-.15277744E-03	-.35779704E-03	.48514524E-04
15	-.14116061E-03	-.34472214E-03	.58699804E-04
16	-.13787838E-03	-.35714027E-03	.77396926E-04
17	-.13398255E-03	-.36957154E-03	.97323000E-04
18	-.12950597E-03	-.38196067E-03	.11835864E-03
19	-.12449968E-03	-.39424166E-03	.14033790E-03
20	-.11902168E-03	-.40636078E-03	.16309308E-03
21	-.11313834E-03	-.41826752E-03	.18644303E-03

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1925.0000	104.4496	542.9417
2	1956.7109	104.6517	788.6459
3	1988.8636	104.8356	1034.8038
4	2021.4581	105.0015	1281.3729
5	2054.4944	105.1493	1528.3107
6	2087.9725	105.2789	1775.5742
7	2121.8924	105.3901	2023.1206
8	2156.2541	105.4828	2270.9063
9	2191.0576	105.5567	2518.8884
10	2226.3029	105.6116	2767.0195
11	2261.9900	105.6470	3015.2622
12	2298.1189	105.6606	3263.5709
13	2334.6896	105.6472	3511.8563
14	2371.7021	105.6001	3760.0710
15	2409.1564	105.5343	4008.1695
16	2447.0525	105.4496	4256.0772
17	2485.3904	105.3261	4503.7175
18	2524.1701	105.1610	4751.0800
19	2563.3916	104.9512	4997.9748
20	2603.0549	104.6939	5244.3142
21	2643.1600	104.3866	5489.9724

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.58277139E-01	.40109508E+08
2	.53718644E-01	.41220778E+08
3	.49388328E-01	.42326661E+08
4	.45312072E-01	.43427270E+08
5	.41520840E-01	.44523644E+08
6	.38050777E-01	.45613929E+08
7	.34943604E-01	.46699115E+08
8	.32229323E-01	.47779275E+08
9	.29022613E-01	.48854483E+08
10	.28316565E-01	.49924809E+08
11	.22253563E-01	.46434619E+08
12	.86235495E-02	.37713163E+08
13	.19747392E-01	.29770099E+08
14	.31365848E-01	.26597956E+08
15	.19374722E-01	.28811980E+08
16	.28310878E-01	.27612243E+08
17	.60486245E-01	.27440212E+08
18	.31614693E-01	.24839284E+08
19	.30119789E-01	.23822266E+08
20	.34990748E-01	.22452029E+08
21	.57175724E-01	.21499243E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-2 DE 47.0 M V FRANCOLÍ (ROT) XH2

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	47.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	3.8800 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	3.0800 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

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DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	32.500	10.0500	10.0500
2	14.500	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	36.0000 T
REACCION VERTICAL TABLERO	=	1299.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

1

1

FASE ELASTICA

REACCION DEL TABLERO = 51.8400 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.28316668E-02	.76412238E-01
2	.16340346E-04	.28124669E-02	.69772861E-01
3	.29251526E-04	.27588965E-02	.63220567E-01
4	.39478755E-04	.26781384E-02	.56827345E-01
5	.47586487E-04	.25758367E-02	.50650193E-01
6	.54007189E-04	.24564642E-02	.44734284E-01
7	.59075663E-04	.23235918E-02	.39115386E-01
8	.63053564E-04	.21800900E-02	.33821729E-01
9	.66147143E-04	.20282791E-02	.28875472E-01
10	.68520260E-04	.18700449E-02	.24293849E-01
11	.70304032E-04	.17069264E-02	.20090087E-01
12	.71604068E-04	.15401844E-02	.16274133E-01
13	.72505943E-04	.13708551E-02	.12853247E-01
14	.73079377E-04	.11997924E-02	.98324723E-02
15	.73381465E-04	.10277009E-02	.72150288E-02
16	.73459176E-04	.85516311E-03	.50026278E-02
17	.73351309E-04	.68266079E-03	.31957344E-02
18	.73090041E-04	.51059221E-03	.17937824E-02
19	.72702148E-04	.33928639E-03	.79535351E-03
20	.72209983E-04	.16901463E-03	.19832632E-03
21	.71632256E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1870.5600	51.8400	.0000
2	1916.2237	51.8400	121.8240
3	1962.5236	51.8400	243.6480
4	2009.4597	51.8400	365.4720
5	2057.0319	51.8400	487.2960
6	2105.2404	51.8400	609.1200
7	2154.0851	51.8400	730.9440
8	2203.5659	51.8400	852.7680
9	2253.6829	51.8400	974.5920
10	2304.4362	51.8400	1096.4160
11	2355.8256	51.8400	1218.2400
12	2407.8512	51.8400	1340.0640
13	2460.5130	51.8400	1461.8880
14	2513.8110	51.8400	1583.7120
15	2567.7452	51.8400	1705.5360
16	2622.3156	51.8400	1827.3600
17	2677.5222	51.8400	1949.1840
18	2733.3649	51.8400	2071.0080
19	2789.8439	51.8400	2192.8320
20	2846.9591	51.8400	2314.6560
21	2904.7104	51.8400	2436.4800

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 51.8400 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.29182610E-02	.77603301E-01
2	.17300818E-04	.28979326E-02	.70761311E-01
3	.31023531E-04	.28411514E-02	.64011572E-01
4	.41926011E-04	.27554357E-02	.57430565E-01
5	.50586803E-04	.26467332E-02	.51079031E-01
6	.57452143E-04	.25197874E-02	.45005210E-01
7	.62869753E-04	.23784092E-02	.39247335E-01
8	.67113103E-04	.22256793E-02	.33835579E-01
9	.70399076E-04	.20641025E-02	.28793573E-01
10	.72900994E-04	.18957249E-02	.24139624E-01
11	.74758334E-04	.17222252E-02	.19887678E-01
12	.76084053E-04	.15449854E-02	.16048095E-01
13	.76970170E-04	.13651467E-02	.12628282E-01
14	.77492033E-04	.11836536E-02	.96332015E-02
15	.72323747E-04	.10076201E-02	.70608334E-02
16	.72287389E-04	.83770200E-03	.48925967E-02
17	.72059700E-04	.66809417E-03	.31233910E-02
18	.71673357E-04	.49920783E-03	.17519889E-02
19	.71155661E-04	.33138373E-03	.77628211E-03
20	.70529489E-04	.16490368E-03	.19343258E-03
21	.69814066E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.15726699E-03	-.15726699E-03	-.15726699E-03
2	-.14512675E-03	-.16324070E-03	-.12787783E-03
3	-.14683420E-03	-.18077394E-03	-.11444564E-03
4	-.14861291E-03	-.19645049E-03	-.10287163E-03
5	-.15043917E-03	-.21053629E-03	-.92871385E-04
6	-.15229592E-03	-.22324931E-03	-.84215128E-04
7	-.15417088E-03	-.23476991E-03	-.76715349E-04
8	-.15605525E-03	-.24524856E-03	-.70217589E-04
9	-.15794271E-03	-.25481184E-03	-.64593537E-04
10	-.15982883E-03	-.26356695E-03	-.59735768E-04
11	-.16171053E-03	-.27160528E-03	-.55553692E-04
12	-.16358572E-03	-.27900522E-03	-.51970409E-04
13	-.16545306E-03	-.28583441E-03	-.48920228E-04
14	-.16731179E-03	-.29215145E-03	-.46346725E-04
15	-.15821280E-03	-.27812558E-03	-.41916216E-04
16	-.15990343E-03	-.28315343E-03	-.40267799E-04
17	-.16158748E-03	-.28783607E-03	-.38941869E-04
18	-.16326517E-03	-.29220554E-03	-.37908471E-04
19	-.16493681E-03	-.29629016E-03	-.37141244E-04
20	-.16660275E-03	-.30011508E-03	-.36616903E-04
21	-.16826339E-03	-.30370268E-03	-.36314807E-04

1

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1870.5600	57.2906	.0000
2	1916.2237	57.3843	134.7803
3	1962.5236	57.4067	269.6944
4	2009.4597	57.3676	404.5862
5	2057.0319	57.2751	539.3207
6	2105.2404	57.1355	673.7795
7	2154.0851	56.9543	807.8582
8	2203.5659	56.7357	941.4635
9	2253.6829	56.4835	1074.5119
10	2304.4362	56.2006	1206.9275
11	2355.8256	55.8897	1338.6411
12	2407.8512	55.5529	1469.5892
13	2460.5130	55.1921	1599.7130
14	2513.8110	54.8089	1728.9579
15	2567.7452	54.4214	1857.4212
16	2622.3156	54.0314	1984.8511
17	2677.5222	53.6242	2111.3461
18	2733.3649	53.2004	2236.8667
19	2789.8439	52.7610	2361.3755
20	2846.9591	52.3065	2484.8367
21	2904.7104	51.8376	2607.2159

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	-.28159910E-02	.77896856E+07
3	-.50457787E-02	.86912534E+07
4	-.65859589E-02	.96457664E+07
5	-.72225402E-02	.10653891E+08
6	-.67029346E-02	.11716262E+08
7	-.47463465E-02	.12833509E+08
8	-.10536479E-02	.14006255E+08
9	.46850515E-02	.15235118E+08
10	.12784511E-01	.16520711E+08
11	.23560049E-01	.17863644E+08
12	.37324737E-01	.19264519E+08
13	.54347169E-01	.20723932E+08
14	.75008519E-01	.22242473E+08
15	-.36072771E-01	.25619738E+08
16	-.22698997E-01	.27387385E+08
17	-.12842769E-01	.29221137E+08
18	-.66887930E-02	.31121625E+08
19	-.44602550E-02	.33089478E+08
20	-.64187818E-02	.35125320E+08
21	-.12864582E-01	.37229770E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-2 DE 47.0 M V FRANCOLÍ (ROT) ZH2

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	47.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	3.8800 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	3.0800 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	32.500	10.0500	10.0500
2	14.500	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0650 T/M2
REACCION HORIZONTAL TABLERO	=	28.0000 T
REACCION VERTICAL TABLERO	=	1299.0000 T
MOMENTO EXTERIOR EN CABEZA	=	41.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

1

FASE ELASTICA

REACCION DEL TABLERO = 40.3200 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.15337552E-05	.97900550E-03	.29423861E-01
2	.38987571E-05	.97262230E-03	.27129610E-01
3	.61639118E-05	.96079866E-03	.24856798E-01
4	.83381831E-05	.94375870E-03	.22617943E-01
5	.10429625E-04	.92170653E-03	.20425059E-01
6	.12445493E-04	.89482826E-03	.18289703E-01
7	.14392344E-04	.86329381E-03	.16223013E-01
8	.16276113E-04	.82725837E-03	.14235747E-01
9	.18102191E-04	.78686386E-03	.12338313E-01
10	.19875483E-04	.74224009E-03	.10540800E-01
11	.21600459E-04	.69350586E-03	.88530048E-02
12	.23281207E-04	.64076990E-03	.72844573E-02
13	.24921470E-04	.58413176E-03	.58444430E-02
14	.26524678E-04	.52368254E-03	.45420234E-02
15	.28093987E-04	.45950560E-03	.33860551E-02
16	.29632302E-04	.39167721E-03	.23852073E-02
17	.31142300E-04	.32026706E-03	.15479779E-02
18	.32626456E-04	.24533877E-03	.88270805E-03
19	.34087058E-04	.16695039E-03	.39759612E-03
20	.35526226E-04	.85154780E-04	.10071023E-03
21	.36945927E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1870.5600	40.3200	59.0400
2	1916.2237	40.7703	154.3170
3	1962.5236	41.2412	250.6764
4	2009.4597	41.7328	348.1668
5	2057.0319	42.2451	446.8368
6	2105.2404	42.7781	546.7349
7	2154.0851	43.3317	647.9098
8	2203.5659	43.9060	750.4101
9	2253.6829	44.5010	854.2843
10	2304.4362	45.1167	959.5810
11	2355.8256	45.7530	1066.3488
12	2407.8512	46.4100	1174.6363
13	2460.5130	47.0877	1284.4921
14	2513.8110	47.7861	1395.9648
15	2567.7452	48.5052	1509.1030
16	2622.3156	49.2449	1623.9553
17	2677.5222	50.0053	1740.5701
18	2733.3649	50.7864	1858.9963
19	2789.8439	51.5881	1979.2822
20	2846.9591	52.4105	2101.4766
21	2904.7104	53.2536	2225.6280

1

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 40.3200 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.14666550E-05	.94905408E-03	.28227267E-01
2	.38353385E-05	.94282423E-03	.26003220E-01
3	.61089615E-05	.93113968E-03	.23800266E-01
4	.82958819E-05	.91421399E-03	.21630969E-01
5	.10403392E-04	.89224234E-03	.19507413E-01
6	.12438018E-04	.86540369E-03	.17441243E-01
7	.14405633E-04	.83386240E-03	.15443700E-01
8	.16311543E-04	.79776971E-03	.13525655E-01
9	.18160537E-04	.75726502E-03	.11697638E-01
10	.19956955E-04	.71247697E-03	.99698645E-02
11	.21704737E-04	.66352448E-03	.83522584E-02
12	.23407462E-04	.61051764E-03	.68544753E-02
13	.25068387E-04	.55355852E-03	.54859215E-02
14	.26690483E-04	.49274185E-03	.42557720E-02
15	.26329114E-04	.43044382E-03	.31711952E-02
16	.27770754E-04	.36687648E-03	.22336804E-02
17	.29183183E-04	.29995560E-03	.14495027E-02
18	.30568355E-04	.22974754E-03	.82646402E-03
19	.31928058E-04	.15631426E-03	.37221566E-03
20	.33263933E-04	.79713668E-04	.94268067E-04
21	.34577486E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.14352592E-03	-.14755922E-03	-.13956595E-03
2	-.14508131E-03	-.15562849E-03	-.13472589E-03
3	-.14665751E-03	-.16345716E-03	-.13016332E-03
4	-.14825339E-03	-.17106707E-03	-.12585451E-03
5	-.14986791E-03	-.17847724E-03	-.12177875E-03
6	-.15150014E-03	-.18570469E-03	-.11791749E-03
7	-.15314926E-03	-.19276476E-03	-.11425405E-03
8	-.15481453E-03	-.19967127E-03	-.11077336E-03
9	-.15649527E-03	-.20643675E-03	-.10746182E-03
10	-.15819087E-03	-.21307250E-03	-.10430709E-03
11	-.15990079E-03	-.21958882E-03	-.10129800E-03
12	-.16162452E-03	-.22599504E-03	-.98424374E-04
13	-.16336161E-03	-.23229968E-03	-.95676964E-04
14	-.16511164E-03	-.23851047E-03	-.93047340E-04
15	-.15636061E-03	-.22876568E-03	-.85272004E-04
16	-.15799853E-03	-.23436811E-03	-.83017497E-04
17	-.15964661E-03	-.23990037E-03	-.80852016E-04
18	-.16130459E-03	-.24536756E-03	-.78770028E-04
19	-.16297222E-03	-.25077438E-03	-.76766466E-04
20	-.16464930E-03	-.25612511E-03	-.74836679E-04
21	-.16633561E-03	-.26142370E-03	-.72976399E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1870.5600	42.0966	59.0409
2	1916.2237	42.5782	158.5293
3	1962.5236	43.0698	259.1612
4	2009.4597	43.5710	360.9596
5	2057.0319	44.0815	463.9468
6	2105.2404	44.6009	568.1440
7	2154.0851	45.1288	673.5716
8	2203.5659	45.6647	780.2491
9	2253.6829	46.2082	888.1950
10	2304.4362	46.7589	997.4266
11	2355.8256	47.3163	1107.9603
12	2407.8512	47.8800	1219.8112
13	2460.5130	48.4495	1332.9936
14	2513.8110	49.0242	1447.5204
15	2567.7452	49.6097	1563.4484
16	2622.3156	50.2062	1680.7305
17	2677.5222	50.8075	1799.4206
18	2733.3649	51.4134	1919.5299
19	2789.8439	52.0232	2041.0684
20	2846.9591	52.6364	2164.0446
21	2904.7104	53.2525	2288.4661

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	-.93882381E-03	.40219917E+08
2	-.15877487E-02	.41327828E+08
3	-.21282841E-02	.42419286E+08
4	-.25616777E-02	.43506377E+08
5	-.29229385E-02	.44595708E+08
6	-.30894903E-02	.45678014E+08
7	-.28643959E-02	.46746766E+08
8	-.24999682E-02	.47820070E+08
9	-.18284888E-02	.48890006E+08
10	-.80089010E-03	.49956532E+08
11	.63512553E-03	.51019637E+08
12	.25344633E-02	.52079300E+08
13	.49549858E-02	.53135501E+08
14	.79572919E-02	.54188217E+08
15	-.28792452E-01	.59335336E+08
16	-.28435478E-01	.60469275E+08
17	-.28535239E-01	.61599981E+08
18	-.29148500E-01	.62727432E+08
19	-.30342137E-01	.63851608E+08
20	-.32194663E-01	.64972487E+08
21	-.34797411E-01	.66090047E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-2 DE 47.0 M V FRANCOLÍ (ROT) XH3

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	47.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	3.8800 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	3.0800 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	32.500	10.0500	10.0500
2	14.500	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	50.0000 T
REACCION VERTICAL TABLERO	=	2581.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

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FASE ELASTICA

REACCION DEL TABLERO = 72.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.39328706E-02	.10612811E+00
2	.22694925E-04	.39062040E-02	.96906752E-01
3	.40627119E-04	.38318006E-02	.87806344E-01
4	.54831605E-04	.37196366E-02	.78926868E-01
5	.66092343E-04	.35775510E-02	.70347490E-01
6	.75009984E-04	.34117558E-02	.62130951E-01
7	.82049532E-04	.32272108E-02	.54326925E-01
8	.87574394E-04	.30279027E-02	.46974624E-01
9	.91871032E-04	.28170543E-02	.40104822E-01
10	.95167027E-04	.25972846E-02	.33741457E-01
11	.97644489E-04	.23707311E-02	.27902898E-01
12	.99450095E-04	.21391450E-02	.22602963E-01
13	.10070270E-03	.19039654E-02	.17851732E-01
14	.10149913E-03	.16663783E-02	.13656212E-01
15	.10191870E-03	.14273623E-02	.10020873E-01
16	.10202663E-03	.11877265E-02	.69480942E-02
17	.10187682E-03	.94813999E-03	.44385200E-02
18	.10151395E-03	.70915584E-03	.24913644E-02
19	.10097521E-03	.47123109E-03	.11046577E-02
20	.10029164E-03	.23474254E-03	.27545322E-03
21	.99489245E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3716.6400	72.0000	.0000
2	3762.3037	72.0000	169.2000
3	3808.6036	72.0000	338.4000
4	3855.5397	72.0000	507.6000
5	3903.1119	72.0000	676.8000
6	3951.3204	72.0000	846.0000
7	4000.1651	72.0000	1015.2000
8	4049.6459	72.0000	1184.4000
9	4099.7629	72.0000	1353.6000
10	4150.5162	72.0000	1522.8000
11	4201.9056	72.0000	1692.0000
12	4253.9312	72.0000	1861.2000
13	4306.5930	72.0000	2030.4000
14	4359.8910	72.0000	2199.6000
15	4413.8252	72.0000	2368.8000
16	4468.3956	72.0000	2538.0000
17	4523.6022	72.0000	2707.2000
18	4579.4449	72.0000	2876.4000
19	4635.9239	72.0000	3045.6000
20	4693.0391	72.0000	3214.8000
21	4750.7904	72.0000	3384.0000

1

FASE FINAL EN ITERACION NUMERO 4

REACCION DEL TABLERO = 72.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.49200994E-02	.12942643E+00
2	.30265424E-04	.48845376E-02	.11789205E+00
3	.54170288E-04	.47853256E-02	.10651896E+00
4	.73047101E-04	.46358452E-02	.95440401E-01
5	.87918933E-04	.44467101E-02	.84761555E-01
6	.99578773E-04	.42264003E-02	.74565284E-01
7	.10864740E-03	.39817345E-02	.64916552E-01
8	.11561508E-03	.37182261E-02	.55865892E-01
9	.12087208E-03	.34403537E-02	.47452141E-01
10	.12473129E-03	.31517697E-02	.39704620E-01
11	.12744520E-03	.28554624E-02	.32644874E-01
12	.12921870E-03	.25538823E-02	.26288077E-01
13	.13021901E-03	.22490430E-02	.20644180E-01
14	.13058316E-03	.19426004E-02	.15718831E-01
15	.11975251E-03	.16484560E-02	.11504324E-01
16	.11921385E-03	.13676705E-02	.79606236E-02
17	.11836008E-03	.10885211E-02	.50749913E-02
18	.11724880E-03	.81168070E-03	.28427656E-02
19	.11592801E-03	.53769794E-03	.12578535E-02
20	.11443779E-03	.26701813E-03	.31299795E-03
21	.11281168E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.31247583E-03	-.31247583E-03	-.31247583E-03
2	-.29964736E-03	-.33133526E-03	-.26947273E-03
3	-.29964383E-03	-.35890613E-03	-.24309005E-03
4	-.29990049E-03	-.38324723E-03	-.22020610E-03
5	-.30033678E-03	-.40478447E-03	-.20028504E-03
6	-.30089443E-03	-.42387422E-03	-.18289358E-03
7	-.30153133E-03	-.44081730E-03	-.16767774E-03
8	-.30221721E-03	-.45586965E-03	-.15434553E-03
9	-.30293047E-03	-.46925045E-03	-.14265410E-03
10	-.30365594E-03	-.48114857E-03	-.13239987E-03
11	-.30438316E-03	-.49172760E-03	-.12341097E-03
12	-.30510519E-03	-.50112996E-03	-.11554136E-03
13	-.30581768E-03	-.50948021E-03	-.10866610E-03
14	-.30651814E-03	-.51688762E-03	-.10267782E-03
15	-.28502899E-03	-.48357865E-03	-.92466948E-04
16	-.28558481E-03	-.48884443E-03	-.88285881E-04
17	-.28613775E-03	-.49350462E-03	-.84688890E-04
18	-.28668843E-03	-.49761902E-03	-.81620268E-04
19	-.28723768E-03	-.50124079E-03	-.79030975E-04
20	-.28778653E-03	-.50441726E-03	-.76877681E-04
21	-.28833605E-03	-.50719071E-03	-.75121969E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3716.6400	90.2879	.0000
2	3762.3037	90.3779	212.3298
3	3808.6036	90.2255	424.5771
4	3855.5397	89.8731	636.2242
5	3903.1119	89.3548	846.8429
6	3951.3204	88.6982	1056.0770
7	4000.1651	87.9254	1263.6286
8	4049.6459	87.0549	1469.2473
9	4099.7629	86.1017	1672.7217
10	4150.5162	85.0782	1873.8729
11	4201.9056	83.9948	2072.5484
12	4253.9312	82.8603	2268.6181
13	4306.5930	81.6819	2461.9712
14	4359.8910	80.4657	2652.5118
15	4413.8252	79.2724	2840.1545
16	4468.3956	78.1076	3025.0892
17	4523.6022	76.9202	3207.2578
18	4579.4449	75.7132	3386.6107
19	4635.9239	74.4889	3563.1047
20	4693.0391	73.2493	3736.7016
21	4750.7904	71.9962	3907.3676

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	.82241527E-03	.70137152E+07
3	.16122887E-02	.78318758E+07
4	.22679759E-02	.86968792E+07
5	.26609072E-02	.96097060E+07
6	.26495840E-02	.10571258E+08
7	.20754759E-02	.11582412E+08
8	.75957958E-03	.12644021E+08
9	-.15007026E-02	.13756921E+08
10	-.49343171E-02	.14921930E+08
11	-.97984157E-02	.16139856E+08
12	-.16103443E-01	.17408260E+08
13	-.24667879E-01	.18733935E+08
14	-.35610386E-01	.20114942E+08
15	-.25711593E-02	.23546971E+08
16	-.11497260E-01	.25184730E+08
17	-.18473052E-01	.26885645E+08
18	-.23632949E-01	.28650483E+08
19	-.27071104E-01	.30479998E+08
20	-.28845273E-01	.32374934E+08
21	-.28979877E-01	.34336019E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-2 DE 47.0 M V FRANCOLÍ (ROT) ZH3

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	47.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	3.8800 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	3.0800 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	32.500	10.0500	10.0500
2	14.500	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0390 T/M2
REACCION HORIZONTAL TABLERO	=	50.0000 T
REACCION VERTICAL TABLERO	=	2581.0000 T
MOMENTO EXTERIOR EN CABEZA	=	310.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.1400

1

FASE ELASTICA

REACCION DEL TABLERO = 72.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.11596685E-04	.19914312E-02	.56685398E-01
2	.15560845E-04	.19595211E-02	.52041204E-01
3	.19329000E-04	.19185256E-02	.47482765E-01
4	.22917162E-04	.18688863E-02	.43030905E-01
5	.26339714E-04	.18110095E-02	.38705453E-01
6	.29609617E-04	.17452690E-02	.34525320E-01
7	.32738580E-04	.16720099E-02	.30508578E-01
8	.35737206E-04	.15915508E-02	.26672514E-01
9	.38615123E-04	.15041869E-02	.23033698E-01
10	.41381090E-04	.14101913E-02	.19608030E-01
11	.44043095E-04	.13098179E-02	.16410795E-01
12	.46608436E-04	.12033023E-02	.13456698E-01
13	.49083797E-04	.10908640E-02	.10759913E-01
14	.51475309E-04	.97270701E-03	.83341166E-02
15	.53788606E-04	.84902191E-03	.61925205E-02
16	.56028876E-04	.71998637E-03	.43479048E-02
17	.58200903E-04	.58576638E-03	.28126457E-02
18	.60309105E-04	.44651712E-03	.15987424E-02
19	.62357569E-04	.30238378E-03	.71784113E-03
20	.64350083E-04	.15350229E-03	.18125803E-03
21	.66290161E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3716.6400	72.0000	446.4000
2	3762.3037	72.2702	615.9150
3	3808.6036	72.5527	786.0794
4	3855.5397	72.8477	956.9225
5	3903.1119	73.1551	1128.4733
6	3951.3204	73.4748	1300.7610
7	4000.1651	73.8070	1473.8147
8	4049.6459	74.1516	1647.6636
9	4099.7629	74.5086	1822.3370
10	4150.5162	74.8780	1997.8638
11	4201.9056	75.2598	2174.2733
12	4253.9312	75.6540	2351.5946
13	4306.5930	76.0606	2529.8569
14	4359.8910	76.4797	2709.0893
15	4413.8252	76.9111	2889.3210
16	4468.3956	77.3549	3070.5812
17	4523.6022	77.8112	3252.8989
18	4579.4449	78.2798	3436.3034
19	4635.9239	78.7609	3620.8237
20	4693.0391	79.2543	3806.4891
21	4750.7904	79.7602	3993.3288

1

FASE FINAL EN ITERACION NUMERO 4

REACCION DEL TABLERO = 72.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.12337718E-04	.21872317E-02	.61407522E-01
2	.17062856E-04	.21526860E-02	.56305944E-01
3	.21547536E-04	.21073188E-02	.51298374E-01
4	.25809647E-04	.20516741E-02	.46409596E-01
5	.29865209E-04	.19862561E-02	.41663162E-01
6	.33728615E-04	.19115334E-02	.37081481E-01
7	.37412831E-04	.18279422E-02	.32685902E-01
8	.40929563E-04	.17358899E-02	.28496781E-01
9	.44289405E-04	.16357576E-02	.24533549E-01
10	.47501964E-04	.15279027E-02	.20814770E-01
11	.50575968E-04	.14126612E-02	.17358192E-01
12	.53519361E-04	.12903492E-02	.14180801E-01
13	.56339386E-04	.11612651E-02	.11298856E-01
14	.59042658E-04	.10256912E-02	.87279383E-02
15	.56650319E-04	.88975197E-03	.64783935E-02
16	.58933723E-04	.75394072E-03	.45460037E-02
17	.61126631E-04	.61286980E-03	.29389922E-02
18	.63233356E-04	.46674682E-03	.16694731E-02
19	.65257869E-04	.31576963E-03	.74908459E-03
20	.67203824E-04	.16012714E-03	.18901033E-03
21	.69074594E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.30019354E-03	-.33412226E-03	-.26688170E-03
2	-.29978242E-03	-.34670527E-03	-.25371270E-03
3	-.29948609E-03	-.35874182E-03	-.24130775E-03
4	-.29929650E-03	-.37027303E-03	-.22961045E-03
5	-.29920631E-03	-.38133563E-03	-.21857024E-03
6	-.29920885E-03	-.39196254E-03	-.20814158E-03
7	-.29929801E-03	-.40218330E-03	-.19828337E-03
8	-.29946821E-03	-.41202451E-03	-.18895839E-03
9	-.29971431E-03	-.42151018E-03	-.18013292E-03
10	-.30003158E-03	-.43066198E-03	-.17177627E-03
11	-.30041563E-03	-.43949954E-03	-.16386052E-03
12	-.30086243E-03	-.44804067E-03	-.15636016E-03
13	-.30136822E-03	-.45630153E-03	-.14925188E-03
14	-.30192950E-03	-.46429681E-03	-.14251432E-03
15	-.28139247E-03	-.43718085E-03	-.12843661E-03
16	-.28193950E-03	-.44400724E-03	-.12281845E-03
17	-.28252869E-03	-.45062692E-03	-.11748679E-03
18	-.28315779E-03	-.45704952E-03	-.11242772E-03
19	-.28382468E-03	-.46328382E-03	-.10762843E-03
20	-.28452737E-03	-.46933789E-03	-.10307704E-03
21	-.28526398E-03	-.47521912E-03	-.98762578E-04

1

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3716.6400	80.1288	446.4017
2	3762.3037	80.3687	634.9927
3	3808.6036	80.5780	824.1114
4	3855.5397	80.7572	1013.6866
5	3903.1119	80.9068	1203.6481
6	3951.3204	81.0269	1393.9266
7	4000.1651	81.1180	1584.4533
8	4049.6459	81.1802	1775.1601
9	4099.7629	81.2135	1965.9793
10	4150.5162	81.2182	2156.8433
11	4201.9056	81.1942	2347.6849
12	4253.9312	81.1416	2538.4365
13	4306.5930	81.0601	2729.0308
14	4359.8910	80.9499	2919.4001
15	4413.8252	80.8367	3109.4832
16	4468.3956	80.7222	3299.3212
17	4523.6022	80.5818	3488.8594
18	4579.4449	80.4154	3678.0370
19	4635.9239	80.2229	3866.7926
20	4693.0391	80.0038	4055.0645
21	4750.7904	79.7582	4242.7900

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	-.17396676E-02	.36173637E+08
2	-.11819223E-02	.37201738E+08
3	-.68924193E-03	.38225520E+08
4	-.27684510E-03	.39245207E+08
5	.39631566E-04	.40260875E+08
6	.24333220E-03	.41272573E+08
7	.31600314E-03	.42280343E+08
8	.23790655E-03	.43284214E+08
9	-.12798823E-04	.44284207E+08
10	-.46036792E-03	.45280336E+08
11	-.11318247E-02	.46272606E+08
12	-.20574531E-02	.47261021E+08
13	-.32709919E-02	.48245584E+08
14	-.48103442E-02	.49226304E+08
15	.71040311E-02	.54698766E+08
16	.61164548E-02	.55771189E+08
17	.53368831E-02	.56840459E+08
18	.47630252E-02	.57906600E+08
19	.43954121E-02	.58969640E+08
20	.42373770E-02	.60029609E+08
21	.42951862E-02	.61086539E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-2 DE 47.0 M V FRANCOLÍ (ROT) XH4

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	47.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	3.8800 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	3.0800 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

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DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	32.500	10.0500	10.0500
2	14.500	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	59.0000 T
REACCION VERTICAL TABLERO	=	2067.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

1

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FASE ELASTICA

REACCION DEL TABLERO = 84.9600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.46407873E-02	.12523117E+00
2	.26780011E-04	.46093208E-02	.11434997E+00
3	.47940001E-04	.45215248E-02	.10361149E+00
4	.64701294E-04	.43891712E-02	.93133704E-01
5	.77988965E-04	.42215102E-02	.83010038E-01
6	.88511781E-04	.40258718E-02	.73314522E-01
7	.96818448E-04	.38081088E-02	.64105772E-01
8	.10333779E-03	.35729252E-02	.55430056E-01
9	.10840782E-03	.33241241E-02	.47323690E-01
10	.11229709E-03	.30647959E-02	.39814919E-01
11	.11522050E-03	.27974627E-02	.32925420E-01
12	.11735111E-03	.25241911E-02	.26671496E-01
13	.11882918E-03	.22466792E-02	.21065044E-01
14	.11976898E-03	.19663264E-02	.16114330E-01
15	.12026407E-03	.16842875E-02	.11824630E-01
16	.12039143E-03	.14015173E-02	.81987512E-02
17	.12021464E-03	.11188052E-02	.52374536E-02
18	.11978646E-03	.83680390E-03	.29398100E-02
19	.11915074E-03	.55605269E-03	.13034960E-02
20	.11834414E-03	.27699620E-03	.32503480E-03
21	.11739731E-03	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2976.4800	84.9600	.0000
2	3022.1437	84.9600	199.6560
3	3068.4436	84.9600	399.3120
4	3115.3797	84.9600	598.9680
5	3162.9519	84.9600	798.6240
6	3211.1604	84.9600	998.2800
7	3260.0051	84.9600	1197.9360
8	3309.4859	84.9600	1397.5920
9	3359.6029	84.9600	1597.2480
10	3410.3562	84.9600	1796.9040
11	3461.7456	84.9600	1996.5600
12	3513.7712	84.9600	2196.2160
13	3566.4330	84.9600	2395.8720
14	3619.7310	84.9600	2595.5280
15	3673.6652	84.9600	2795.1840
16	3728.2356	84.9600	2994.8400
17	3783.4422	84.9600	3194.4960
18	3839.2849	84.9600	3394.1520
19	3895.7639	84.9600	3593.8080
20	3952.8791	84.9600	3793.4640
21	4010.6304	84.9600	3993.1200

FASE FINAL EN ITERACION NUMERO 4

REACCION DEL TABLERO = 84.9600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.53542218E-02	.14153595E+00
2	.32374323E-04	.53161820E-02	.12898333E+00
3	.57997732E-04	.52099948E-02	.11660328E+00
4	.78294025E-04	.50498520E-02	.10453862E+00
5	.94351308E-04	.48469937E-02	.92902435E-01
6	.10701025E-03	.46103939E-02	.81784179E-01
7	.11692720E-03	.43472674E-02	.71254363E-01
8	.12461938E-03	.40634502E-02	.61368230E-01
9	.13049783E-03	.37636875E-02	.52168638E-01
10	.13489169E-03	.34518548E-02	.43688353E-01
11	.13806635E-03	.31311291E-02	.35951886E-01
12	.14023709E-03	.28041225E-02	.28976967E-01
13	.14157954E-03	.24729880E-02	.22775744E-01
14	.14223773E-03	.21395027E-02	.17355765E-01
15	.13136621E-03	.18180181E-02	.12710681E-01
16	.13101065E-03	.15097253E-02	.88007462E-02
17	.13030667E-03	.12026774E-02	.56139970E-02
18	.12931584E-03	.89762097E-03	.31466024E-02
19	.12808957E-03	.59516961E-03	.13931378E-02
20	.12667091E-03	.29582605E-03	.34687079E-03
21	.12509594E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.25024702E-03	-.25024702E-03	-.25024702E-03
2	-.23581503E-03	-.26971095E-03	-.20353783E-03
3	-.23674844E-03	-.30019796E-03	-.17619881E-03
4	-.23794357E-03	-.32727705E-03	-.15252479E-03
5	-.23931302E-03	-.35140237E-03	-.13194123E-03
6	-.24079377E-03	-.37295143E-03	-.11398662E-03
7	-.24234037E-03	-.39224104E-03	-.98286063E-04
8	-.24392018E-03	-.40953933E-03	-.84531999E-04
9	-.24550992E-03	-.42507493E-03	-.72469803E-04
10	-.24709323E-03	-.43904412E-03	-.61886936E-04
11	-.24865886E-03	-.45161640E-03	-.52604640E-04
12	-.25019933E-03	-.46293899E-03	-.44471526E-04
13	-.25170996E-03	-.47314036E-03	-.37358532E-04
14	-.25318811E-03	-.48233310E-03	-.31155013E-04
15	-.23641716E-03	-.45422233E-03	-.25180295E-04
16	-.23764186E-03	-.46101502E-03	-.20819231E-04
17	-.23884497E-03	-.46714225E-03	-.17063026E-04
18	-.24002745E-03	-.47266664E-03	-.13854047E-04
19	-.24119052E-03	-.47764387E-03	-.11141643E-04
20	-.24233560E-03	-.48212363E-03	-.88811204E-05
21	-.24346423E-03	-.48615036E-03	-.70329049E-05

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2976.4800	100.8962	.0000
2	3022.1437	101.0248	237.3012
3	3068.4436	100.9444	474.6517
4	3115.3797	100.6894	711.6023
5	3162.9519	100.2875	947.7766
6	3211.1604	99.7610	1182.8565
7	3260.0051	99.1281	1416.5713
8	3309.4859	98.4036	1648.6892
9	3359.6029	97.6000	1879.0102
10	3410.3562	96.7274	2107.3605
11	3461.7456	95.7944	2333.5888
12	3513.7712	94.8082	2557.5617
13	3566.4330	93.7749	2779.1618
14	3619.7310	92.6997	2998.2848
15	3673.6652	91.6344	3214.8337
16	3728.2356	90.5842	3428.9516
17	3783.4422	89.5058	3640.5667
18	3839.2849	88.4018	3849.6159
19	3895.7639	87.2743	4056.0414
20	3952.8791	86.1250	4259.7901
21	4010.6304	84.9557	4460.8130

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	.19701189E-02	.73280172E+07
3	.38673024E-02	.81772569E+07
4	.56021256E-02	.90741110E+07
5	.70711511E-02	.10019492E+08
6	.81649170E-02	.11014272E+08
7	.87677560E-02	.12059308E+08
8	.87574022E-02	.13155444E+08
9	.80039750E-02	.14303503E+08
10	.63688589E-02	.15504293E+08
11	.37036424E-02	.16758612E+08
12	-.33484175E-04	.18063865E+08
13	-.52263301E-02	.19427015E+08
14	-.11961175E-01	.20846067E+08
15	.20505758E-01	.24268218E+08
16	.15710358E-01	.25943470E+08
17	.12073643E-01	.27682510E+08
18	.95603226E-02	.29486105E+08
19	.81597145E-02	.31355010E+08
20	.78840025E-02	.33289967E+08
21	.87665645E-02	.35291705E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-2 DE 47.0 M V FRANCOLÍ (ROT) ZH4

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	47.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	3.8800 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	3.0800 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	32.500	10.0500	10.0500
2	14.500	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0390 T/M2
REACCION HORIZONTAL TABLERO	=	50.0000 T
REACCION VERTICAL TABLERO	=	2067.0000 T
MOMENTO EXTERIOR EN CABEZA	=	1694.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

1

FASE ELASTICA

REACCION DEL TABLERO = 72.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.63370274E-04	.39206131E-02	.98647966E-01
2	.65912178E-04	.37687062E-02	.89611846E-01
3	.68334129E-04	.36109668E-02	.80939616E-01
4	.70646196E-04	.34476649E-02	.72644660E-01
5	.72857426E-04	.32790481E-02	.64739754E-01
6	.74975971E-04	.31053439E-02	.57237119E-01
7	.77009193E-04	.29267613E-02	.50148459E-01
8	.78963761E-04	.27434931E-02	.43485011E-01
9	.80845731E-04	.25557169E-02	.37257573E-01
10	.82660610E-04	.23635970E-02	.31476544E-01
11	.84413423E-04	.21672850E-02	.26151951E-01
12	.86108760E-04	.19669214E-02	.21293478E-01
13	.87750824E-04	.17626364E-02	.16910492E-01
14	.89343470E-04	.15545506E-02	.13012064E-01
15	.90890244E-04	.13427760E-02	.96069934E-02
16	.92394406E-04	.11274166E-02	.67038249E-02
17	.93858966E-04	.90856885E-03	.43108681E-02
18	.95286702E-04	.68632269E-03	.24362135E-02
19	.96680185E-04	.46076159E-03	.10877481E-02
20	.98041797E-04	.23196326E-03	.27316981E-03
21	.99373748E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2976.4800	72.0000	2439.3600
2	3022.1437	72.2702	2608.8750
3	3068.4436	72.5527	2779.0394
4	3115.3797	72.8477	2949.8825
5	3162.9519	73.1551	3121.4333
6	3211.1604	73.4748	3293.7210
7	3260.0051	73.8070	3466.7747
8	3309.4859	74.1516	3640.6236
9	3359.6029	74.5086	3815.2970
10	3410.3562	74.8780	3990.8238
11	3461.7456	75.2598	4167.2333
12	3513.7712	75.6540	4344.5546
13	3566.4330	76.0606	4522.8169
14	3619.7310	76.4797	4702.0493
15	3673.6652	76.9111	4882.2810
16	3728.2356	77.3549	5063.5412
17	3783.4422	77.8112	5245.8589
18	3839.2849	78.2798	5429.2634
19	3895.7639	78.7609	5613.7837
20	3952.8791	79.2543	5799.4491
21	4010.6304	79.7602	5986.2888

1

FASE FINAL EN ITERACION NUMERO 4

REACCION DEL TABLERO = 72.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.64619955E-04	.41386390E-02	.10377778E+00
2	.67983578E-04	.39828299E-02	.94233504E-01
3	.71173518E-04	.38193203E-02	.85064509E-01
4	.74202382E-04	.36485036E-02	.76288422E-01
5	.77081454E-04	.34707451E-02	.67921980E-01
6	.79820863E-04	.32863849E-02	.59981091E-01
7	.82429719E-04	.30957404E-02	.52480894E-01
8	.84916234E-04	.28991089E-02	.45435801E-01
9	.87287825E-04	.26967692E-02	.38859553E-01
10	.89551204E-04	.24889833E-02	.32765252E-01
11	.91715781E-04	.22759946E-02	.27165407E-01
12	.93850722E-04	.20579540E-02	.22072035E-01
13	.95980008E-04	.18349029E-02	.17496948E-01
14	.98114941E-04	.16068413E-02	.13451916E-01
15	.92358280E-04	.13830353E-02	.99414607E-02
16	.94254011E-04	.11637658E-02	.69480970E-02
17	.96152800E-04	.94003781E-03	.44752539E-02
18	.98060984E-04	.71183662E-03	.25334233E-02
19	.99987178E-04	.47913003E-03	.11331511E-02
20	.10194352E-03	.24186145E-03	.28508576E-03
21	.10389601E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.23986782E-03	-.41757270E-03	-.65393939E-04
2	-.24076098E-03	-.42771582E-03	-.57205315E-04
3	-.24170763E-03	-.43743480E-03	-.49539126E-04
4	-.24270381E-03	-.44676036E-03	-.42357380E-04
5	-.24374593E-03	-.45571993E-03	-.35626004E-04
6	-.24483069E-03	-.46433806E-03	-.29314356E-04
7	-.24595506E-03	-.47263679E-03	-.23394817E-04
8	-.24711626E-03	-.48063591E-03	-.17842430E-04
9	-.24831173E-03	-.48835325E-03	-.12634601E-04
10	-.24953908E-03	-.49580489E-03	-.77508298E-05
11	-.25079084E-03	-.50300924E-03	-.31582340E-05
12	-.25198827E-03	-.51007776E-03	.14086737E-05
13	-.25310082E-03	-.51704585E-03	.60451993E-05
14	-.25412220E-03	-.52393829E-03	.10788145E-04
15	-.23683039E-03	-.49081566E-03	.12536971E-04
16	-.23760070E-03	-.49679923E-03	.16885131E-04
17	-.23828348E-03	-.50270368E-03	.21329078E-04
18	-.23886877E-03	-.50853647E-03	.25895891E-04
19	-.23934261E-03	-.51430735E-03	.30622771E-04
20	-.23968479E-03	-.52002948E-03	.35562717E-04
21	-.23994774E-03	-.52566177E-03	.40571486E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2976.4800	84.3153	2439.3792
2	3022.1437	84.3035	2637.5191
3	3068.4436	84.2687	2835.6041
4	3115.3797	84.2108	3033.5800
5	3162.9519	84.1295	3231.3925
6	3211.1604	84.0246	3428.9863
7	3260.0051	83.8959	3626.3059
8	3309.4859	83.7431	3823.2949
9	3359.6029	83.5657	4019.8963
10	3410.3562	83.3635	4216.0522
11	3461.7456	83.1362	4411.6615
12	3513.7712	82.8829	4606.7033
13	3566.4330	82.6025	4801.0722
14	3619.7310	82.2940	4995.0020
15	3673.6652	81.9902	5187.9068
16	3728.2356	81.6919	5380.2381
17	3783.4422	81.3658	5571.8366
18	3839.2849	81.0107	5762.6362
19	3895.7639	80.6253	5952.5624
20	3952.8791	80.2083	6141.5244
21	4010.6304	79.7584	6329.5495

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	-.19220741E-01	.37587561E+08
2	-.19868668E-01	.38608874E+08
3	-.20492743E-01	.39626160E+08
4	-.21239697E-01	.40639453E+08
5	-.22254312E-01	.41648495E+08
6	-.23680373E-01	.42653587E+08
7	-.25661537E-01	.43654721E+08
8	-.28342271E-01	.44651938E+08
9	-.31868686E-01	.45645279E+08
10	-.36377760E-01	.46634791E+08
11	.32427200E-03	.46930327E+08
12	.39157990E-01	.45542362E+08
13	.12347209E+00	.44053492E+08
14	-.45462839E-01	.42442000E+08
15	.77367917E-01	.46402892E+08
16	.79032818E-01	.44812489E+08
17	.80035671E-01	.43107418E+08
18	.79990687E-01	.41271169E+08
19	.83415854E-01	.39285153E+08
20	.10823853E+00	.34408398E+08
21	.50983808E-01	.35700002E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-2 DE 47.0 M V FRANCOLÍ (ROT) XH51

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	47.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	3.8800 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	3.0800 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

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DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	32.500	10.0500	10.0500
2	14.500	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	71.0000 T
REACCION VERTICAL TABLERO	=	1964.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

1

1

FASE ELASTICA

REACCION DEL TABLERO = 102.2400 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.55846762E-02	.15070191E+00
2	.32226793E-04	.55468097E-02	.13760759E+00
3	.57690510E-04	.54411569E-02	.12468501E+00
4	.77860879E-04	.52818840E-02	.11207615E+00
5	.93851128E-04	.50801224E-02	.99893436E-01
6	.10651418E-03	.48446932E-02	.88225950E-01
7	.11651034E-03	.45826394E-02	.77144234E-01
8	.12435564E-03	.42996219E-02	.66703966E-01
9	.13045687E-03	.40002172E-02	.56948847E-01
10	.13513718E-03	.36881442E-02	.47912869E-01
11	.13865517E-03	.33664382E-02	.39622116E-01
12	.14121913E-03	.30375858E-02	.32096208E-01
13	.14299783E-03	.27036309E-02	.25349459E-01
14	.14412877E-03	.23662571E-02	.19391820E-01
15	.14472456E-03	.20268545E-02	.14229640E-01
16	.14487782E-03	.16865717E-02	.98662938E-02
17	.14466508E-03	.13463588E-02	.63026984E-02
18	.14414980E-03	.10070013E-02	.35377374E-02
19	.14338479E-03	.66914815E-03	.15686139E-02
20	.14241413E-03	.33333441E-03	.39114357E-03
21	.14127473E-03	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2828.1600	102.2400	.0000
2	2873.8237	102.2400	240.2640
3	2920.1236	102.2400	480.5280
4	2967.0597	102.2400	720.7920
5	3014.6319	102.2400	961.0560
6	3062.8404	102.2400	1201.3200
7	3111.6851	102.2400	1441.5840
8	3161.1659	102.2400	1681.8480
9	3211.2829	102.2400	1922.1120
10	3262.0362	102.2400	2162.3760
11	3313.4256	102.2400	2402.6400
12	3365.4512	102.2400	2642.9040
13	3418.1130	102.2400	2883.1680
14	3471.4110	102.2400	3123.4320
15	3525.3452	102.2400	3363.6960
16	3579.9156	102.2400	3603.9600
17	3635.1222	102.2400	3844.2240
18	3690.9649	102.2400	4084.4880
19	3747.4439	102.2400	4324.7520
20	3804.5591	102.2400	4565.0160
21	3862.3104	102.2400	4805.2800

FASE FINAL EN ITERACION NUMERO 6

REACCION DEL TABLERO = 102.2400 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.65772517E-02	.17669131E+00
2	.38451160E-04	.65320716E-02	.16127016E+00
3	.68906093E-04	.64059268E-02	.14605400E+00
4	.93056827E-04	.62156204E-02	.13121256E+00
5	.11219276E-03	.59744521E-02	.11688042E+00
6	.12730823E-03	.56930385E-02	.10316416E+00
7	.13917851E-03	.53799165E-02	.90147980E-01
8	.14841403E-03	.50419953E-02	.77897983E-01
9	.15549968E-03	.46848967E-02	.66465624E-01
10	.16082370E-03	.43132167E-02	.55890391E-01
11	.16470303E-03	.39307228E-02	.46201976E-01
12	.16779590E-03	.35400366E-02	.37422410E-01
13	.17052020E-03	.31425152E-02	.29569158E-01
14	.17301009E-03	.27388671E-02	.22657388E-01
15	.16112190E-03	.23462620E-02	.16687833E-01
16	.16296134E-03	.19654642E-02	.11620708E-01
17	.16514549E-03	.15799387E-02	.74538541E-02
18	.16734457E-03	.11892629E-02	.41990302E-02
19	.16867603E-03	.79443866E-03	.18675682E-02
20	.16920986E-03	.39742274E-03	.46688538E-03
21	.16902226E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.23777704E-03	-.23777704E-03	-.23777704E-03
2	-.22343739E-03	-.26369576E-03	-.18510159E-03
3	-.22476500E-03	-.30014826E-03	-.15282704E-03
4	-.22644036E-03	-.33261820E-03	-.12491536E-03
5	-.22834234E-03	-.36162734E-03	-.10066698E-03
6	-.23038367E-03	-.38760934E-03	-.79523419E-04
7	-.23250144E-03	-.41092829E-03	-.61033521E-04
8	-.23465045E-03	-.43189268E-03	-.44828907E-04
9	-.23679846E-03	-.45076602E-03	-.30605885E-04
10	-.23892283E-03	-.46777495E-03	-.18111900E-04
11	-.24100479E-03	-.48311823E-03	-.71264897E-05
12	-.24269020E-03	-.49723658E-03	.34663775E-05
13	-.24373748E-03	-.51043108E-03	.14430102E-04
14	-.24409843E-03	-.52281769E-03	.25970318E-04
15	-.22645545E-03	-.49359555E-03	.32628560E-04
16	-.22558538E-03	-.50343446E-03	.44115646E-04
17	-.23364286E-03	-.51297776E-03	.57434771E-04
18	-.22103606E-03	-.52208895E-03	.71649594E-04
19	-.21888992E-03	-.53026587E-03	.84052225E-04
20	-.21723205E-03	-.53754632E-03	.94621722E-04
21	-.21607026E-03	-.54397343E-03	.10338181E-03

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2828.1600	120.8401	.0000
2	2873.8237	121.0095	284.2265
3	2920.1236	120.9428	568.5654
4	2967.0597	120.6781	852.5085
5	3014.6319	120.2462	1135.6280
6	3062.8404	119.6719	1417.5611
7	3111.6851	118.9753	1697.9978
8	3161.1659	118.1730	1976.6708
9	3211.2829	117.2788	2253.3485
10	3262.0362	116.3040	2527.8287
11	3313.4256	115.2582	2799.9329
12	3365.4512	114.1479	3069.4874
13	3418.1130	112.9755	3336.3630
14	3471.4110	111.7417	3600.4125
15	3525.3452	110.5057	3861.5314
16	3579.9156	109.2704	4119.7771
17	3635.1222	107.9773	4375.0490
18	3690.9649	106.6236	4627.2620
19	3747.4439	105.2112	4876.1749
20	3804.5591	103.7462	5121.6932
21	3862.3104	102.2342	5363.7092

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	.62442236E-03	.73894179E+07
3	.11288297E-02	.82420347E+07
4	.14181420E-02	.91406277E+07
5	.13952744E-02	.10086131E+08
6	.96298459E-03	.11079466E+08
7	.13115596E-04	.12120700E+08
8	-.15399950E-02	.13212191E+08
9	-.38002286E-02	.14354256E+08
10	-.68726057E-02	.15547818E+08
11	-.10131098E-01	.16650290E+08
12	.17776811E-02	.16401552E+08
13	.99525882E-02	.15756490E+08
14	.16555826E-01	.14908684E+08
15	.28587246E-01	.16057146E+08
16	.31954133E-01	.14561454E+08
17	.39167920E-01	.12086428E+08
18	-.45592842E-02	.12150243E+08
19	.96839037E-04	.12882505E+08
20	.16936452E-01	.13319825E+08
21	.36764480E-01	.13940162E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-2 DE 47.0 M V FRANCOLÍ (ROT) ZH51

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	47.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	3.8800 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	3.0800 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	32.500	10.0500	10.0500
2	14.500	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0390 T/M2
REACCION HORIZONTAL TABLERO	=	43.0000 T
REACCION VERTICAL TABLERO	=	1964.0000 T
MOMENTO EXTERIOR EN CABEZA	=	1402.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

1

1

FASE ELASTICA

REACCION DEL TABLERO = 61.9200 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.52446945E-04	.33014377E-02	.83389630E-01
2	.54690452E-04	.31755513E-02	.75778136E-01
3	.56829962E-04	.30445148E-02	.68468573E-01
4	.58874299E-04	.29085623E-02	.61472767E-01
5	.60831388E-04	.27679081E-02	.54802014E-01
6	.62708371E-04	.26227489E-02	.48467128E-01
7	.64511701E-04	.24732653E-02	.42478481E-01
8	.66247221E-04	.23196236E-02	.36846038E-01
9	.67920236E-04	.21619768E-02	.31579388E-01
10	.69535572E-04	.20004662E-02	.26687774E-01
11	.71097632E-04	.18352222E-02	.22180121E-01
12	.72610437E-04	.16663652E-02	.18065059E-01
13	.74077671E-04	.14940067E-02	.14350947E-01
14	.75502712E-04	.13182498E-02	.11045890E-01
15	.76888665E-04	.11391899E-02	.81577606E-02
16	.78238388E-04	.95691561E-03	.56942155E-02
17	.79554518E-04	.77150895E-03	.36627109E-02
18	.80839489E-04	.58304599E-03	.20705175E-02
19	.82095553E-04	.39159732E-03	.92473356E-03
20	.83324799E-04	.19722840E-03	.23229763E-03
21	.84529161E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2828.1600	61.9200	2018.8800
2	2873.8237	62.1902	2164.7070
3	2920.1236	62.4727	2311.1834
4	2967.0597	62.7677	2458.3385
5	3014.6319	63.0751	2606.2013
6	3062.8404	63.3948	2754.8010
7	3111.6851	63.7270	2904.1667
8	3161.1659	64.0716	3054.3276
9	3211.2829	64.4286	3205.3130
10	3262.0362	64.7980	3357.1518
11	3313.4256	65.1798	3509.8733
12	3365.4512	65.5740	3663.5066
13	3418.1130	65.9806	3818.0809
14	3471.4110	66.3997	3973.6253
15	3525.3452	66.8311	4130.1690
16	3579.9156	67.2749	4287.7412
17	3635.1222	67.7312	4446.3709
18	3690.9649	68.1998	4606.0874
19	3747.4439	68.6809	4766.9197
20	3804.5591	69.1743	4928.8971
21	3862.3104	69.6802	5092.0488

1

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 61.9200 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.52984897E-04	.34198938E-02	.85689790E-01
2	.55855003E-04	.32920069E-02	.77801986E-01
3	.58580894E-04	.31575447E-02	.70222508E-01
4	.61173174E-04	.30168337E-02	.62966421E-01
5	.63641337E-04	.28701767E-02	.56048047E-01
6	.65993903E-04	.27178552E-02	.49481027E-01
7	.68238540E-04	.25601321E-02	.43278359E-01
8	.70382159E-04	.23972528E-02	.37452445E-01
9	.72431005E-04	.22294473E-02	.32015130E-01
10	.74390729E-04	.20569318E-02	.26977732E-01
11	.76266451E-04	.18799096E-02	.22351080E-01
12	.78062822E-04	.16985727E-02	.18145537E-01
13	.79784071E-04	.15131026E-02	.14371026E-01
14	.81434045E-04	.13236713E-02	.11037058E-01
15	.76755806E-04	.11377983E-02	.81469839E-02
16	.78150074E-04	.95578385E-03	.56863832E-02
17	.79489021E-04	.77055792E-03	.36573154E-02
18	.80775134E-04	.58224753E-03	.20671772E-02
19	.82010692E-04	.39097419E-03	.92307303E-03
20	.83197783E-04	.19685423E-03	.23182833E-03
21	.84337731E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.22570986E-03	-.37141832E-03	-.82650636E-04
2	-.22660238E-03	-.38020364E-03	-.75793878E-04
3	-.22754179E-03	-.38863925E-03	-.69373372E-04
4	-.22852499E-03	-.39675122E-03	-.63357415E-04
5	-.22954917E-03	-.40456284E-03	-.57717560E-04
6	-.23061175E-03	-.41209498E-03	-.52428215E-04
7	-.23171036E-03	-.41936635E-03	-.47466306E-04
8	-.23284281E-03	-.42639375E-03	-.42810977E-04
9	-.23400705E-03	-.43319232E-03	-.38443339E-04
10	-.23520122E-03	-.43977572E-03	-.34346251E-04
11	-.23642354E-03	-.44615628E-03	-.30504127E-04
12	-.23767240E-03	-.45234516E-03	-.26902775E-04
13	-.23894624E-03	-.45835243E-03	-.23529246E-04
14	-.24024363E-03	-.46418725E-03	-.20371711E-04
15	-.22467493E-03	-.43575340E-03	-.17434258E-04
16	-.22586124E-03	-.44077394E-03	-.14856038E-04
17	-.22706641E-03	-.44566122E-03	-.12446054E-04
18	-.22828948E-03	-.45042110E-03	-.10196614E-04
19	-.22952951E-03	-.45505891E-03	-.81006373E-05
20	-.23078562E-03	-.45957952E-03	-.61516027E-05
21	-.23205685E-03	-.46398561E-03	-.43449783E-05

1

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2828.1600	71.5861	2018.8604
2	2873.8237	71.6447	2187.1646
3	2920.1236	71.6867	2355.5878
4	2967.0597	71.7122	2524.0908
5	3014.6319	71.7208	2692.6339
6	3062.8404	71.7122	2861.1768
7	3111.6851	71.6862	3029.6787
8	3161.1659	71.6425	3198.0979
9	3211.2829	71.5807	3366.3921
10	3262.0362	71.5004	3534.5180
11	3313.4256	71.4013	3702.4315
12	3365.4512	71.2829	3870.0877
13	3418.1130	71.1450	4037.4406
14	3471.4110	70.9869	4204.4433
15	3525.3452	70.8351	4371.3215
16	3579.9156	70.6903	4537.6144
17	3635.1222	70.5269	4703.5465
18	3690.9649	70.3445	4869.0735
19	3747.4439	70.1426	5034.1503
20	3804.5591	69.9208	5198.7306
21	3862.3104	69.6787	5362.7295

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.19639622E-01	.37995426E+08
2	.28766689E-01	.39035390E+08
3	.37599687E-01	.40072046E+08
4	.46385066E-01	.41105386E+08
5	.55362148E-01	.42135397E+08
6	.64765855E-01	.43162071E+08
7	.74829462E-01	.44185399E+08
8	.85787388E-01	.45205374E+08
9	.97878033E-01	.46221989E+08
10	.11134653E+00	.47235237E+08
11	.12644773E+00	.48245112E+08
12	.14344894E+00	.49251611E+08
13	.16263297E+00	.50254728E+08
14	.18430095E+00	.51254460E+08
15	-.44354710E-01	.56601905E+08
16	-.28069283E-01	.57689600E+08
17	-.15330412E-01	.58774375E+08
18	-.61623489E-02	.59856248E+08
19	-.59968385E-03	.60935239E+08
20	.13083461E-02	.62011368E+08
21	.37063748E-01	.63084677E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-2 DE 47.0 M V FRANCOLÍ (ROT) XH52

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	47.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	3.8800 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	3.0800 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	32.500	10.0500	10.0500
2	14.500	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	84.0000 T
REACCION VERTICAL TABLERO	=	2375.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

1

FASE ELASTICA

REACCION DEL TABLERO = 120.9600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.66072226E-02	.17829522E+00
2	.38127473E-04	.65624228E-02	.16280334E+00
3	.68253561E-04	.64374251E-02	.14751466E+00
4	.92117096E-04	.62489896E-02	.13259714E+00
5	.11103514E-03	.60102857E-02	.11818378E+00
6	.12601677E-03	.57317497E-02	.10438000E+00
7	.13784321E-03	.54217142E-02	.91269234E-01
8	.14712498E-03	.50868766E-02	.78917368E-01
9	.15434333E-03	.47326513E-02	.67376101E-01
10	.15988061E-03	.43634382E-02	.56685648E-01
11	.16404274E-03	.39828282E-02	.46876869E-01
12	.16707616E-03	.35937635E-02	.37972978E-01
13	.16918053E-03	.31986619E-02	.29990910E-01
14	.17051855E-03	.27995155E-02	.22942435E-01
15	.17122342E-03	.23979687E-02	.16835067E-01
16	.17140474E-03	.19953806E-02	.11672798E-01
17	.17115305E-03	.15928752E-02	.74567136E-02
18	.17054343E-03	.11913818E-02	.41854922E-02
19	.16963835E-03	.79166823E-03	.18558249E-02
20	.16848996E-03	.39436747E-03	.46276141E-03
21	.16714193E-03	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3420.0000	120.9600	.0000
2	3465.6637	120.9600	284.2560
3	3511.9636	120.9600	568.5120
4	3558.8997	120.9600	852.7680
5	3606.4719	120.9600	1137.0240
6	3654.6804	120.9600	1421.2800
7	3703.5251	120.9600	1705.5360
8	3753.0059	120.9600	1989.7920
9	3803.1229	120.9600	2274.0480
10	3853.8762	120.9600	2558.3040
11	3905.2656	120.9600	2842.5600
12	3957.2912	120.9600	3126.8160
13	4009.9530	120.9600	3411.0720
14	4063.2510	120.9600	3695.3280
15	4117.1852	120.9600	3979.5840
16	4171.7556	120.9600	4263.8400
17	4226.9622	120.9600	4548.0960
18	4282.8049	120.9600	4832.3520
19	4339.2839	120.9600	5116.6080
20	4396.3991	120.9600	5400.8640
21	4454.1504	120.9600	5685.1200

1

FASE FINAL EN ITERACION NUMERO 7

REACCION DEL TABLERO = 120.9600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.87043365E-02	.23647366E+00
2	.49645296E-04	.86460033E-02	.21606417E+00
3	.88935457E-04	.84831709E-02	.19591930E+00
4	.12006266E-03	.82375981E-02	.17625808E+00
5	.14469374E-03	.79265094E-02	.15725391E+00
6	.16411273E-03	.75636618E-02	.13904403E+00
7	.17932063E-03	.71601276E-02	.12173657E+00
8	.19110602E-03	.67248763E-02	.10541627E+00
9	.20009590E-03	.62652140E-02	.90148778E-01
10	.20681514E-03	.57870935E-02	.75984224E-01
11	.21252673E-03	.52943668E-02	.62960880E-01
12	.21797920E-03	.47885224E-02	.51110976E-01
13	.22364742E-03	.42696111E-02	.40465061E-01
14	.23080710E-03	.37356270E-02	.31055611E-01
15	.21576656E-03	.32109030E-02	.22900360E-01
16	.22191768E-03	.26966240E-02	.15956185E-01
17	.22658967E-03	.21696278E-02	.10236189E-01
18	.22983216E-03	.16333322E-02	.57662189E-02
19	.23173281E-03	.10909933E-02	.25642617E-02
20	.23240360E-03	.54563306E-03	.64091698E-03
21	.23196496E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.28753588E-03	-.28753588E-03	-.28753588E-03
2	-.27404542E-03	-.32602405E-03	-.22454906E-03
3	-.27523497E-03	-.37253036E-03	-.18238635E-03
4	-.27700333E-03	-.41399482E-03	-.14601496E-03
5	-.27914449E-03	-.45104065E-03	-.11448302E-03
6	-.28150988E-03	-.48418910E-03	-.87036297E-04
7	-.28399224E-03	-.51388129E-03	-.63069217E-04
8	-.28651441E-03	-.54049430E-03	-.42089808E-04
9	-.28902136E-03	-.56435333E-03	-.23694195E-04
10	-.29145771E-03	-.58575566E-03	-.75005186E-05
11	-.29310292E-03	-.60551722E-03	.86850406E-05
12	-.29346569E-03	-.62414014E-03	.26309797E-04
13	-.29215887E-03	-.64194343E-03	.46443317E-04
14	-.28787944E-03	-.65970968E-03	.72410451E-04
15	-.26199138E-03	-.61973235E-03	.84961253E-04
16	-.25558256E-03	-.63395221E-03	.11169121E-03
17	-.24975188E-03	-.64673697E-03	.13590374E-03
18	-.24462680E-03	-.65809486E-03	.15734966E-03
19	-.24028411E-03	-.66806287E-03	.17590801E-03
20	-.23675852E-03	-.67669853E-03	.19156131E-03
21	-.23405505E-03	-.68406708E-03	.20435873E-03

1

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3420.0000	150.7274	.0000
2	3465.6637	150.9213	354.5161
3	3511.9636	150.7487	709.0435
4	3558.8997	150.2719	1062.7967
5	3606.4719	149.5411	1415.1220
6	3654.6804	148.5965	1765.4711
7	3703.5251	147.4709	2113.3812
8	3753.0059	146.1913	2458.4595
9	3803.1229	144.7797	2800.3707
10	3853.8762	143.2547	3138.8300
11	3905.2656	141.6276	3473.6030
12	3957.2912	139.9011	3804.4330
13	4009.9530	138.0724	4131.0811
14	4063.2510	136.1301	4453.2817
15	4117.1852	134.1719	4770.9056
16	4171.7556	132.2016	5083.8513
17	4226.9622	130.1226	5392.1058
18	4282.8049	127.9467	5695.3792
19	4339.2839	125.6857	5993.4317
20	4396.3991	123.3506	6286.0779
21	4454.1504	120.9521	6573.1282

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	.31830409E-02	.71369175E+07
3	.65086174E-02	.79569546E+07
4	.10119344E-01	.88174935E+07
5	.14168056E-01	.97196527E+07
6	.18815550E-01	.10664654E+08
7	.24228106E-01	.11653712E+08
8	.30581144E-01	.12688055E+08
9	.38057821E-01	.13768916E+08
10	.44079257E-01	.14614883E+08
11	.31482129E-01	.14011007E+08
12	.21546782E-01	.13079540E+08
13	.16768538E-01	.11553729E+08
14	.31546884E-01	.86866732E+07
15	-.21360179E-02	.96768642E+07
16	.65716824E-01	.98352411E+07
17	.64417553E-01	.10083100E+08
18	.42522499E-01	.10403555E+08
19	.25610725E-01	.10774199E+08
20	.11827674E-01	.11294764E+08
21	.29065435E-01	.11712075E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-2 DE 47.0 M V FRANCOLÍ (ROT) ZH52

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	47.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	3.8800 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	3.0800 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	32.500	10.0500	10.0500
2	14.500	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0390 T/M2
REACCION HORIZONTAL TABLERO	=	46.0000 T
REACCION VERTICAL TABLERO	=	2375.0000 T
MOMENTO EXTERIOR EN CABEZA	=	295.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.1400

1

FASE ELASTICA

REACCION DEL TABLERO = 66.2400 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.11035555E-04	.18492931E-02	.52570623E-01
2	.14673148E-04	.18190853E-02	.48258604E-01
3	.18132199E-04	.17805391E-02	.44027454E-01
4	.21427354E-04	.17340566E-02	.39896288E-01
5	.24571772E-04	.16800076E-02	.35883315E-01
6	.27577309E-04	.16187325E-02	.32005912E-01
7	.30454677E-04	.15505449E-02	.28280687E-01
8	.33213575E-04	.14757347E-02	.24723539E-01
9	.35862811E-04	.13945699E-02	.21349712E-01
10	.38410397E-04	.13072989E-02	.18173844E-01
11	.40863640E-04	.12141519E-02	.15210010E-01
12	.43229217E-04	.11153428E-02	.12471765E-01
13	.45513243E-04	.10110704E-02	.99721784E-02
14	.47721326E-04	.90151979E-03	.77238687E-02
15	.49858621E-04	.78686335E-03	.57390349E-02
16	.51929872E-04	.66726187E-03	.40294846E-02
17	.53939456E-04	.54286541E-03	.26066602E-02
18	.55891414E-04	.41381414E-03	.14816634E-02
19	.57789487E-04	.28023908E-03	.66527738E-03
20	.59637139E-04	.14226280E-03	.16798737E-03
21	.61437583E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3420.0000	66.2400	424.8000
2	3465.6637	66.5102	580.7790
3	3511.9636	66.7927	737.4074
4	3558.8997	67.0877	894.7145
5	3606.4719	67.3951	1052.7293
6	3654.6804	67.7148	1211.4810
7	3703.5251	68.0470	1370.9987
8	3753.0059	68.3916	1531.3116
9	3803.1229	68.7486	1692.4490
10	3853.8762	69.1180	1854.4398
11	3905.2656	69.4998	2017.3133
12	3957.2912	69.8940	2181.0986
13	4009.9530	70.3006	2345.8249
14	4063.2510	70.7197	2511.5213
15	4117.1852	71.1511	2678.2170
16	4171.7556	71.5949	2845.9412
17	4226.9622	72.0512	3014.7229
18	4282.8049	72.5198	3184.5914
19	4339.2839	73.0009	3355.5757
20	4396.3991	73.4943	3527.7051
21	4454.1504	74.0002	3701.0088

1

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 66.2400 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.11528539E-04	.19882346E-02	.55790995E-01
2	.15749089E-04	.19561834E-02	.51154362E-01
3	.19758821E-04	.19144616E-02	.46604509E-01
4	.23573527E-04	.18635461E-02	.42163594E-01
5	.27207354E-04	.18038785E-02	.37852698E-01
6	.30673011E-04	.17358691E-02	.33691899E-01
7	.33981946E-04	.16598995E-02	.29700349E-01
8	.37144500E-04	.15763260E-02	.25896328E-01
9	.40170026E-04	.14854814E-02	.22297312E-01
10	.43067008E-04	.13876779E-02	.18920017E-01
11	.45843153E-04	.12832084E-02	.15780448E-01
12	.48505472E-04	.11723488E-02	.12893943E-01
13	.51060359E-04	.10553590E-02	.10275210E-01
14	.53513649E-04	.93248451E-03	.79383651E-02
15	.51477511E-04	.80911989E-03	.58929170E-02
16	.53561772E-04	.68569874E-03	.41355459E-02
17	.55567241E-04	.55747214E-03	.26738972E-02
18	.57497733E-04	.42462080E-03	.15190496E-02
19	.59356757E-04	.28731677E-03	.68166737E-03
20	.61147543E-04	.14572422E-03	.17202006E-03
21	.62873071E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.27386982E-03	-.30557330E-03	-.24274276E-03
2	-.27380111E-03	-.31711111E-03	-.23127857E-03
3	-.27382692E-03	-.32816367E-03	-.22047810E-03
4	-.27394085E-03	-.33876805E-03	-.21029233E-03
5	-.27413711E-03	-.34895733E-03	-.20067725E-03
6	-.27441040E-03	-.35876118E-03	-.19159327E-03
7	-.27475588E-03	-.36820624E-03	-.18300463E-03
8	-.27516911E-03	-.37731648E-03	-.17487896E-03
9	-.27564599E-03	-.38611356E-03	-.16718692E-03
10	-.27618274E-03	-.39461701E-03	-.15990182E-03
11	-.27677589E-03	-.40284456E-03	-.15299937E-03
12	-.27742218E-03	-.41081223E-03	-.14645741E-03
13	-.27811863E-03	-.41853462E-03	-.14025566E-03
14	-.27886243E-03	-.42602496E-03	-.13437558E-03
15	-.26045216E-03	-.40201532E-03	-.12146288E-03
16	-.26116780E-03	-.40846267E-03	-.11655101E-03
17	-.26191979E-03	-.41472970E-03	-.11188823E-03
18	-.26270630E-03	-.42082506E-03	-.10746242E-03
19	-.26352561E-03	-.42675669E-03	-.10326237E-03
20	-.26437611E-03	-.43253185E-03	-.99277738E-04
21	-.26525625E-03	-.43815719E-03	-.95498956E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3420.0000	73.0366	424.7798
2	3465.6637	73.2861	596.7133
3	3511.9636	73.5124	769.2057
4	3558.8997	73.7156	942.2027
5	3606.4719	73.8961	1115.6503
6	3654.6804	74.0539	1289.4949
7	3703.5251	74.1891	1463.6833
8	3753.0059	74.3017	1638.1624
9	3803.1229	74.3918	1812.8788
10	3853.8762	74.4592	1987.7794
11	3905.2656	74.5038	2162.8106
12	3957.2912	74.5255	2337.9186
13	4009.9530	74.5241	2513.0491
14	4063.2510	74.4994	2688.1475
15	4117.1852	74.4735	2863.3960
16	4171.7556	74.4477	3038.3842
17	4226.9622	74.4009	3213.2876
18	4282.8049	74.3329	3388.0564
19	4339.2839	74.2433	3562.6405
20	4396.3991	74.1319	3736.9890
21	4454.1504	73.9984	3911.0503

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.20174205E-01	.36838583E+08
2	.28191105E-01	.37877394E+08
3	.36744369E-01	.38912243E+08
4	.45982629E-01	.39943328E+08
5	.56059363E-01	.40970703E+08
6	.67134652E-01	.41994408E+08
7	.79376543E-01	.43014463E+08
8	.92964017E-01	.44030882E+08
9	.10808924E+00	.45043664E+08
10	.12496048E+00	.46052800E+08
11	.14380472E+00	.47058281E+08
12	.16487021E+00	.48060093E+08
13	.18842945E+00	.49058231E+08
14	.21478182E+00	.50052697E+08
15	.23720354E-01	.55467103E+08
16	.38373015E-01	.56551330E+08
17	.49865870E-01	.57632480E+08
18	.58097407E-01	.58710567E+08
19	.62949551E-01	.59785604E+08
20	.64286056E-01	.60857610E+08
21	.61950859E-01	.61926600E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-2 DE 47.0 M V FRANCOLÍ (ROT) XH10

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	47.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	3.8800 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	3.0800 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

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DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	32.500	10.0500	10.0500
2	14.500	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	49.0000 T
REACCION VERTICAL TABLERO	=	1925.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

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1

FASE ELASTICA

REACCION DEL TABLERO = 70.5600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.38542132E-02	.10400555E+00
2	.22241026E-04	.38280800E-02	.94968617E-01
3	.39814577E-04	.37551646E-02	.86050217E-01
4	.53734973E-04	.36452439E-02	.77348330E-01
5	.64770497E-04	.35060000E-02	.68940540E-01
6	.73509784E-04	.33435207E-02	.60888332E-01
7	.80408541E-04	.31626666E-02	.53240387E-01
8	.85822906E-04	.29673447E-02	.46035132E-01
9	.90033611E-04	.27607133E-02	.39302726E-01
10	.93263687E-04	.25453389E-02	.33066628E-01
11	.95691599E-04	.23233165E-02	.27344840E-01
12	.97461093E-04	.20963621E-02	.22150904E-01
13	.98688644E-04	.18658861E-02	.17494697E-01
14	.99469152E-04	.16330507E-02	.13383087E-01
15	.99880328E-04	.13988151E-02	.98204558E-02
16	.99986100E-04	.11639720E-02	.68091323E-02
17	.99839281E-04	.92917719E-03	.43497496E-02
18	.99483667E-04	.69497273E-03	.24415371E-02
19	.98955702E-04	.46180647E-03	.10825645E-02
20	.98285810E-04	.23004769E-03	.26994415E-03
21	.97499460E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2772.0000	70.5600	.0000
2	2817.6637	70.5600	165.8160
3	2863.9636	70.5600	331.6320
4	2910.8997	70.5600	497.4480
5	2958.4719	70.5600	663.2640
6	3006.6804	70.5600	829.0800
7	3055.5251	70.5600	994.8960
8	3105.0059	70.5600	1160.7120
9	3155.1229	70.5600	1326.5280
10	3205.8762	70.5600	1492.3440
11	3257.2656	70.5600	1658.1600
12	3309.2912	70.5600	1823.9760
13	3361.9530	70.5600	1989.7920
14	3415.2510	70.5600	2155.6080
15	3469.1852	70.5600	2321.4240
16	3523.7556	70.5600	2487.2400
17	3578.9622	70.5600	2653.0560
18	3634.8049	70.5600	2818.8720
19	3691.2839	70.5600	2984.6880
20	3748.3991	70.5600	3150.5040
21	3806.1504	70.5600	3316.3200

1

FASE FINAL EN ITERACION NUMERO 4

REACCION DEL TABLERO = 70.5600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.43462542E-02	.11501214E+00
2	.26198406E-04	.43154711E-02	.10482256E+00
3	.46939820E-04	.42295337E-02	.94772633E-01
4	.63374679E-04	.40999141E-02	.84977968E-01
5	.76383060E-04	.39356988E-02	.75530137E-01
6	.86645160E-04	.37441406E-02	.66501603E-01
7	.94692068E-04	.35310694E-02	.57949528E-01
8	.10094224E-03	.33011991E-02	.49918736E-01
9	.10572812E-03	.30583614E-02	.42444050E-01
10	.10931579E-03	.28056848E-02	.35552145E-01
11	.11191966E-03	.25457331E-02	.29263030E-01
12	.11371356E-03	.22806141E-02	.23591247E-01
13	.11483924E-03	.20120646E-02	.18546831E-01
14	.11541283E-03	.17415184E-02	.14136107E-01
15	.10683960E-03	.14803718E-02	.10354332E-01
16	.10659227E-03	.12295893E-02	.71702413E-02
17	.10606208E-03	.97972047E-03	.45745463E-02
18	.10529879E-03	.73137145E-03	.25643645E-02
19	.10434391E-03	.48504128E-03	.11355190E-02
20	.10323219E-03	.24113936E-03	.28276837E-03
21	.10199279E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.23305540E-03	-.23305540E-03	-.23305540E-03
2	-.21857786E-03	-.24600759E-03	-.19245805E-03
3	-.21954503E-03	-.27089719E-03	-.17053986E-03
4	-.22069121E-03	-.29300172E-03	-.15154944E-03
5	-.22195930E-03	-.31270237E-03	-.13503538E-03
6	-.22330802E-03	-.33031480E-03	-.12063351E-03
7	-.22470760E-03	-.34610283E-03	-.10804697E-03
8	-.22613658E-03	-.36028882E-03	-.97031450E-04
9	-.22757960E-03	-.37306150E-03	-.87384110E-04
10	-.22902582E-03	-.38458220E-03	-.78935241E-04
11	-.23046771E-03	-.39498961E-03	-.71541792E-04
12	-.23190017E-03	-.40440365E-03	-.65082376E-04
13	-.23331995E-03	-.41292851E-03	-.59453345E-04
14	-.23472511E-03	-.42065517E-03	-.54565684E-04
15	-.21982068E-03	-.39696074E-03	-.48022606E-04
16	-.22104071E-03	-.40278052E-03	-.44630503E-04
17	-.22225175E-03	-.40807252E-03	-.41734090E-04
18	-.22345425E-03	-.41288677E-03	-.39286667E-04
19	-.22464882E-03	-.41726767E-03	-.37247153E-04
20	-.22583620E-03	-.42125475E-03	-.35579267E-04
21	-.22701723E-03	-.42488325E-03	-.34250852E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2772.0000	82.6069	.0000
2	2817.6637	82.7179	194.2909
3	2863.9636	82.6710	388.6517
4	2910.8997	82.4917	582.7425
5	2958.4719	82.2005	776.2772
6	3006.6804	81.8140	969.0131
7	3055.5251	81.3456	1160.7426
8	3105.0059	80.8064	1351.2867
9	3155.1229	80.2055	1540.4903
10	3205.8762	79.5506	1728.2176
11	3257.2656	78.8480	1914.3496
12	3309.2912	78.1031	2098.7807
13	3361.9530	77.3204	2281.4171
14	3415.2510	76.5038	2462.1746
15	3469.1852	75.6921	2640.9582
16	3523.7556	74.8891	2817.9006
17	3578.9622	74.0628	2992.9270
18	3634.8049	73.2148	3165.9846
19	3691.2839	72.3469	3337.0244
20	3748.3991	71.4604	3506.0014
21	3806.1504	70.5565	3672.8732

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	.16454078E-02	.74149816E+07
3	.31815065E-02	.82753388E+07
4	.45204749E-02	.91855060E+07
5	.55618362E-02	.10146067E+08
6	.62024312E-02	.11157790E+08
7	.63354606E-02	.12221429E+08
8	.58498228E-02	.13337728E+08
9	.46295942E-02	.14507421E+08
10	.25534523E-02	.15731236E+08
11	-.50576642E-03	.17009888E+08
12	-.46815198E-02	.18344088E+08
13	-.10113691E-01	.19734539E+08
14	-.16948702E-01	.21181933E+08
15	.21881264E-01	.24583965E+08
16	.17684518E-01	.26284336E+08
17	.14579064E-01	.28049157E+08
18	.12557099E-01	.29879133E+08
19	.11630460E-01	.31774962E+08
20	.11829391E-01	.33737332E+08
21	.13201530E-01	.35766923E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-2 DE 47.0 M V FRANCOLÍ (ROT) ZH10

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	47.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	3.8800 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	3.0800 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	32.500	10.0500	10.0500
2	14.500	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0390 T/M2
REACCION HORIZONTAL TABLERO	=	99.0000 T
REACCION VERTICAL TABLERO	=	1925.0000 T
MOMENTO EXTERIOR EN CABEZA	=	543.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

1

FASE ELASTICA

REACCION DEL TABLERO = 142.5600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.20312904E-04	.38012739E-02	.10858464E+00
2	.28226897E-04	.37442396E-02	.99715015E-01
3	.35733679E-04	.36690860E-02	.91000903E-01
4	.42865760E-04	.35767316E-02	.82483785E-01
5	.49652348E-04	.34680229E-02	.74203075E-01
6	.56119760E-04	.33437406E-02	.66196276E-01
7	.62291773E-04	.32046071E-02	.58499128E-01
8	.68189917E-04	.30512911E-02	.51145733E-01
9	.73833741E-04	.28844133E-02	.44168683E-01
10	.79241031E-04	.27045504E-02	.37599162E-01
11	.84428008E-04	.25122393E-02	.31467047E-01
12	.89409491E-04	.23079802E-02	.25800996E-01
13	.94199053E-04	.20922402E-02	.20628533E-01
14	.98809143E-04	.18654556E-02	.15976119E-01
15	.10325120E-03	.16280347E-02	.11869224E-01
16	.10753576E-03	.13803600E-02	.83323883E-02
17	.11167254E-03	.11227902E-02	.53892830E-02
18	.11567050E-03	.85566217E-03	.30627615E-02
19	.11953796E-03	.57929223E-03	.13749103E-02
20	.12328259E-03	.29397809E-03	.34709432E-03
21	.12691153E-03	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2772.0000	142.5600	781.9200
2	2817.6637	142.8302	1117.2510
3	2863.9636	143.1127	1453.2314
4	2910.8997	143.4077	1789.8905
5	2958.4719	143.7151	2127.2573
6	3006.6804	144.0348	2465.3610
7	3055.5251	144.3670	2804.2307
8	3105.0059	144.7116	3143.8956
9	3155.1229	145.0686	3484.3850
10	3205.8762	145.4380	3825.7278
11	3257.2656	145.8198	4167.9533
12	3309.2912	146.2140	4511.0906
13	3361.9530	146.6206	4855.1689
14	3415.2510	147.0397	5200.2173
15	3469.1852	147.4711	5546.2650
16	3523.7556	147.9149	5893.3412
17	3578.9622	148.3712	6241.4749
18	3634.8049	148.8398	6590.6954
19	3691.2839	149.3209	6941.0317
20	3748.3991	149.8143	7292.5131
21	3806.1504	150.3202	7645.1688

1

FASE FINAL EN ITERACION NUMERO 5

REACCION DEL TABLERO = 142.5600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.20430414E-04	.44708428E-02	.13222835E+00
2	.29149624E-04	.44125862E-02	.12178631E+00
3	.37433924E-04	.43343506E-02	.11150485E+00
4	.45316811E-04	.42371185E-02	.10142974E+00
5	.52828149E-04	.41217981E-02	.91604561E-01
6	.59994634E-04	.39892314E-02	.82070803E-01
7	.66840197E-04	.38402004E-02	.72868071E-01
8	.73386339E-04	.36754343E-02	.64034187E-01
9	.79652423E-04	.34956137E-02	.55605322E-01
10	.85669204E-04	.33013608E-02	.47616108E-01
11	.92124204E-04	.30924535E-02	.40100406E-01
12	.10001595E-03	.28666889E-02	.33094782E-01
13	.10951311E-03	.26204922E-02	.26642973E-01
14	.11987743E-03	.23509583E-02	.20796749E-01
15	.11756999E-03	.20719576E-02	.15600885E-01
16	.12697711E-03	.17846148E-02	.11065083E-01
17	.13670708E-03	.14747858E-02	.72308093E-02
18	.14668255E-03	.11418030E-02	.41517266E-02
19	.15682667E-03	.78517969E-03	.18828535E-02
20	.16705753E-03	.40461577E-03	.48013550E-03
21	.17729632E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.21832688E-03	-.27451052E-03	-.16316476E-03
2	-.21937925E-03	-.29954072E-03	-.14067527E-03
3	-.22061625E-03	-.32355954E-03	-.11954465E-03
4	-.22202000E-03	-.34664123E-03	-.99664606E-04
5	-.22357457E-03	-.36885198E-03	-.80938573E-04
6	-.22526574E-03	-.39025099E-03	-.63280233E-04
7	-.22708072E-03	-.41089126E-03	-.46612187E-04
8	-.22900797E-03	-.43082041E-03	-.30864858E-04
9	-.23103708E-03	-.45008125E-03	-.15975540E-04
10	-.23314299E-03	-.46873330E-03	-.18361403E-05
11	-.23448623E-03	-.48782779E-03	.14249124E-04
12	-.23368927E-03	-.50873312E-03	.36353792E-04
13	-.23039903E-03	-.53156009E-03	.65286374E-04
14	-.22552873E-03	-.55519167E-03	.98140327E-04
15	-.20756498E-03	-.53088246E-03	.10987400E-03
16	-.20217820E-03	-.55136526E-03	.14066000E-03
17	-.19588122E-03	-.57182570E-03	.17322791E-03
18	-.18876381E-03	-.59214081E-03	.20727906E-03
19	-.18093090E-03	-.61220423E-03	.24250110E-03
20	-.17250361E-03	-.63191181E-03	.27855171E-03
21	-.16360903E-03	-.65117391E-03	.31509103E-03

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2772.0000	154.9513	781.9186
2	2817.6637	155.2611	1146.4248
3	2863.9636	155.5237	1511.6035
4	2910.8997	155.7387	1877.3431
5	2958.4719	155.9062	2243.5320
6	3006.6804	156.0258	2610.0580
7	3055.5251	156.0972	2976.8080
8	3105.0059	156.1198	3343.6681
9	3155.1229	156.0933	3710.5233
10	3205.8762	156.0171	4077.2694
11	3257.2656	155.8879	4443.8729
12	3309.2912	155.6959	4809.9789
13	3361.9530	155.4257	5175.5367
14	3415.2510	155.0637	5540.3807
15	3469.1852	154.6543	5904.3102
16	3523.7556	154.1986	6267.2375
17	3578.9622	153.6444	6628.9848
18	3634.8049	152.9850	6989.2653
19	3691.2839	152.2140	7347.8916
20	3748.3991	151.3257	7704.5676
21	3806.1504	150.3147	8059.0113

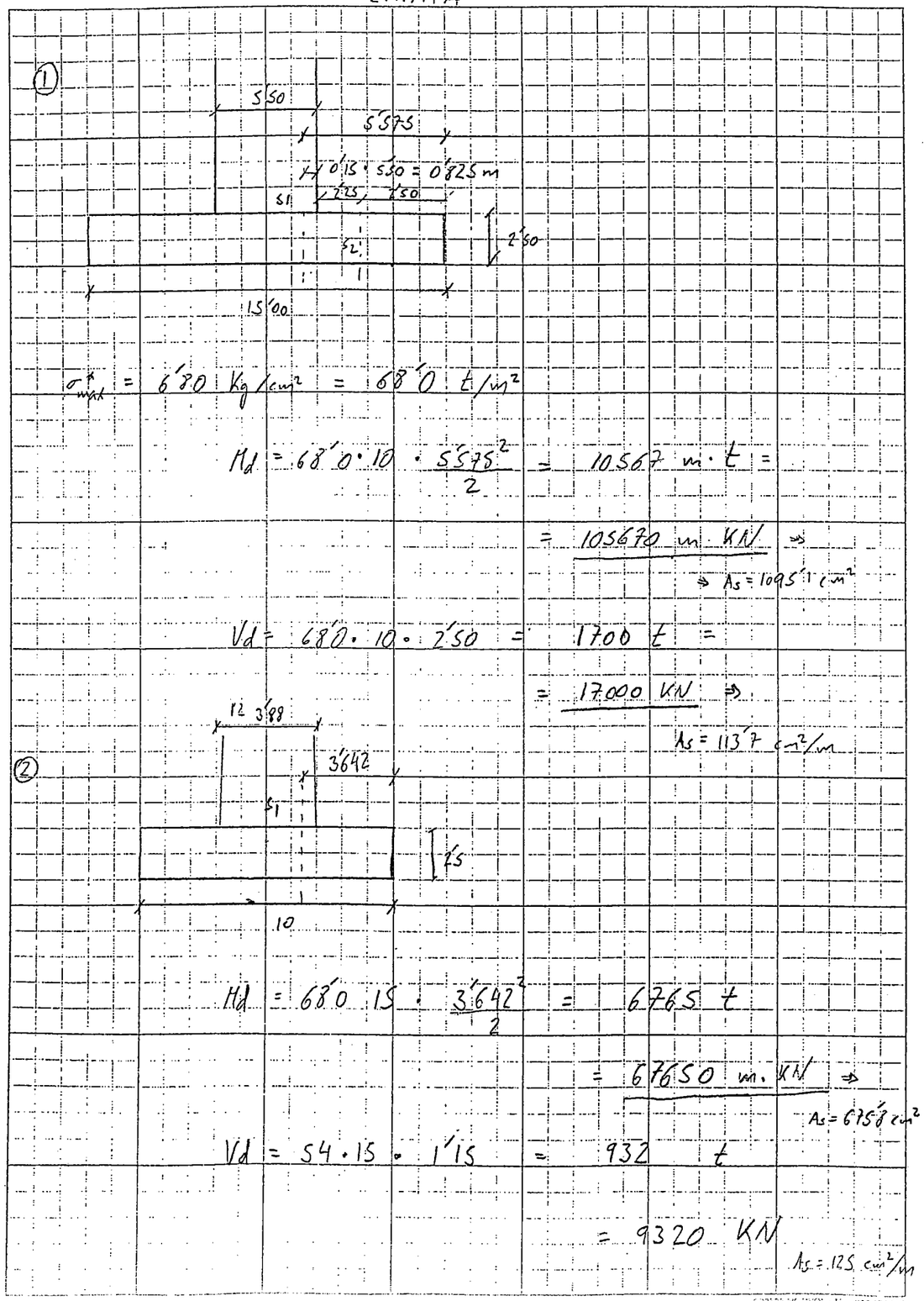
SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.13653981E-02	.38255578E+08
2	.85450233E-02	.39294435E+08
3	.15965378E-01	.40321394E+08
4	.23711527E-01	.41336777E+08
5	.31870271E-01	.42340759E+08
6	.40530830E-01	.43333507E+08
7	.49786007E-01	.44315188E+08
8	.59732709E-01	.45285970E+08
9	.70473043E-01	.46246026E+08
10	.70022404E-01	.45947256E+08
11	-.27927358E-01	.38448652E+08
12	-.34888891E-02	.28491008E+08
13	.28561013E-01	.25522066E+08
14	.33200043E-01	.22841677E+08
15	.25994553E-01	.26075404E+08
16	.22016944E-01	.24379376E+08
17	.13798180E-01	.22901021E+08
18	.46201471E-01	.22261157E+08
19	.52701230E-01	.21388023E+08
20	.60177184E-01	.20681780E+08
21	.68587205E-01	.20115556E+08

intecsa-inarsa

Proyecto: Hoja de

Ejecutante: PILA 2 Fecha

ZAPATA



PRONTUARIO INFORMÁTICO DEL HORMIGÓN ESTRUCTURAL 3.0

Cátedra de Hormigón Estructural ETSICCPM - IECA

Obra: Viaducto río Francoli
Fecha: 23/07/02
Hora: 11:29:14

Dimensionamiento de secciones a flexión simple

1 Datos

- Materiales

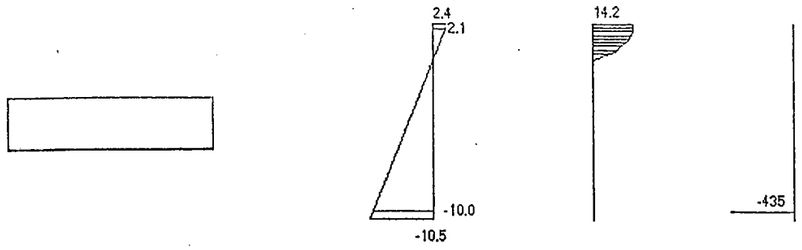
Tipo de hormigón : HA-25
Tipo de acero : B-500-S
fck [MPa] = 25.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

Sección : ZAPA_P21
b [m] = 10.00
h [m] = 2.50
ri [m] = 0.100
rs [m] = 0.062

2 Dimensionamiento

Md [kN·m] = 105670



Plano de deformación de agotamiento

x [m] = 0.466

1/r [1/m]·1.E-3 = 5.2

εs ·1.E-3 = 2.4

εi ·1.E-3 = -10.5

Deformación y tensión de armaduras

Profundidad [m]	Armadura [cm²]	Deformación ·1.E-3	Tensión [MPa]
0.062	0.0	2.1	0.0
2.400	1095.1	-10.0	434.8

At_est [cm²] = 1095.1

ϕ [mm]	12	14	16	20	25
n°ϕ	----	----	----	349	224
n° capas	----	----	----	2	2
At [cm²]	----	----	----	1096.4	1099.6
wk [mm]	----	----	----	0.54	0.57

Obra: Viaducto río Francolí
Fecha: 23/07/02
Hora: 11:29:33

Comprobación de secciones a flexión simple

1 Datos

- Materiales

Tipo de hormigón : HA-25

Tipo de acero : B-500-S

fck [MPa] = 25.00

fyk [MPa] = 500.00

γc = 1.50

γs = 1.15

- Sección

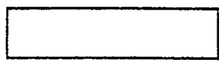
Sección : ZAPA_P21

b [m] = 10.00

h [m] = 2.50

ri [m] = 0.100

rs [m] = 0.062

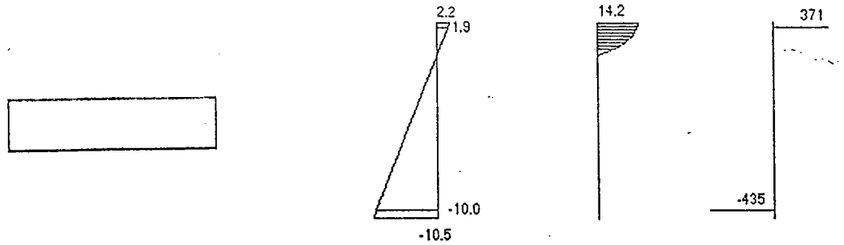


2 Comprobación

At [cm²] = 1158.1

Ac [cm²] = 226.2

Mu [kN·m] = 113488.9



Plano de deformación de agotamiento

x [m] = 0.429

1/r [1/m]·1.E-3 = 5.1

εs ·1.E-3 = 2.2

εi ·1.E-3 = -10.5

Deformación y tensión de armaduras

Profundidad [m]	Armadura [cm²]	Deformación ·1.E-3	Tensión [MPa]
0.062	226.2	1.9	-370.9
2.400	1158.1	-10.0	434.8

Obra: Viaducto rio Francolí
Fecha: 23/07/02
Hora: 11:32:36

Cálculo de secciones a cortante

1 Datos

- Materiales

Tipo de hormigón : HA-25

Tipo de acero : B-500-S

fck [MPa] = 25.00

fyk [MPa] = 500.00

γc = 1.50

γs = 1.15

- Tipo de elemento estructural

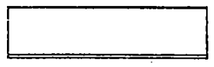
Tipo : elemento con armadura a cortante

- Sección

Sección : ZAPA_P21

b0 [m] = 10.00

h [m] = 2.50



2 Dimensionamiento

Esfuerzo cortante de cálculo Vd [kN] = 17000

Inclinación de las bielas [°] = 45

Inclinación de los cercos [°] = 90.0

ρ [·1.E-3] = 5

Nd [kN] = 0.0

σxd [MPa] = 0.0

σyd [MPa] = 0

θe [°] = 45.0

ϕ [mm]	Separación [mm]	nº ramas	Area [cm²/m]	Tipo	Vsu [kN]	Vu2 [kN]
ø 6	----	----	----	----	----	----
ø 8	----	----	----	----	----	----
ø 10	----	----	----	----	----	----
ø 12	----	----	----	----	----	----

Área estricta [cm²/m] = 113.7

Vu1 [kN] = 120000.0

Vcu [kN] = 7177.8

Obra: Viaducto río Francolí
Fecha: 23/07/02
Hora: 11:37:46

Dimensionamiento de secciones a flexión simple

1 Datos

- Materiales

Tipo de hormigón : HA-25

Tipo de acero : B-500-S

fck [MPa] = 25.00

fyk [MPa] = 500.00

γc = 1.50

γs = 1.15

- Sección

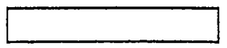
Sección : ZAPA_P22

b [m] = 15.00

h [m] = 2.50

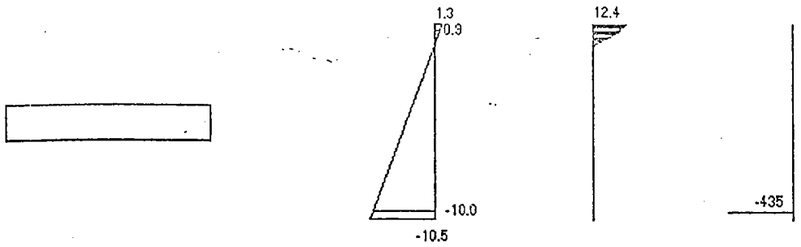
ri [m] = 0.100

rs [m] = 0.084



2 Dimensionamiento

Md [kN·m] = 67650



Plano de deformación de agotamiento

x [m] = 0.274

1/r [1/m]·1.E-3 = 4.7

εs ·1.E-3 = 1.3

εi ·1.E-3 = -10.5

Deformación y tensión de armaduras

Profundidad [m]	Armadura [cm²]	Deformación ·1.E-3	Tensión [MPa]
0.084	0.0	0.9	0.0
2.400	675.8	-10.0	434.8

At_est [cm²] = 675.8

ϕ [mm]	12	14	16	20	25
n°ϕ	598	439	337	216	138
n° capas	2	2	2	1	1
At [cm²]	676.3	675.8	677.6	678.6	677.4
wk [mm]	0.28	0.30	0.31	0.35	0.39

Obra: Viaducto río Francolí
Fecha: 23/07/02
Hora: 11:37:55

Comprobación de secciones a flexión simple

1 Datos

- Materiales

Tipo de hormigón : HA-25

Tipo de acero : B-500-S

fck [MPa] = 25.00

fyk [MPa] = 500.00

γc = 1.50

γs = 1.15

- Sección

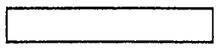
Sección : ZAPA_P22

b [m] = 15.00

h [m] = 2.50

ri [m] = 0.100

rs [m] = 0.084

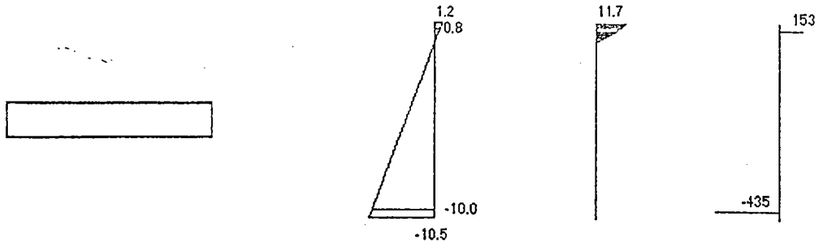


2 Comprobación

At [cm²] = 723.8

Ac [cm²] = 441.8

Mu [kN·m] = 72780.9



Plano de deformación de agotamiento

x [m] = 0.249

1/r [1/m]·1.E-3 = 4.6

εs ·1.E-3 = 1.2

εi ·1.E-3 = -10.5

Deformación y tensión de armaduras

Profundidad [m]	Armadura [cm²]	Deformación ·1.E-3	Tensión [MPa]
0.084	441.8	0.8	-153.3
2.400	723.8	-10.0	434.8

Obra: Viaducto río Francolí
Fecha: 23/07/02
Hora: 11:43:04

Cálculo de secciones a cortante

1 Datos

- Materiales

Tipo de hormigón : HA-25

Tipo de acero : B-500-S

fck [MPa] = 25.00

fyk [MPa] = 500.00

γc = 1.50

γs = 1.15

- Tipo de elemento estructural

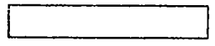
Tipo : elemento con armadura a cortante

- Sección

Sección : ZAPA_P22

b0 [m] = 15.00

h [m] = 2.50



2 Dimensionamiento

Esfuerzo cortante de cálculo Vd [kN] = 9320

Inclinación de las bielas [°] = 45

Inclinación de los cercos [°] = 90.0

ρ [·1.E-3] = 2

Nd [kN] = 0.0

σxd [MPa] = 0.0

σyd [MPa] = 0

θe [°] = 45.0

ϕ [mm]	Separación [mm]	nº ramas	Area [cm²/m]	Tipo	Vsu [kN]	Vu2 [kN]
ø 6	----	----	----	----	----	----
ø 8	----	----	----	----	----	----
ø 10	----	----	----	----	----	----
ø 12	----	----	----	----	----	----

Área estricta [cm²/m] = 125.0

(Cuantía mínima)

Vu1 [kN] = 180000.0

Vcu [kN] = 7933.0

TENSIONES DE LA CIMENTACIÓN SOBRE EL TERRENO

PILA 2

$$\sigma_{med} = \frac{N}{A}$$

$$\sigma_{max} = \frac{N}{A} + \frac{M_x}{W_z} + \frac{M_z}{W_x}$$

	Zapata
a (m)	15,00
b (m)	10,00
h (m)	2,00
A (m^2)	150,00
W_x (m^3)	250,00
W_z (m^3)	375,00
Peso cimentación (KN)	7500

	Base de pila					
	H2	H3	H4	H51	H52	H10
N (KN)	20175	32995	27855	26825	30935	26435
M_x (m·KN)	15745	28835	43105	36680	26640	54900
M_z (m·KN)	17695	25715	29770	35950	43015	24600
F_x (KN)	360	500	590	710	840	490
F_z (KN)	370	555	555	485	515	1045

	Base de pila					
	H2	H3	H4	H51	H52	H10
N (KN)	27675	40495	35355	34325	38435	33935
M_x (m·KN)	16485	29945	44215	37650	27670	56990
M_z (m·KN)	18415	26715	30950	37370	44695	25580

	Base de pila					
	H2	H3	H4	H51	H52	H10
σ_{med} (Kg/cm^2)	1,85	2,70	2,36	2,29	2,56	2,26
σ_{max} (Kg/cm^2)	3,02	4,57	4,77	4,79	5,09	4,81
σ_{min} (Kg/cm^2)	0,67	0,83	-0,06	-0,21	0,04	-0,28

σ_{med} admisible (Kg/cm^2)	4,50
σ_{max} admisible (Kg/cm^2)	5,63

ESFUERZOS EN ROTURA EN BASE DE PILA

PILA 2

	Base de pila					
	H2	H3	H4	H51	H52	H10
N_d (KN)	29050	47510	40110	36825	44545	38015
$M_{x,d}$ (m·KN)	22885	42430	63295	53630	39110	80590
$M_{z,d}$ (m·KN)	26075	39075	44610	53640	65735	36730
$F_{x,d}$ (KN)	520	720	850	1025	1210	705
$F_{z,d}$ (KN)	535	780	800	670	740	1505

Obra: Viaducto río Francolí
Fecha: 06/06/02
Hora: 9:35:52

Cálculo de secciones a flexión compuesta esviada

1 Datos

- Materiales

Tipo de hormigón : HA-30
Tipo de acero : B-500-S
fck [MPa] = 30.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

Sección : FRANCOLI_P2

Contorno exterior

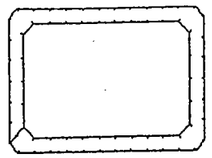
Vértice	X [m]	Y [m]	Lado	nº barras
1	0.000	0.250	1-2	2
2	0.250	0.000	2-3	12
3	5.250	0.000	3-4	2
4	5.500	0.250	4-5	7
5	5.500	3.630	5-6	2
6	5.250	3.880	6-7	12
7	0.250	3.880	7-8	2
8	0.000	3.630	8-1	7

Contorno interior

Vértice	X [m]	Y [m]	Lado	nº barras
1	0.400	0.700	1-2	2
2	0.700	0.400	2-3	10
3	4.800	0.400	3-4	2
4	5.100	0.700	4-5	5
5	5.100	3.180	5-6	2
6	4.800	3.480	6-7	10
7	0.700	3.480	7-8	2
8	0.400	3.180	8-1	5

Recubrimiento exterior [m] : 0.050

Recubrimiento interior [m] : 0.050

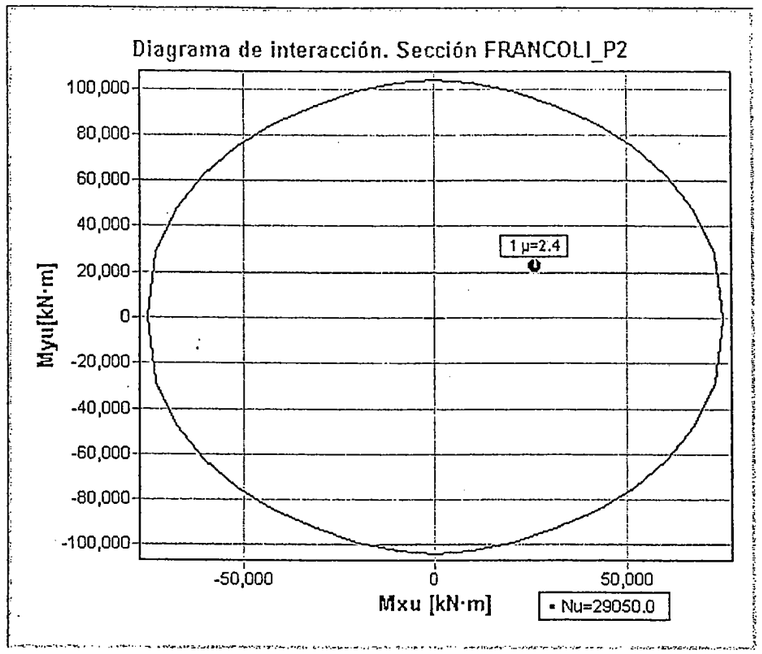


2 Diagrama

ϕ [mm] = 25

Resultados numéricos del diagrama de interacción

Nu [kN]	Mxu [kN·m]	Myu [kN·m]	x [cm]	1/r [1/m] ·1.E-3	β [°]
-29050.0	75344.9	-0.2	0.66	3.2	0.0
-29050.0	73223.7	28044.1	1.17	2.9	10.0
-29050.0	67698.6	47684.7	1.72	2.0	20.0
-29050.0	60525.9	62525.4	2.09	1.7	30.0
-29050.0	51850.1	74736.5	2.25	1.6	40.0
-29050.0	42048.6	84839.7	2.26	1.5	50.0
-29050.0	31226.5	93009.6	2.14	1.6	60.0
-29050.0	20270.1	99041.3	1.89	1.9	70.0
-29050.0	9638.4	102867.6	1.56	2.2	80.0
-29050.0	0.1	103986.4	1.25	2.4	90.0
-29050.0	-9638.3	102867.6	1.56	2.2	100.0
-29050.0	-20269.5	99041.5	1.89	1.9	110.0
-29050.0	-31225.4	93010.2	2.14	1.6	120.0
-29050.0	-42047.0	84841.1	2.26	1.5	130.0
-29050.0	-51850.1	74736.5	2.25	1.6	140.0
-29050.0	-60525.9	62525.4	2.09	1.7	150.0
-29050.0	-67698.6	47684.7	1.72	2.0	160.0
-29050.0	-73223.7	28044.1	1.17	2.9	170.0
-29050.0	-75344.9	-0.2	0.66	3.2	180.0
-29050.0	-73223.4	-28045.7	1.17	2.9	190.0
-29050.0	-67698.1	-47686.3	1.72	2.0	200.0
-29050.0	-60525.8	-62525.7	2.09	1.7	210.0
-29050.0	-51849.5	-74737.3	2.25	1.6	220.0
-29050.0	-42047.0	-84841.1	2.26	1.5	230.0
-29050.0	-31225.4	-93010.2	2.14	1.6	240.0
-29050.0	-20269.5	-99041.5	1.89	1.9	250.0
-29050.0	-9638.3	-102867.6	1.56	2.2	260.0
-29050.0	0.1	-103986.4	1.26	2.4	270.0
-29050.0	9638.4	-102867.6	1.56	2.2	280.0
-29050.0	20270.1	-99041.3	1.89	1.9	290.0
-29050.0	31226.5	-93009.6	2.14	1.6	300.0
-29050.0	42048.6	-84839.7	2.26	1.5	310.0
-29050.0	51849.5	-74737.3	2.25	1.6	320.0
-29050.0	60525.8	-62525.7	2.09	1.7	330.0
-29050.0	67698.1	-47686.3	1.72	2.0	340.0
-29050.0	73223.4	-28045.7	1.17	2.9	350.0



Coeficientes de seguridad de los pares de esfuerzos de cálculo

Punto	Mxd [kN·m]	Myd [kN·m]	γ
1	26075	22885	2.44

Obra: Viaducto río Francolí
Fecha: 06/06/02
Hora: 9:36:52

Cálculo de secciones a flexión compuesta esviada

1 Datos

- Materiales

Tipo de hormigón : HA-30
Tipo de acero : B-500-S
fck [MPa] = 30.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

Sección : FRANCOLI_P2

Contorno exterior

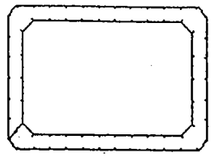
Vértice	X [m]	Y [m]	Lado	nº barras
1	0.000	0.250	1-2	2
2	0.250	0.000	2-3	12
3	5.250	0.000	3-4	2
4	5.500	0.250	4-5	7
5	5.500	3.630	5-6	2
6	5.250	3.880	6-7	12
7	0.250	3.880	7-8	2
8	0.000	3.630	8-1	7

Contorno interior

Vértice	X [m]	Y [m]	Lado	nº barras
1	0.400	0.700	1-2	2
2	0.700	0.400	2-3	10
3	4.800	0.400	3-4	2
4	5.100	0.700	4-5	5
5	5.100	3.180	5-6	2
6	4.800	3.480	6-7	10
7	0.700	3.480	7-8	2
8	0.400	3.180	8-1	5

Recubrimiento exterior [m] : 0.050

Recubrimiento interior [m] : 0.050



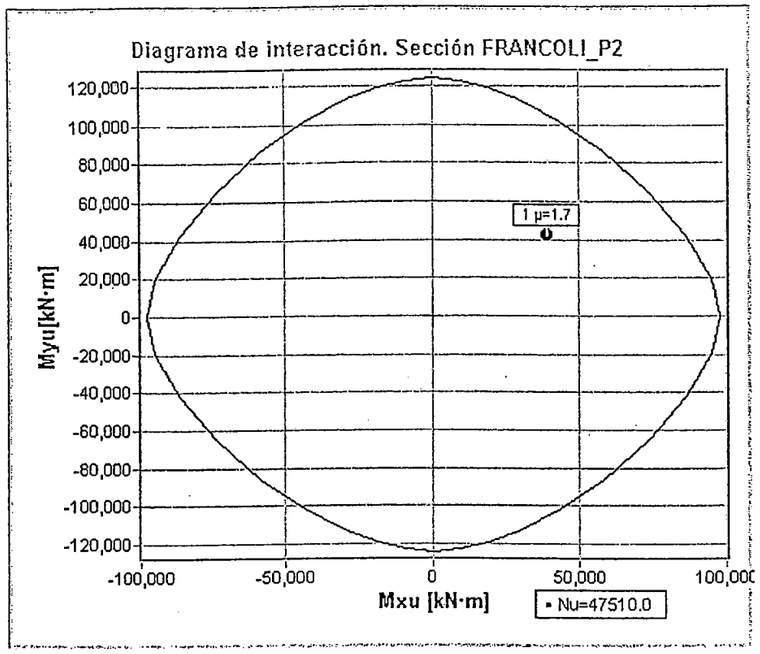
2 Diagrama

ϕ [mm] = 25

Resultados numéricos del diagrama de interacción

Nu [kN]	Mxu [kN·m]	Myu [kN·m]	x [cm]	1/r [1/m] ·1.E-3	β [°]
-47510.0	97790.1	-0.1	1.49	2.3	0.0
-47510.0	95030.2	19828.0	2.01	1.7	10.0
-47510.0	86507.1	42538.9	2.53	1.4	20.0
-47510.0	73689.3	65156.6	2.92	1.2	30.0
-47510.0	58453.0	85830.7	3.13	1.1	40.0
-47510.0	43654.1	101441.2	3.18	1.1	50.0
-47510.0	30628.6	112118.4	3.14	1.1	60.0
-47510.0	19270.8	118937.0	3.00	1.2	70.0
-47510.0	9331.3	122584.6	2.78	1.3	80.0
-47510.0	0.2	124177.2	2.47	1.4	90.0
-47510.0	-9331.0	122584.6	2.78	1.3	100.0
-47510.0	-19268.9	118937.7	3.00	1.2	110.0
-47510.0	-30628.6	112118.4	3.14	1.1	120.0
-47510.0	-43653.2	101442.0	3.18	1.1	130.0
-47510.0	-58453.0	85830.7	3.13	1.1	140.0
-47510.0	-73689.3	65156.6	2.92	1.2	150.0
-47510.0	-86507.1	42538.9	2.53	1.4	160.0
-47510.0	-95030.2	19828.0	2.01	1.7	170.0
-47510.0	-97790.1	-0.1	1.49	2.3	180.0
-47510.0	-95029.9	-19830.0	2.01	1.7	190.0
-47510.0	-86505.8	-42542.5	2.53	1.4	200.0
-47510.0	-73686.8	-65161.0	2.92	1.2	210.0
-47510.0	-58449.5	-85834.9	3.13	1.1	220.0
-47510.0	-43653.2	-101442.0	3.18	1.1	230.0
-47510.0	-30628.6	-112118.4	3.14	1.1	240.0
-47510.0	-19268.9	-118937.7	3.00	1.2	250.0
-47510.0	-9331.0	-122584.6	2.78	1.3	260.0
-47510.0	0.2	-124177.2	2.47	1.4	270.0
-47510.0	9331.3	-122584.6	2.78	1.3	280.0
-47510.0	19270.8	-118937.0	3.00	1.2	290.0
-47510.0	30628.6	-112118.4	3.14	1.1	300.0
-47510.0	43654.1	-101441.2	3.18	1.1	310.0
-47510.0	58449.5	-85834.9	3.13	1.1	320.0
-47510.0	73686.8	-65161.0	2.92	1.2	330.0

-47510.0	86505.8	-42542.5	2.53	1.4	340.0
-47510.0	95029.9	-19830.0	2 01	1.7	350.0



Coeficientes de seguridad de los pares de esfuerzos de cálculo

Punto	Mxd [kN·m]	Myd [kN·m]	γ
1	39075	42430	1.73

Obra: Viaducto río Francolí
Fecha: 06/06/02
Hora: 9:37:25

Cálculo de secciones a flexión compuesta esviada

1 Datos

- Materiales

Tipo de hormigón : HA-30
Tipo de acero : B-500-S
fck [MPa] = 30.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

Sección : FRANCOLI_P2

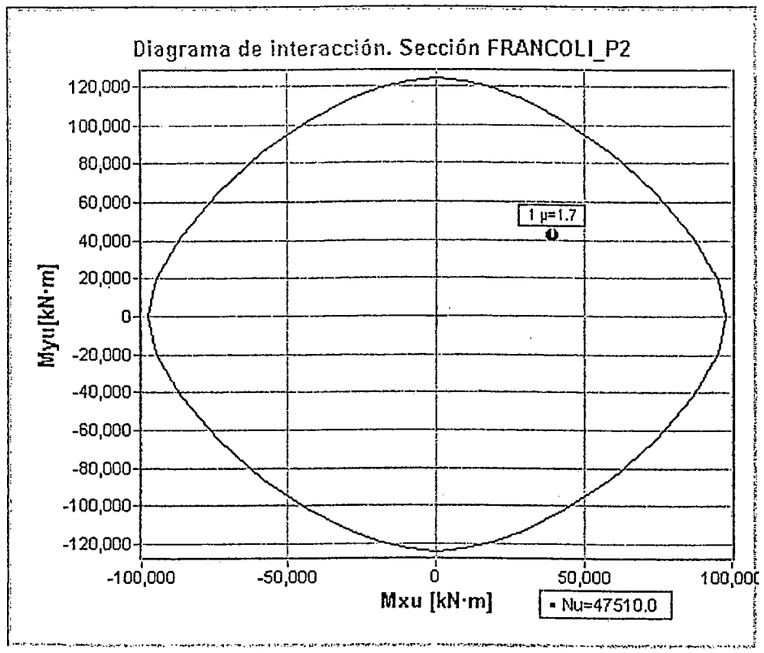
Contorno exterior

Vértice	X [m]	Y [m]	Lado	nº barras
1	0.000	0.250	1-2	2
2	0.250	0.000	2-3	12
3	5.250	0.000	3-4	2
4	5.500	0.250	4-5	7
5	5.500	3.630	5-6	2
6	5.250	3.880	6-7	12
7	0.250	3.880	7-8	2
8	0.000	3.630	8-1	7

Contorno interior

Vértice	X [m]	Y [m]	Lado	nº barras
1	0.400	0.700	1-2	2
2	0.700	0.400	2-3	10
3	4.800	0.400	3-4	2
4	5.100	0.700	4-5	5
5	5.100	3.180	5-6	2
6	4.800	3.480	6-7	10
7	0.700	3.480	7-8	2
8	0.400	3.180	8-1	5

-47510.0	86505.8	-42542.5	2.53	1.4	340.0
-47510.0	95029.9	-19830.0	2 01	1.7	350.0



Coeficientes de seguridad de los pares de esfuerzos de cálculo

Punto	Mxd [kN·m]	Myd [kN·m]	γ
1	39075	42430	1.73

Obra: Viaducto río Francolí
Fecha: 06/06/02
Hora: 9:37:25

Cálculo de secciones a flexión compuesta esviada

1 Datos

- Materiales

Tipo de hormigón : HA-30
Tipo de acero : B-500-S
fck [MPa] = 30.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

Sección : FRANCOLI_P2

Contorno exterior

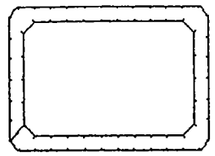
Vértice	X [m]	Y [m]	Lado	nº barras
1	0.000	0.250	1-2	2
2	0.250	0.000	2-3	12
3	5.250	0.000	3-4	2
4	5.500	0.250	4-5	7
5	5.500	3.630	5-6	2
6	5.250	3.880	6-7	12
7	0.250	3.880	7-8	2
8	0.000	3.630	8-1	7

Contorno interior

Vértice	X [m]	Y [m]	Lado	nº barras
1	0.400	0.700	1-2	2
2	0.700	0.400	2-3	10
3	4.800	0.400	3-4	2
4	5.100	0.700	4-5	5
5	5.100	3.180	5-6	2
6	4.800	3.480	6-7	10
7	0.700	3.480	7-8	2
8	0.400	3.180	8-1	5

Recubrimiento exterior [m] : 0.050

Recubrimiento interior [m] : 0.050

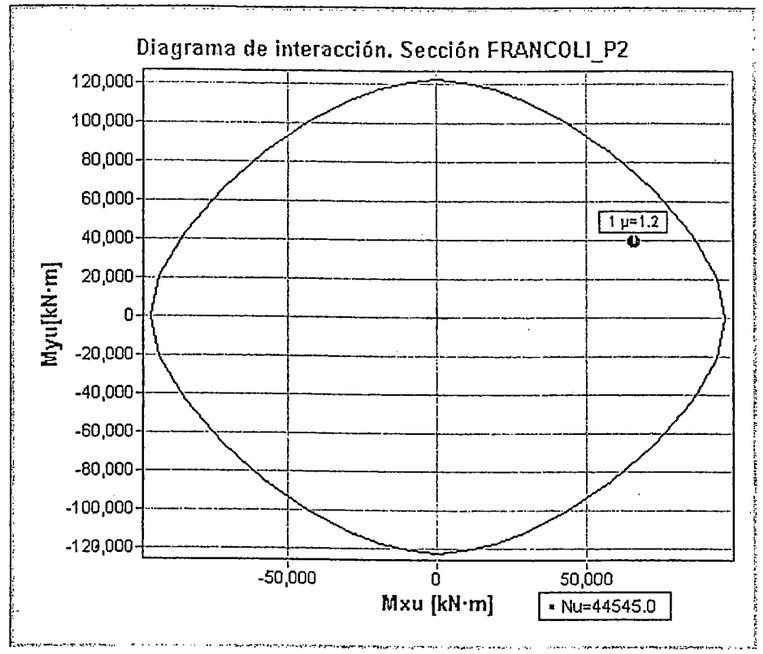


2 Diagrama

ϕ [mm] = 25

Resultados numéricos del diagrama de interacción

Nu [kN]	Mxu [kN·m]	Myu [kN·m]	x [cm]	1/r [1/m] ·1.E-3	β [°]
-44545.0	95678.6	-0.1	1.28	2.7	0.0
-44545.0	92782.0	20426.4	1.83	1.9	10.0
-44545.0	84646.8	43095.8	2.38	1.5	20.0
-44545.0	72273.8	65387.2	2.79	1.3	30.0
-44545.0	58016.6	84817.5	2.99	1.2	40.0
-44545.0	43669.8	99910.5	3.03	1.2	50.0
-44545.0	30688.2	110461.7	2.97	1.2	60.0
-44545.0	19304.0	117211.7	2.82	1.2	70.0
-44545.0	9300.0	120859.7	2.58	1.4	80.0
-44545.0	0.3	122385.8	2.27	1.5	90.0
-44545.0	-9299.7	120859.7	2.58	1.4	100.0
-44545.0	-19301.5	117212.6	2.82	1.2	110.0
-44545.0	-30685.4	110463.3	2.97	1.2	120.0
-44545.0	-43667.1	99912.7	3.03	1.2	130.0
-44545.0	-58016.6	84817.5	2.99	1.2	140.0
-44545.0	-72273.8	65387.2	2.79	1.3	150.0
-44545.0	-84646.8	43095.8	2.38	1.5	160.0
-44545.0	-92782.0	20426.4	1.83	1.9	170.0
-44545.0	-95678.6	-0.1	1.28	2.7	180.0
-44545.0	-92781.7	-20428.6	1.83	1.9	190.0
-44545.0	-84646.2	-43097.4	2.38	1.5	200.0
-44545.0	-72273.4	-65388.0	2.79	1.3	210.0
-44545.0	-58013.4	-84821.3	2.99	1.2	220.0
-44545.0	-43667.1	-99912.7	3.03	1.2	230.0
-44545.0	-30685.4	-110463.3	2.97	1.2	240.0
-44545.0	-19301.5	-117212.6	2.82	1.2	250.0
-44545.0	-9299.7	-120859.7	2.58	1.4	260.0
-44545.0	0.3	-122385.8	2.27	1.5	270.0
-44545.0	9300.0	-120859.7	2.58	1.4	280.0
-44545.0	19304.0	-117211.7	2.82	1.2	290.0
-44545.0	30688.2	-110461.7	2.97	1.2	300.0
-44545.0	43669.8	-99910.5	3.03	1.2	310.0
-44545.0	58013.4	-84821.3	2.99	1.2	320.0
-44545.0	72273.4	-65388.0	2.79	1.3	330.0
-44545.0	84646.2	-43097.4	2.38	1.5	340.0
-44545.0	92781.7	-20428.6	1.83	1.9	350.0



Coeficientes de seguridad de los pares de esfuerzos de cálculo

Punto	Mxd [kN·m]	Myd [kN·m]	γ
1	65735	39110	1.24

PRONTUARIO INFORMÁTICO DEL HORMIGÓN ESTRUCTURAL 3.0
Cátedra de Hormigón Estructural ETSICCPM - IECA

Obra: Viaducto río Francolí
Fecha: 06/06/02
Hora: 9:37:51

Cálculo de secciones a flexión compuesta esviada

1 Datos

- Materiales

Tipo de hormigón : HA-30
Tipo de acero : B-500-S
fck [MPa] = 30.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

Sección : FRANCOLI_P2

Contorno exterior

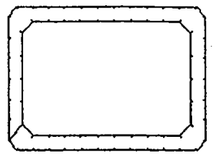
Vértice	X [m]	Y [m]	Lado	nº barras
1	0.000	0.250	1-2	2
2	0.250	0.000	2-3	12
3	5.250	0.000	3-4	2
4	5.500	0.250	4-5	7
5	5.500	3.630	5-6	2
6	5.250	3.880	6-7	12
7	0.250	3.880	7-8	2
8	0.000	3.630	8-1	7

Contorno interior

Vértice	X [m]	Y [m]	Lado	nº barras
1	0.400	0.700	1-2	2
2	0.700	0.400	2-3	10
3	4.800	0.400	3-4	2
4	5.100	0.700	4-5	5
5	5.100	3.180	5-6	2
6	4.800	3.480	6-7	10
7	0.700	3.480	7-8	2
8	0.400	3.180	8-1	5

Recubrimiento exterior [m] : 0.050

Recubrimiento interior [m] : 0.050



2 Diagrama

ϕ [mm] = 25

Resultados numéricos del diagrama de interacción

Nu [kN]	Mxu [kN·m]	Myu [kN·m]	x [cm]	1/r [1/m] ·1.E-3	β [º]
-38015.0	88750.2	-0.3	0.88	3.4	0.0
-38015.0	85829.7	22924.8	1.49	2.4	10.0
-38015.0	78659.2	45113.8	2.08	1.7	20.0
-38015.0	68136.7	65203.3	2.49	1.4	30.0
-38015.0	56266.4	81501.8	2.68	1.3	40.0
-38015.0	43391.6	94891.7	2.70	1.3	50.0
-38015.0	30874.2	104838.9	2.61	1.3	60.0
-38015.0	19502.5	111436.3	2.41	1.5	70.0
-38015.0	9334.3	115152.6	2.14	1.6	80.0
-38015.0	0.4	116623.1	1.83	1.9	90.0
-38015.0	-9333.3	115152.8	2.14	1.6	100.0
-38015.0	-19501.1	111436.8	2.41	1.5	110.0
-38015.0	-30872.2	104840.1	2.61	1.3	120.0
-38015.0	-43389.8	94893.2	2.70	1.3	130.0
-38015.0	-56266.4	81501.8	2.68	1.3	140.0
-38015.0	-68136.7	65203.3	2.49	1.4	150.0
-38015.0	-78659.2	45113.8	2.08	1.7	160.0
-38015.0	-85829.7	22924.8	1.49	2.4	170.0
-38015.0	-88750.2	-0.3	0.88	3.4	180.0
-38015.0	-85829.5	-22926.3	1.49	2.4	190.0
-38015.0	-78658.6	-45115.4	2.08	1.7	200.0
-38015.0	-68135.7	-65205.0	2.49	1.4	210.0
-38015.0	-56265.3	-81503.1	2.68	1.3	220.0
-38015.0	-43389.8	-94893.2	2.70	1.3	230.0
-38015.0	-30872.2	-104840.1	2.61	1.3	240.0
-38015.0	-19501.1	-111436.8	2.41	1.5	250.0
-38015.0	-9333.3	-115152.8	2.14	1.6	260.0
-38015.0	0.4	-116623.1	1.83	1.9	270.0
-38015.0	9334.3	-115152.6	2.14	1.6	280.0
-38015.0	19502.5	-111436.3	2.41	1.5	290.0
-38015.0	30874.2	-104838.9	2.61	1.3	300.0
-38015.0	43391.6	-94891.7	2.70	1.3	310.0
-38015.0	56265.3	-81503.1	2.68	1.3	320.0
-38015.0	68135.7	-65205.0	2.49	1.4	330.0

PILA 3

1

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-3 DE 50.0 M V FRANCOLÍ (SER) XH2

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	50.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	4.0000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	3.2000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	38.000	10.0500	10.0500
2	12.000	24.5400	24.5400

1

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	36.0000 T
REACCION VERTICAL TABLERO	=	1299.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

FASE ELASTICA

REACCION DEL TABLERO = 36.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.21144631E-02	.60255867E-01
2	.11984662E-04	.20994823E-02	.54982193E-01
3	.21314743E-04	.20578580E-02	.49780658E-01
4	.28597558E-04	.19954676E-02	.44710208E-01
5	.34285696E-04	.19168636E-02	.39816832E-01
6	.38720779E-04	.18256055E-02	.35136435E-01
7	.42163659E-04	.17244999E-02	.30697011E-01
8	.44815601E-04	.16157758E-02	.26520285E-01
9	.46833363E-04	.15012146E-02	.22622996E-01
10	.48340089E-04	.13822478E-02	.19017883E-01
11	.49433272E-04	.12600311E-02	.15714465E-01
12	.50190646E-04	.11355012E-02	.12719655E-01
13	.50674594E-04	.10094197E-02	.10038252E-01
14	.50935468E-04	.88240709E-03	.76733324E-02
15	.51014132E-04	.75497009E-03	.56265700E-02
16	.50943911E-04	.62752254E-03	.38984908E-02
17	.50752097E-04	.50040253E-03	.24886843E-02
18	.50461136E-04	.37388599E-03	.13959752E-02
19	.50089548E-04	.24819763E-03	.61856424E-03
20	.49652667E-04	.12351986E-03	.15414491E-03
21	.49163223E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1299.0000	36.0000	.0000

2	1332.7500	36.0000	90.0000
3	1367.0000	36.0000	180.0000
4	1401.7500	36.0000	270.0000
5	1437.0000	36.0000	360.0000
6	1472.7500	36.0000	450.0000
7	1509.0000	36.0000	540.0000
8	1545.7500	36.0000	630.0000
9	1583.0000	36.0000	720.0000
10	1620.7500	36.0000	810.0000
11	1659.0000	36.0000	900.0000
12	1697.7500	36.0000	990.0000
13	1737.0000	36.0000	1080.0000
14	1776.7500	36.0000	1170.0000
15	1817.0000	36.0000	1260.0000
16	1857.7500	36.0000	1350.0000
17	1899.0000	36.0000	1440.0000
18	1940.7500	36.0000	1530.0000
19	1983.0000	36.0000	1620.0000
20	2025.7500	36.0000	1710.0000
21	2069.0000	36.0000	1800.0000

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 36.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.20759747E-02	.58500557E-01
2	.11970759E-04	.20610113E-02	.53323090E-01
3	.21316886E-04	.20194017E-02	.48217706E-01
4	.28628186E-04	.19569704E-02	.43243433E-01
5	.34346921E-04	.18782515E-02	.38446427E-01
6	.38808610E-04	.17868071E-02	.33862780E-01
7	.42270697E-04	.16854579E-02	.29520646E-01
8	.44932735E-04	.15764537E-02	.25441870E-01
9	.46950839E-04	.14615992E-02	.21643253E-01
10	.48448162E-04	.13423504E-02	.18137536E-01
11	.49522593E-04	.12198870E-02	.14934179E-01
12	.50252482E-04	.10951682E-02	.12039980E-01
13	.50700936E-04	.96897638E-03	.94595659E-02
14	.50919074E-04	.84195137E-03	.71957926E-02
15	.50948642E-04	.71461672E-03	.52500671E-02
16	.50823342E-04	.58740174E-03	.36226093E-02
17	.47273493E-04	.46478070E-03	.23092301E-02
18	.46938589E-04	.34701560E-03	.12946592E-02
19	.46525783E-04	.23018513E-03	.57337325E-03
20	.46049770E-04	.11446569E-03	.14280764E-03
21	.45522783E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.10921319E-03	-.10921319E-03	-.10921319E-03
2	-.99357797E-04	-.11192709E-03	-.87387037E-04
3	-.10054351E-03	-.12399208E-03	-.78160776E-04
4	-.10176374E-03	-.13468615E-03	-.70272730E-04
5	-.10300691E-03	-.14422322E-03	-.63507952E-04
6	-.10426491E-03	-.15277567E-03	-.57694578E-04
7	-.10553202E-03	-.16048393E-03	-.52693650E-04
8	-.10680424E-03	-.16746343E-03	-.48391683E-04
9	-.10807878E-03	-.17380995E-03	-.44695142E-04
10	-.10935371E-03	-.17960355E-03	-.41526288E-04
11	-.11062776E-03	-.18491165E-03	-.38820004E-04
12	-.11190009E-03	-.18979143E-03	-.36521362E-04
13	-.11317017E-03	-.19429166E-03	-.34583714E-04
14	-.11443773E-03	-.19845420E-03	-.32967207E-04
15	-.11570266E-03	-.20231535E-03	-.31637400E-04
16	-.11696496E-03	-.20590581E-03	-.30565277E-04
17	-.11088689E-03	-.19597918E-03	-.28158278E-04
18	-.11205490E-03	-.19889129E-03	-.27565445E-04
19	-.11322152E-03	-.20162051E-03	-.27148825E-04
20	-.11438690E-03	-.20418396E-03	-.26892340E-04
21	-.11555122E-03	-.20659678E-03	-.26781791E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1299.0000	38.6998	.0000
2	1332.7500	38.7497	96.8148
3	1367.0000	38.7632	193.7072
4	1401.7500	38.7457	290.5933
5	1437.0000	38.7014	387.4009
6	1472.7500	38.6336	484.0676
7	1509.0000	38.5452	580.5385
8	1545.7500	38.4384	676.7647
9	1583.0000	38.3150	772.7027
10	1620.7500	38.1766	868.3132
11	1659.0000	38.0245	963.5602
12	1697.7500	37.8597	1058.4108
13	1737.0000	37.6832	1152.8346
14	1776.7500	37.4957	1246.8032
15	1817.0000	37.2978	1340.2931
16	1857.7500	37.0902	1433.2701
17	1899.0000	36.8815	1525.8228
18	1940.7500	36.6723	1617.7676
19	1983.0000	36.4552	1709.1818

20	2025.7500	36.2306	1800.0462
21	2069.0000	35.9988	1890.3423

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	-.24991515E-02	.80876035E+07
3	-.47101708E-02	.90870307E+07
4	-.65262764E-02	.10148511E+08
5	-.79718585E-02	.11275440E+08
6	-.89629066E-02	.12467651E+08
7	-.94442524E-02	.13725962E+08
8	-.93480116E-02	.15051186E+08
9	-.86545143E-02	.16444134E+08
10	-.73038799E-02	.17905614E+08
11	-.52567981E-02	.19436426E+08
12	-.24794434E-02	.21037368E+08
13	.10572688E-02	.22709233E+08
14	.53832895E-02	.24452810E+08
15	.73036647E-02	.26268882E+08
16	.16188991E-01	.28158231E+08
17	-.73753530E-01	.32233786E+08
18	-.74887295E-01	.34418081E+08
19	-.78125845E-01	.36683676E+08
20	-.83626829E-01	.39031405E+08
21	-.91565590E-01	.41462100E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-3 DE 50.0 M V FRANCOLÍ (SER) ZH2

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	50.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	4.0000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	3.2000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	38.000	10.0500	10.0500
2	12.000	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0650 T/M2
REACCION HORIZONTAL TABLERO	=	28.0000 T
REACCION VERTICAL TABLERO	=	1299.0000 T
MOMENTO EXTERIOR EN CABEZA	=	41.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

1

FASE ELASTICA

REACCION DEL TABLERO = 28.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.10651078E-05	.75868044E-03	.24257292E-01
2	.28098782E-05	.75383671E-03	.22365736E-01
3	.44766402E-05	.74472856E-03	.20491662E-01
4	.60728127E-05	.73154174E-03	.18645492E-01
5	.76050186E-05	.71444445E-03	.16837212E-01
6	.90791886E-05	.69358919E-03	.15076402E-01
7	.10500650E-04	.66911440E-03	.13372282E-01
8	.11874199E-04	.64114583E-03	.11733741E-01
9	.13204171E-04	.60979787E-03	.10169369E-01
10	.14494487E-04	.57517455E-03	.86874814E-02
11	.15748708E-04	.53737055E-03	.72961468E-02
12	.16970073E-04	.49647208E-03	.60032074E-02
13	.18161534E-04	.45255757E-03	.48162998E-02
14	.19325789E-04	.40569841E-03	.37428734E-02
15	.20465307E-04	.35595954E-03	.27902075E-02
16	.21582353E-04	.30339997E-03	.19654263E-02
17	.22679007E-04	.24807327E-03	.12755136E-02
18	.23757185E-04	.19002803E-03	.72732542E-03
19	.24818652E-04	.12930823E-03	.32760225E-03
20	.25865039E-04	.65953618E-04	.82979947E-04
21	.26897855E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1299.0000	28.0000	41.0000
2	1332.7500	28.3331	111.4130
3	1367.0000	28.6825	182.6792
4	1401.7500	29.0481	254.8391
5	1437.0000	29.4300	327.9333
6	1472.7500	29.8281	402.0026
7	1509.0000	30.2425	477.0875
8	1545.7500	30.6731	553.2286
9	1583.0000	31.1200	630.4667
10	1620.7500	31.5831	708.8422
11	1659.0000	32.0625	788.3958
12	1697.7500	32.5581	869.1682
13	1737.0000	33.0700	951.2000
14	1776.7500	33.5981	1034.5318
15	1817.0000	34.1425	1119.2042
16	1857.7500	34.7031	1205.2578
17	1899.0000	35.2800	1292.7333
18	1940.7500	35.8731	1381.6714
19	1983.0000	36.4825	1472.1125
20	2025.7500	37.1081	1564.0974
21	2069.0000	37.7500	1657.6667

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FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 28.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.98849420E-06	.71307629E-03	.22599254E-01
2	.26654996E-05	.70850880E-03	.20821399E-01
3	.42700036E-05	.69983942E-03	.19060128E-01
4	.58088306E-05	.68724088E-03	.17325476E-01
5	.72879232E-05	.67086993E-03	.15627068E-01
6	.87125789E-05	.65086931E-03	.13974152E-01
7	.10087543E-04	.62736916E-03	.12375637E-01
8	.11417076E-04	.60048838E-03	.10840123E-01
9	.12705019E-04	.57033576E-03	.93759220E-02
10	.13954836E-04	.53701094E-03	.79910876E-02
11	.15169660E-04	.50060532E-03	.66934346E-02
12	.16352332E-04	.46120283E-03	.54905584E-02
13	.17505429E-04	.41888063E-03	.43898535E-02
14	.18631298E-04	.37370972E-03	.33985292E-02
15	.19732073E-04	.32575551E-03	.25236243E-02
16	.20809701E-04	.27507829E-03	.17720208E-02
17	.20445184E-04	.22350969E-03	.11489757E-02
18	.21412480E-04	.17118761E-03	.65510025E-03
19	.22362771E-04	.11646854E-03	.29503512E-03
20	.23297343E-04	.59393400E-04	.74720934E-04
21	.24217377E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.98224183E-04	-.10094254E-03	-.95555249E-04
2	-.99336183E-04	-.10666631E-03	-.92139334E-04
3	-.10046054E-03	-.11220305E-03	-.88931533E-04
4	-.10159656E-03	-.11757084E-03	-.85912714E-04
5	-.10274360E-03	-.12278539E-03	-.83066206E-04
6	-.10390111E-03	-.12786070E-03	-.80377143E-04
7	-.10506858E-03	-.13280932E-03	-.77832212E-04
8	-.10624556E-03	-.13764252E-03	-.75419452E-04
9	-.10743164E-03	-.14237045E-03	-.73128091E-04
10	-.10862646E-03	-.14700226E-03	-.70948406E-04
11	-.10982968E-03	-.15154625E-03	-.68871603E-04
12	-.11104101E-03	-.15600992E-03	-.66889712E-04
13	-.11226016E-03	-.16040009E-03	-.64995497E-04
14	-.11348688E-03	-.16472295E-03	-.63182378E-04
15	-.11472096E-03	-.16898416E-03	-.61444363E-04
16	-.11596218E-03	-.17318886E-03	-.59775985E-04
17	-.11005571E-03	-.16627997E-03	-.54853714E-04
18	-.11122187E-03	-.17010619E-03	-.53408178E-04
19	-.11239382E-03	-.17389144E-03	-.52014335E-04
20	-.11357141E-03	-.17763910E-03	-.50668579E-04
21	-.11475452E-03	-.18135230E-03	-.49367602E-04

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ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1299.0000	28.9269	41.0006
2	1332.7500	29.2780	113.7535
3	1367.0000	29.6398	187.3975
4	1401.7500	30.0120	261.9590
5	1437.0000	30.3945	337.4640
6	1472.7500	30.7871	413.9380
7	1509.0000	31.1896	491.4058
8	1545.7500	31.6017	569.8918
9	1583.0000	32.0231	649.4197
10	1620.7500	32.4536	730.0127
11	1659.0000	32.8931	811.6932
12	1697.7500	33.3411	894.4831
13	1737.0000	33.7974	978.4035
14	1776.7500	34.2618	1063.4750
15	1817.0000	34.7340	1149.7173
16	1857.7500	35.2136	1237.1494
17	1899.0000	35.7038	1325.8098
18	1940.7500	36.2047	1415.6946
19	1983.0000	36.7128	1506.8410
20	2025.7500	37.2278	1599.2667
21	2069.0000	37.7494	1692.9886

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	-.55838818E-03	.41441866E+08
2	-.12042248E-02	.42670750E+08
3	-.18284390E-02	.43884038E+08
4	-.24291022E-02	.45093912E+08
5	-.29941677E-02	.46301157E+08
6	-.35101416E-02	.47505924E+08
7	-.39619193E-02	.48708251E+08
8	-.43351716E-02	.49908146E+08
9	-.46136003E-02	.51105606E+08
10	-.47816835E-02	.52300623E+08
11	-.48231800E-02	.53493999E+08
12	-.47219597E-02	.54684250E+08
13	-.44626479E-02	.55872036E+08
14	-.40301243E-02	.57057347E+08
15	-.34101739E-02	.58240170E+08
16	-.25895873E-02	.59420495E+08
17	-.18849243E-01	.64815063E+08
18	-.19283385E-01	.66079238E+08
19	-.20073887E-01	.67341049E+08
20	-.21271727E-01	.68600480E+08
21	-.22936538E-01	.69857518E+08

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ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-3 DE 50.0 M V FRANCOLÍ (SER) XH3

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	50.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	4.0000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	3.2000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	38.000	10.0500	10.0500
2	12.000	24.5400	24.5400

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DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	50.0000 T
REACCION VERTICAL TABLERO	=	2581.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

FASE ELASTICA

REACCION DEL TABLERO = 50.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.29367543E-02	.83688704E-01
2	.16645363E-04	.29159476E-02	.76364157E-01
3	.29603809E-04	.28581361E-02	.69139803E-01
4	.39718831E-04	.27714828E-02	.62097511E-01
5	.47619022E-04	.26623105E-02	.55301155E-01
6	.53778859E-04	.25355631E-02	.48800605E-01
7	.58560638E-04	.23951388E-02	.42634737E-01
8	.62243891E-04	.22441331E-02	.36833729E-01
9	.65046338E-04	.20850203E-02	.31420827E-01
10	.67139012E-04	.19197886E-02	.26413726E-01
11	.68657322E-04	.17500432E-02	.21825646E-01
12	.69709231E-04	.15770850E-02	.17666187E-01
13	.70381380E-04	.14019718E-02	.13942016E-01
14	.70743705E-04	.12255654E-02	.10657406E-01
15	.70852961E-04	.10485696E-02	.78146805E-02
16	.70755431E-04	.87155908E-03	.54145705E-02
17	.70489024E-04	.69500351E-03	.34565060E-02
18	.70084911E-04	.51928609E-03	.19388545E-02
19	.69568817E-04	.34471893E-03	.85911700E-03
20	.68962038E-04	.17155537E-03	.21409015E-03
21	.68282254E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2581.0000	50.0000	.0000

2	2614.7500	50.0000	125.0000
3	2649.0000	50.0000	250.0000
4	2683.7500	50.0000	375.0000
5	2719.0000	50.0000	500.0000
6	2754.7500	50.0000	625.0000
7	2791.0000	50.0000	750.0000
8	2827.7500	50.0000	875.0000
9	2865.0000	50.0000	1000.0000
10	2902.7500	50.0000	1125.0000
11	2941.0000	50.0000	1250.0000
12	2979.7500	50.0000	1375.0000
13	3019.0000	50.0000	1500.0000
14	3058.7500	50.0000	1625.0000
15	3099.0000	50.0000	1750.0000
16	3139.7500	50.0000	1875.0000
17	3181.0000	50.0000	2000.0000
18	3222.7500	50.0000	2125.0000
19	3265.0000	50.0000	2250.0000
20	3307.7500	50.0000	2375.0000
21	3351.0000	50.0000	2500.0000

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FASE FINAL EN ITERACION NUMERO 4

REACCION DEL TABLERO = 50.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.32726198E-02	.91570608E-01
2	.19346991E-04	.32484361E-02	.83409212E-01
3	.34404364E-04	.31812469E-02	.75364265E-01
4	.46128797E-04	.30805805E-02	.67530875E-01
5	.55241211E-04	.29538679E-02	.59983068E-01
6	.62290653E-04	.28069531E-02	.52778370E-01
7	.67699810E-04	.26444650E-02	.45961280E-01
8	.71797242E-04	.24700937E-02	.39565948E-01
9	.74840571E-04	.22867965E-02	.33618250E-01
10	.77033398E-04	.20969540E-02	.28137420E-01
11	.78537748E-04	.19024901E-02	.23137331E-01
12	.79483424E-04	.17049636E-02	.18627522E-01
13	.79975004E-04	.15056406E-02	.14614010E-01
14	.80097187E-04	.13055503E-02	.11099958E-01
15	.79918903E-04	.11055302E-02	.80862003E-02
16	.79496484E-04	.90626098E-03	.55716813E-02
17	.73172301E-04	.71542500E-03	.35478677E-02
18	.72450682E-04	.53339627E-03	.19872169E-02
19	.71612615E-04	.35331715E-03	.87926166E-03
20	.70681734E-04	.17544921E-03	.21878855E-03
21	.69677635E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.21699711E-03	-.21699711E-03	-.21699711E-03
2	-.20148853E-03	-.22180287E-03	-.18214154E-03
3	-.20134402E-03	-.23918882E-03	-.16521944E-03
4	-.20132266E-03	-.25437077E-03	-.15058098E-03
5	-.20139107E-03	-.26768052E-03	-.13786367E-03
6	-.20152550E-03	-.27938881E-03	-.12677671E-03
7	-.20170901E-03	-.28971876E-03	-.11708425E-03
8	-.20192951E-03	-.29885579E-03	-.10859310E-03
9	-.20217841E-03	-.30695521E-03	-.10114364E-03
10	-.20244960E-03	-.31414802E-03	-.94602839E-04
11	-.20273880E-03	-.32054542E-03	-.88859066E-04
12	-.20304305E-03	-.32624236E-03	-.83817918E-04
13	-.20336035E-03	-.33132035E-03	-.79399091E-04
14	-.20368935E-03	-.33584971E-03	-.75533851E-04
15	-.20402923E-03	-.33989137E-03	-.72163043E-04
16	-.20437952E-03	-.34349836E-03	-.69235494E-04
17	-.19118745E-03	-.32289759E-03	-.63135924E-04
18	-.19151389E-03	-.32554765E-03	-.61102660E-04
19	-.19185221E-03	-.32791618E-03	-.59368876E-04
20	-.19220239E-03	-.33003178E-03	-.57907098E-04
21	-.19256443E-03	-.33191970E-03	-.56693039E-04

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ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2581.0000	58.4452	.0000
2	2614.7500	58.4920	146.2000
3	2649.0000	58.4249	292.3699
4	2683.7500	58.2651	438.2523
5	2719.0000	58.0290	583.6368
6	2754.7500	57.7297	728.3499
7	2791.0000	57.3779	872.2472
8	2827.7500	56.9820	1015.2085
9	2865.0000	56.5488	1157.1323
10	2902.7500	56.0841	1297.9331
11	2941.0000	55.5925	1437.5377
12	2979.7500	55.0777	1575.8838
13	3019.0000	54.5429	1712.9177
14	3058.7500	53.9909	1848.5928
15	3099.0000	53.4237	1982.8689
16	3139.7500	52.8432	2115.7103
17	3181.0000	52.2738	2247.0555
18	3222.7500	51.7170	2377.0473
19	3265.0000	51.1516	2505.6350

20	3307.7500	50.5784	2632.7980
21	3351.0000	49.9981	2758.5177

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	.12419488E-02	.75557989E+07
3	.24304233E-02	.84959925E+07
4	.35052290E-02	.94963086E+07
5	.44012895E-02	.10557773E+08
6	.50584432E-02	.11681312E+08
7	.54200990E-02	.12867832E+08
8	.54321057E-02	.14118230E+08
9	.50424464E-02	.15433396E+08
10	.40868432E-02	.16807203E+08
11	.27127849E-02	.18253156E+08
12	.78513951E-03	.19766446E+08
13	-.17435260E-02	.21347953E+08
14	-.49198497E-02	.22998552E+08
15	-.87895969E-02	.24719103E+08
16	-.13397593E-01	.26510461E+08
17	.30836334E-01	.30618475E+08
18	.29625502E-01	.32709058E+08
19	.29589830E-01	.34878902E+08
20	.30766126E-01	.37128890E+08
21	.33206357E-01	.39459901E+08

ESTUDIO PANDEO DE PILAS DE PUENTÈS

PROYECTO : P-3 DE 50.0 M V FRANCOLÍ (SER) ZH3

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	50.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	4.0000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	3.2000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	38.000	10.0500	10.0500
2	12.000	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0390 T/M2
REACCION HORIZONTAL TABLERO	=	50.0000 T
REACCION VERTICAL TABLERO	=	2581.0000 T
MOMENTO EXTERIOR EN CABEZA	=	310.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

FASE ELASTICA

REACCION DEL TABLERO = 50.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.80532537E-05	.15235143E-02	.46185223E-01
2	.10977113E-04	.14997263E-02	.42404650E-01
3	.13747757E-04	.14688202E-02	.38692524E-01
4	.16378435E-04	.14311625E-02	.35066175E-01
5	.18880978E-04	.13870882E-02	.31542058E-01
6	.21265977E-04	.13369045E-02	.28135825E-01
7	.23542948E-04	.12808934E-02	.24862392E-01
8	.25720459E-04	.12193141E-02	.21735999E-01
9	.27806250E-04	.11524057E-02	.18770262E-01
10	.29807327E-04	.10803887E-02	.15978227E-01
11	.31730049E-04	.10034670E-02	.13372406E-01
12	.33580202E-04	.92182920E-03	.10964822E-01
13	.35363058E-04	.83565013E-03	.87670444E-02
14	.37083436E-04	.74509201E-03	.67902207E-02
15	.38745746E-04	.65030553E-03	.50451080E-02
16	.40354032E-04	.55143081E-03	.35421000E-02
17	.41912012E-04	.44859825E-03	.22912522E-02
18	.43423106E-04	.34192935E-03	.13023056E-02
19	.44890467E-04	.23153739E-03	.58470797E-03
20	.46317009E-04	.11752804E-03	.14763319E-03
21	.47705426E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2581.0000	50.0000	310.0000
2	2614.7500	50.1999	435.2478
3	2649.0000	50.4095	561.0075
4	2683.7500	50.6289	687.3034
5	2719.0000	50.8580	814.1600
6	2754.7500	51.0969	941.6016
7	2791.0000	51.3455	1069.6525
8	2827.7500	51.6039	1198.3372
9	2865.0000	51.8720	1327.6800
10	2902.7500	52.1499	1457.7053
11	2941.0000	52.4375	1588.4375
12	2979.7500	52.7349	1719.9009
13	3019.0000	53.0420	1852.1200
14	3058.7500	53.3589	1985.1191
15	3099.0000	53.6855	2118.9225
16	3139.7500	54.0219	2253.5547
17	3181.0000	54.3680	2389.0400
18	3222.7500	54.7239	2525.4028
19	3265.0000	55.0895	2662.6675
20	3307.7500	55.4649	2800.8584
21	3351.0000	55.8500	2940.0000

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 50.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.80107357E-05	.15564517E-02	.46689512E-01
2	.11168544E-04	.15324776E-02	.42826706E-01
3	.14157630E-04	.15008199E-02	.39033527E-01
4	.16991663E-04	.14618833E-02	.35328672E-01
5	.19682821E-04	.14160402E-02	.31729866E-01
6	.22241996E-04	.13636342E-02	.28253940E-01
7	.24678957E-04	.13049830E-02	.24916900E-01
8	.27002489E-04	.12403812E-02	.21733984E-01
9	.29220512E-04	.11701024E-02	.18719725E-01
10	.31340185E-04	.10944015E-02	.15887991E-01
11	.33367989E-04	.10135163E-02	.13252037E-01
12	.35309810E-04	.92766908E-03	.10824544E-01
13	.37170997E-04	.83706807E-03	.86176533E-02
14	.38956424E-04	.74190879E-03	.66430023E-02
15	.40670539E-04	.64237509E-03	.49117547E-02
16	.42317409E-04	.53864016E-03	.34346279E-02
17	.40744484E-04	.43481279E-03	.22186309E-02
18	.42157446E-04	.33118538E-03	.12603973E-02
19	.43518344E-04	.22409064E-03	.56559349E-03
20	.44829857E-04	.11365539E-03	.14272788E-03
21	.46094451E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.20187338E-03	-.22390290E-03	-.18024439E-03
2	-.20154820E-03	-.23226169E-03	-.17139313E-03
3	-.20129400E-03	-.24022748E-03	-.16306840E-03
4	-.20110621E-03	-.24783328E-03	-.15522872E-03
5	-.20098068E-03	-.25510844E-03	-.14783706E-03
6	-.20091362E-03	-.26207911E-03	-.14086023E-03
7	-.20090157E-03	-.26876870E-03	-.13426838E-03
8	-.20094134E-03	-.27519818E-03	-.12803462E-03
9	-.20103000E-03	-.28138641E-03	-.12213462E-03
10	-.20116486E-03	-.28735037E-03	-.11654636E-03
11	-.20134343E-03	-.29310540E-03	-.11124986E-03
12	-.20156338E-03	-.29866536E-03	-.10622690E-03
13	-.20182259E-03	-.30404283E-03	-.10146090E-03
14	-.20211904E-03	-.30924921E-03	-.96936701E-04
15	-.20245089E-03	-.31429487E-03	-.92640435E-04
16	-.20281639E-03	-.31918926E-03	-.88559385E-04
17	-.18996349E-03	-.30201082E-03	-.79953386E-04
18	-.19033598E-03	-.30626896E-03	-.76510878E-04
19	-.19073536E-03	-.31041080E-03	-.73235825E-04
20	-.19116042E-03	-.31444253E-03	-.70119806E-04
21	-.19161006E-03	-.31836980E-03	-.67155037E-04

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ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2581.0000	54.0147	310.0007
2	2614.7500	54.2043	445.2833
3	2649.0000	54.3825	581.0258
4	2683.7500	54.5495	717.1996
5	2719.0000	54.7055	853.7769
6	2754.7500	54.8506	990.7302
7	2791.0000	54.9850	1128.0324
8	2827.7500	55.1087	1265.6566
9	2865.0000	55.2217	1403.5759
10	2902.7500	55.3241	1541.7636
11	2941.0000	55.4158	1680.1929
12	2979.7500	55.4967	1818.8368
13	3019.0000	55.5668	1957.6683
14	3058.7500	55.6260	2096.6600
15	3099.0000	55.6741	2235.7843
16	3139.7500	55.7110	2375.0134
17	3181.0000	55.7493	2514.3884
18	3222.7500	55.7895	2653.8109
19	3265.0000	55.8197	2793.3228
20	3307.7500	55.8395	2932.8988
21	3351.0000	55.8489	3072.5131

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	-.67816229E-03	.38693214E+08
2	-.85006509E-03	.39863239E+08
3	-.10769683E-02	.41030824E+08
4	-.12757292E-02	.42196218E+08
5	-.13580542E-02	.43359451E+08
6	-.12334786E-02	.44520519E+08
7	-.81002198E-03	.45679406E+08
8	.57803265E-05	.46836093E+08
9	.13091316E-02	.47987317E+08
10	.31978439E-02	.49138839E+08
11	.57724286E-02	.50288059E+08
12	.91364217E-02	.51434971E+08
13	.13397014E-01	.52579558E+08
14	.18665005E-01	.53721813E+08
15	.25055276E-01	.54869663E+08
16	.32686783E-01	.56008069E+08
17	-.17169224E-01	.61602927E+08
18	-.11946213E-01	.62830539E+08
19	-.87143753E-02	.64056087E+08
20	-.76038364E-02	.65279562E+08
21	-.87942267E-02	.66500967E+08

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ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-3 DE 50.0 M V FRANCOLÍ (SER) XH4

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	50.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	4.0000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	3.2000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	38.000	10.0500	10.0500
2	12.000	24.5400	24.5400

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DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	59.0000 T
REACCION VERTICAL TABLERO	=	2067.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

FASE ELASTICA

REACCION DEL TABLERO = 59.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.34653700E-02	.98752670E-01
2	.19641529E-04	.34408181E-02	.90109705E-01
3	.34932495E-04	.33726006E-02	.81584968E-01
4	.46868220E-04	.32703497E-02	.73275063E-01
5	.56190446E-04	.31415264E-02	.65255363E-01
6	.63459054E-04	.29919645E-02	.57584714E-01
7	.69101553E-04	.28262637E-02	.50308989E-01
8	.73447791E-04	.26480771E-02	.43463800E-01
9	.76754679E-04	.24603240E-02	.37076576E-01
10	.79224034E-04	.22653506E-02	.31168197E-01
11	.81015640E-04	.20650510E-02	.25754262E-01
12	.82256893E-04	.18609603E-02	.20846101E-01
13	.83050028E-04	.16543267E-02	.16451579E-01
14	.83477572E-04	.14461672E-02	.12575739E-01
15	.83606494E-04	.12373121E-02	.92213230E-02
16	.83491409E-04	.10284397E-02	.63891932E-02
17	.83177048E-04	.82010414E-03	.40786771E-02
18	.82700194E-04	.61275759E-03	.22878483E-02
19	.82091204E-04	.40676834E-03	.10137581E-02
20	.81375205E-04	.20243533E-03	.25262638E-03
21	.80573060E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2067.0000	59.0000	.0000

2	2100.7500	59.0000	147.5000
3	2135.0000	59.0000	295.0000
4	2169.7500	59.0000	442.5000
5	2205.0000	59.0000	590.0000
6	2240.7500	59.0000	737.5000
7	2277.0000	59.0000	885.0000
8	2313.7500	59.0000	1032.5000
9	2351.0000	59.0000	1180.0000
10	2388.7500	59.0000	1327.5000
11	2427.0000	59.0000	1475.0000
12	2465.7500	59.0000	1622.5000
13	2505.0000	59.0000	1770.0000
14	2544.7500	59.0000	1917.5000
15	2585.0000	59.0000	2065.0000
16	2625.7500	59.0000	2212.5000
17	2667.0000	59.0000	2360.0000
18	2708.7500	59.0000	2507.5000
19	2751.0000	59.0000	2655.0000
20	2793.7500	59.0000	2802.5000
21	2837.0000	59.0000	2950.0000

FASE FINAL EN ITERACION NUMERO 4

REACCION DEL TABLERO = 59.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.36654300E-02	.10287732E+00
2	.21431632E-04	.36386404E-02	.93736067E-01
3	.38135303E-04	.35641817E-02	.84723839E-01
4	.51169728E-04	.34525505E-02	.75946135E-01
5	.61330190E-04	.33119256E-02	.67485248E-01
6	.69221145E-04	.31487364E-02	.59405311E-01
7	.75307178E-04	.29680760E-02	.51756126E-01
8	.79948960E-04	.27740058E-02	.44576106E-01
9	.83429027E-04	.25697833E-02	.37894557E-01
10	.85970518E-04	.23580339E-02	.31733462E-01
11	.87750968E-04	.21408820E-02	.26108889E-01
12	.88912571E-04	.19200526E-02	.21032116E-01
13	.89569911E-04	.16969495E-02	.16510521E-01
14	.89815831E-04	.14727173E-02	.12548309E-01
15	.89725926E-04	.12482901E-02	.91470969E-02
16	.89362033E-04	.10244302E-02	.63063860E-02
17	.82596461E-04	.80948207E-03	.40175194E-02
18	.81879915E-04	.60388660E-03	.22511817E-02
19	.81029471E-04	.40024987E-03	.99645409E-03
20	.80071417E-04	.19887376E-03	.24804854E-03
21	.79027591E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.17378265E-03	-.17378265E-03	-.17378265E-03
2	-.15973997E-03	-.18224319E-03	-.13830834E-03
3	-.16024423E-03	-.20219306E-03	-.12020216E-03
4	-.16086994E-03	-.21971513E-03	-.10458324E-03
5	-.16157834E-03	-.23517457E-03	-.91048625E-04
6	-.16234209E-03	-.24886852E-03	-.79276711E-04
7	-.16314187E-03	-.26104120E-03	-.69007898E-04
8	-.16396411E-03	-.27189521E-03	-.60030463E-04
9	-.16479930E-03	-.28159994E-03	-.52170116E-04
10	-.16564087E-03	-.29029812E-03	-.45282147E-04
11	-.16648436E-03	-.29811081E-03	-.39245460E-04
12	-.16732684E-03	-.30514133E-03	-.33957985E-04
13	-.16816648E-03	-.31147834E-03	-.29333115E-04
14	-.16900223E-03	-.31719835E-03	-.25296904E-04
15	-.16983363E-03	-.32236771E-03	-.21785854E-04
16	-.17066060E-03	-.32704416E-03	-.18745149E-04
17	-.16015754E-03	-.30883117E-03	-.15613733E-04
18	-.16089659E-03	-.31237443E-03	-.13512741E-04
19	-.16163534E-03	-.31559133E-03	-.11730816E-04
20	-.16237418E-03	-.31851344E-03	-.10238489E-04
21	-.16311355E-03	-.32116873E-03	-.90097475E-05

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2067.0000	66.5757	.0000
2	2100.7500	66.6427	166.5470
3	2135.0000	66.6080	333.1302
4	2169.7500	66.4893	499.5184
5	2205.0000	66.3007	665.5201
6	2240.7500	66.0533	830.9748
7	2277.0000	65.7560	995.7468
8	2313.7500	65.4159	1159.7209
9	2351.0000	65.0391	1322.7977
10	2388.7500	64.6303	1484.8916
11	2427.0000	64.1934	1645.9277
12	2465.7500	63.7319	1805.8403
13	2505.0000	63.2484	1964.5712
14	2544.7500	62.7453	2122.0684
15	2585.0000	62.2245	2278.2855
16	2625.7500	61.6877	2433.1803
17	2667.0000	61.1568	2586.7119
18	2708.7500	60.6337	2738.9525
19	2751.0000	60.0990	2889.8702

20	2793.7500	59.5535	3039.4371
21	2837.0000	58.9979	3187.6270

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	.11074942E-02	.77702100E+07
3	.21872187E-02	.87324986E+07
4	.32166950E-02	.97554814E+07
5	.41697210E-02	.10840059E+08
6	.50209620E-02	.11987161E+08
7	.57460440E-02	.13197709E+08
8	.63214722E-02	.14472615E+08
9	.67247965E-02	.15812789E+08
10	.69355630E-02	.17219129E+08
11	.69306894E-02	.18692530E+08
12	.66915362E-02	.20233874E+08
13	.61988840E-02	.21844039E+08
14	.54341403E-02	.23523891E+08
15	.43792763E-02	.25274288E+08
16	.30168494E-02	.27096079E+08
17	.21106067E-01	.31201456E+08
18	.20993433E-01	.33322362E+08
19	.21303597E-01	.35523126E+08
20	.22056766E-01	.37804635E+08
21	.23279795E-01	.40167766E+08

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ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-3 DE 50.0 M V FRANCOLÍ (SER) ZH4

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	50.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	4.0000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	3.2000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	38.000	10.0500	10.0500
2	12.000	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0390 T/M2
REACCION HORIZONTAL TABLERO	=	50.0000 T
REACCION VERTICAL TABLERO	=	2067.0000 T
MOMENTO EXTERIOR EN CABEZA	=	1694.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

FASE ELASTICA

REACCION DEL TABLERO = 50.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.44007135E-04	.29313855E-02	.78630880E-01
2	.45882113E-04	.28190239E-02	.71441891E-01
3	.47663338E-04	.27020921E-02	.64539569E-01
4	.49359144E-04	.25808140E-02	.57935053E-01
5	.50976970E-04	.24553939E-02	.51638950E-01
6	.52523479E-04	.23260183E-02	.45661379E-01
7	.54004654E-04	.21928582E-02	.40012012E-01
8	.55425884E-04	.20560700E-02	.34700112E-01
9	.56792037E-04	.19157976E-02	.29734566E-01
10	.58107519E-04	.17721731E-02	.25123917E-01
11	.59376330E-04	.16253183E-02	.20876392E-01
12	.60602107E-04	.14753453E-02	.16999924E-01
13	.61788167E-04	.13223574E-02	.13502178E-01
14	.62937541E-04	.11664503E-02	.10390570E-01
15	.64053001E-04	.10077121E-02	.76722857E-02
16	.65137092E-04	.84622451E-03	.53543003E-02
17	.66192152E-04	.68206296E-03	.34433914E-02
18	.67220330E-04	.51529735E-03	.19461556E-02
19	.68223612E-04	.34599243E-03	.86902078E-03
20	.69203828E-04	.17420813E-03	.21825956E-03
21	.70162674E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2067.0000	50.0000	1694.0000
2	2100.7500	50.1999	1819.2478
3	2135.0000	50.4095	1945.0075
4	2169.7500	50.6289	2071.3034
5	2205.0000	50.8580	2198.1600
6	2240.7500	51.0969	2325.6016
7	2277.0000	51.3455	2453.6525
8	2313.7500	51.6039	2582.3372
9	2351.0000	51.8720	2711.6800
10	2388.7500	52.1499	2841.7053
11	2427.0000	52.4375	2972.4375
12	2465.7500	52.7349	3103.9009
13	2505.0000	53.0420	3236.1200
14	2544.7500	53.3589	3369.1191
15	2585.0000	53.6855	3502.9225
16	2625.7500	54.0219	3637.5547
17	2667.0000	54.3680	3773.0400
18	2708.7500	54.7239	3909.4028
19	2751.0000	55.0895	4046.6675
20	2793.7500	55.4649	4184.8584
21	2837.0000	55.8500	4324.0000

FASE FINAL EN ITERACION NUMERO 4

REACCION DEL TABLERO = 50.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.42584944E-04	.29150784E-02	.77966708E-01
2	.44775320E-04	.28058780E-02	.70814372E-01
3	.46848311E-04	.26913485E-02	.63941759E-01
4	.48813352E-04	.25717714E-02	.57361836E-01
5	.50678847E-04	.24474062E-02	.51086892E-01
6	.52452306E-04	.23184922E-02	.45128595E-01
7	.54140453E-04	.21852513E-02	.39498037E-01
8	.55749328E-04	.20478891E-02	.34205773E-01
9	.57284369E-04	.19065969E-02	.29261867E-01
10	.58750480E-04	.17615534E-02	.24675915E-01
11	.60152095E-04	.16129251E-02	.20457087E-01
12	.61495506E-04	.14608656E-02	.16614149E-01
13	.62820594E-04	.13054705E-02	.13155538E-01
14	.64142313E-04	.11467669E-02	.10089553E-01
15	.65463544E-04	.98475957E-03	.74244570E-02
16	.66787864E-04	.81944531E-03	.51685112E-02
17	.63267985E-04	.65687550E-03	.33249434E-02
18	.64469097E-04	.49720414E-03	.18817183E-02
19	.65677691E-04	.33452066E-03	.84143282E-03
20	.66899091E-04	.16879968E-03	.21164625E-03
21	.68140654E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.16137013E-03	-.27847873E-03	-.46390787E-04
2	-.16184141E-03	-.28497354E-03	-.40948041E-04
3	-.16234908E-03	-.29118193E-03	-.35858639E-04
4	-.16289088E-03	-.29712760E-03	-.31094831E-04
5	-.16346474E-03	-.30283157E-03	-.26631852E-04
6	-.16406875E-03	-.30831260E-03	-.22447528E-04
7	-.16470118E-03	-.31358743E-03	-.18521960E-04
8	-.16536042E-03	-.31867107E-03	-.14837230E-04
9	-.16604497E-03	-.32357699E-03	-.11377177E-04
10	-.16675348E-03	-.32831730E-03	-.81271832E-05
11	-.16748466E-03	-.33290292E-03	-.50740030E-05
12	-.16823434E-03	-.33734698E-03	-.21964773E-05
13	-.16895482E-03	-.34171145E-03	.66078300E-06
14	-.16962751E-03	-.34601887E-03	.35567321E-05
15	-.17024869E-03	-.35027344E-03	.65028790E-05
16	-.17081344E-03	-.35448007E-03	.95137913E-05
17	-.16006119E-03	-.33404814E-03	.10762373E-04
18	-.16049803E-03	-.33778805E-03	.13568528E-04
19	-.16087753E-03	-.34149118E-03	.16452235E-04
20	-.16119104E-03	-.34516354E-03	.19436502E-04
21	-.16142626E-03	-.34881305E-03	.22553509E-04

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ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2067.0000	56.0257	1694.0000
2	2100.7500	56.0945	1834.1519
3	2135.0000	56.1557	1974.4662
4	2169.7500	56.2090	2114.9237
5	2205.0000	56.2545	2255.5049
6	2240.7500	56.2920	2396.1897
7	2277.0000	56.3212	2536.9578
8	2313.7500	56.3419	2677.7884
9	2351.0000	56.3541	2818.6602
10	2388.7500	56.3573	2959.5514
11	2427.0000	56.3515	3100.4394
12	2465.7500	56.3363	3241.2976
13	2505.0000	56.3114	3382.1086
14	2544.7500	56.2761	3522.8450
15	2585.0000	56.2300	3663.4801
16	2625.7500	56.1722	3803.9870
17	2667.0000	56.1186	3944.3473
18	2708.7500	56.0694	4084.5866
19	2751.0000	56.0086	4224.6924
20	2793.7500	55.9355	4364.6245
21	2837.0000	55.8490	4504.3343

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	-.36005122E-06	.39710309E+08
2	-.63937857E-03	.40883122E+08
3	-.12764133E-02	.42053536E+08
4	-.18986225E-02	.43221548E+08
5	-.24920720E-02	.44387152E+08
6	-.30641460E-02	.45555001E+08
7	-.35329851E-02	.46711135E+08
8	-.39493985E-02	.47869516E+08
9	-.42754203E-02	.49025491E+08
10	-.44952953E-02	.50179065E+08
11	-.45936733E-02	.51330242E+08
12	-.91793821E-03	.51468786E+08
13	.26520396E-04	.50125717E+08
14	.83464001E-03	.48681417E+08
15	.14201982E-02	.47124173E+08
16	.88319747E-03	.45464634E+08
17	.12214297E-02	.49273920E+08
18	.51003724E-03	.47058919E+08
19	-.43118731E-02	.44930699E+08
20	-.30904327E-02	.42399068E+08
21	.20606046E-01	.39227828E+08

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ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-3 DE 50.0 M V FRANCOLÍ (SER) XH51

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	50.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	4.0000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	3.2000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

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DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	38.000	10.0500	10.0500
2	12.000	24.5400	24.5400

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DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	98.0000 T
REACCION VERTICAL TABLERO	=	1964.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

FASE ELASTICA

REACCION DEL TABLERO = 98.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.57560384E-02	.16402986E+00
2	.32624912E-04	.57152572E-02	.14967375E+00
3	.58023466E-04	.56019468E-02	.13551401E+00
4	.77848908E-04	.54321063E-02	.12171112E+00
5	.93333283E-04	.52181286E-02	.10839026E+00
6	.10540656E-03	.49697037E-02	.95649185E-01
7	.11477885E-03	.46944720E-02	.83564084E-01
8	.12199803E-03	.43985009E-02	.72194108E-01
9	.12749082E-03	.40866398E-02	.61584821E-01
10	.13159246E-03	.37627857E-02	.51770903E-01
11	.13456835E-03	.34300847E-02	.42778265E-01
12	.13663009E-03	.30910866E-02	.34625727E-01
13	.13794750E-03	.27478646E-02	.27326352E-01
14	.13865766E-03	.24021082E-02	.20888516E-01
15	.13887180E-03	.20551964E-02	.15316774E-01
16	.13868065E-03	.17082558E-02	.10612558E-01
17	.13815849E-03	.13622069E-02	.67747518E-02
18	.13736642E-03	.10178007E-02	.38001548E-02
19	.13635488E-03	.67564911E-03	.16838693E-02
20	.13516559E-03	.33624852E-03	.41961670E-03
21	.13383322E-03	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1964.0000	98.0000	.0000

2	1997.7500	98.0000	245.0000
3	2032.0000	98.0000	490.0000
4	2066.7500	98.0000	735.0000
5	2102.0000	98.0000	980.0000
6	2137.7500	98.0000	1225.0000
7	2174.0000	98.0000	1470.0000
8	2210.7500	98.0000	1715.0000
9	2248.0000	98.0000	1960.0000
10	2285.7500	98.0000	2205.0000
11	2324.0000	98.0000	2450.0000
12	2362.7500	98.0000	2695.0000
13	2402.0000	98.0000	2940.0000
14	2441.7500	98.0000	3185.0000
15	2482.0000	98.0000	3430.0000
16	2522.7500	98.0000	3675.0000
17	2564.0000	98.0000	3920.0000
18	2605.7500	98.0000	4165.0000
19	2648.0000	98.0000	4410.0000
20	2690.7500	98.0000	4655.0000
21	2734.0000	98.0000	4900.0000

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FASE FINAL EN ITERACION NUMERO 9

REACCION DEL TABLERO = 98.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.11234015E-01	.34787477E+00
2	.38466848E-04	.11185932E-01	.31982980E+00
3	.68518279E-04	.11052200E-01	.29201649E+00
4	.92044701E-04	.10851497E-01	.26462461E+00
5	.11045965E-03	.10598366E-01	.23780269E+00
6	.12483447E-03	.10304248E-01	.21166694E+00
7	.13789338E-03	.99758387E-02	.18631003E+00
8	.15669680E-03	.96076009E-02	.16182094E+00
9	.19383324E-03	.91694384E-02	.13833029E+00
10	.23509981E-03	.86332721E-02	.11605541E+00
11	.27659163E-03	.79936578E-02	.95250141E-01
12	.31476487E-03	.72544622E-02	.76170109E-01
13	.34743821E-03	.64267083E-02	.59051628E-01
14	.37374419E-03	.55252303E-02	.44098004E-01
15	.39365124E-03	.45659861E-02	.31473615E-01
16	.40756604E-03	.35644645E-02	.21303305E-01
17	.27250750E-03	.27143725E-02	.13525101E-01
18	.27324247E-03	.20321851E-02	.75915216E-02
19	.27242459E-03	.13501013E-02	.33640897E-02
20	.27029516E-03	.67170158E-03	.83794517E-03
21	.26706610E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.16512294E-03	-.16512294E-03	-.16512294E-03
2	-.15172032E-03	-.19211051E-03	-.11325347E-03
3	-.15287400E-03	-.22824411E-03	-.80929812E-04
4	-.15435007E-03	-.26020148E-03	-.53100899E-04
5	-.15602867E-03	-.28858025E-03	-.29000079E-04
6	-.15782561E-03	-.31386871E-03	-.80242447E-05
7	-.15824548E-03	-.33750687E-03	.14121239E-04
8	-.15132717E-03	-.36286785E-03	.52378674E-04
9	-.12389180E-03	-.39525833E-03	.13778307E-03
10	-.87531039E-04	-.42842576E-03	.24160869E-03
11	-.45599009E-04	-.46048645E-03	.35545885E-03
12	-.21987625E-05	-.49008431E-03	.46994854E-03
13	.39342200E-04	-.51655894E-03	.57787143E-03
14	.76930901E-04	-.53974700E-03	.67492160E-03
15	.10946908E-03	-.55973803E-03	.75899363E-03
16	.13651194E-03	-.57672863E-03	.82937420E-03
17	-.83807259E-05	-.49889422E-03	.46850739E-03
18	-.20678327E-05	-.50756639E-03	.48976861E-03
19	.26191743E-05	-.51498754E-03	.50660466E-03
20	.58083094E-05	-.52126726E-03	.51936912E-03
21	.76276147E-05	-.52650459E-03	.52840651E-03

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ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1964.0000	120.0611	.0000
2	1997.7500	120.3433	300.5370
3	2032.0000	120.4539	601.5573
4	2066.7500	120.4225	902.6704
5	2102.0000	120.2723	1203.5513
6	2137.7500	120.0218	1503.9252
7	2174.0000	119.6808	1803.6019
8	2210.7500	119.2327	2102.2789
9	2248.0000	118.6047	2399.6454
10	2285.7500	117.7244	2695.1157
11	2324.0000	116.5673	2988.0435
12	2362.7500	115.1299	3277.7295
13	2402.0000	113.4260	3563.4767
14	2441.7500	111.4800	3844.6558
15	2482.0000	109.3214	4120.6981
16	2522.7500	106.9808	4391.1106
17	2564.0000	104.9519	4655.8639
18	2605.7500	103.2877	4916.1751
19	2648.0000	101.5675	5172.2533

20	2690.7500	99.8000	5423.9694
21	2734.0000	97.9927	5671.2167

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	.14096775E-01	.78104235E+07
3	.29092542E-01	.87700392E+07
4	.45244440E-01	.97858425E+07
5	.62778276E-01	.10858957E+08
6	.83580055E-01	.11990497E+08
7	.62212685E-01	.10073403E+08
8	.62173262E-01	.51027355E+07
9	.50504300E-01	.36566370E+07
10	.56764724E-01	.31017346E+07
11	.61265495E-01	.28409180E+07
12	.62328888E-01	.27582669E+07
13	.69929824E-01	.27817569E+07
14	.76168318E-01	.28689844E+07
15	.80857420E-01	.29982445E+07
16	.83843435E-01	.31578609E+07
17	.83852370E-01	.71836694E+07
18	.86305034E-01	.76389918E+07
19	.88843181E-01	.81240541E+07
20	.91642531E-01	.86384690E+07
21	.92931115E-01	.91820687E+07

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-3 DE 50.0 M V FRANCOLÍ (SER) ZH51

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	50.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	4.0000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	3.2000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	38.000	10.0500	10.0500
2	12.000	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0390 T/M2
REACCION HORIZONTAL TABLERO	=	43.0000 T
REACCION VERTICAL TABLERO	=	1964.0000 T
MOMENTO EXTERIOR EN CABEZA	=	1402.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

1

FASE ELASTICA

REACCION DEL TABLERO = 43.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.36421489E-04	.24703164E-02	.66526953E-01
2	.38076406E-04	.23771941E-02	.60466703E-01
3	.39650046E-04	.22800360E-02	.54644346E-01
4	.41149711E-04	.21790363E-02	.49069725E-01
5	.42581920E-04	.20743718E-02	.43752218E-01
6	.43952509E-04	.19662037E-02	.38700785E-01
7	.45266722E-04	.18546797E-02	.33923997E-01
8	.46529281E-04	.17399347E-02	.29430071E-01
9	.47744450E-04	.16220925E-02	.25226904E-01
10	.48916091E-04	.15012668E-02	.21322095E-01
11	.50047708E-04	.13775621E-02	.17722969E-01
12	.51142488E-04	.12510744E-02	.14436603E-01
13	.52203337E-04	.11218921E-02	.11469843E-01
14	.53232911E-04	.99009676E-03	.88293205E-02
15	.54233640E-04	.85576357E-03	.65214739E-02
16	.55207752E-04	.71896183E-03	.45525598E-02
17	.56157296E-04	.57975552E-03	.29286685E-02
18	.57084157E-04	.43820370E-03	.16557368E-02
19	.57990072E-04	.29436092E-03	.73955915E-03
20	.58876647E-04	.14827752E-03	.18579935E-03
21	.59745366E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1964.0000	43.0000	1402.0000
2	1997.7500	43.1999	1509.7478
3	2032.0000	43.4095	1618.0075
4	2066.7500	43.6289	1726.8034
5	2102.0000	43.8580	1836.1600
6	2137.7500	44.0969	1946.1016
7	2174.0000	44.3455	2056.6525
8	2210.7500	44.6039	2167.8372
9	2248.0000	44.8720	2279.6800
10	2285.7500	45.1499	2392.2053
11	2324.0000	45.4375	2505.4375
12	2362.7500	45.7349	2619.4009
13	2402.0000	46.0420	2734.1200
14	2441.7500	46.3589	2849.6191
15	2482.0000	46.6855	2965.9225
16	2522.7500	47.0219	3083.0547
17	2564.0000	47.3680	3201.0400
18	2605.7500	47.7239	3319.9028
19	2648.0000	48.0895	3439.6675
20	2690.7500	48.4649	3560.3584
21	2734.0000	48.8500	3682.0000

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FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 43.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.35038820E-04	.24267197E-02	.64951776E-01
2	.36929074E-04	.23367598E-02	.58996442E-01
3	.38720683E-04	.22421976E-02	.53271812E-01
4	.40421673E-04	.21432697E-02	.47789092E-01
5	.42039195E-04	.20401936E-02	.42558920E-01
6	.43579636E-04	.19331701E-02	.37591413E-01
7	.45048718E-04	.18223846E-02	.32896205E-01
8	.46451581E-04	.17080093E-02	.28482482E-01
9	.47792838E-04	.15902037E-02	.24359017E-01
10	.49076680E-04	.14691168E-02	.20534198E-01
11	.50306868E-04	.13448874E-02	.17016052E-01
12	.51486819E-04	.12176453E-02	.13812271E-01
13	.52619631E-04	.10875122E-02	.10930234E-01
14	.53708121E-04	.95460254E-03	.83770239E-02
15	.54754852E-04	.81902382E-03	.61594458E-02
16	.55762159E-04	.68087756E-03	.42840444E-02
17	.52832249E-04	.54513455E-03	.27530553E-02
18	.53699711E-04	.41196960E-03	.15562233E-02
19	.54536306E-04	.27667458E-03	.69498237E-03
20	.55342502E-04	.13932607E-03	.17456167E-03
21	.56118351E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.15238288E-03	-.24873963E-03	-.57778064E-04
2	-.15290496E-03	-.25445992E-03	-.53196463E-04
3	-.15345931E-03	-.25994119E-03	-.48913471E-04
4	-.15404407E-03	-.26520368E-03	-.44905556E-04
5	-.15465753E-03	-.27026532E-03	-.41151708E-04
6	-.15529813E-03	-.27514213E-03	-.37633115E-04
7	-.15596442E-03	-.27984839E-03	-.34332882E-04
8	-.15665507E-03	-.28439692E-03	-.31235797E-04
9	-.15736883E-03	-.28879914E-03	-.28328170E-04
10	-.15810457E-03	-.29306544E-03	-.25597537E-04
11	-.15886122E-03	-.29720511E-03	-.23032674E-04
12	-.15963777E-03	-.30122652E-03	-.20623357E-04
13	-.16043329E-03	-.30513728E-03	-.18360288E-04
14	-.16124691E-03	-.30894425E-03	-.16234987E-04
15	-.16207782E-03	-.31265366E-03	-.14239716E-04
16	-.16292522E-03	-.31627116E-03	-.12367394E-04
17	-.15310740E-03	-.29839608E-03	-.10460325E-04
18	-.15390446E-03	-.30157867E-03	-.89152403E-05
19	-.15471513E-03	-.30468997E-03	-.74671014E-05
20	-.15553869E-03	-.30773058E-03	-.61139384E-05
21	-.15637443E-03	-.31069990E-03	-.48548836E-05

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ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1964.0000	47.7678	1402.0001
2	1997.7500	47.8700	1521.5483
3	2032.0000	47.9677	1641.3465
4	2066.7500	48.0606	1761.3828
5	2102.0000	48.1487	1881.6454
6	2137.7500	48.2317	2002.1218
7	2174.0000	48.3094	2122.7993
8	2210.7500	48.3818	2243.6647
9	2248.0000	48.4486	2364.7035
10	2285.7500	48.5095	2485.9024
11	2324.0000	48.5643	2607.2461
12	2362.7500	48.6129	2728.7190
13	2402.0000	48.6549	2850.3051
14	2441.7500	48.6901	2971.9878
15	2482.0000	48.7182	3093.7497
16	2522.7500	48.7390	3215.5727
17	2564.0000	48.7652	3337.4522
18	2605.7500	48.7971	3459.4225
19	2648.0000	48.8221	3581.4383
20	2690.7500	48.8395	3703.4104
21	2734.0000	48.8492	3825.2242

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	-.14206100E-03	.39965420E+08
2	-.47002890E-02	.41146705E+08
3	-.98167913E-02	.42325793E+08
4	-.15345894E-01	.43500820E+08
5	-.21148440E-01	.44675882E+08
6	-.27090859E-01	.45848749E+08
7	-.33080324E-01	.47021590E+08
8	-.39077141E-01	.48188119E+08
9	-.44337206E-01	.49353825E+08
10	-.49679454E-01	.50517272E+08
11	-.54493346E-01	.51678452E+08
12	-.58720133E-01	.52837358E+08
13	-.62257291E-01	.53993985E+08
14	-.64999100E-01	.55148330E+08
15	-.66840323E-01	.56300390E+08
16	-.67676796E-01	.57450161E+08
17	-.70818277E-01	.62988481E+08
18	-.87488809E-01	.64227120E+08
19	-.79185445E-01	.64310566E+08
20	.25698856E-01	.66700332E+08
21	.32375288E+00	.67932246E+08

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ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-3 DE 50.0 M V FRANCOLÍ (SER) XH52

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	50.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	4.0000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	3.2000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	38.000	10.0500	10.0500
2	12.000	24.5400	24.5400

1

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	84.0000 T
REACCION VERTICAL TABLERO	=	2375.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

FASE ELASTICA

REACCION DEL TABLERO = 84.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.49337472E-02	.14059702E+00
2	.27964210E-04	.48987919E-02	.12829178E+00
3	.49734400E-04	.48016687E-02	.11615487E+00
4	.66727636E-04	.46560911E-02	.10432382E+00
5	.79999957E-04	.44726816E-02	.92905940E-01
6	.90348484E-04	.42597461E-02	.81985016E-01
7	.98381872E-04	.40238331E-02	.71626358E-01
8	.10456974E-03	.37701436E-02	.61880664E-01
9	.10927785E-03	.35028341E-02	.52786990E-01
10	.11279354E-03	.32252449E-02	.44375060E-01
11	.11534430E-03	.29400726E-02	.36667084E-01
12	.11711151E-03	.26495028E-02	.29679195E-01
13	.11824072E-03	.23553126E-02	.23422587E-01
14	.11884942E-03	.20589499E-02	.17904442E-01
15	.11903297E-03	.17615969E-02	.13128663E-01
16	.11886912E-03	.14642193E-02	.90964784E-02
17	.11842156E-03	.11676059E-02	.58069301E-02
18	.11774265E-03	.87240064E-03	.32572755E-02
19	.11687561E-03	.57912781E-03	.14433166E-02
20	.11585622E-03	.28821301E-03	.35967146E-03
21	.11471419E-03	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2375.0000	84.0000	.0000

2	2408.7500	84.0000	210.0000
3	2443.0000	84.0000	420.0000
4	2477.7500	84.0000	630.0000
5	2513.0000	84.0000	840.0000
6	2548.7500	84.0000	1050.0000
7	2585.0000	84.0000	1260.0000
8	2621.7500	84.0000	1470.0000
9	2659.0000	84.0000	1680.0000
10	2696.7500	84.0000	1890.0000
11	2735.0000	84.0000	2100.0000
12	2773.7500	84.0000	2310.0000
13	2813.0000	84.0000	2520.0000
14	2852.7500	84.0000	2730.0000
15	2893.0000	84.0000	2940.0000
16	2933.7500	84.0000	3150.0000
17	2975.0000	84.0000	3360.0000
18	3016.7500	84.0000	3570.0000
19	3059.0000	84.0000	3780.0000
20	3101.7500	84.0000	3990.0000
21	3145.0000	84.0000	4200.0000

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FASE FINAL EN ITERACION NUMERO 5

REACCION DEL TABLERO = 84.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.56533737E-02	.16167373E+00
2	.31889798E-04	.56135114E-02	.14757352E+00
3	.56734388E-04	.55027312E-02	.13366528E+00
4	.76111737E-04	.53366736E-02	.12010593E+00
5	.91205795E-04	.51275266E-02	.10701782E+00
6	.10291613E-03	.48848742E-02	.94496215E-01
7	.11193420E-03	.46163113E-02	.82615036E-01
8	.11879701E-03	.43278973E-02	.71431201E-01
9	.12392545E-03	.40244942E-02	.60988040E-01
10	.12765220E-03	.37100222E-02	.51317954E-01
11	.13027368E-03	.33876148E-02	.42444542E-01
12	.13243865E-03	.30592244E-02	.34384866E-01
13	.13443055E-03	.27256379E-02	.27152750E-01
14	.13643563E-03	.23870552E-02	.20760840E-01
15	.13883384E-03	.20429683E-02	.15222061E-01
16	.14266749E-03	.16910917E-02	.10552490E-01
17	.13246432E-03	.13471769E-02	.67599681E-02
18	.13417021E-03	.10138838E-02	.38077537E-02
19	.13519188E-03	.67718114E-03	.16933905E-02
20	.13557555E-03	.33872186E-03	.42331190E-03
21	.13540194E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.19967769E-03	-.19967769E-03	-.19967769E-03
2	-.18474296E-03	-.21822725E-03	-.15285316E-03
3	-.18518153E-03	-.24758936E-03	-.12561043E-03
4	-.18586241E-03	-.27339090E-03	-.10213950E-03
5	-.18670003E-03	-.29614698E-03	-.81813363E-04
6	-.18763429E-03	-.31627946E-03	-.64134936E-04
7	-.18862301E-03	-.33413747E-03	-.48705256E-04
8	-.18963669E-03	-.35001265E-03	-.35200586E-04
9	-.19065496E-03	-.36415059E-03	-.23355602E-04
10	-.19166396E-03	-.37675966E-03	-.12950878E-04
11	-.19262948E-03	-.38804000E-03	-.37326466E-05
12	-.19315622E-03	-.39843612E-03	.55017570E-05
13	-.19306900E-03	-.40815788E-03	.15298357E-04
14	-.19223589E-03	-.41735468E-03	.26061109E-04
15	-.19027692E-03	-.42629445E-03	.38798919E-04
16	-.18598377E-03	-.43565187E-03	.56550955E-04
17	-.17214184E-03	-.41057761E-03	.59670709E-04
18	-.16912893E-03	-.41734383E-03	.72377450E-04
19	-.16651964E-03	-.42338421E-03	.83585338E-04
20	-.16434606E-03	-.42871838E-03	.93247476E-04
21	-.16260272E-03	-.43340660E-03	.10143107E-03

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ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2375.0000	97.4242	.0000
2	2408.7500	97.5182	243.7125
3	2443.0000	97.4392	487.4361
4	2477.7500	97.2184	730.7787
5	2513.0000	96.8803	973.4176
6	2548.7500	96.4446	1215.0849
7	2585.0000	95.9270	1455.5566
8	2621.7500	95.3399	1694.6440
9	2659.0000	94.6939	1932.1870
10	2696.7500	93.9972	2168.0488
11	2735.0000	93.2568	2402.1399
12	2773.7500	92.4769	2634.3847
13	2813.0000	91.6586	2864.5968
14	2852.7500	90.8012	3092.6674
15	2893.0000	89.9019	3318.5107
16	2933.7500	88.9534	3542.1963
17	2975.0000	88.0006	3763.2334
18	3016.7500	87.0515	3982.1912
19	3059.0000	86.0653	4198.6871

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0390 T/M2
REACCION HORIZONTAL TABLERO	=	46.0000 T
REACCION VERTICAL TABLERO	=	2375.0000 T
MOMENTO EXTERIOR EN CABEZA	=	295.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

1

FASE ELASTICA

REACCION DEL TABLERO = 46.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.76635802E-05	.14145226E-02	.42828741E-01
2	.10346604E-04	.13920099E-02	.39319178E-01
3	.12890065E-04	.13629640E-02	.35874135E-01
4	.15306086E-04	.13277188E-02	.32509524E-01
5	.17605487E-04	.12865794E-02	.29240453E-01
6	.19797959E-04	.12398251E-02	.26081306E-01
7	.21892205E-04	.11877124E-02	.23045793E-01
8	.23896065E-04	.11304770E-02	.20147013E-01
9	.25816619E-04	.10683362E-02	.17397496E-01
10	.27660275E-04	.10014901E-02	.14809253E-01
11	.29432851E-04	.93012365E-03	.12393813E-01
12	.31139640E-04	.85440803E-03	.10162259E-01
13	.32785465E-04	.77450165E-03	.81252648E-02
14	.34374733E-04	.69055140E-03	.62931207E-02
15	.35911480E-04	.60269364E-03	.46757640E-02
16	.37399405E-04	.51105503E-03	.32828032E-02
17	.38841908E-04	.41575339E-03	.21235414E-02
18	.40242118E-04	.31689836E-03	.12069974E-02
19	.41602921E-04	.21459206E-03	.54192566E-03
20	.42926982E-04	.10892968E-03	.13683386E-03
21	.44216764E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2375.0000	46.0000	295.0000
2	2408.7500	46.1999	410.2478
3	2443.0000	46.4095	526.0075
4	2477.7500	46.6289	642.3034
5	2513.0000	46.8580	759.1600
6	2548.7500	47.0969	876.6016
7	2585.0000	47.3455	994.6525
8	2621.7500	47.6039	1113.3372
9	2659.0000	47.8720	1232.6800
10	2696.7500	48.1499	1352.7053
11	2735.0000	48.4375	1473.4375
12	2773.7500	48.7349	1594.9009
13	2813.0000	49.0420	1717.1200
14	2852.7500	49.3589	1840.1191
15	2893.0000	49.6855	1963.9225
16	2933.7500	50.0219	2088.5547
17	2975.0000	50.3680	2214.0400
18	3016.7500	50.7239	2340.4028
19	3059.0000	51.0895	2467.6675
20	3101.7500	51.4649	2595.8584
21	3145.0000	51.8500	2725.0000

1

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 46.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.75356960E-05	.14251801E-02	.42719338E-01
2	.10383236E-04	.14027815E-02	.39182903E-01
3	.13080885E-04	.13734513E-02	.35711207E-01
4	.15640872E-04	.13375491E-02	.32321123E-01
5	.18074094E-04	.12954054E-02	.29028662E-01
6	.20390296E-04	.12473249E-02	.25849043E-01
7	.22598216E-04	.11935893E-02	.22796750E-01
8	.24705712E-04	.11344594E-02	.19885592E-01
9	.26719867E-04	.10701774E-02	.17128747E-01
10	.28647083E-04	.10009687E-02	.14538810E-01
11	.30493155E-04	.92704342E-03	.12127834E-01
12	.32263343E-04	.84859780E-03	.99073602E-02
13	.33962427E-04	.76581559E-03	.78884586E-02
14	.35594764E-04	.67886910E-03	.60817525E-02
15	.37164325E-04	.58792024E-03	.44974484E-02
16	.38674742E-04	.49312140E-03	.31453597E-02
17	.37291685E-04	.39816337E-03	.20319740E-02
18	.38593220E-04	.30330724E-03	.11544579E-02
19	.39848933E-04	.20525455E-03	.51810165E-03
20	.41061216E-04	.10411686E-03	.13075600E-03
21	.42232272E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.18473057E-03	-.20545373E-03	-.16438419E-03
2	-.18464943E-03	-.21320333E-03	-.15661470E-03
3	-.18462777E-03	-.22060020E-03	-.14930938E-03
4	-.18466186E-03	-.22767426E-03	-.14243151E-03
5	-.18474831E-03	-.23445207E-03	-.13594826E-03
6	-.18488403E-03	-.24095734E-03	-.12983023E-03
7	-.18506618E-03	-.24721127E-03	-.12405100E-03
8	-.18529216E-03	-.25323287E-03	-.11858674E-03
9	-.18555957E-03	-.25903921E-03	-.11341593E-03
10	-.18586621E-03	-.26464569E-03	-.10851909E-03
11	-.18621002E-03	-.27006619E-03	-.10387850E-03
12	-.18658910E-03	-.27531329E-03	-.99478076E-04
13	-.18700170E-03	-.28039837E-03	-.95303142E-04
14	-.18744616E-03	-.28533176E-03	-.91340297E-04
15	-.18792096E-03	-.29012285E-03	-.87577279E-04
16	-.18842466E-03	-.29478020E-03	-.84002853E-04
17	-.17677277E-03	-.27932490E-03	-.76085220E-04
18	-.17727045E-03	-.28340180E-03	-.73068751E-04
19	-.17779132E-03	-.28737588E-03	-.70199200E-04
20	-.17833439E-03	-.29125274E-03	-.67469111E-04
21	-.17889874E-03	-.29503748E-03	-.64871604E-04

1

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2375.0000	49.3846	295.0003
2	2408.7500	49.5785	418.7063
3	2443.0000	49.7645	542.8872
4	2477.7500	49.9426	667.5232
5	2513.0000	50.1129	792.5946
6	2548.7500	50.2755	918.0821
7	2585.0000	50.4304	1043.9664
8	2621.7500	50.5776	1170.2282
9	2659.0000	50.7170	1296.8481
10	2696.7500	50.8486	1423.8067
11	2735.0000	50.9723	1551.0842
12	2773.7500	51.0880	1678.6608
13	2813.0000	51.1955	1806.5162
14	2852.7500	51.2948	1934.6298
15	2893.0000	51.3856	2062.9807
16	2933.7500	51.4677	2191.5474
17	2975.0000	51.5517	2320.3251
18	3016.7500	51.6380	2449.3125
19	3059.0000	51.7165	2578.5062
20	3101.7500	51.7869	2707.8866
21	3145.0000	51.8490	2837.4331

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	-.34162773E-03	.39142551E+08
2	-.19984370E-03	.40319699E+08
3	-.87346609E-04	.41494454E+08
4	.93756656E-05	.42667065E+08
5	.10503155E-03	.43837539E+08
6	.21564210E-03	.45005871E+08
7	.35831453E-03	.46172045E+08
8	.55258036E-03	.47336043E+08
9	.81968802E-03	.48497844E+08
10	.11839959E-02	.49657430E+08
11	.16731633E-02	.50814780E+08
12	.23183937E-02	.51969877E+08
13	.31552430E-02	.53122702E+08
14	.42235498E-02	.54273238E+08
15	.55682919E-02	.55421469E+08
16	.72397511E-02	.56567378E+08
17	.12769035E-02	.62124608E+08
18	.27496856E-02	.63358259E+08
19	.37714397E-02	.64589765E+08
20	.43159087E-02	.65819457E+08
21	.43699785E-02	.67046601E+08

1

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-3 DE 50.0 M V FRANCOLÍ (SER) XH10

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	50.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	4.0000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	3.2000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	38.000	10.0500	10.0500
2	12.000	24.5400	24.5400

1

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	49.0000 T
REACCION VERTICAL TABLERO	=	1925.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

FASE ELASTICA

REACCION DEL TABLERO = 49.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.28780192E-02	.82014930E-01
2	.16312456E-04	.28576286E-02	.74836874E-01
3	.29011733E-04	.28009734E-02	.67757007E-01
4	.38924454E-04	.27160531E-02	.60855561E-01
5	.46666642E-04	.26090643E-02	.54195132E-01
6	.52703282E-04	.24848519E-02	.47824593E-01
7	.57389425E-04	.23472360E-02	.41782042E-01
8	.60999013E-04	.21992504E-02	.36097054E-01
9	.63745411E-04	.20433199E-02	.30792411E-01
10	.65796232E-04	.18813929E-02	.25885452E-01
11	.67284175E-04	.17150423E-02	.21389133E-01
12	.68315046E-04	.15455433E-02	.17312864E-01
13	.68973752E-04	.13739323E-02	.13663176E-01
14	.69328831E-04	.12010541E-02	.10444258E-01
15	.69435902E-04	.10275982E-02	.76583869E-02
16	.69340323E-04	.85412790E-03	.53062791E-02
17	.69079243E-04	.68110344E-03	.33873759E-02
18	.68683212E-04	.50890037E-03	.19000774E-02
19	.68177440E-04	.33782456E-03	.84193466E-03
20	.67582797E-04	.16812426E-03	.20980835E-03
21	.66916609E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1925.0000	49.0000	.0000

2	1958.7500	49.0000	122.5000
3	1993.0000	49.0000	245.0000
4	2027.7500	49.0000	367.5000
5	2063.0000	49.0000	490.0000
6	2098.7500	49.0000	612.5000
7	2135.0000	49.0000	735.0000
8	2171.7500	49.0000	857.5000
9	2209.0000	49.0000	980.0000
10	2246.7500	49.0000	1102.5000
11	2285.0000	49.0000	1225.0000
12	2323.7500	49.0000	1347.5000
13	2363.0000	49.0000	1470.0000
14	2402.7500	49.0000	1592.5000
15	2443.0000	49.0000	1715.0000
16	2483.7500	49.0000	1837.5000
17	2525.0000	49.0000	1960.0000
18	2566.7500	49.0000	2082.5000
19	2609.0000	49.0000	2205.0000
20	2651.7500	49.0000	2327.5000
21	2695.0000	49.0000	2450.0000

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 49.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.29999717E-02	.84261323E-01
2	.17499621E-04	.29780972E-02	.76779622E-01
3	.31142528E-04	.29172945E-02	.69403277E-01
4	.41792513E-04	.28261257E-02	.62218455E-01
5	.50098544E-04	.27112619E-02	.55292394E-01
6	.56553813E-04	.25779464E-02	.48677522E-01
7	.61537316E-04	.24303325E-02	.42414577E-01
8	.65343214E-04	.22717319E-02	.36535015E-01
9	.68201885E-04	.21048005E-02	.31062860E-01
10	.70295230E-04	.19316791E-02	.26016171E-01
11	.71767935E-04	.17541001E-02	.21408179E-01
12	.72735862E-04	.15734704E-02	.17248212E-01
13	.73292351E-04	.13909351E-02	.13542415E-01
14	.73513022E-04	.12074284E-02	.10294346E-01
15	.73459438E-04	.10237128E-02	.75054475E-02
16	.73181951E-04	.84041110E-03	.51754371E-02
17	.67738816E-04	.66426014E-03	.32974330E-02
18	.67170738E-04	.49562320E-03	.18478747E-02
19	.66492793E-04	.32854378E-03	.81801907E-03
20	.65726413E-04	.16326977E-03	.20365128E-03
21	.64889407E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.16184403E-03	-.16184403E-03	-.16184403E-03
2	-.14837253E-03	-.16674713E-03	-.13087290E-03
3	-.14895837E-03	-.18321515E-03	-.11625872E-03
4	-.14963078E-03	-.19769217E-03	-.10365902E-03
5	-.15036382E-03	-.21048207E-03	-.92750491E-04
6	-.15113912E-03	-.22183139E-03	-.83274546E-04
7	-.15194369E-03	-.23194220E-03	-.75022045E-04
8	-.15276831E-03	-.24098165E-03	-.67822134E-04
9	-.15360649E-03	-.24908913E-03	-.61533946E-04
10	-.15445368E-03	-.25638177E-03	-.56040361E-04
11	-.15530675E-03	-.26295865E-03	-.51243245E-04
12	-.15616358E-03	-.26890416E-03	-.47059784E-04
13	-.15702278E-03	-.27429054E-03	-.43419635E-04
14	-.15788351E-03	-.27918000E-03	-.40262674E-04
15	-.15874530E-03	-.28362634E-03	-.37537224E-04
16	-.15960795E-03	-.28767636E-03	-.35198630E-04
17	-.15010891E-03	-.27203878E-03	-.31565985E-04
18	-.15089883E-03	-.27516470E-03	-.29991504E-04
19	-.15169167E-03	-.27802798E-03	-.28680004E-04
20	-.15248758E-03	-.28065409E-03	-.27607396E-04
21	-.15328674E-03	-.28306555E-03	-.26752399E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1925.0000	54.7621	.0000
2	1958.7500	54.8200	137.0235
3	1993.0000	54.8006	274.0916
4	2027.7500	54.7172	411.0278
5	2063.0000	54.5801	547.6849
6	2098.7500	54.3975	683.9390
7	2135.0000	54.1763	819.6849
8	2171.7500	53.9217	954.8323
9	2209.0000	53.6382	1089.3034
10	2246.7500	53.3293	1223.0300
11	2285.0000	52.9981	1355.9527
12	2323.7500	52.6469	1488.0185
13	2363.0000	52.2780	1619.1803
14	2402.7500	51.8930	1749.3957
15	2443.0000	51.4933	1878.6264
16	2483.7500	51.0803	2006.8375
17	2525.0000	50.6711	2134.2700
18	2566.7500	50.2671	2260.4510
19	2609.0000	49.8532	2385.6132

20	2651.7500	49.4301	2509.7330
21	2695.0000	48.9982	2632.7882

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	.40952770E-02	.78293542E+07
3	.86574348E-02	.87991696E+07
4	.13689876E-01	.98305977E+07
5	.19317518E-01	.10924553E+08
6	.25692286E-01	.12081926E+08
7	.32981850E-01	.13303598E+08
8	.41358776E-01	.14590441E+08
9	.50993196E-01	.15943325E+08
10	.62047636E-01	.17363111E+08
11	.74673592E-01	.18850652E+08
12	.88976532E-01	.20406799E+08
13	.10514679E+00	.22032393E+08
14	.12325743E+00	.23728270E+08
15	.14339995E+00	.25495258E+08
16	.16564912E+00	.27334179E+08
17	-.69671955E-01	.31429080E+08
18	-.66291555E-01	.33565588E+08
19	-.69264245E-01	.35782324E+08
20	-.78900387E-01	.38080155E+08
21	-.95551629E-01	.40459940E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-3 DE 50.0 M V FRANCOLÍ (SER) ZH10

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	50.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	4.0000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	3.2000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	38.000	10.0500	10.0500
2	12.000	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0390 T/M2
REACCION HORIZONTAL TABLERO	=	99.0000 T
REACCION VERTICAL TABLERO	=	1925.0000 T
MOMENTO EXTERIOR EN CABEZA	=	543.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

1

FASE ELASTICA

REACCION DEL TABLERO = 99.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.14106183E-04	.29087616E-02	.88456723E-01
2	.19942957E-04	.28662001E-02	.81234981E-01
3	.25461375E-04	.28094447E-02	.74137551E-01
4	.30688345E-04	.27392576E-02	.67198951E-01
5	.35647887E-04	.26563373E-02	.60451874E-01
6	.40361510E-04	.25613255E-02	.53927340E-01
7	.44848534E-04	.24548130E-02	.47654830E-01
8	.49126359E-04	.23373444E-02	.41662406E-01
9	.53210701E-04	.22094230E-02	.35976819E-01
10	.57115786E-04	.20715149E-02	.30623613E-01
11	.60854527E-04	.19240520E-02	.25627207E-01
12	.64438671E-04	.17674355E-02	.21010980E-01
13	.67878926E-04	.16020386E-02	.16797346E-01
14	.71185075E-04	.14282086E-02	.13007815E-01
15	.74366074E-04	.12462696E-02	.96630607E-02
16	.77430135E-04	.10565244E-02	.67829724E-02
17	.80384805E-04	.85925568E-03	.43867085E-02
18	.83237032E-04	.65472838E-03	.24927429E-02
19	.85993218E-04	.44319057E-03	.11189086E-02
20	.88659278E-04	.22487495E-03	.28243817E-03
21	.91240683E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1925.0000	99.0000	543.0000
2	1958.7500	99.1999	790.7478
3	1993.0000	99.4095	1039.0075
4	2027.7500	99.6289	1287.8034
5	2063.0000	99.8580	1537.1600
6	2098.7500	100.0969	1787.1016
7	2135.0000	100.3455	2037.6525
8	2171.7500	100.6039	2288.8372
9	2209.0000	100.8720	2540.6800
10	2246.7500	101.1499	2793.2053
11	2285.0000	101.4375	3046.4375
12	2323.7500	101.7349	3300.4009
13	2363.0000	102.0420	3555.1200
14	2402.7500	102.3589	3810.6191
15	2443.0000	102.6855	4066.9225
16	2483.7500	103.0219	4324.0547
17	2525.0000	103.3680	4582.0400
18	2566.7500	103.7239	4840.9028
19	2609.0000	104.0895	5100.6675
20	2651.7500	104.4649	5361.3584
21	2695.0000	104.8500	5623.0000

1

FASE FINAL EN ITERACION NUMERO 4

REACCION DEL TABLERO = 99.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.13531668E-04	.32807987E-02	.10372636E+00
2	.19523168E-04	.32394802E-02	.95572888E-01
3	.25193737E-04	.31835840E-02	.87541105E-01
4	.30569532E-04	.31138800E-02	.79666475E-01
5	.35673816E-04	.30310758E-02	.71982622E-01
6	.40527347E-04	.29358243E-02	.64521469E-01
7	.45148699E-04	.28287293E-02	.57313370E-01
8	.49554539E-04	.27103502E-02	.50387226E-01
9	.53759860E-04	.25812072E-02	.43770589E-01
10	.57798207E-04	.24417596E-02	.37489777E-01
11	.62198210E-04	.22917641E-02	.31570580E-01
12	.67684718E-04	.21294104E-02	.26041255E-01
13	.74153563E-04	.19521126E-02	.20935982E-01
14	.81220670E-04	.17578948E-02	.16294792E-01
15	.88914962E-04	.15452253E-02	.12161884E-01
16	.97250602E-04	.13125183E-02	.85853633E-02
17	.93498354E-04	.10740821E-02	.56040670E-02
18	.10036473E-03	.83175325E-03	.32181966E-02
19	.10735429E-03	.57210448E-03	.14597340E-02
20	.11441403E-03	.29489409E-03	.37230887E-03
21	.12150125E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.14810717E-03	-.18531926E-03	-.11157167E-03
2	-.14872555E-03	-.20241426E-03	-.96012994E-04
3	-.14943932E-03	-.21872210E-03	-.81416229E-04
4	-.15023914E-03	-.23430536E-03	-.67701408E-04
5	-.15111675E-03	-.24921974E-03	-.54797443E-04
6	-.15206477E-03	-.26351497E-03	-.42640928E-04
7	-.15307663E-03	-.27723556E-03	-.31175147E-04
8	-.15414647E-03	-.29042145E-03	-.20349212E-04
9	-.15526898E-03	-.30310860E-03	-.10117362E-04
10	-.15641418E-03	-.31535925E-03	-.35901941E-06
11	-.15690826E-03	-.32795334E-03	.11026909E-04
12	-.15570324E-03	-.34183622E-03	.27045496E-04
13	-.15285433E-03	-.35677663E-03	.47360290E-04
14	-.14883056E-03	-.37218740E-03	.70465254E-04
15	-.14351800E-03	-.38803415E-03	.96552398E-04
16	-.13682047E-03	-.40425963E-03	.12575615E-03
17	-.12803601E-03	-.38515648E-03	.12440955E-03
18	-.12242359E-03	-.39842660E-03	.14856118E-03
19	-.11627443E-03	-.41149872E-03	.17358215E-03
20	-.10967335E-03	-.42431192E-03	.19924452E-03
21	-.10270018E-03	-.43682860E-03	.22535318E-03

1

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1925.0000	105.3128	542.8509
2	1958.7500	105.5420	806.4455
3	1993.0000	105.7507	1070.5882
4	2027.7500	105.9389	1335.2278
5	2063.0000	106.1066	1600.3127
6	2098.7500	106.2536	1865.7912
7	2135.0000	106.3798	2131.6111
8	2171.7500	106.4848	2397.7197
9	2209.0000	106.5685	2664.0634
10	2246.7500	106.6304	2930.5815
11	2285.0000	106.6687	3197.2495
12	2323.7500	106.6777	3463.9134
13	2363.0000	106.6495	3730.6010
14	2402.7500	106.5775	3997.1260
15	2443.0000	106.4554	4263.4257
16	2483.7500	106.2772	4529.3372
17	2525.0000	106.0761	4794.7900
18	2566.7500	105.8549	5059.7027
19	2609.0000	105.5784	5323.9826
20	2651.7500	105.2434	5587.4774
21	2695.0000	104.8470	5850.2098

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.14912422E+00	.40109489E+08
2	.13458503E+00	.41291374E+08
3	.12011443E+00	.42467098E+08
4	.10580108E+00	.43636788E+08
5	.91749257E-01	.44800540E+08
6	.78077959E-01	.45959178E+08
7	.64949724E-01	.47111131E+08
8	.52438715E-01	.48257330E+08
9	.40810149E-01	.49399784E+08
10	.36986037E-01	.48433185E+08
11	.90600588E-02	.40013348E+08
12	.45380786E-01	.29963247E+08
13	.35160300E-01	.26784158E+08
14	.62642571E-01	.24046963E+08
15	.73312961E-01	.21640316E+08
16	.96960106E-01	.19279986E+08
17	.88147288E-01	.24370201E+08
18	.10462374E+00	.23129959E+08
19	.13154322E+00	.21888145E+08
20	.17881554E+00	.20638541E+08
21	.73392142E-01	.21121723E+08

1

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-3 DE 50.0 M V FRANCOLÍ (ROT) XH2

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	50.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	4.0000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	3.2000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	38.000	10.0500	10.0500
2	12.000	24.5400	24.5400

1

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	36.0000 T
REACCION VERTICAL TABLERO	=	1299.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

FASE ELASTICA

REACCION DEL TABLERO = 51.8400 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.30448268E-02	.86768448E-01
2	.17257913E-04	.30232544E-02	.79174358E-01
3	.30693230E-04	.29633155E-02	.71684148E-01
4	.41180484E-04	.28734734E-02	.64382700E-01
5	.49371402E-04	.27602835E-02	.57336237E-01
6	.55757921E-04	.26288719E-02	.50596467E-01
7	.60715670E-04	.24832799E-02	.44203695E-01
8	.64534466E-04	.23267172E-02	.38189210E-01
9	.67440043E-04	.21617491E-02	.32577114E-01
10	.69609728E-04	.19904369E-02	.27385751E-01
11	.71183911E-04	.18144448E-02	.22628829E-01
12	.72274531E-04	.16351218E-02	.18316303E-01
13	.72971415E-04	.14535643E-02	.14455082E-01
14	.73347073E-04	.12706662E-02	.11049599E-01
15	.73460350E-04	.10871569E-02	.81022608E-02
16	.73359231E-04	.90363245E-03	.56138267E-02
17	.73083020E-04	.72057964E-03	.35837054E-02
18	.72664035E-04	.53839582E-03	.20102043E-02
19	.72128949E-04	.35740459E-03	.89073250E-03
20	.71499841E-04	.17786860E-03	.22196867E-03
21	.70795041E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1870.5600	51.8400	.0000

2	1919.1600	51.8400	129.6000
3	1968.4800	51.8400	259.2000
4	2018.5200	51.8400	388.8000
5	2069.2800	51.8400	518.4000
6	2120.7600	51.8400	648.0000
7	2172.9600	51.8400	777.6000
8	2225.8800	51.8400	907.2000
9	2279.5200	51.8400	1036.8000
10	2333.8800	51.8400	1166.4000
11	2388.9600	51.8400	1296.0000
12	2444.7600	51.8400	1425.6000
13	2501.2800	51.8400	1555.2000
14	2558.5200	51.8400	1684.8000
15	2616.4800	51.8400	1814.4000
16	2675.1600	51.8400	1944.0000
17	2734.5600	51.8400	2073.6000
18	2794.6800	51.8400	2203.2000
19	2855.5200	51.8400	2332.8000
20	2917.0800	51.8400	2462.4000
21	2979.3600	51.8400	2592.0000

FASE FINAL EN ITERACION NUMERO 4

REACCION DEL TABLERO = 51.8400 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.31960829E-02	.89951582E-01
2	.18441771E-04	.31730307E-02	.81980585E-01
3	.32860356E-04	.31089030E-02	.74120658E-01
4	.44152898E-04	.30126365E-02	.66462852E-01
5	.52993421E-04	.28912036E-02	.59078448E-01
6	.59894331E-04	.27500939E-02	.52023232E-01
7	.65249612E-04	.25936639E-02	.45340745E-01
8	.69365283E-04	.24253953E-02	.39064778E-01
9	.72481240E-04	.22480872E-02	.33221302E-01
10	.74787107E-04	.20640017E-02	.27829990E-01
11	.76433914E-04	.18749755E-02	.22905410E-01
12	.77542779E-04	.16825046E-02	.18457983E-01
13	.78211440E-04	.14878118E-02	.14494739E-01
14	.78519219E-04	.12918985E-02	.11019941E-01
15	.78530825E-04	.10955859E-02	.80355794E-02
16	.78299295E-04	.89954828E-03	.55417822E-02
17	.72431879E-04	.71113432E-03	.35314849E-02
18	.71870745E-04	.53075604E-03	.19794142E-02
19	.71187995E-04	.35193261E-03	.87640898E-03
20	.70406461E-04	.17493954E-03	.21822584E-03
21	.69545173E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.15726699E-03	-.15726699E-03	-.15726699E-03
2	-.14523429E-03	-.16459815E-03	-.12679252E-03
3	-.14706240E-03	-.18320879E-03	-.11255903E-03
4	-.14896865E-03	-.19974449E-03	-.10040047E-03
5	-.15092547E-03	-.21451757E-03	-.89983032E-04
6	-.15291339E-03	-.22778130E-03	-.81040192E-04
7	-.15491872E-03	-.23974321E-03	-.73356703E-04
8	-.15693182E-03	-.25057495E-03	-.66756950E-04
9	-.15894598E-03	-.26041972E-03	-.61096311E-04
10	-.16095661E-03	-.26939792E-03	-.56254665E-04
11	-.16296063E-03	-.27761150E-03	-.52131455E-04
12	-.16495606E-03	-.28514737E-03	-.48641889E-04
13	-.16694172E-03	-.29208002E-03	-.45713988E-04
14	-.16891702E-03	-.29847373E-03	-.43286273E-04
15	-.17088178E-03	-.30438419E-03	-.41305923E-04
16	-.17283612E-03	-.30985988E-03	-.39727316E-04
17	-.16336749E-03	-.29374487E-03	-.36611703E-04
18	-.16514836E-03	-.29810924E-03	-.35781018E-04
19	-.16692261E-03	-.30217980E-03	-.35224823E-04
20	-.16869074E-03	-.30598333E-03	-.34918460E-04
21	-.17045324E-03	-.30954358E-03	-.34840150E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1870.5600	57.8180	.0000
2	1919.1600	57.9285	144.7018
3	1968.4800	57.9583	289.5762
4	2018.5200	57.9192	434.4369
5	2069.2800	57.8206	579.1237
6	2120.7600	57.6699	723.4974
7	2172.9600	57.4734	867.4361
8	2225.8800	57.2360	1010.8314
9	2279.5200	56.9618	1153.5864
10	2333.8800	56.6543	1295.6137
11	2388.9600	56.3163	1436.8338
12	2444.7600	55.9504	1577.1735
13	2501.2800	55.5585	1716.5657
14	2558.5200	55.1424	1854.9476
15	2616.4800	54.7037	1992.2608
16	2675.1600	54.2436	2128.4502
17	2734.5600	53.7820	2263.4663
18	2794.6800	53.3206	2397.3483
19	2855.5200	52.8423	2530.0553

20	2917.0800	52.3476	2661.5456
21	2979.3600	51.8373	2791.7793

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	.75120615E-03	.78456710E+07
3	.14716626E-02	.88100859E+07
4	.21549417E-02	.98345109E+07
5	.27887202E-02	.10919719E+08
6	.33588497E-02	.12066473E+08
7	.38498740E-02	.13275529E+08
8	.42450660E-02	.14547633E+08
9	.45268667E-02	.15883531E+08
10	.46769161E-02	.17283957E+08
11	.46762380E-02	.18749642E+08
12	.45063618E-02	.20281309E+08
13	.41447893E-02	.21879674E+08
14	.35717927E-02	.23545443E+08
15	.27658699E-02	.25279315E+08
16	.17047620E-02	.27081972E+08
17	.13738092E-01	.31160277E+08
18	.13467828E-01	.33257290E+08
19	.13478172E-01	.35431298E+08
20	.13781734E-01	.37683046E+08
21	.14396820E-01	.40013274E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-3 DE 50.0 M V FRANCOLÍ (ROT) ZH2

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	50.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	4.0000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	3.2000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	38.000	10.0500	10.0500
2	12.000	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0650 T/M2
REACCION HORIZONTAL TABLERO	=	28.0000 T
REACCION VERTICAL TABLERO	=	1299.0000 T
MOMENTO EXTERIOR EN CABEZA	=	41.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

1

FASE ELASTICA

REACCION DEL TABLERO = 40.3200 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.15337552E-05	.10924998E-02	.34930500E-01
2	.40462246E-05	.10855249E-02	.32206660E-01
3	.64463619E-05	.10724091E-02	.29507993E-01
4	.87448503E-05	.10534201E-02	.26849509E-01
5	.10951227E-04	.10288000E-02	.24245585E-01
6	.13074032E-04	.99876844E-03	.21710019E-01
7	.15120936E-04	.96352473E-03	.19256086E-01
8	.17098847E-04	.92325000E-03	.16896588E-01
9	.19014006E-04	.87810894E-03	.14643891E-01
10	.20872061E-04	.82825135E-03	.12509973E-01
11	.22678140E-04	.77381360E-03	.10506451E-01
12	.24436905E-04	.71491979E-03	.86446187E-02
13	.26152610E-04	.65168290E-03	.69354717E-02
14	.27829137E-04	.58420572E-03	.53897377E-02
15	.29470043E-04	.51258174E-03	.40178988E-02
16	.31078588E-04	.43689595E-03	.28302139E-02
17	.32657770E-04	.35722550E-03	.18367396E-02
18	.34210346E-04	.27364036E-03	.10473486E-02
19	.35738859E-04	.18620385E-03	.47174724E-03
20	.37245656E-04	.94973210E-04	.11949112E-03
21	.38732911E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1870.5600	40.3200	59.0400
2	1919.1600	40.7997	160.4348
3	1968.4800	41.3028	263.0580
4	2018.5200	41.8293	366.9683
5	2069.2800	42.3792	472.2240
6	2120.7600	42.9525	578.8838
7	2172.9600	43.5492	687.0060
8	2225.8800	44.1693	796.6492
9	2279.5200	44.8128	907.8720
10	2333.8800	45.4797	1020.7328
11	2388.9600	46.1700	1135.2900
12	2444.7600	46.8837	1251.6023
13	2501.2800	47.6208	1369.7280
14	2558.5200	48.3813	1489.7258
15	2616.4800	49.1652	1611.6540
16	2675.1600	49.9725	1735.5713
17	2734.5600	50.8032	1861.5360
18	2794.6800	51.6573	1989.6068
19	2855.5200	52.5348	2119.8420
20	2917.0800	53.4357	2252.3003
21	2979.3600	54.3600	2387.0400

1

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 40.3200 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.14666554E-05	.10757479E-02	.34085474E-01
2	.39977044E-05	.10689175E-02	.31403324E-01
3	.64213729E-05	.10558936E-02	.28746048E-01
4	.87476235E-05	.10369324E-02	.26128804E-01
5	.10985112E-04	.10122665E-02	.23566140E-01
6	.13141549E-04	.98210815E-03	.21072049E-01
7	.15223828E-04	.94665143E-03	.18660015E-01
8	.17238132E-04	.90607398E-03	.16343059E-01
9	.19190022E-04	.86053879E-03	.14133776E-01
10	.21084504E-04	.81019563E-03	.12044371E-01
11	.22926099E-04	.75518238E-03	.10086690E-01
12	.24718894E-04	.69562614E-03	.82722454E-02
13	.26466589E-04	.63164428E-03	.66122471E-02
14	.28172539E-04	.56334537E-03	.51176215E-02
15	.29839789E-04	.49082996E-03	.37990340E-02
16	.31471107E-04	.41419134E-03	.26669077E-02
17	.30777115E-04	.33638106E-03	.17290537E-02
18	.32230490E-04	.25762156E-03	.98579343E-03
19	.33656958E-04	.17526225E-03	.44394572E-03
20	.35058316E-04	.89368154E-04	.11242784E-03
21	.36436207E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.14352592E-03	-.14755922E-03	-.13956595E-03
2	-.14518143E-03	-.15617512E-03	-.13438763E-03
3	-.14686058E-03	-.16451935E-03	-.12952287E-03
4	-.14856197E-03	-.17261793E-03	-.12494339E-03
5	-.15028438E-03	-.18049344E-03	-.12062458E-03
6	-.15202673E-03	-.18816599E-03	-.11654455E-03
7	-.15378804E-03	-.19565356E-03	-.11268370E-03
8	-.15556743E-03	-.20297229E-03	-.10902447E-03
9	-.15736413E-03	-.21013669E-03	-.10555107E-03
10	-.15917744E-03	-.21715982E-03	-.10224928E-03
11	-.16100671E-03	-.22405349E-03	-.99106247E-04
12	-.16285139E-03	-.23082835E-03	-.96110380E-04
13	-.16471096E-03	-.23749407E-03	-.93251165E-04
14	-.16658493E-03	-.24405941E-03	-.90519075E-04
15	-.16847289E-03	-.25053231E-03	-.87905459E-04
16	-.17037444E-03	-.25691999E-03	-.85402452E-04
17	-.16135331E-03	-.24599037E-03	-.78255097E-04
18	-.16312932E-03	-.25176317E-03	-.76107000E-04
19	-.16491606E-03	-.25747270E-03	-.74042276E-04
20	-.16671328E-03	-.26312365E-03	-.72055822E-04
21	-.16852074E-03	-.26872031E-03	-.70142982E-04

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ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1870.5600	42.3335	59.0410
2	1919.1600	42.8523	165.5184
3	1968.4800	43.3825	273.3069
4	2018.5200	43.9235	382.4343
5	2069.2800	44.4749	492.9271
6	2120.7600	45.0362	604.8109
7	2172.9600	45.6071	718.1098
8	2225.8800	46.1868	832.8470
9	2279.5200	46.7750	949.0440
10	2333.8800	47.3710	1066.7212
11	2388.9600	47.9744	1185.8976
12	2444.7600	48.5844	1306.5907
13	2501.2800	49.2006	1428.8165
14	2558.5200	49.8223	1552.5895
15	2616.4800	50.4489	1677.9229
16	2675.1600	51.0797	1804.8278
17	2734.5600	51.7221	1933.3703
18	2794.6800	52.3762	2063.4911
19	2855.5200	53.0341	2195.2530
20	2917.0800	53.6951	2328.6649
21	2979.3600	54.3586	2463.7338

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	-.96458528E-03	.40219978E+08
2	-.16632074E-02	.41397663E+08
3	-.22412492E-02	.42558248E+08
4	-.27414728E-02	.43718650E+08
5	-.30612311E-02	.44865979E+08
6	-.32442290E-02	.46013974E+08
7	-.32309324E-02	.47158149E+08
8	-.29811751E-02	.48298500E+08
9	-.24521161E-02	.49435009E+08
10	-.15968887E-02	.50567659E+08
11	-.36501663E-03	.51695908E+08
12	.12976720E-02	.52820634E+08
13	.34489264E-02	.53941415E+08
14	.61501584E-02	.55058227E+08
15	.94661856E-02	.56171042E+08
16	.13465615E-01	.57279842E+08
17	-.31356462E-01	.62750830E+08
18	-.30408614E-01	.63946498E+08
19	-.30408445E-01	.65138427E+08
20	-.31460902E-01	.66326590E+08
21	-.33687808E-01	.67510958E+08

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ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-3 DE 50.0 M V FRANCOLÍ (ROT) XH3

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	50.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	4.0000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	3.2000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

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DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	38.000	10.0500	10.0500
2	12.000	24.5400	24.5400

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DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	50.0000 T
REACCION VERTICAL TABLERO	=	2581.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

FASE ELASTICA

REACCION DEL TABLERO = 72.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.42289262E-02	.12051173E+00
2	.23969323E-04	.41989645E-02	.10996439E+00
3	.42629486E-04	.41157160E-02	.99561317E-01
4	.57195116E-04	.39909352E-02	.89420416E-01
5	.68571392E-04	.38337271E-02	.79633663E-01
6	.77441558E-04	.36512109E-02	.70272871E-01
7	.84327319E-04	.34489998E-02	.61394021E-01
8	.89631203E-04	.32315517E-02	.53040569E-01
9	.93666726E-04	.30024293E-02	.45245991E-01
10	.96680177E-04	.27644956E-02	.38035766E-01
11	.98866543E-04	.25200622E-02	.31428930E-01
12	.10038129E-03	.22710024E-02	.25439310E-01
13	.10134919E-03	.20188393E-02	.20076503E-01
14	.10187094E-03	.17648142E-02	.15346665E-01
15	.10202826E-03	.15099402E-02	.11253140E-01
16	.10188782E-03	.12550451E-02	.77969815E-02
17	.10150419E-03	.10008051E-02	.49773687E-02
18	.10092227E-03	.74777197E-03	.27919505E-02
19	.10017910E-03	.49639526E-03	.12371285E-02
20	.99305335E-04	.24703973E-03	.30828982E-03
21	.98326446E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3716.6400	72.0000	.0000

2	3765.2400	72.0000	180.0000
3	3814.5600	72.0000	360.0000
4	3864.6000	72.0000	540.0000
5	3915.3600	72.0000	720.0000
6	3966.8400	72.0000	900.0000
7	4019.0400	72.0000	1080.0000
8	4071.9600	72.0000	1260.0000
9	4125.6000	72.0000	1440.0000
10	4179.9600	72.0000	1620.0000
11	4235.0400	72.0000	1800.0000
12	4290.8400	72.0000	1980.0000
13	4347.3600	72.0000	2160.0000
14	4404.6000	72.0000	2340.0000
15	4462.5600	72.0000	2520.0000
16	4521.2400	72.0000	2700.0000
17	4580.6400	72.0000	2880.0000
18	4640.7600	72.0000	3060.0000
19	4701.6000	72.0000	3240.0000
20	4763.1600	72.0000	3420.0000
21	4825.4400	72.0000	3600.0000

FASE FINAL EN ITERACION NUMERO 4

REACCION DEL TABLERO = 72.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.54529818E-02	.15177920E+00
2	.32670747E-04	.54121433E-02	.13818078E+00
3	.58097685E-04	.52986828E-02	.12477900E+00
4	.77879243E-04	.51287116E-02	.11173446E+00
5	.93223233E-04	.49148335E-02	.99172035E-01
6	.10505254E-03	.46669888E-02	.87188596E-01
7	.11408012E-03	.43930730E-02	.75858817E-01
8	.12086215E-03	.40993952E-02	.65239700E-01
9	.12583627E-03	.37910221E-02	.55374087E-01
10	.12934955E-03	.34720399E-02	.46293430E-01
11	.13167912E-03	.31457540E-02	.38019974E-01
12	.13304775E-03	.28148454E-02	.30568512E-01
13	.13363538E-03	.24814915E-02	.23947785E-01
14	.13358820E-03	.21474621E-02	.18161618E-01
15	.13302545E-03	.18141950E-02	.13209839E-01
16	.13204479E-03	.14828572E-02	.90890349E-02
17	.11999834E-03	.11678033E-02	.57819835E-02
18	.11854117E-03	.86962891E-03	.32359521E-02
19	.11689377E-03	.57533523E-03	.14306050E-02
20	.11509626E-03	.28534769E-03	.35568755E-03
21	.11318189E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.31247583E-03	-.31247583E-03	-.31247583E-03
2	-.29964724E-03	-.33395153E-03	-.26697650E-03
3	-.29969874E-03	-.36360619E-03	-.23869617E-03
4	-.30004127E-03	-.38960240E-03	-.21437410E-03
5	-.30057873E-03	-.41244661E-03	-.19337201E-03
6	-.30124300E-03	-.43255867E-03	-.17517995E-03
7	-.30198593E-03	-.45029008E-03	-.15938578E-03
8	-.30277367E-03	-.46593758E-03	-.14565288E-03
9	-.30358275E-03	-.47975353E-03	-.13370378E-03
10	-.30439715E-03	-.49195399E-03	-.12330779E-03
11	-.30520631E-03	-.50272499E-03	-.11427158E-03
12	-.30600359E-03	-.51222759E-03	-.10643197E-03
13	-.30678519E-03	-.52060180E-03	-.99650355E-04
14	-.30754937E-03	-.52796989E-03	-.93808250E-04
15	-.30829579E-03	-.53443904E-03	-.88803802E-04
16	-.30902514E-03	-.54010351E-03	-.84548998E-04
17	-.28710795E-03	-.50310496E-03	-.77110845E-04
18	-.28770344E-03	-.50700461E-03	-.74329333E-04
19	-.28829699E-03	-.51039516E-03	-.72043520E-04
20	-.28889004E-03	-.51332774E-03	-.70207143E-04
21	-.28948404E-03	-.51584783E-03	-.68779340E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3716.6400	92.2680	.0000
2	3765.2400	92.3783	230.8694
3	3814.5600	92.2115	461.6562
4	3864.6000	91.8191	691.7348
5	3915.3600	91.2413	920.5934
6	3966.8400	90.5106	1147.8107
7	4019.0400	89.6529	1373.0380
8	4071.9600	88.6891	1595.9849
9	4125.6000	87.6364	1816.4085
10	4179.9600	86.5088	2034.1047
11	4235.0400	85.3180	2248.9012
12	4290.8400	84.0734	2460.6527
13	4347.3600	82.7831	2669.2352
14	4404.6000	81.4538	2874.5431
15	4462.5600	80.0911	3076.4860
16	4521.2400	78.6995	3274.9866
17	4580.6400	77.3448	3470.0013
18	4640.7600	76.0312	3661.7305
19	4701.6000	74.7005	3850.1522

20	4763.1600	73.3547	4035.2261
21	4825.4400	71.9956	4216.9169

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	-.98691034E-03	.70644367E+07
3	-.19193002E-02	.79392548E+07
4	-.27797614E-02	.88671325E+07
5	-.35770369E-02	.98492807E+07
6	-.43363702E-02	.10886794E+08
7	-.51008962E-02	.11980689E+08
8	-.59342102E-02	.13131925E+08
9	-.69234567E-02	.14341445E+08
10	-.81819781E-02	.15610194E+08
11	-.96118548E-02	.16932900E+08
12	-.11818053E-01	.18322199E+08
13	-.14801279E-01	.19773743E+08
14	-.18786682E-01	.21288480E+08
15	-.24025973E-01	.22867341E+08
16	-.30796482E-01	.24511234E+08
17	-.11135451E-01	.28673434E+08
18	-.16440121E-01	.30621821E+08
19	-.20012697E-01	.32644258E+08
20	-.21958893E-01	.34741624E+08
21	-.22339991E-01	.36914782E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-3 DE 50.0 M V FRANCOLÍ (ROT) ZH3

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	50.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	4.0000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	3.2000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	38.000	10.0500	10.0500
2	12.000	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0390 T/M2
REACCION HORIZONTAL TABLERO	=	50.0000 T
REACCION VERTICAL TABLERO	=	2581.0000 T
MOMENTO EXTERIOR EN CABEZA	=	310.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

FASE ELASTICA

REACCION DEL TABLERO = 72.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.11596685E-04	.21938605E-02	.66506721E-01
2	.15807043E-04	.21596059E-02	.61062696E-01
3	.19796770E-04	.21151011E-02	.55717234E-01
4	.23584947E-04	.20608740E-02	.50495292E-01
5	.27188608E-04	.19974070E-02	.45420564E-01
6	.30623007E-04	.19251425E-02	.40515588E-01
7	.33901845E-04	.18444864E-02	.35801844E-01
8	.37037461E-04	.17558123E-02	.31299838E-01
9	.40041000E-04	.16594642E-02	.27029178E-01
10	.42922551E-04	.15557598E-02	.23008647E-01
11	.45691271E-04	.14449925E-02	.19256265E-01
12	.48355491E-04	.13274341E-02	.15789344E-01
13	.50922804E-04	.12033362E-02	.12624544E-01
14	.53400148E-04	.10729325E-02	.97779179E-02
15	.55793874E-04	.93643996E-03	.72649556E-02
16	.58109807E-04	.79406036E-03	.51006239E-02
17	.60353297E-04	.64598148E-03	.32994031E-02
18	.62529272E-04	.49237827E-03	.18753201E-02
19	.64642272E-04	.33341384E-03	.84197947E-03
20	.66696493E-04	.16924038E-03	.21259179E-03
21	.68695813E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3716.6400	72.0000	446.4000
2	3765.2400	72.2878	626.7569
3	3814.5600	72.5897	807.8508
4	3864.6000	72.9056	989.7170
5	3915.3600	73.2355	1172.3904
6	3966.8400	73.5795	1355.9063
7	4019.0400	73.9375	1540.2996
8	4071.9600	74.3096	1725.6056
9	4125.6000	74.6957	1911.8592
10	4179.9600	75.0958	2099.0957
11	4235.0400	75.5100	2287.3500
12	4290.8400	75.9382	2476.6574
13	4347.3600	76.3805	2667.0528
14	4404.6000	76.8368	2858.5715
15	4462.5600	77.3071	3051.2484
16	4521.2400	77.7915	3245.1188
17	4580.6400	78.2899	3440.2176
18	4640.7600	78.8024	3636.5801
19	4701.6000	79.3289	3834.2412
20	4763.1600	79.8694	4033.2362
21	4825.4400	80.4240	4233.6000

FASE FINAL EN ITERACION NUMERO 4

REACCION DEL TABLERO = 72.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.12337727E-04	.24603385E-02	.73741287E-01
2	.17424627E-04	.24231355E-02	.67634295E-01
3	.22237668E-04	.23735577E-02	.61635921E-01
4	.26798411E-04	.23122626E-02	.55776271E-01
5	.31126039E-04	.22398570E-02	.50083867E-01
6	.35237675E-04	.21569024E-02	.44585777E-01
7	.39148650E-04	.20639195E-02	.39307712E-01
8	.42872728E-04	.19613927E-02	.34274132E-01
9	.46422293E-04	.18497740E-02	.29508325E-01
10	.49808516E-04	.17294855E-02	.25032487E-01
11	.53041494E-04	.16009229E-02	.20867793E-01
12	.56130369E-04	.14644581E-02	.17034458E-01
13	.59083439E-04	.13204409E-02	.13551796E-01
14	.61908242E-04	.11692013E-02	.10438272E-01
15	.64611642E-04	.10110514E-02	.77115484E-02
16	.67199897E-04	.84628698E-03	.53885274E-02
17	.64024304E-04	.68225673E-03	.34795017E-02
18	.66201729E-04	.51947419E-03	.19762040E-02
19	.68289735E-04	.35135986E-03	.88657392E-03
20	.70292380E-04	.17813221E-03	.22366579E-03
21	.72213388E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.30019354E-03	-.33412229E-03	-.26688167E-03
2	-.29976288E-03	-.34768060E-03	-.25271639E-03
3	-.29946297E-03	-.36061656E-03	-.23942127E-03
4	-.29928405E-03	-.37297968E-03	-.22692834E-03
5	-.29921728E-03	-.38481388E-03	-.21517697E-03
6	-.29925467E-03	-.39615827E-03	-.20411295E-03
7	-.29938895E-03	-.40704774E-03	-.19368759E-03
8	-.29961349E-03	-.41751349E-03	-.18385713E-03
9	-.29992223E-03	-.42758354E-03	-.17458204E-03
10	-.30030961E-03	-.43728303E-03	-.16582662E-03
11	-.30077050E-03	-.44663461E-03	-.15755847E-03
12	-.30130018E-03	-.45565870E-03	-.14974819E-03
13	-.30189430E-03	-.46437375E-03	-.14236901E-03
14	-.30254879E-03	-.47279645E-03	-.13539653E-03
15	-.30325989E-03	-.48094191E-03	-.12880846E-03
16	-.30402411E-03	-.48882382E-03	-.12258439E-03
17	-.28328994E-03	-.45935678E-03	-.11042432E-03
18	-.28401115E-03	-.46606591E-03	-.10526649E-03
19	-.28477280E-03	-.47256957E-03	-.10039051E-03
20	-.28557261E-03	-.47887665E-03	-.95783180E-04
21	-.28640845E-03	-.48499526E-03	-.91432297E-04

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ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3716.6400	81.1437	446.4021
2	3765.2400	81.4109	649.6030
3	3814.5600	81.6430	853.4279
4	3864.6000	81.8406	1057.7900
5	3915.3600	82.0043	1262.6038
6	3966.8400	82.1344	1467.7847
7	4019.0400	82.2312	1673.2494
8	4071.9600	82.2948	1878.9147
9	4125.6000	82.3255	2084.6980
10	4179.9600	82.3233	2290.5171
11	4235.0400	82.2882	2496.2897
12	4290.8400	82.2201	2701.9335
13	4347.3600	82.1189	2907.3659
14	4404.6000	81.9846	3112.5043
15	4462.5600	81.8168	3317.2653
16	4521.2400	81.6155	3521.5655
17	4580.6400	81.4130	3725.3286
18	4640.7600	81.2109	3928.6164
19	4701.6000	80.9785	4131.3608
20	4763.1600	80.7155	4333.4854
21	4825.4400	80.4215	4534.9133

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	-.20731813E-02	.36173637E+08
2	-.12000281E-02	.37267068E+08
3	-.41648835E-03	.38355540E+08
4	.26445162E-03	.39439304E+08
5	.82898256E-03	.40518458E+08
6	.12622448E-02	.41593082E+08
7	.15478484E-02	.42663243E+08
8	.16674174E-02	.43729005E+08
9	.16000661E-02	.44790402E+08
10	.13219114E-02	.45847441E+08
11	.80557030E-03	.46900099E+08
12	.19290104E-04	.47948341E+08
13	-.10732255E-02	.48992136E+08
14	-.25136683E-02	.50031471E+08
15	-.43495489E-02	.51066358E+08
16	-.66350280E-02	.52096828E+08
17	.96724821E-02	.57920523E+08
18	.82006520E-02	.59050275E+08
19	.71968138E-02	.60176509E+08
20	.66642012E-02	.61299263E+08
21	.66117357E-02	.62418580E+08

1

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-3 DE 50.0 M V FRANCOLÍ (ROT) XH4

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	50.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	4.0000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	3.2000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	38.000	10.0500	10.0500
2	12.000	24.5400	24.5400

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DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	59.0000 T
REACCION VERTICAL TABLERO	=	2067.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

FASE ELASTICA

REACCION DEL TABLERO = 84.9600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.49901329E-02	.14220385E+00
2	.28283801E-04	.49547781E-02	.12975798E+00
3	.50302793E-04	.48565449E-02	.11748235E+00
4	.67490237E-04	.47093036E-02	.10551609E+00
5	.80914242E-04	.45237980E-02	.93967723E-01
6	.91381038E-04	.43084289E-02	.82921988E-01
7	.99506236E-04	.40698198E-02	.72444945E-01
8	.10576482E-03	.38132310E-02	.62587872E-01
9	.11052674E-03	.35428665E-02	.53390270E-01
10	.11408261E-03	.32621048E-02	.44882203E-01
11	.11666252E-03	.29736734E-02	.37086137E-01
12	.11844993E-03	.26797829E-02	.30018386E-01
13	.11959204E-03	.23822304E-02	.23690274E-01
14	.12020770E-03	.20824807E-02	.18109064E-01
15	.12039335E-03	.17817294E-02	.13278705E-01
16	.12022763E-03	.14809532E-02	.92004382E-02
17	.11977495E-03	.11809500E-02	.58732950E-02
18	.11908828E-03	.88237093E-03	.32945015E-02
19	.11821133E-03	.58574641E-03	.14598116E-02
20	.11718030E-03	.29150688E-03	.36378199E-03
21	.11602521E-03	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2976.4800	84.9600	.0000

2	3025.0800	84.9600	212.4000
3	3074.4000	84.9600	424.8000
4	3124.4400	84.9600	637.2000
5	3175.2000	84.9600	849.6000
6	3226.6800	84.9600	1062.0000
7	3278.8800	84.9600	1274.4000
8	3331.8000	84.9600	1486.8000
9	3385.4400	84.9600	1699.2000
10	3439.8000	84.9600	1911.6000
11	3494.8800	84.9600	2124.0000
12	3550.6800	84.9600	2336.4000
13	3607.2000	84.9600	2548.8000
14	3664.4400	84.9600	2761.2000
15	3722.4000	84.9600	2973.6000
16	3781.0800	84.9600	3186.0000
17	3840.4800	84.9600	3398.4000
18	3900.6000	84.9600	3610.8000
19	3961.4400	84.9600	3823.2000
20	4023.0000	84.9600	4035.6000
21	4085.2800	84.9600	4248.0000

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FASE FINAL EN ITERACION NUMERO 4

REACCION DEL TABLERO = 84.9600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.59041668E-02	.16516847E+00
2	.34753095E-04	.58607255E-02	.15044425E+00
3	.61861633E-04	.57399571E-02	.13592928E+00
4	.83023207E-04	.55588510E-02	.12179475E+00
5	.99514652E-04	.53306787E-02	.10817425E+00
6	.11230835E-03	.50658999E-02	.95171860E-01
7	.12215346E-03	.47728227E-02	.82868330E-01
8	.12963313E-03	.44580894E-02	.71325794E-01
9	.13520552E-03	.41270411E-02	.60591478E-01
10	.13923351E-03	.37839923E-02	.50700588E-01
11	.14200673E-03	.34324420E-02	.41678601E-01
12	.14375783E-03	.30752363E-02	.33543091E-01
13	.14467485E-03	.27146955E-02	.26305199E-01
14	.14491060E-03	.23527137E-02	.19970814E-01
15	.14458984E-03	.19908381E-02	.14541542E-01
16	.14381488E-03	.16303322E-02	.10015482E-01
17	.13161678E-03	.12860427E-02	.63763670E-02
18	.13027397E-03	.95867922E-03	.35711641E-02
19	.12872353E-03	.63493234E-03	.15799571E-02
20	.12701910E-03	.31525406E-03	.39311187E-03
21	.12518415E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.25024702E-03	-.25024702E-03	-.25024702E-03
2	-.23587282E-03	-.27236357E-03	-.20111973E-03
3	-.23691743E-03	-.30496523E-03	-.17196272E-03
4	-.23825230E-03	-.33372899E-03	-.14692678E-03
5	-.23977430E-03	-.35919188E-03	-.12533245E-03
6	-.24141054E-03	-.38179597E-03	-.10664052E-03
7	-.24310956E-03	-.40190906E-03	-.90417742E-04
8	-.24483524E-03	-.41983997E-03	-.76312167E-04
9	-.24656247E-03	-.43585019E-03	-.64035020E-04
10	-.24827414E-03	-.45016273E-03	-.53347219E-04
11	-.24995892E-03	-.46296902E-03	-.44049166E-04
12	-.25160973E-03	-.47443436E-03	-.35972980E-04
13	-.25322248E-03	-.48470225E-03	-.28976461E-04
14	-.25479535E-03	-.49389784E-03	-.22938388E-04
15	-.25632804E-03	-.50213076E-03	-.17754811E-04
16	-.25782139E-03	-.50949744E-03	-.13336094E-04
17	-.24042366E-03	-.47733385E-03	-.10094295E-04
18	-.24167232E-03	-.48267917E-03	-.71791802E-05
19	-.24289159E-03	-.48746630E-03	-.47530517E-05
20	-.24407027E-03	-.49175751E-03	-.27339808E-05
21	-.24522219E-03	-.49559049E-03	-.11131080E-05

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ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2976.4800	102.5323	.0000
2	3025.0800	102.6868	256.5783
3	3074.4000	102.6037	513.2362
4	3124.4400	102.3243	769.4335
5	3175.2000	101.8814	1024.7222
6	3226.6800	101.3010	1278.7272
7	3278.8800	100.6041	1531.1319
8	3331.8000	99.8078	1781.6673
9	3385.4400	98.9260	2030.1027
10	3439.8000	97.9702	2276.2394
11	3494.8800	96.9499	2519.9048
12	3550.6800	95.8731	2760.9480
13	3607.2000	94.7464	2999.2362
14	3664.4400	93.5754	3234.6520
15	3722.4000	92.3649	3467.0910
16	3781.0800	91.1189	3696.4593
17	3840.4800	89.8939	3922.6532
18	3900.6000	88.6942	4145.8963
19	3961.4400	87.4700	4366.1313

20	4023.0000	86.2231	4583.2764
21	4085.2800	84.9551	4797.2695

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	.31689955E-02	.73807193E+07
3	.63287464E-02	.82887251E+07
4	.94309729E-02	.92506425E+07
5	.12405277E-01	.10267598E+08
6	.15171188E-01	.11340664E+08
7	.17639917E-01	.12470870E+08
8	.19714903E-01	.13659198E+08
9	.21291434E-01	.14906597E+08
10	.22284510E-01	.16208959E+08
11	.22517442E-01	.17576157E+08
12	.21881335E-01	.19005277E+08
13	.20232493E-01	.20497280E+08
14	.17418386E-01	.22053114E+08
15	.13270642E-01	.23673707E+08
16	.76158651E-02	.25359973E+08
17	.64373980E-01	.29510701E+08
18	.62331758E-01	.31501030E+08
19	.38315424E-01	.33005229E+08
20	.14845547E-01	.34501185E+08
21	-.87144145E-03	.36057320E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-3 DE 50.0 M V FRANCOLÍ (ROT) ZH4

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	50.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	4.0000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	3.2000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	38.000	10.0500	10.0500
2	12.000	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0390 T/M2
REACCION HORIZONTAL TABLERO	=	50.0000 T
REACCION VERTICAL TABLERO	=	2067.0000 T
MOMENTO EXTERIOR EN CABEZA	=	1694.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

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FASE ELASTICA

REACCION DEL TABLERO = 72.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.63370274E-04	.42211951E-02	.11322847E+00
2	.66070242E-04	.40593945E-02	.10287632E+00
3	.68635206E-04	.38910127E-02	.92936979E-01
4	.71077167E-04	.37163722E-02	.83426476E-01
5	.73406837E-04	.35357672E-02	.74360088E-01
6	.75633810E-04	.33494664E-02	.65752386E-01
7	.77766702E-04	.31577158E-02	.57617298E-01
8	.79813273E-04	.29607408E-02	.49968161E-01
9	.81780533E-04	.27587485E-02	.42817775E-01
10	.83674828E-04	.25519293E-02	.36178441E-01
11	.85501915E-04	.23404584E-02	.30062005E-01
12	.87267034E-04	.21244972E-02	.24479891E-01
13	.88974961E-04	.19041947E-02	.19443136E-01
14	.90630059E-04	.16796884E-02	.14962420E-01
15	.92236322E-04	.14511055E-02	.11048091E-01
16	.93797413E-04	.12185633E-02	.77101924E-02
17	.95316698E-04	.98217066E-03	.49584837E-02
18	.96797275E-04	.74202819E-03	.28024640E-02
19	.98242001E-04	.49822910E-03	.12513899E-02
20	.99653513E-04	.25085970E-03	.31429376E-03
21	.10103425E-03	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2976.4800	72.0000	2439.3600
2	3025.0800	72.2878	2619.7169
3	3074.4000	72.5897	2800.8108
4	3124.4400	72.9056	2982.6770
5	3175.2000	73.2355	3165.3504
6	3226.6800	73.5795	3348.8663
7	3278.8800	73.9375	3533.2596
8	3331.8000	74.3096	3718.5656
9	3385.4400	74.6957	3904.8192
10	3439.8000	75.0958	4092.0557
11	3494.8800	75.5100	4280.3100
12	3550.6800	75.9382	4469.6174
13	3607.2000	76.3805	4660.0128
14	3664.4400	76.8368	4851.5314
15	3722.4000	77.3071	5044.2084
16	3781.0800	77.7915	5238.0788
17	3840.4800	78.2899	5433.1776
18	3900.6000	78.8024	5629.5401
19	3961.4400	79.3289	5827.2012
20	4023.0000	79.8694	6026.1962
21	4085.2800	80.4240	6226.5600

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FASE FINAL EN ITERACION NUMERO 5

REACCION DEL TABLERO = 72.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.64619362E-04	.45539253E-02	.12256683E+00
2	.68272172E-04	.43878109E-02	.11138776E+00
3	.71726219E-04	.42128129E-02	.10063518E+00
4	.74996775E-04	.40294091E-02	.90330701E-01
5	.78097418E-04	.38380414E-02	.80494773E-01
6	.81040254E-04	.36391193E-02	.71146789E-01
7	.83836108E-04	.34330238E-02	.62305154E-01
8	.86494676E-04	.32201104E-02	.53987352E-01
9	.89024666E-04	.30007112E-02	.46210007E-01
10	.91436244E-04	.27751350E-02	.38988943E-01
11	.93809859E-04	.25435774E-02	.32339317E-01
12	.96186763E-04	.23060816E-02	.26276005E-01
13	.98574576E-04	.20626300E-02	.20813872E-01
14	.10098327E-03	.18131827E-02	.15967851E-01
15	.10342802E-03	.15576686E-02	.11753014E-01
16	.10593085E-03	.12959700E-02	.81846622E-02
17	.99486367E-04	.10391984E-02	.52690582E-02
18	.10172658E-03	.78768226E-03	.29842905E-02
19	.10396315E-03	.53057009E-03	.13353102E-02
20	.10613248E-03	.26795054E-03	.33602957E-03
21	.10822795E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.23986773E-03	-.41757098E-03	-.65395456E-04
2	-.24083205E-03	-.42858052E-03	-.56497189E-04
3	-.24185771E-03	-.43910481E-03	-.48196916E-04
4	-.24293987E-03	-.44918100E-03	-.40448576E-04
5	-.24407416E-03	-.45884206E-03	-.33211130E-04
6	-.24525659E-03	-.46811729E-03	-.26447907E-04
7	-.24648354E-03	-.47703284E-03	-.20126051E-04
8	-.24775167E-03	-.48561203E-03	-.14216049E-04
9	-.24905793E-03	-.49387576E-03	-.86913265E-05
10	-.25039674E-03	-.50184641E-03	-.35188852E-05
11	-.25167620E-03	-.50965331E-03	.16104188E-05
12	-.25284581E-03	-.51735941E-03	.68584483E-05
13	-.25389406E-03	-.52497414E-03	.12257297E-04
14	-.25480510E-03	-.53250910E-03	.17849728E-04
15	-.25555614E-03	-.53998319E-03	.23699500E-04
16	-.25611258E-03	-.54742242E-03	.29900718E-04
17	-.23845006E-03	-.51203757E-03	.30163130E-04
18	-.23873253E-03	-.51848064E-03	.35929248E-04
19	-.23891657E-03	-.52481524E-03	.41783940E-04
20	-.23909897E-03	-.53096330E-03	.47458732E-04
21	-.23929115E-03	-.53691801E-03	.52924319E-04

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ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2976.4800	85.5544	2439.3569
2	3025.0800	85.5609	2653.2563
3	3074.4000	85.5410	2867.1389
4	3124.4400	85.4945	3080.9386
5	3175.2000	85.4212	3294.5886
6	3226.6800	85.3207	3508.0215
7	3278.8800	85.1928	3721.1688
8	3331.8000	85.0370	3933.9615
9	3385.4400	84.8529	4146.3293
10	3439.8000	84.6401	4358.2027
11	3494.8800	84.3977	4569.5120
12	3550.6800	84.1245	4780.1760
13	3607.2000	83.8188	4990.1171
14	3664.4400	83.4790	5199.2385
15	3722.4000	83.1032	5407.4727
16	3781.0800	82.6893	5614.7208
17	3840.4800	82.2788	5820.9377
18	3900.6000	81.8726	6026.1384
19	3961.4400	81.4285	6230.2607
20	4023.0000	80.9451	6433.2402
21	4085.2800	80.4217	6634.9529

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.30749782E-02	.37587856E+08
2	.39576371E-02	.38673549E+08
3	.48696726E-02	.39754506E+08
4	.58344424E-02	.40830765E+08
5	.68750917E-02	.41902368E+08
6	.80148401E-02	.42969359E+08
7	.92772590E-02	.44031786E+08
8	.10686631E-01	.45089699E+08
9	.12267435E-01	.46143151E+08
10	.12343601E-01	.46716377E+08
11	.76791522E-02	.45128095E+08
12	.41866949E-02	.43406559E+08
13	.27868820E-03	.41522074E+08
14	.94899221E-02	.39438012E+08
15	.11726693E-01	.37105567E+08
16	.13323777E-01	.34442332E+08
17	-.20596482E-02	.37567262E+08
18	-.48274346E-02	.34584739E+08
19	.79071866E-02	.34591461E+08
20	.40742285E-02	.35057635E+08
21	.84314430E-02	.35431322E+08

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ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-3 DE 50.0 M V FRANCOLÍ (ROT) XH51

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	50.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	4.0000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	3.2000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

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DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	38.000	10.0500	10.0500
2	12.000	24.5400	24.5400

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DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	71.0000 T
REACCION VERTICAL TABLERO	=	1964.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

FASE ELASTICA

REACCION DEL TABLERO = 102.2400 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.60050751E-02	.17112666E+00
2	.34036439E-04	.59625296E-02	.15614943E+00
3	.60533869E-04	.58443167E-02	.14137707E+00
4	.81217065E-04	.56671280E-02	.12697699E+00
5	.97371376E-04	.54438925E-02	.11307980E+00
6	.10996701E-03	.51847195E-02	.99787476E-01
7	.11974479E-03	.48975797E-02	.87179510E-01
8	.12727631E-03	.45888034E-02	.75317608E-01
9	.13300675E-03	.42634495E-02	.64249308E-01
10	.13728585E-03	.39255838E-02	.54010787E-01
11	.14039049E-03	.35784884E-02	.44629080E-01
12	.14254144E-03	.32248235E-02	.36123820E-01
13	.14391585E-03	.28667519E-02	.28508635E-01
14	.14465673E-03	.25060361E-02	.21792264E-01
15	.14488013E-03	.21441151E-02	.15979459E-01
16	.14468071E-03	.17821640E-02	.11071714E-01
17	.14413596E-03	.14211432E-02	.70678635E-02
18	.14330963E-03	.10618362E-02	.39645696E-02
19	.14225432E-03	.70488128E-03	.17567224E-02
20	.14101358E-03	.35079641E-03	.43777154E-03
21	.13962355E-03	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2828.1600	102.2400	.0000

2	2876.7600	102.2400	255.6000
3	2926.0800	102.2400	511.2000
4	2976.1200	102.2400	766.8000
5	3026.8800	102.2400	1022.4000
6	3078.3600	102.2400	1278.0000
7	3130.5600	102.2400	1533.6000
8	3183.4800	102.2400	1789.2000
9	3237.1200	102.2400	2044.8000
10	3291.4800	102.2400	2300.4000
11	3346.5600	102.2400	2556.0000
12	3402.3600	102.2400	2811.6000
13	3458.8800	102.2400	3067.2000
14	3516.1200	102.2400	3322.8000
15	3574.0800	102.2400	3578.4000
16	3632.7600	102.2400	3834.0000
17	3692.1600	102.2400	4089.6000
18	3752.2800	102.2400	4345.2000
19	3813.1200	102.2400	4600.8000
20	3874.6800	102.2400	4856.4000
21	3936.9600	102.2400	5112.0000

FASE FINAL EN ITERACION NUMERO 6

REACCION DEL TABLERO = 102.2400 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.74512399E-02	.21368265E+00
2	.41450584E-04	.73994267E-02	.19509773E+00
3	.73812340E-04	.72553480E-02	.17676240E+00
4	.99109926E-04	.70391952E-02	.15888105E+00
5	.11886163E-03	.67667308E-02	.14161335E+00
6	.13422145E-03	.64503769E-02	.12508397E+00
7	.14607730E-03	.61000035E-02	.10938982E+00
8	.15511979E-03	.57235071E-02	.94605720E-01
9	.16189127E-03	.53272433E-02	.80788756E-01
10	.16682646E-03	.49163461E-02	.67981698E-01
11	.17081133E-03	.44942989E-02	.56216317E-01
12	.17443545E-03	.40627404E-02	.45518130E-01
13	.17794547E-03	.36222643E-02	.35910046E-01
14	.18182948E-03	.31725456E-02	.27414511E-01
15	.18749556E-03	.27108893E-02	.20057266E-01
16	.19322906E-03	.22349835E-02	.13871939E-01
17	.17602277E-03	.17734187E-02	.88703980E-02
18	.17749117E-03	.13315263E-02	.49884520E-02
19	.17799156E-03	.88717288E-03	.22148174E-02
20	.17762514E-03	.44265201E-03	.55272717E-03
21	.17649647E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.23777704E-03	-.23777704E-03	-.23777704E-03
2	-.22352329E-03	-.26704640E-03	-.18207270E-03
3	-.22501383E-03	-.30620740E-03	-.14751087E-03
4	-.22689308E-03	-.34086950E-03	-.11787216E-03
5	-.22901698E-03	-.37165094E-03	-.92326102E-04
6	-.23128378E-03	-.39906060E-03	-.70218034E-04
7	-.23362165E-03	-.42352214E-03	-.51025023E-04
8	-.23598011E-03	-.44539182E-03	-.34324389E-04
9	-.23832407E-03	-.46497185E-03	-.19770853E-04
10	-.24062539E-03	-.48252375E-03	-.70683436E-05
11	-.24240739E-03	-.49862438E-03	.52690278E-05
12	-.24331503E-03	-.51368997E-03	.18338144E-04
13	-.24319701E-03	-.52790977E-03	.32618471E-04
14	-.24160282E-03	-.54162146E-03	.49324357E-04
15	-.23695667E-03	-.55569912E-03	.72411006E-04
16	-.23114627E-03	-.56929713E-03	.97343136E-04
17	-.21579215E-03	-.53263313E-03	.92247689E-04
18	-.21322378E-03	-.54158244E-03	.10626032E-03
19	-.21128154E-03	-.54946549E-03	.11800284E-03
20	-.20996932E-03	-.55633835E-03	.12751844E-03
21	-.20927018E-03	-.56226313E-03	.13489793E-03

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2828.1600	123.3068	.0000
2	2876.7600	123.5185	308.6074
3	2926.0800	123.4609	617.3971
4	2976.1200	123.1799	925.7560
5	3026.8800	122.7119	1233.1730
6	3078.3600	122.0860	1539.2187
7	3130.5600	121.3257	1843.5288
8	3183.4800	120.4499	2145.7920
9	3237.1200	119.4742	2445.7399
10	3291.4800	118.4114	2743.1369
11	3346.5600	117.2700	3037.7025
12	3402.3600	116.0525	3329.3428
13	3458.8800	114.7586	3617.8615
14	3516.1200	113.3848	3903.0884
15	3574.0800	111.9188	4184.6896
16	3632.7600	110.3495	4462.7175
17	3692.1600	108.7798	4736.5928
18	3752.2800	107.2289	5006.5425
19	3813.1200	105.6159	5272.5482

20	3874.6800	103.9483	5534.4565
21	3936.9600	102.2331	5792.1417

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	.21712226E-02	.74423463E+07
3	.38190472E-02	.83536020E+07
4	.45478241E-02	.93167516E+07
5	.39292213E-02	.10332107E+08
6	.16024890E-02	.11401977E+08
7	-.28408243E-02	.12527022E+08
8	-.97867401E-02	.13708348E+08
9	-.19621678E-01	.14947113E+08
10	-.29950599E-01	.16073817E+08
11	.33936425E-01	.15782591E+08
12	.73533329E-01	.14838139E+08
13	.95119380E-01	.13598883E+08
14	.74528571E-01	.11428753E+08
15	.13271413E+00	.85564144E+07
16	-.30521480E-01	.85810421E+07
17	-.10985266E-01	.11726115E+08
18	.66342044E-01	.12129000E+08
19	.12976524E+00	.12755563E+08
20	.18756427E+00	.13412889E+08
21	.23812309E+00	.14130644E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-3 DE 50.0 M V FRANCOLÍ (ROT) ZH51

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	50.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	4.0000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	3.2000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	38.000	10.0500	10.0500
2	12.000	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0390 T/M2
REACCION HORIZONTAL TABLERO	=	43.0000 T
REACCION VERTICAL TABLERO	=	1964.0000 T
MOMENTO EXTERIOR EN CABEZA	=	1402.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

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FASE ELASTICA

REACCION DEL TABLERO = 61.9200 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.52446945E-04	.35572557E-02	.95798813E-01
2	.54830025E-04	.34231595E-02	.87072053E-01
3	.57096067E-04	.32832518E-02	.78687858E-01
4	.59255584E-04	.31378123E-02	.70660403E-01
5	.61317965E-04	.29870953E-02	.63003195E-01
6	.63291613E-04	.28313334E-02	.55729131E-01
7	.65184080E-04	.26707388E-02	.48850555E-01
8	.67002165E-04	.25055059E-02	.42379302E-01
9	.68752009E-04	.23358132E-02	.36326742E-01
10	.70439171E-04	.21618243E-02	.30703816E-01
11	.72068699E-04	.19836894E-02	.25521075E-01
12	.73645182E-04	.18015471E-02	.20788709E-01
13	.75172806E-04	.16155246E-02	.16516574E-01
14	.76655392E-04	.14257393E-02	.12714221E-01
15	.78096442E-04	.12322995E-02	.93909224E-02
16	.79499163E-04	.10353050E-02	.65556861E-02
17	.80866507E-04	.83484795E-03	.42172827E-02
18	.82201186E-04	.63101333E-03	.23842609E-02
19	.83505704E-04	.42387972E-03	.10649652E-02
20	.84782372E-04	.21351962E-03	.26755107E-03
21	.86033328E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2828.1600	61.9200	2018.8800
2	2876.7600	62.2078	2174.0369
3	2926.0800	62.5097	2329.9308
4	2976.1200	62.8256	2486.5970
5	3026.8800	63.1555	2644.0704
6	3078.3600	63.4995	2802.3863
7	3130.5600	63.8575	2961.5796
8	3183.4800	64.2296	3121.6856
9	3237.1200	64.6157	3282.7392
10	3291.4800	65.0158	3444.7757
11	3346.5600	65.4300	3607.8300
12	3402.3600	65.8582	3771.9374
13	3458.8800	66.3005	3937.1328
14	3516.1200	66.7568	4103.4515
15	3574.0800	67.2271	4270.9284
16	3632.7600	67.7115	4439.5988
17	3692.1600	68.2099	4609.4976
18	3752.2800	68.7224	4780.6601
19	3813.1200	69.2489	4953.1212
20	3874.6800	69.7894	5126.9162
21	3936.9600	70.3440	5302.0800

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FASE FINAL EN ITERACION NUMERO 4

REACCION DEL TABLERO = 61.9200 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.52985438E-04	.37432527E-02	.10039570E+00
2	.56092925E-04	.36069047E-02	.91206385E-01
3	.59035702E-04	.34629940E-02	.82367479E-01
4	.61826596E-04	.33119161E-02	.73897388E-01
5	.64477016E-04	.31540366E-02	.65813566E-01
6	.66997137E-04	.29896939E-02	.58132591E-01
7	.69396056E-04	.28192024E-02	.50870221E-01
8	.71681926E-04	.26428549E-02	.44041459E-01
9	.73862070E-04	.24609249E-02	.37660599E-01
10	.75943076E-04	.22736685E-02	.31741273E-01
11	.77930887E-04	.20813260E-02	.26296494E-01
12	.79830867E-04	.18841238E-02	.21338693E-01
13	.81647871E-04	.16822754E-02	.16879747E-01
14	.83386294E-04	.14759827E-02	.12931019E-01
15	.85050123E-04	.12654372E-02	.95033777E-02
16	.86642978E-04	.10508208E-02	.66072256E-02
17	.81476779E-04	.84067111E-03	.42455514E-02
18	.82815722E-04	.63530548E-03	.23998833E-02
19	.84099378E-04	.42666161E-03	.10717559E-02
20	.85340823E-04	.21486136E-03	.26920557E-03
21	.86548263E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.22570992E-03	-.37141988E-03	-.82649236E-04
2	-.22666845E-03	-.38092399E-03	-.75217551E-04
3	-.22768049E-03	-.39002867E-03	-.68284093E-04
4	-.22874230E-03	-.39876543E-03	-.61810487E-04
5	-.22985047E-03	-.40716227E-03	-.55762530E-04
6	-.23100192E-03	-.41524405E-03	-.50109649E-04
7	-.23219379E-03	-.42303294E-03	-.44824437E-04
8	-.23342347E-03	-.43054877E-03	-.39882272E-04
9	-.23468856E-03	-.43780925E-03	-.35260974E-04
10	-.23598683E-03	-.44483029E-03	-.30940524E-04
11	-.23731621E-03	-.45162615E-03	-.26902814E-04
12	-.23867477E-03	-.45820966E-03	-.23131432E-04
13	-.24006073E-03	-.46459238E-03	-.19611482E-04
14	-.24147241E-03	-.47078472E-03	-.16329414E-04
15	-.24290822E-03	-.47679606E-03	-.13272889E-04
16	-.24436669E-03	-.48263488E-03	-.10430652E-04
17	-.22845008E-03	-.45251122E-03	-.84627733E-05
18	-.22977910E-03	-.45752233E-03	-.61766485E-05
19	-.23112621E-03	-.46239950E-03	-.40578947E-05
20	-.23247604E-03	-.46716330E-03	-.20558155E-05
21	-.23381886E-03	-.47182658E-03	-.13854568E-06

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2828.1600	72.5062	2018.8809
2	2876.7600	72.5835	2200.2475
3	2926.0800	72.6421	2381.7841
4	2976.1200	72.6815	2563.4432
5	3026.8800	72.7016	2745.1767
6	3078.3600	72.7019	2926.9359
7	3130.5600	72.6822	3108.6709
8	3183.4800	72.6420	3290.3310
9	3237.1200	72.5808	3471.8646
10	3291.4800	72.4983	3653.2186
11	3346.5600	72.3939	3834.3393
12	3402.3600	72.2673	4015.1713
13	3458.8800	72.1178	4195.6584
14	3516.1200	71.9450	4375.7427
15	3574.0800	71.7483	4555.3654
16	3632.7600	71.5272	4734.4661
17	3692.1600	71.3124	4912.9952
18	3752.2800	71.1047	5091.0219
19	3813.1200	70.8742	5268.5006
20	3874.6800	70.6202	5445.3744
21	3936.9600	70.3422	5621.5820

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	-.94959640E-03	.37993737E+08
2	-.62195156E-03	.39097262E+08
3	-.27843798E-03	.40203670E+08
4	.53791338E-04	.41302134E+08
5	.36399684E-03	.42396800E+08
6	.63760419E-03	.43487658E+08
7	.86010825E-03	.44574698E+08
8	.10168956E-02	.45657910E+08
9	.10929280E-02	.46737289E+08
10	.10725333E-02	.47812826E+08
11	.93914299E-03	.48884517E+08
12	.67505222E-03	.49952355E+08
13	.26110779E-03	.51016337E+08
14	-.32287002E-03	.52076112E+08
15	-.11011542E-02	.53132399E+08
16	-.20980166E-02	.54184819E+08
17	.10626640E-01	.59869374E+08
18	.99309793E-02	.61016140E+08
19	.96889019E-02	.62147044E+08
20	.87859052E-02	.61912610E+08
21	.93437814E-02	.61597363E+08

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ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-3 DE 50.0 M V FRANCOLÍ (ROT) XH52

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	50.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	4.0000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	3.2000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

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DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	38.000	10.0500	10.0500
2	12.000	24.5400	24.5400

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DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	84.0000 T
REACCION VERTICAL TABLERO	=	2375.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

FASE ELASTICA

REACCION DEL TABLERO = 120.9600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.71045959E-02	.20245971E+00
2	.40268463E-04	.70542604E-02	.18474017E+00
3	.71617536E-04	.69144029E-02	.16726301E+00
4	.96087795E-04	.67047712E-02	.15022630E+00
5	.11519994E-03	.64406615E-02	.13378455E+00
6	.13010182E-03	.61340343E-02	.11805842E+00
7	.14166990E-03	.57943197E-02	.10314196E+00
8	.15058042E-03	.54290068E-02	.89108156E-01
9	.15736010E-03	.50440812E-02	.76013265E-01
10	.16242270E-03	.46443527E-02	.63900086E-01
11	.16609579E-03	.42337045E-02	.52800602E-01
12	.16864057E-03	.38152841E-02	.42738040E-01
13	.17026663E-03	.33916501E-02	.33728526E-01
14	.17114317E-03	.29648878E-02	.25782397E-01
15	.17140748E-03	.25366995E-02	.18905275E-01
16	.17117154E-03	.21084757E-02	.13098929E-01
17	.17052705E-03	.16813525E-02	.83619793E-02
18	.16954942E-03	.12562569E-02	.46904768E-02
19	.16830088E-03	.83394404E-03	.20783758E-02
20	.16683296E-03	.41502674E-03	.51792690E-03
21	.16518843E-03	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3420.0000	120.9600	.0000

2	3468.6000	120.9600	302.4000
3	3517.9200	120.9600	604.8000
4	3567.9600	120.9600	907.2000
5	3618.7200	120.9600	1209.6000
6	3670.2000	120.9600	1512.0000
7	3722.4000	120.9600	1814.4000
8	3775.3200	120.9600	2116.8000
9	3828.9600	120.9600	2419.2000
10	3883.3200	120.9600	2721.6000
11	3938.4000	120.9600	3024.0000
12	3994.2000	120.9600	3326.4000
13	4050.7200	120.9600	3628.8000
14	4107.9600	120.9600	3931.2000
15	4165.9200	120.9600	4233.6000
16	4224.6000	120.9600	4536.0000
17	4284.0000	120.9600	4838.4000
18	4344.1200	120.9600	5140.8000
19	4404.9600	120.9600	5443.2000
20	4466.5200	120.9600	5745.6000
21	4528.8000	120.9600	6048.0000

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FASE FINAL EN ITERACION NUMERO 9

REACCION DEL TABLERO = 120.9600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.10338449E-01	.30183267E+00
2	.54392878E-04	.10270458E-01	.27604321E+00
3	.96832746E-04	.10081426E-01	.25058125E+00
4	.12998418E-03	.97979051E-02	.22571482E+00
5	.15583974E-03	.94406252E-02	.20165319E+00
6	.17591190E-03	.90259357E-02	.17855953E+00
7	.19136415E-03	.85668406E-02	.15656051E+00
8	.20310194E-03	.80737580E-02	.13575365E+00
9	.21190843E-03	.75549950E-02	.11621313E+00
10	.21970491E-03	.70154783E-02	.97995973E-01
11	.22759243E-03	.64563567E-02	.81152071E-01
12	.23701321E-03	.58755996E-02	.65732219E-01
13	.25238176E-03	.52638559E-02	.51799895E-01
14	.26763484E-03	.46138351E-02	.39444837E-01
15	.28070523E-03	.39284101E-02	.28760223E-01
16	.29123534E-03	.32134843E-02	.19827370E-01
17	.25213103E-03	.25342764E-02	.12663036E-01
18	.25408047E-03	.19015120E-02	.71172855E-02
19	.25446539E-03	.12658297E-02	.31579080E-02
20	.25346637E-03	.63091497E-03	.78749749E-03
21	.25126561E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.28753588E-03	-.28753588E-03	-.28753588E-03
2	-.27414381E-03	-.33125633E-03	-.21975093E-03
3	-.27559185E-03	-.38210787E-03	-.17391747E-03
4	-.27770663E-03	-.42718843E-03	-.13472403E-03
5	-.28023545E-03	-.46724313E-03	-.10101975E-03
6	-.28299958E-03	-.50288946E-03	-.71905292E-04
7	-.28587252E-03	-.53464591E-03	-.46667336E-04
8	-.28876519E-03	-.56295281E-03	-.24732663E-04
9	-.29156224E-03	-.58823404E-03	-.54858613E-05
10	-.29312551E-03	-.61169763E-03	.14461363E-04
11	-.29265356E-03	-.63404220E-03	.37355457E-04
12	-.28875337E-03	-.65612385E-03	.66766454E-04
13	-.27664244E-03	-.68045326E-03	.11454929E-03
14	-.26239728E-03	-.70399477E-03	.16581847E-03
15	-.24839046E-03	-.72558935E-03	.21477317E-03
16	-.23530843E-03	-.74497028E-03	.25979165E-03
17	-.22985421E-03	-.68369006E-03	.21137509E-03
18	-.22464206E-03	-.69469093E-03	.23270279E-03
19	-.22055791E-03	-.70404216E-03	.25020307E-03
20	-.21758333E-03	-.71184275E-03	.26400276E-03
21	-.21566866E-03	-.71819989E-03	.27429928E-03

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ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3420.0000	156.3159	.0000
2	3468.6000	156.5808	391.2191
3	3517.9200	156.4210	782.5517
4	3567.9600	155.9128	1173.0347
5	3618.7200	155.1163	1561.8752
6	3670.2000	154.0796	1948.4145
7	3722.4000	152.8412	2332.1016
8	3775.3200	151.4325	2712.4725
9	3828.9600	149.8788	3089.1398
10	3883.3200	148.1940	3461.7829
11	3938.4000	146.3781	3830.0351
12	3994.2000	144.4184	4193.5678
13	4050.7200	142.2720	4551.9964
14	4107.9600	139.9026	4904.7269
15	4165.9200	137.3141	5251.2873
16	4224.6000	134.5239	5591.1211
17	4284.0000	131.8065	5923.9928
18	4344.1200	129.2100	6250.2939
19	4404.9600	126.5257	6569.9926

20	4466.5200	123.7679	6882.8755
21	4528.8000	120.9502	7188.7939

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	.32002511E-02	.71876023E+07
3	.66198237E-02	.80626124E+07
4	.10483869E-01	.89826422E+07
5	.15025561E-01	.99491408E+07
6	.20483337E-01	.10963583E+08
7	.27103240E-01	.12027471E+08
8	.35139856E-01	.13142325E+08
9	.39366387E-01	.13858682E+08
10	.18571147E-01	.12999521E+08
11	.13849125E-01	.11556925E+08
12	.12999091E-01	.89230679E+07
13	-.30907583E-02	.65094053E+07
14	.35208710E-01	.62221353E+07
15	.42678834E-01	.61601402E+07
16	.48979183E-01	.61433019E+07
17	.22467036E-01	.96041275E+07
18	.14076682E-01	.10037176E+08
19	.33051502E-02	.10533977E+08
20	.22083398E-02	.11092481E+08
21	-.70809132E-02	.11710839E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-3 DE 50.0 M V FRANCOLÍ (ROT) ZH52

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	50.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	4.0000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	3.2000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	38.000	10.0500	10.0500
2	12.000	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0390 T/M2
REACCION HORIZONTAL TABLERO	=	46.0000 T
REACCION VERTICAL TABLERO	=	2375.0000 T
MOMENTO EXTERIOR EN CABEZA	=	295.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

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FASE ELASTICA

REACCION DEL TABLERO = 66.2400 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.11035555E-04	.20369125E-02	.61673386E-01
2	.14899109E-04	.20044942E-02	.56619616E-01
3	.18561694E-04	.19626682E-02	.51658755E-01
4	.22040763E-04	.19119151E-02	.46813714E-01
5	.25351901E-04	.18526743E-02	.42106253E-01
6	.28509061E-04	.17853481E-02	.37557080E-01
7	.31524775E-04	.17103058E-02	.33185942E-01
8	.34410334E-04	.16278869E-02	.29011698E-01
9	.37175931E-04	.15384041E-02	.25052394E-01
10	.39830796E-04	.14421457E-02	.21325324E-01
11	.42383306E-04	.13393780E-02	.17847090E-01
12	.44841081E-04	.12303476E-02	.14633653E-01
13	.47211069E-04	.11152824E-02	.11700381E-01
14	.49499616E-04	.99439402E-03	.90620938E-02
15	.51712531E-04	.86787884E-03	.67331002E-02
16	.53855143E-04	.73591925E-03	.47272367E-02
17	.55932347E-04	.59868488E-03	.30578996E-02
18	.57948650E-04	.45633364E-03	.17380763E-02
19	.59908207E-04	.30901257E-03	.78037294E-03
20	.61814854E-04	.15685874E-03	.19704076E-03
21	.63672140E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3420.0000	66.2400	424.8000
2	3468.6000	66.5278	590.7569
3	3517.9200	66.8297	757.4508
4	3567.9600	67.1456	924.9169
5	3618.7200	67.4755	1093.1904
6	3670.2000	67.8195	1262.3063
7	3722.4000	68.1775	1432.2996
8	3775.3200	68.5496	1603.2056
9	3828.9600	68.9357	1775.0592
10	3883.3200	69.3358	1947.8957
11	3938.4000	69.7500	2121.7500
12	3994.2000	70.1782	2296.6574
13	4050.7200	70.6205	2472.6528
14	4107.9600	71.0768	2649.7715
15	4165.9200	71.5471	2828.0484
16	4224.6000	72.0315	3007.5188
17	4284.0000	72.5299	3188.2176
18	4344.1200	73.0424	3370.1801
19	4404.9600	73.5689	3553.4412
20	4466.5200	74.1094	3738.0362
21	4528.8000	74.6640	3924.0000

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FASE FINAL EN ITERACION NUMERO 4

REACCION DEL TABLERO = 66.2400 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.11529120E-04	.22336191E-02	.66913440E-01
2	.16067607E-04	.21991232E-02	.61370148E-01
3	.20366288E-04	.21535808E-02	.55927029E-01
4	.24444179E-04	.20975677E-02	.50610970E-01
5	.28318200E-04	.20316147E-02	.45447474E-01
6	.32003458E-04	.19562127E-02	.40460770E-01
7	.35513479E-04	.18718165E-02	.35673906E-01
8	.38860407E-04	.17788491E-02	.31108830E-01
9	.42055170E-04	.16777047E-02	.26786474E-01
10	.45107624E-04	.15687512E-02	.22726815E-01
11	.48026677E-04	.14523333E-02	.18948939E-01
12	.50820394E-04	.13287745E-02	.15471099E-01
13	.53496093E-04	.11983788E-02	.12310764E-01
14	.56060422E-04	.10614332E-02	.94846631E-02
15	.58519432E-04	.91820839E-03	.70088304E-02
16	.60878636E-04	.76896080E-03	.48986401E-02
17	.58154808E-04	.62016900E-03	.31636466E-02
18	.60152481E-04	.47228488E-03	.17970388E-02
19	.62072495E-04	.31950366E-03	.80630307E-03
20	.63918431E-04	.16201501E-03	.20344331E-03
21	.65693573E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.27386983E-03	-.30557491E-03	-.24274121E-03
2	-.27380206E-03	-.31798797E-03	-.23041952E-03
3	-.27384180E-03	-.32984910E-03	-.21885283E-03
4	-.27398136E-03	-.34120285E-03	-.20798208E-03
5	-.27421375E-03	-.35208880E-03	-.19775461E-03
6	-.27453265E-03	-.36254216E-03	-.18812331E-03
7	-.27493229E-03	-.37259435E-03	-.17904589E-03
8	-.27540740E-03	-.38227352E-03	-.17048430E-03
9	-.27595317E-03	-.39160489E-03	-.16240421E-03
10	-.27656517E-03	-.40061114E-03	-.15477459E-03
11	-.27723932E-03	-.40931268E-03	-.14756729E-03
12	-.27797185E-03	-.41772793E-03	-.14075679E-03
13	-.27875927E-03	-.42587353E-03	-.13431982E-03
14	-.27959834E-03	-.43376451E-03	-.12823521E-03
15	-.28048605E-03	-.44141449E-03	-.12248359E-03
16	-.28141959E-03	-.44883584E-03	-.11704727E-03
17	-.26281177E-03	-.42273750E-03	-.10579379E-03
18	-.26369254E-03	-.42911187E-03	-.10128085E-03
19	-.26460854E-03	-.43530790E-03	-.97012804E-04
20	-.26555791E-03	-.44133360E-03	-.92978151E-04
21	-.26653892E-03	-.44719625E-03	-.89166273E-04

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ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3420.0000	73.8786	424.8012
2	3468.6000	74.1552	609.8495
3	3517.9200	74.4051	795.5558
4	3567.9600	74.6288	981.8543
5	3618.7200	74.8264	1168.6793
6	3670.2000	74.9981	1355.9661
7	3722.4000	75.1440	1543.6498
8	3775.3200	75.2640	1731.6661
9	3828.9600	75.3581	1919.9501
10	3883.3200	75.4263	2108.4370
11	3938.4000	75.4683	2297.0618
12	3994.2000	75.4839	2485.7587
13	4050.7200	75.4730	2674.4618
14	4107.9600	75.4353	2863.1043
15	4165.9200	75.3704	3051.6187
16	4224.6000	75.2781	3239.9369
17	4284.0000	75.1848	3427.9967
18	4344.1200	75.0921	3615.8491
19	4404.9600	74.9742	3803.4379
20	4466.5200	74.8309	3990.7000
21	4528.8000	74.6618	4177.5712

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	-.12194054E-02	.36838588E+08
2	-.70464892E-03	.37943463E+08
3	-.23338017E-03	.39043809E+08
4	.18310668E-03	.40139830E+08
5	.53263894E-03	.41231606E+08
6	.80245222E-03	.42319194E+08
7	.97860054E-03	.43402642E+08
8	.10460236E-02	.44481987E+08
9	.98790207E-03	.45557228E+08
10	.78541359E-03	.46628340E+08
11	.41727002E-03	.47695274E+08
12	-.14040474E-03	.48757987E+08
13	-.91444131E-03	.49816449E+08
14	-.19351129E-02	.50870658E+08
15	-.32363958E-02	.51920632E+08
16	-.48562939E-02	.52966396E+08
17	.88195862E-02	.58726922E+08
18	.79071085E-02	.59869675E+08
19	.73189965E-02	.61008963E+08
20	.70612233E-02	.62144808E+08
21	.71443903E-02	.63277236E+08

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ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-3 DE 50.0 M V FRANCOLÍ (ROT) XH10

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	50.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	4.0000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	3.2000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	38.000	10.0500	10.0500
2	12.000	24.5400	24.5400

1

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	49.0000 T
REACCION VERTICAL TABLERO	=	1925.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

FASE ELASTICA

REACCION DEL TABLERO = 70.5600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.41443476E-02	.11810150E+00
2	.23489937E-04	.41149852E-02	.10776510E+00
3	.41776896E-04	.40334017E-02	.97570090E-01
4	.56051214E-04	.39111165E-02	.87632008E-01
5	.67199964E-04	.37570526E-02	.78040990E-01
6	.75892726E-04	.35781867E-02	.68867413E-01
7	.82640773E-04	.33800198E-02	.60166141E-01
8	.87838579E-04	.31669206E-02	.51979758E-01
9	.91793392E-04	.29423807E-02	.44341071E-01
10	.94746574E-04	.27092057E-02	.37275050E-01
11	.96889212E-04	.24696610E-02	.30800351E-01
12	.98373667E-04	.22255824E-02	.24930524E-01
13	.99322203E-04	.19784625E-02	.19674973E-01
14	.99833516E-04	.17295179E-02	.15039732E-01
15	.99987699E-04	.14797414E-02	.11028077E-01
16	.99850065E-04	.12299442E-02	.76410419E-02
17	.99474110E-04	.98078895E-03	.48778213E-02
18	.98903826E-04	.73281653E-03	.27361114E-02
19	.98175514E-04	.48646736E-03	.12123859E-02
20	.97319228E-04	.24209893E-03	.30212402E-03
21	.96359917E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2772.0000	70.5600	.0000

2	2820.6000	70.5600	176.4000
3	2869.9200	70.5600	352.8000
4	2919.9600	70.5600	529.2000
5	2970.7200	70.5600	705.6000
6	3022.2000	70.5600	882.0000
7	3074.4000	70.5600	1058.4000
8	3127.3200	70.5600	1234.8000
9	3180.9600	70.5600	1411.2000
10	3235.3200	70.5600	1587.6000
11	3290.4000	70.5600	1764.0000
12	3346.2000	70.5600	1940.4000
13	3402.7200	70.5600	2116.8000
14	3459.9600	70.5600	2293.2000
15	3517.9200	70.5600	2469.6000
16	3576.6000	70.5600	2646.0000
17	3636.0000	70.5600	2822.4000
18	3696.1200	70.5600	2998.8000
19	3756.9600	70.5600	3175.2000
20	3818.5200	70.5600	3351.6000
21	3880.8000	70.5600	3528.0000

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FASE FINAL EN ITERACION NUMERO 4

REACCION DEL TABLERO = 70.5600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.47851511E-02	.13400245E+00
2	.28082244E-04	.47500483E-02	.12206883E+00
3	.49993871E-04	.46524532E-02	.11030429E+00
4	.67104662E-04	.45060800E-02	.98847212E-01
5	.80445943E-04	.43216417E-02	.87805611E-01
6	.90803418E-04	.41075800E-02	.77263689E-01
7	.98782450E-04	.38705977E-02	.67286811E-01
8	.10485416E-03	.36160519E-02	.57925337E-01
9	.10938851E-03	.33482486E-02	.49217599E-01
10	.11267842E-03	.30706649E-02	.41192244E-01
11	.11495749E-03	.27861201E-02	.33870076E-01
12	.11641324E-03	.24969066E-02	.27265534E-01
13	.11719716E-03	.22048936E-02	.21387876E-01
14	.11743224E-03	.19116069E-02	.16242127E-01
15	.11721884E-03	.16182930E-02	.11829864E-01
16	.11663921E-03	.13259705E-02	.81498362E-02
17	.10701023E-03	.10464087E-02	.51893773E-02
18	.10596682E-03	.78018737E-03	.29066757E-02
19	.10474749E-03	.51679449E-03	.12860834E-02
20	.10338698E-03	.25662641E-03	.32001591E-03
21	.10191415E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXİLES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.23305540E-03	-.23305540E-03	-.23305540E-03
2	-.21863768E-03	-.24812404E-03	-.19055544E-03
3	-.21969986E-03	-.27469312E-03	-.16720629E-03
4	-.22096028E-03	-.29813064E-03	-.14714515E-03
5	-.22235171E-03	-.31888684E-03	-.12983888E-03
6	-.22382658E-03	-.33733085E-03	-.11486248E-03
7	-.22535124E-03	-.35376842E-03	-.10187318E-03
8	-.22690200E-03	-.36845511E-03	-.90591591E-04
9	-.22846232E-03	-.38160624E-03	-.80787830E-04
10	-.23002087E-03	-.39340458E-03	-.72271076E-04
11	-.23157003E-03	-.40400626E-03	-.64881679E-04
12	-.23310495E-03	-.41354547E-03	-.58485081E-04
13	-.23462271E-03	-.42213817E-03	-.52967105E-04
14	-.23612185E-03	-.42988505E-03	-.48230266E-04
15	-.23760192E-03	-.43687394E-03	-.44190839E-04
16	-.23906318E-03	-.44318179E-03	-.40776534E-04
17	-.22370385E-03	-.41632227E-03	-.36435941E-04
18	-.22498208E-03	-.42102069E-03	-.34241807E-04
19	-.22625148E-03	-.42527171E-03	-.32468623E-04
20	-.22751310E-03	-.42911770E-03	-.31077847E-04
21	-.22876803E-03	-.43259633E-03	-.30035442E-04

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ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2772.0000	83.8233	.0000
2	2820.6000	83.9560	209.7659
3	2869.9200	83.9095	419.6325
4	2919.9600	83.7143	629.1915
5	2970.7200	83.3947	838.1028
6	3022.2000	82.9699	1046.0802
7	3074.4000	82.4554	1252.8810
8	3127.3200	81.8640	1458.2975
9	3180.9600	81.2059	1662.1507
10	3235.3200	80.4898	1864.2851
11	3290.4000	79.7226	2064.5647
12	3346.2000	78.9103	2262.8695
13	3402.7200	78.0578	2459.0932
14	3459.9600	77.1693	2653.1408
15	3517.9200	76.2483	2844.9271
16	3576.6000	75.2979	3034.3747
17	3636.0000	74.3606	3221.3913
18	3696.1200	73.4395	3406.1511
19	3756.9600	72.4975	3588.5797

20	3818.5200	71.5359	3768.6264
21	3880.8000	70.5560	3946.2440

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	.19442366E-02	.74684631E+07
3	.38152457E-02	.83897246E+07
4	.55433250E-02	.93650734E+07
5	.70562984E-02	.10398782E+08
6	.82664276E-02	.11490565E+08
7	.90819812E-02	.12641317E+08
8	.94044735E-02	.13851915E+08
9	.91282688E-02	.15123222E+08
10	.81398447E-02	.16456096E+08
11	.63174396E-02	.17851390E+08
12	.35306201E-02	.19309953E+08
13	-.35986962E-03	.20832626E+08
14	-.55020787E-02	.22420243E+08
15	-.12052717E-01	.24073630E+08
16	-.20176854E-01	.25793601E+08
17	.25460233E-01	.29909994E+08
18	.20723229E-01	.31929619E+08
19	.17887165E-01	.34024582E+08
20	.16959751E-01	.36195703E+08
21	.17977246E-01	.38443793E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-3 DE 50.0 M V FRANCOLÍ (ROT) ZH10

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	50.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	4.0000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	3.2000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	38.000	10.0500	10.0500
2	12.000	24.5400	24.5400

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0390 T/M2
REACCION HORIZONTAL TABLERO	=	99.0000 T
REACCION VERTICAL TABLERO	=	1925.0000 T
MOMENTO EXTERIOR EN CABEZA	=	543.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

FASE ELASTICA

REACCION DEL TABLERO = 142.5600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.20312904E-04	.41886167E-02	.12737768E+00
2	.28717857E-04	.41273282E-02	.11697837E+00
3	.36664380E-04	.40456004E-02	.10675807E+00
4	.44191217E-04	.39445309E-02	.96766489E-01
5	.51332957E-04	.38251257E-02	.87050699E-01
6	.58120575E-04	.36883088E-02	.77655370E-01
7	.64581889E-04	.35349307E-02	.68622956E-01
8	.70741958E-04	.33657759E-02	.59993864E-01
9	.76623409E-04	.31815692E-02	.51806619E-01
10	.82246731E-04	.29829815E-02	.44098002E-01
11	.87630519E-04	.27706349E-02	.36903178E-01
12	.92791686E-04	.25451072E-02	.30255812E-01
13	.97745653E-04	.23069355E-02	.24188178E-01
14	.10250651E-03	.20566203E-02	.18731254E-01
15	.10708715E-03	.17946282E-02	.13914807E-01
16	.11149939E-03	.15213951E-02	.97674803E-02
17	.11575412E-03	.12373282E-02	.63168602E-02
18	.11986133E-03	.94280887E-03	.35895497E-02
19	.12383023E-03	.63819442E-03	.16112285E-02
20	.12766936E-03	.32381993E-03	.40671097E-03
21	.13138658E-03	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2772.0000	142.5600	781.9200
2	2820.6000	142.8478	1138.6769
3	2869.9200	143.1497	1496.1708
4	2919.9600	143.4656	1854.4370
5	2970.7200	143.7955	2213.5104
6	3022.2000	144.1395	2573.4263
7	3074.4000	144.4975	2934.2196
8	3127.3200	144.8696	3295.9256
9	3180.9600	145.2557	3658.5792
10	3235.3200	145.6558	4022.2157
11	3290.4000	146.0700	4386.8700
12	3346.2000	146.4982	4752.5774
13	3402.7200	146.9405	5119.3728
14	3459.9600	147.3968	5487.2915
15	3517.9200	147.8671	5856.3684
16	3576.6000	148.3515	6226.6388
17	3636.0000	148.8499	6598.1376
18	3696.1200	149.3624	6970.9001
19	3756.9600	149.8889	7344.9612
20	3818.5200	150.4294	7720.3562
21	3880.8000	150.9840	8097.1200

FASE FINAL EN ITERACION NUMERO 6

REACCION DEL TABLERO = 142.5600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.20430458E-04	.52658759E-02	.16772458E+00
2	.29832468E-04	.52030472E-02	.15463353E+00
3	.38739504E-04	.51173322E-02	.14172841E+00
4	.47191984E-04	.50099179E-02	.12906495E+00
5	.55225684E-04	.48818958E-02	.11669600E+00
6	.62872371E-04	.47342732E-02	.10467180E+00
7	.70160339E-04	.45679823E-02	.93040188E-01
8	.77114849E-04	.43838883E-02	.81846728E-01
9	.83758561E-04	.41827966E-02	.71134911E-01
10	.90564688E-04	.39648925E-02	.60946755E-01
11	.98832589E-04	.37281459E-02	.51326151E-01
12	.10914775E-03	.34681705E-02	.42325383E-01
13	.12052470E-03	.31810799E-02	.34007894E-01
14	.13300650E-03	.28641659E-02	.26444836E-01
15	.14661610E-03	.25146377E-02	.19714243E-01
16	.16134054E-03	.21296919E-02	.13901162E-01
17	.15132071E-03	.17388653E-02	.90706842E-02
18	.16256958E-03	.13465025E-02	.52081157E-02
19	.17389941E-03	.92591624E-03	.23616913E-02
20	.18521091E-03	.47702834E-03	.60211921E-03
21	.19641176E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.21832688E-03	-.27451064E-03	-.16316465E-03
2	-.21946227E-03	-.30150155E-03	-.13891460E-03
3	-.22081072E-03	-.32734436E-03	-.11621406E-03
4	-.22235047E-03	-.35212843E-03	-.94932118E-04
5	-.22406228E-03	-.37593291E-03	-.74952933E-04
6	-.22592903E-03	-.39882805E-03	-.56173625E-04
7	-.22793545E-03	-.42087639E-03	-.38502538E-04
8	-.23006787E-03	-.44213370E-03	-.21857778E-04
9	-.23231396E-03	-.46265001E-03	-.61658505E-05
10	-.23410542E-03	-.48315831E-03	.10419239E-04
11	-.23373310E-03	-.50552272E-03	.33114885E-04
12	-.23024420E-03	-.53040051E-03	.64454717E-04
13	-.22485140E-03	-.55629434E-03	.10056530E-03
14	-.21736133E-03	-.58312920E-03	.14175622E-03
15	-.20760614E-03	-.61080041E-03	.18825734E-03
16	-.19547365E-03	-.63916013E-03	.24014579E-03
17	-.18482435E-03	-.60095629E-03	.22374156E-03
18	-.17580043E-03	-.62286676E-03	.26313743E-03
19	-.16611006E-03	-.64433344E-03	.30341834E-03
20	-.15591783E-03	-.66524783E-03	.34415163E-03
21	-.14538719E-03	-.68551954E-03	.38492458E-03

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2772.0000	157.1564	781.9203
2	2820.6000	157.5226	1175.2823
3	2869.9200	157.8348	1569.4923
4	2919.9600	158.0928	1964.4153
5	2970.7200	158.2965	2359.9155
6	3022.2000	158.4454	2755.8566
7	3074.4000	158.5390	3152.1012
8	3127.3200	158.5768	3548.5104
9	3180.9600	158.5582	3944.9462
10	3235.3200	158.4805	4341.2200
11	3290.4000	158.3337	4737.2716
12	3346.2000	158.0996	5132.8374
13	3402.7200	157.7606	5527.6883
14	3459.9600	157.3020	5921.5439
15	3517.9200	156.7082	6314.0934
16	3576.6000	155.9628	6704.9661
17	3636.0000	155.1671	7093.8607
18	3696.1200	154.3334	7480.7661
19	3756.9600	153.3613	7865.4160
20	3818.5200	152.2443	8247.4559
21	3880.8000	150.9769	8626.5166

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	-.32588874E-03	.38255559E+08
2	-.72098809E-03	.39359911E+08
3	-.11644345E-02	.40450509E+08
4	-.16874653E-02	.41527740E+08
5	-.23220470E-02	.42591811E+08
6	-.31074180E-02	.43640949E+08
7	-.40695627E-02	.44678661E+08
8	-.52485698E-02	.45703753E+08
9	-.89241222E-02	.46716289E+08
10	.29866404E-01	.40064537E+08
11	.13416972E-01	.29473943E+08
12	.11053542E-01	.25487571E+08
13	.10161685E-01	.22607506E+08
14	.10625867E-01	.20113252E+08
15	.49523161E-02	.17836555E+08
16	.55059214E-02	.16500084E+08
17	.11804181E-01	.21582920E+08
18	.10872771E-01	.20672854E+08
19	.95413833E-02	.19930455E+08
20	.77758213E-02	.19322016E+08
21	.55680498E-02	.18820171E+08

intecsa-inarsa

Proyecto: Hoja de

Ejecutante: PILA 3 Fecha

Hormigón HA-30 Armadura del encepado

N_d = 1741 t/pilote

$T_{d_1} = \frac{1741}{0'85 \cdot 3'4} (5'70 - 0'25 \cdot 5'50) = 2605$ t

$A_{s_1} = \frac{2605}{51000/1'15} \cdot 100^2 = 688$ cm² ⇒ 73 ∅ 32 ⇒ 3 × 25 ∅ 32

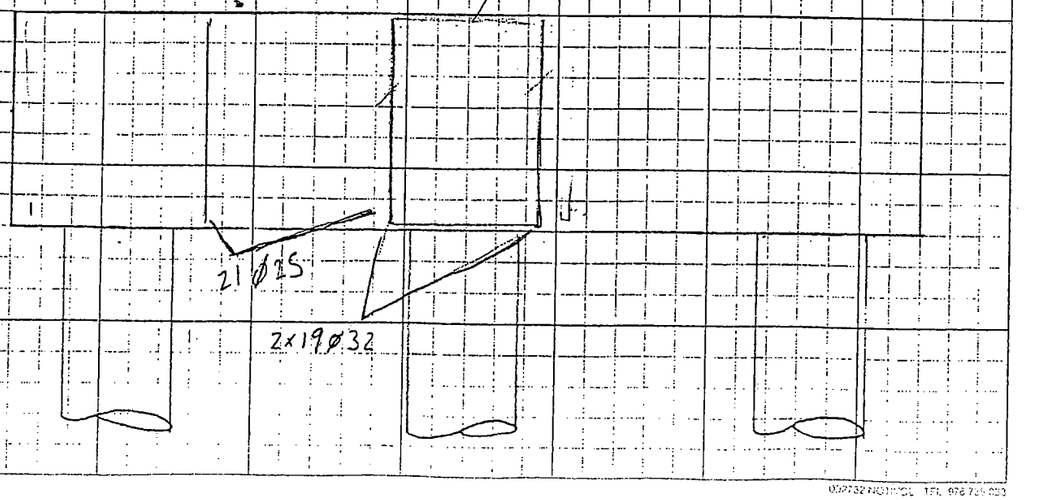
$T_{d_2} = \frac{1741}{0'85 \cdot 3'4} (6'40/2 - 0'25 \cdot 4'00) = 1325$ t

$A_{s_2} = \frac{1325}{51000/1'15} \cdot 100^2 = 298$ cm² ⇒ 38 ∅ 32 ⇒ 2 × 19 ∅ 32

Entre fases:

$A_{s_1}/4$ = 147 cm²

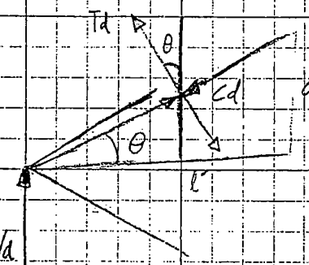
$A_{s_2}/4$ = 75 cm²



intecsa-inarsa

Proyecto: Hoja de

Ejecutante: Fecha



$T_d = A_s \cdot f_{yd} \cdot \cos\theta$

$N_d = C_d \cdot \operatorname{sen}\theta$

$T_d = 0'30 \cdot C_d$

$A_s \cdot f_{yd} \cdot \cos\theta = 0'30 \cdot \frac{N_d}{\operatorname{sen}\theta}$

$A_s = 0'30 \cdot \frac{N_d}{\operatorname{sen}\theta \cdot \cos\theta \cdot f_{yd}}$

N_d = 1741 t

$\operatorname{tg}\theta = \frac{0'85 \cdot d}{l'}$

$l' = \left[(5'70 - 0'25 \cdot 5'50)^2 + (6'40/2 - 0'25 \cdot 4'00)^2\right]^{1/2} = 4'85$ m

$\operatorname{tg}\theta = \frac{0'85 \cdot 3'40}{4'85} = 0'596$

$\operatorname{sen}\theta = 0'512$

$\cos\theta = 0'859$

$A_s = \frac{0'30 \cdot 1741}{40000 \cdot 0'512 \cdot 0'859} \cdot 100^2 = 297$ cm²

$l = 5'70 + 0'90 = 6'60$ m

$A_s = 297 / 6'60 = 45$ cm²/m ⇒ 8 ∅ 12 / 20

ESFUERZOS EN SERVICIO EN BASE DE PILA

PILA 3

	Base de pila					
	H2	H3	H4	H51	H52	H10
N (KN)	20690	33510	28370	27340	31450	26950
M_x (m·KN)	16930	30725	45045	38255	28375	58505
M_z (m·KN)	18905	27585	31880	56715	46240	26330
F_x (KN)	360	500	590	980	840	490
F_z (KN)	380	560	560	490	520	1050

CARGAS POR PILOTE EN SERVICIO

PILA 3

	H2			
	N (t)	M_x (m·t)	M_z (m·t)	M (m·t)
Pilote 1	520,16	16,83	54,03	56,59
Pilote 2	811,34	45,2	63,34	77,81
Pilote 3	693,25	78,09	56,21	96,22
Pilote 4	307,42	19,26	29,51	35,24
Pilote 5	568,83	45,2	16,19	48,01
Pilote 6	480,51	75,66	27,32	80,44

	H3			
	N (t)	M_x (m·t)	M_z (m·t)	M (m·t)
Pilote 1	691,51	27,19	74,18	79,01
Pilote 2	1127,62	65,33	87,32	109,05
Pilote 3	996,93	111,88	78,11	136,45
Pilote 4	383,11	30,74	41,28	51,47
Pilote 5	775,8	65,33	22,3	69,03
Pilote 6	688,54	108,33	37,35	114,59

	H4			
	N (t)	M_x (m·t)	M_z (m·t)	M (m·t)
Pilote 1	577,57	30,38	81,8	87,26
Pilote 2	1050,56	62,15	93,82	112,54
Pilote 3	1007,69	106,68	87,49	137,97
Pilote 4	220,25	34,49	54,72	64,68
Pilote 5	643,06	62,15	35,96	71,80
Pilote 6	650,37	102,58	49,04	113,70

	N (t)
Máximo	1205
Mínimo	101

		T_e (t)
Pilote de ϕ	1,8	1260
f_{ck} (kg/cm^2)	225	

	H51			
	N (t)	M_x (m·t)	M_z (m·t)	M (m·t)
Pilote 1	730,69	21,2	126,15	127,92
Pilote 2	1185,52	54,64	134,79	145,44
Pilote 3	1096,96	98,9	130,98	164,12
Pilote 4	100,5	28,49	99,03	103,05
Pilote 5	466,06	54,64	78,36	95,53
Pilote 6	466,77	91,6	94,19	131,39

	H52			
	N (t)	M_x (m·t)	M_z (m·t)	M (m·t)
Pilote 1	776,92	22,83	112,79	115,08
Pilote 2	1204,56	60,69	123,19	137,33
Pilote 3	1059,18	106,33	116,42	157,67
Pilote 4	259,91	28,78	81,22	86,17
Pilote 5	614,77	60,69	61,04	86,08
Pilote 6	542,16	100,38	77,59	126,87

	H53			
	N (t)	M_x (m·t)	M_z (m·t)	M (m·t)
Pilote 1	450,41	93,76	68,81	116,30
Pilote 2	986,22	122,29	81,88	147,17
Pilote 3	1030,84	166,88	76,28	183,49
Pilote 4	155,08	97,15	44,64	106,92
Pilote 5	649,45	122,29	26	125,02
Pilote 6	735,51	163,49	37,16	167,66

ESFUERZOS EN ROTURA EN BASE DE PILA

PILA 3

	Base de pila					
	H2	H3	H4	H51	H52	H10
N_d (KN)	29795	48255	40855	39370	45290	38810
$M_{x,d}$ (m·KN)	24640	45350	66350	56215	41775	86265
$M_{z,d}$ (m·KN)	27920	42170	47975	57925	71890	39465
$F_{x,d}$ (KN)	520	720	850	1025	1210	705
$F_{z,d}$ (KN)	545	805	805	705	750	1510

Obra: Viaducto río Francolí
Fecha: 05/06/02
Hora: 16:12:39

Cálculo de secciones a flexión compuesta esviada

1 Datos

- Materiales

Tipo de hormigón : HA-30
Tipo de acero : B-500-S
fck [MPa] = 30.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

Sección : FRANCOLI_P3

Contorno exterior

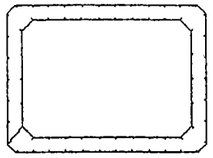
Vértice	X [m]	Y [m]	Lado	nº barras
1	0.000	0.250	1-2	2
2	0.250	0.000	2-3	12
3	5.250	0.000	3-4	2
4	5.500	0.250	4-5	7
5	5.500	3.750	5-6	2
6	5.250	4.000	6-7	12
7	0.250	4.000	7-8	2
8	0.000	3.750	8-1	7

Contorno interior

Vértice	X [m]	Y [m]	Lado	nº barras
1	0.400	0.700	1-2	2
2	0.700	0.400	2-3	10
3	4.800	0.400	3-4	2
4	5.100	0.700	4-5	5
5	5.100	3.300	5-6	2
6	4.800	3.600	6-7	10
7	0.700	3.600	7-8	2
8	0.400	3.300	8-1	5

Recubrimiento exterior [m] : 0.050

Recubrimiento interior [m] : 0.050

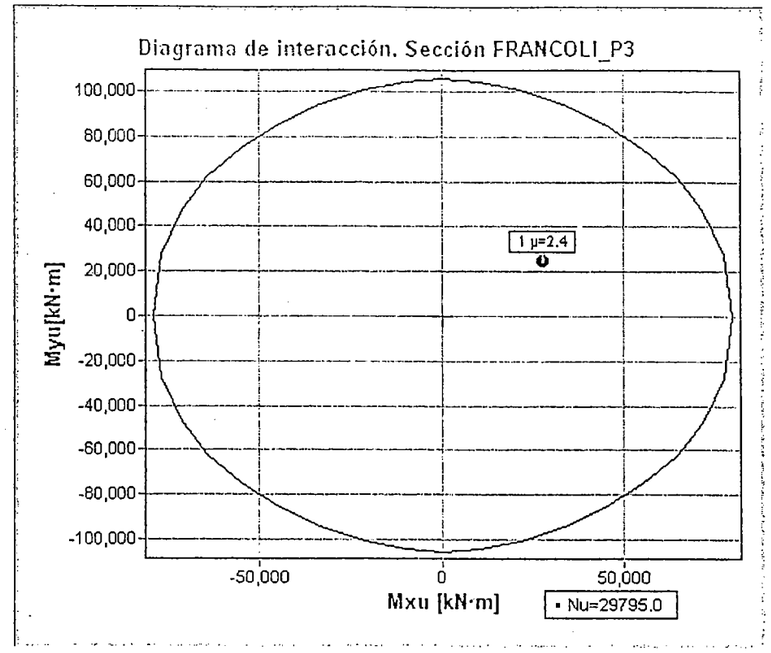


2 Diagrama

ϕ [mm] = 25

Resultados numéricos del diagrama de interacción

Nu [kN]	Mxu [kN·m]	Myu [kN·m]	x [cm]	1/r [1/m] ·1.E-3	β [°]
-29795.0	79142.8	-0.9	0.69	3.1	0.0
-29795.0	77022.2	27465.4	1.20	2.8	10.0
-29795.0	71386.1	47370.3	1.76	2.0	20.0
-29795.0	64025.2	62591.1	2.13	1.6	30.0
-29795.0	55040.5	75177.3	2.29	1.5	40.0
-29795.0	44808.7	85700.4	2.31	1.5	50.0
-29795.0	33417.0	94256.0	2.18	1.6	60.0
-29795.0	21733.6	100657.4	1.92	1.8	70.0
-29795.0	10346.7	104730.8	1.57	2.2	80.0
-29795.0	0.1	105941.3	1.24	2.4	90.0
-29795.0	-10346.0	104731.0	1.57	2.2	100.0
-29795.0	-21733.0	100657.6	1.92	1.8	110.0
-29795.0	-33414.9	94257.2	2.18	1.6	120.0
-29795.0	-44808.4	85700.7	2.31	1.5	130.0
-29795.0	-55040.5	75177.3	2.29	1.5	140.0
-29795.0	-64025.2	62591.1	2.13	1.6	150.0
-29795.0	-71386.1	47370.3	1.76	2.0	160.0
-29795.0	-77022.2	27465.4	1.20	2.8	170.0
-29795.0	-79142.8	-0.9	0.69	3.1	180.0
-29795.0	-77022.2	-27465.6	1.20	2.8	190.0
-29795.0	-71385.3	-47372.6	1.76	2.0	200.0
-29795.0	-64024.3	-62592.6	2.13	1.6	210.0
-29795.0	-55039.4	-75178.7	2.29	1.5	220.0
-29795.0	-44808.4	-85700.7	2.31	1.5	230.0
-29795.0	-33414.9	-94257.2	2.18	1.6	240.0
-29795.0	-21733.0	-100657.6	1.92	1.8	250.0
-29795.0	-10346.0	-104731.0	1.57	2.2	260.0
-29795.0	0.1	-105941.3	1.26	2.4	270.0
-29795.0	10346.7	-104730.8	1.57	2.2	280.0
-29795.0	21733.6	-100657.4	1.92	1.8	290.0
-29795.0	33417.0	-94256.0	2.18	1.6	300.0
-29795.0	44808.7	-85700.4	2.31	1.5	310.0
-29795.0	55039.4	-75178.7	2.29	1.5	320.0
-29795.0	64024.3	-62592.6	2.13	1.6	330.0
-29795.0	71385.3	-47372.6	1.76	2.0	340.0
-29795.0	77022.2	-27465.6	1.20	2.8	350.0



Coeficientes de seguridad de los pares de esfuerzos de cálculo

Punto	Mxd [kN·m]	Myd [kN·m]	γ
1	27920	24640	2.37

Obra: Viaducto río Francolí
Fecha: 05/06/02
Hora: 16:13:05

Cálculo de secciones a flexión compuesta esviada

1 Datos

- Materiales

Tipo de hormigón : HA-30
Tipo de acero : B-500-S
fck [MPa] = 30.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

Sección : FRANCOLI_P3

Contorno exterior

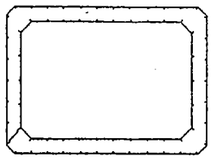
Vértice	X [m]	Y [m]	Lado	nº barras
1	0.000	0.250	1-2	2
2	0.250	0.000	2-3	12
3	5.250	0.000	3-4	2
4	5.500	0.250	4-5	7
5	5.500	3.750	5-6	2
6	5.250	4.000	6-7	12
7	0.250	4.000	7-8	2
8	0.000	3.750	8-1	7

Contorno interior

Vértice	X [m]	Y [m]	Lado	nº barras
1	0.400	0.700	1-2	2
2	0.700	0.400	2-3	10
3	4.800	0.400	3-4	2
4	5.100	0.700	4-5	5
5	5.100	3.300	5-6	2
6	4.800	3.600	6-7	10
7	0.700	3.600	7-8	2
8	0.400	3.300	8-1	5

Recubrimiento exterior [m] : 0.050

Recubrimiento interior [m] : 0.050



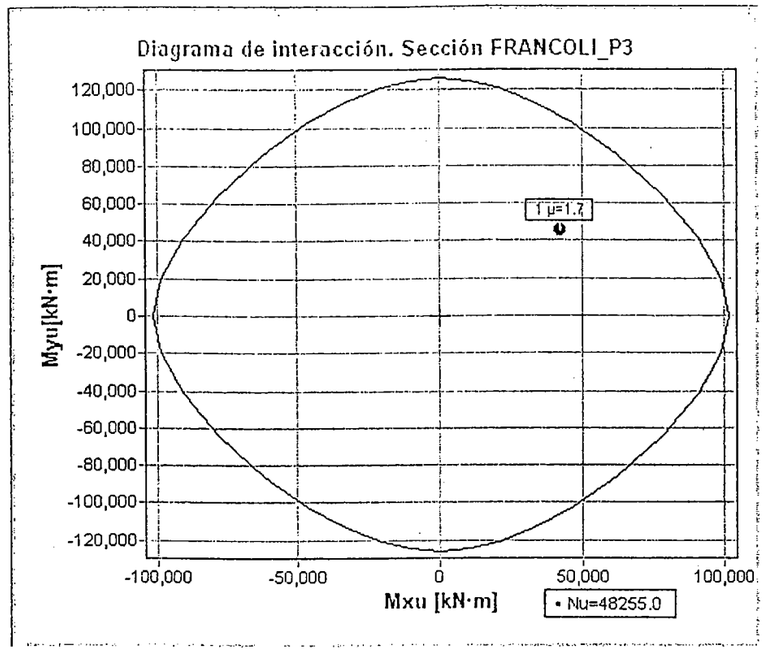
2 Diagrama

ϕ [mm] = 25

Resultados numéricos del diagrama de interacción

Nu [kN]	Mxu [kN·m]	Myu [kN·m]	x [cm]	1/r [1/m] ·1.E-3	β [°]
-48255.0	101977.7	-0.3	1.55	2.3	0.0
-48255.0	99273.7	19566.1	2.07	1.7	10.0
-48255.0	90832.0	42050.3	2.58	1.4	20.0
-48255.0	77842.6	64777.8	2.97	1.2	30.0
-48255.0	62178.1	85858.4	3.18	1.1	40.0
-48255.0	46608.0	102138.6	3.23	1.1	50.0
-48255.0	32776.8	113385.2	3.18	1.1	60.0
-48255.0	20626.8	120650.7	3.02	1.2	70.0
-48255.0	9983.9	124545.0	2.78	1.3	80.0
-48255.0	0.4	126223.4	2.46	1.4	90.0
-48255.0	-9981.6	124545.4	2.78	1.3	100.0
-48255.0	-20624.5	120651.5	3.02	1.2	110.0
-48255.0	-32773.9	113386.8	3.18	1.1	120.0
-48255.0	-46607.1	102139.3	3.23	1.1	130.0
-48255.0	-62178.1	85858.4	3.18	1.1	140.0
-48255.0	-77842.6	64777.8	2.97	1.2	150.0
-48255.0	-90832.0	42050.3	2.58	1.4	160.0
-48255.0	-99273.7	19566.1	2.07	1.7	170.0
-48255.0	-101977.7	-0.3	1.55	2.3	180.0
-48255.0	-99273.4	-19568.2	2.07	1.7	190.0
-48255.0	-90831.1	-42052.9	2.58	1.4	200.0
-48255.0	-77840.9	-64780.8	2.97	1.2	210.0
-48255.0	-62175.1	-85862.0	3.18	1.1	220.0
-48255.0	-46607.1	-102139.3	3.23	1.1	230.0
-48255.0	-32773.9	-113386.8	3.18	1.1	240.0
-48255.0	-20624.5	-120651.5	3.02	1.2	250.0
-48255.0	-9981.6	-124545.4	2.78	1.3	260.0
-48255.0	0.4	-126223.4	2.47	1.4	270.0
-48255.0	9983.9	-124545.0	2.78	1.3	280.0
-48255.0	20626.8	-120650.7	3.02	1.2	290.0
-48255.0	32776.8	-113385.2	3.18	1.1	300.0
-48255.0	46608.0	-102138.6	3.23	1.1	310.0
-48255.0	62175.1	-85862.0	3.18	1.1	320.0
-48255.0	77840.9	-64780.8	2.97	1.2	330.0

-48255.0	90831.1	-42052.9	2.58	1.4	340.0
-48255.0	99273.4	-19568.2	2.07	1.7	350.0



Coeficientes de seguridad de los pares de esfuerzos de cálculo

Punto	Mxd [kN·m]	Myd [kN·m]	γ
1	42170	45350	1.66

Obra: Viaducto río Francolí
Fecha: 05/06/02
Hora: 16:13:41

Cálculo de secciones a flexión compuesta esviada

1 Datos

- Materiales

Tipo de hormigón : HA-30
Tipo de acero : B-500-S
fck [MPa] = 30.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

Sección : FRANCOLI_P3

Contorno exterior

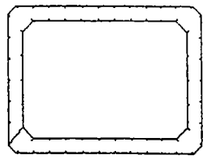
Vértice	X [m]	Y [m]	Lado	nº barras
1	0.000	0.250	1-2	2
2	0.250	0.000	2-3	12
3	5.250	0.000	3-4	2
4	5.500	0.250	4-5	7
5	5.500	3.750	5-6	2
6	5.250	4.000	6-7	12
7	0.250	4.000	7-8	2
8	0.000	3.750	8-1	7

Contorno interior

Vértice	X [m]	Y [m]	Lado	nº barras
1	0.400	0.700	1-2	2
2	0.700	0.400	2-3	10
3	4.800	0.400	3-4	2
4	5.100	0.700	4-5	5
5	5.100	3.300	5-6	2
6	4.800	3.600	6-7	10
7	0.700	3.600	7-8	2
8	0.400	3.300	8-1	5

Recubrimiento exterior [m] : 0.050

Recubrimiento interior [m] : 0.050

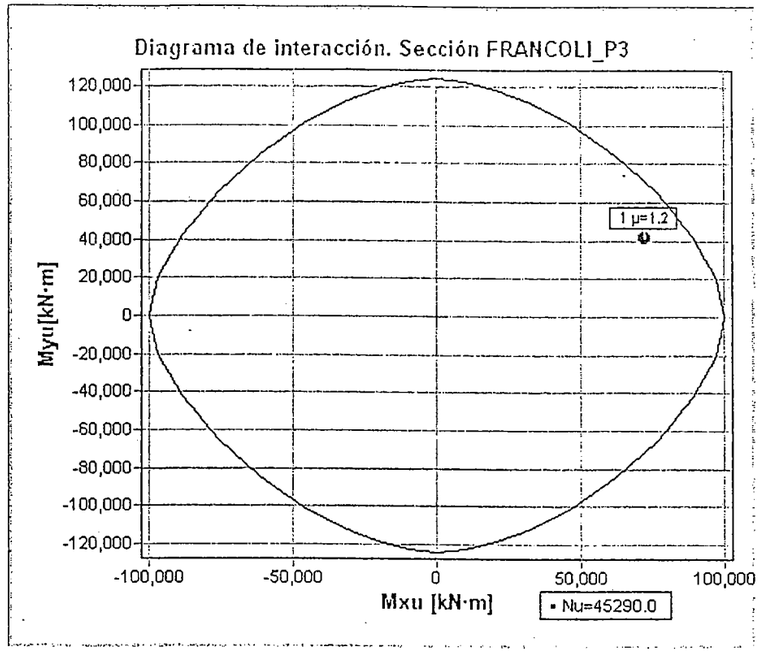


2 Diagrama

ϕ [mm] = 25

Resultados numéricos del diagrama de interacción

Nu [kN]	Mxu [kN·m]	Myu [kN·m]	x [cm]	1/r [1/m] ·1.E-3	β [°]
-45290.0	99826.0	-0.2	1.34	2.6	0.0
-45290.0	97006.1	20093.7	1.88	1.9	10.0
-45290.0	88926.4	42567.2	2.43	1.4	20.0
-45290.0	76363.1	65028.9	2.83	1.2	30.0
-45290.0	61674.4	84892.7	3.04	1.2	40.0
-45290.0	46620.9	100596.0	3.08	1.1	50.0
-45290.0	32846.0	111711.2	3.01	1.2	60.0
-45290.0	20669.6	118908.3	2.84	1.2	70.0
-45290.0	9947.0	122811.5	2.59	1.4	80.0
-45290.0	0.3	124417.1	2.26	1.5	90.0
-45290.0	-9945.7	122811.7	2.59	1.4	100.0
-45290.0	-20668.4	118908.8	2.84	1.2	110.0
-45290.0	-32845.2	111711.7	3.01	1.2	120.0
-45290.0	-46620.1	100596.7	3.08	1.1	130.0
-45290.0	-61674.4	84892.7	3.04	1.2	140.0
-45290.0	-76363.1	65028.9	2.83	1.2	150.0
-45290.0	-88926.4	42567.2	2.43	1.4	160.0
-45290.0	-97006.1	20093.7	1.88	1.9	170.0
-45290.0	-99826.0	-0.2	1.34	2.6	180.0
-45290.0	-97005.8	-20095.1	1.88	1.9	190.0
-45290.0	-88925.7	-42569.3	2.43	1.4	200.0
-45290.0	-76363.0	-65029.1	2.83	1.2	210.0
-45290.0	-61671.9	-84895.7	3.04	1.2	220.0
-45290.0	-46620.1	-100596.7	3.08	1.1	230.0
-45290.0	-32845.2	-111711.7	3.01	1.2	240.0
-45290.0	-20668.4	-118908.8	2.84	1.2	250.0
-45290.0	-9945.7	-122811.7	2.59	1.4	260.0
-45290.0	0.3	-124417.1	2.27	1.5	270.0
-45290.0	9947.0	-122811.5	2.59	1.4	280.0
-45290.0	20669.6	-118908.3	2.84	1.2	290.0
-45290.0	32846.0	-111711.2	3.01	1.2	300.0
-45290.0	46620.9	-100596.0	3.08	1.1	310.0
-45290.0	61671.9	-84895.7	3.04	1.2	320.0
-45290.0	76363.0	-65029.1	2.83	1.2	330.0
-45290.0	88925.7	-42569.3	2.43	1.4	340.0
-45290.0	97005.8	-20095.1	1.88	1.9	350.0



Coeficientes de seguridad de los pares de esfuerzos de cálculo

Punto	Mxd [kN·m]	Myd [kN·m]	γ
1	71890	41775	1.18

PRONTUARIO INFORMÁTICO DEL HORMIGÓN ESTRUCTURAL 3.0
Cátedra de Hormigón Estructural ETSICCPM - IECA

Obra: Viaducto río Francolí
Fecha: 05/06/02
Hora: 16:14:58

Cálculo de secciones a flexión compuesta esviada

1 Datos

- Materiales

Tipo de hormigón : HA-30
Tipo de acero : B-500-S
fck [MPa] = 30.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

Sección : FRANCOLI_P3

Contorno exterior

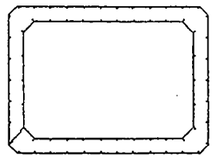
Vértice	X [m]	Y [m]	Lado	nº barras
1	0.000	0.250	1-2	2
2	0.250	0.000	2-3	12
3	5.250	0.000	3-4	2
4	5.500	0.250	4-5	7
5	5.500	3.750	5-6	2
6	5.250	4.000	6-7	12
7	0.250	4.000	7-8	2
8	0.000	3.750	8-1	7

Contorno interior

Vértice	X [m]	Y [m]	Lado	nº barras
1	0.400	0.700	1-2	2
2	0.700	0.400	2-3	10
3	4.800	0.400	3-4	2
4	5.100	0.700	4-5	5
5	5.100	3.300	5-6	2
6	4.800	3.600	6-7	10
7	0.700	3.600	7-8	2
8	0.400	3.300	8-1	5

Recubrimiento exterior [m] : 0.050

Recubrimiento interior [m] : 0.050



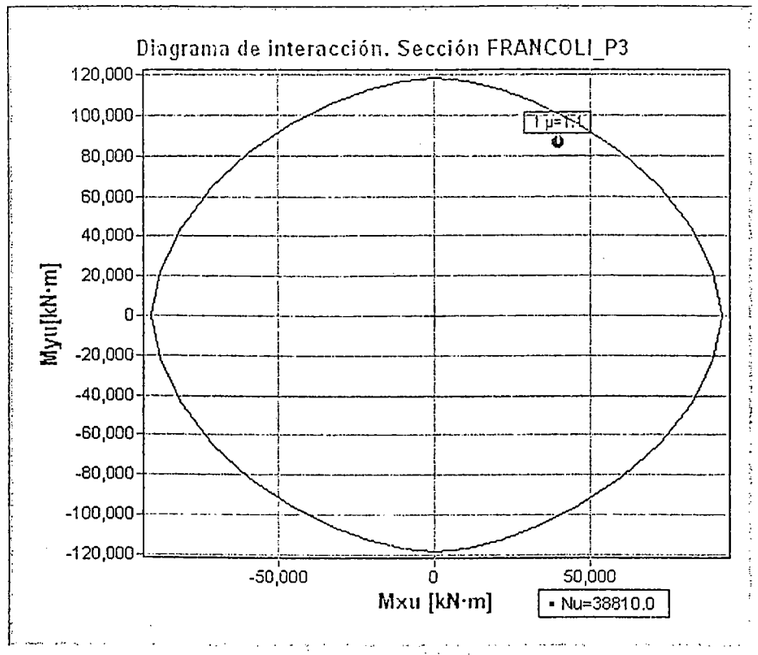
2 Diagrama

ϕ [mm] = 25

Resultados numéricos del diagrama de interacción

Nu [kN]	Mxu [kN·m]	Myu [kN·m]	x [cm]	1/r [1/m] ·1.E-3	β [°]
-38810.0	92960.7	-0.4	0.92	3.3	0.0
-38810.0	90028.5	22386.1	1.53	2.3	10.0
-38810.0	82802.4	44563.2	2.12	1.6	20.0
-38810.0	72077.5	64963.7	2.53	1.4	30.0
-38810.0	59758.6	81770.2	2.73	1.3	40.0
-38810.0	46319.2	95642.6	2.75	1.3	50.0
-38810.0	33048.5	106123.3	2.65	1.3	60.0
-38810.0	20888.4	113158.7	2.44	1.4	70.0
-38810.0	9992.2	117122.3	2.16	1.6	80.0
-38810.0	0.1	118680.0	1.82	1.9	90.0
-38810.0	-9992.2	117122.3	2.16	1.6	100.0
-38810.0	-20888.0	113158.8	2.44	1.4	110.0
-38810.0	-33045.9	106124.8	2.65	1.3	120.0
-38810.0	-46318.2	95643.4	2.75	1.3	130.0
-38810.0	-59758.6	81770.2	2.73	1.3	140.0
-38810.0	-72077.5	64963.7	2.53	1.4	150.0
-38810.0	-82802.4	44563.2	2.12	1.6	160.0
-38810.0	-90028.5	22386.1	1.53	2.3	170.0
-38810.0	-92960.7	-0.4	0.92	3.3	180.0
-38810.0	-90028.4	-22386.3	1.53	2.3	190.0
-38810.0	-82802.2	-44563.6	2.12	1.6	200.0
-38810.0	-72077.1	-64964.5	2.53	1.4	210.0
-38810.0	-59758.2	-81770.7	2.73	1.3	220.0
-38810.0	-46318.2	-95643.4	2.75	1.3	230.0
-38810.0	-33045.9	-106124.8	2.65	1.3	240.0
-38810.0	-20888.0	-113158.8	2.44	1.4	250.0
-38810.0	-9992.2	-117122.3	2.16	1.6	260.0
-38810.0	0.1	-118680.0	1.83	1.9	270.0
-38810.0	9992.2	-117122.3	2.16	1.6	280.0
-38810.0	20888.4	-113158.7	2.44	1.4	290.0
-38810.0	33048.5	-106123.3	2.65	1.3	300.0
-38810.0	46319.2	-95642.6	2.75	1.3	310.0
-38810.0	59758.2	-81770.7	2.73	1.3	320.0
-38810.0	72077.1	-64964.5	2.53	1.4	330.0

-38810.0	82802.2	-44563.6	2.12	1.6	340.0
-38810.0	90028.4	-22386.3	1.53	2.3	350.0



Coeficientes de seguridad de los pares de esfuerzos de cálculo

Punto	Mxd [kN·m]	Myd [kN·m]	γ
1	39465	86265	1.13

CARGAS POR PILOTE EN ROTURA
PILA 3

H51

	N_d (t)	$M_{x,d}$ (m·t)	$M_{z,d}$ (m·t)	M_d (m·t)
Pilote 1	898,93	33,56	137,68	141,71
Pilote 2	1533,63	78,99	152,36	171,62
Pilote 3	1436,45	140,34	144,78	201,63
Pilote 4	252,98	41,02	99,69	107,80
Pilote 5	796,5	78,99	72,75	107,39
Pilote 6	790,51	132,89	92,6	161,97

H52

	N_d (t)	$M_{x,d}$ (m·t)	$M_{z,d}$ (m·t)	M_d (m·t)
Pilote 1	1123,16	33,65	160,83	164,31
Pilote 2	1740,55	87,35	174,92	195,52
Pilote 3	1537,64	152,52	166,16	225,55
Pilote 4	326,98	42,9	116,4	124,05
Pilote 5	831,21	87,35	87,06	123,33
Pilote 6	741,46	143,28	111,07	181,29

H53

	N_d (t)	$M_{x,d}$ (m·t)	$M_{z,d}$ (m·t)	M_d (m·t)
Pilote 1	630,2	135,55	98,73	167,69
Pilote 2	1405,08	175,39	117,15	210,92
Pilote 3	1483,43	238,98	109,74	262,97
Pilote 4	189,43	140,63	65,09	154,96
Pilote 5	902,2	175,39	38,32	179,53
Pilote 6	1042,66	233,9	54,09	240,07

H2

	N_d (t)	$M_{x,d}$ (m·t)	$M_{z,d}$ (m·t)	M_d (m·t)
Pilote 1	733,86	25,55	77,38	81,49
Pilote 2	1148,34	65,39	90,38	111,55
Pilote 3	985,57	111,82	80,55	137,81
Pilote 4	420,66	29,14	43,03	51,97
Pilote 5	791,2	65,39	24,12	69,70
Pilote 6	672,37	108,22	39,85	115,32

H3

	N_d (t)	$M_{x,d}$ (m·t)	$M_{z,d}$ (m·t)	M_d (m·t)
Pilote 1	985,37	40,41	105,77	113,23
Pilote 2	1613,6	94,29	124,14	155,89
Pilote 3	1434,99	160,63	111,56	195,57
Pilote 4	517,52	45,83	59,45	75,06
Pilote 5	1079,38	94,29	32,14	99,62
Pilote 6	967,14	155,2	53,66	164,21

H4

	N_d (t)	$M_{x,d}$ (m·t)	$M_{z,d}$ (m·t)	M_d (m·t)
Pilote 1	817,79	45	116,86	125,22
Pilote 2	1500,61	89,63	133,67	160,94
Pilote 3	1450,39	153,09	125,22	197,78
Pilote 4	283,14	51,17	78,96	94,09
Pilote 5	890,34	89,63	51,99	103,62
Pilote 6	915,63	146,92	70,6	163,00

Obra: Ehe
Fecha: 10/06/02
Hora: 13:12:39

Cálculo de secciones a flexión compuesta recta

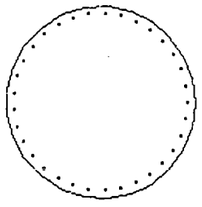
1 Datos

- Materiales

Tipo de hormigón : HA-25
Tipo de acero : B-500-S
fck [MPa] = 25.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

Sección : PILOTE
ϕ [m] = 1.80
r [m] = 0.075
nº barras = 33

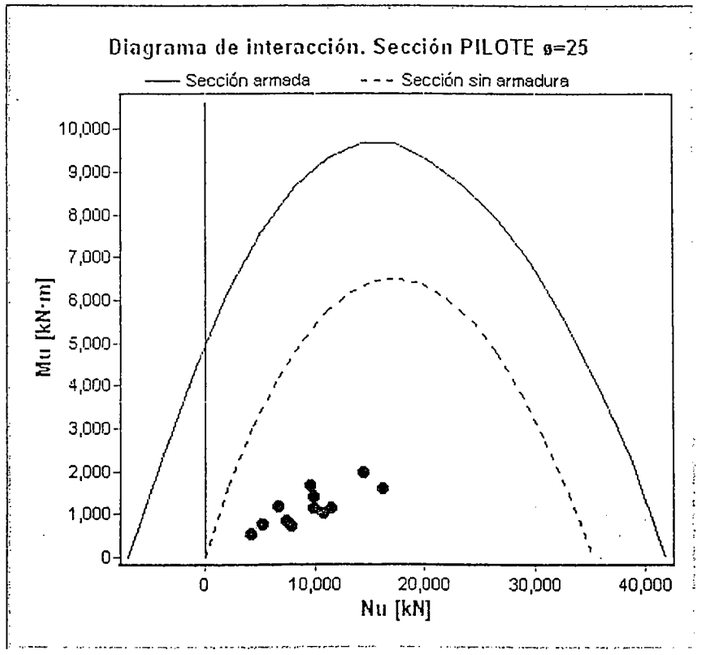


2 Diagrama

ϕ [mm] = 25

Resultados numéricos del diagrama de interacción

x [cm]	1/r [1/m] ·1.E-3	Nu [kN]	Mu [kN·m]
-9999.000	0.0	7043.0	0.0
0.194	6.5	3995.0	2295.8
0.328	7.2	947.1	4412.4
0.435	7.8	-2100.9	6244.4
0.562	6.2	-5148.8	7623.5
0.687	5.1	-8196.8	8646.6
0.809	4.3	-11244.7	9331.7
0.927	3.8	-14292.6	9680.0
1.041	3.4	-17340.6	9671.2
1.150	3.0	-20388.5	9271.9
1.265	2.8	-23436.5	8691.1
1.387	2.5	-26484.4	7912.0
1.519	2.3	-29532.4	6901.0
1.666	2.1	-32580.3	5635.2
1.857	1.8	-35628.3	4081.4
2.331	1.3	-38676.2	2313.2
9999.000	0.4	-41724.1	0.0



Coeficientes de seguridad de los pares de esfuerzos de cálculo

Punto	Nd [kN]	Md [kN·m]	γ
1	7339	815	4.88
2	11483	1116	3.19
3	9856	1378	3.49
4	4207	520	8.36
5	7912	697	4.70
6	6724	1153	4.86
7	9854	1132	3.61
8	16136	1559	2.27
9	14350	1956	2.41
10	5175	751	6.61
11	10794	996	3.42
12	9671	1642	3.39

Obra: Ehe
Fecha: 10/06/02
Hora: 13:13:05

Cálculo de secciones a flexión compuesta recta

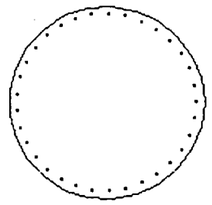
1 Datos

- Materiales

Tipo de hormigón : HA-25
Tipo de acero : B-500-S
fck [MPa] = 25.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

Sección : PILOTE
ϕ [m] = 1.80
r [m] = 0.075
nº barras = 33

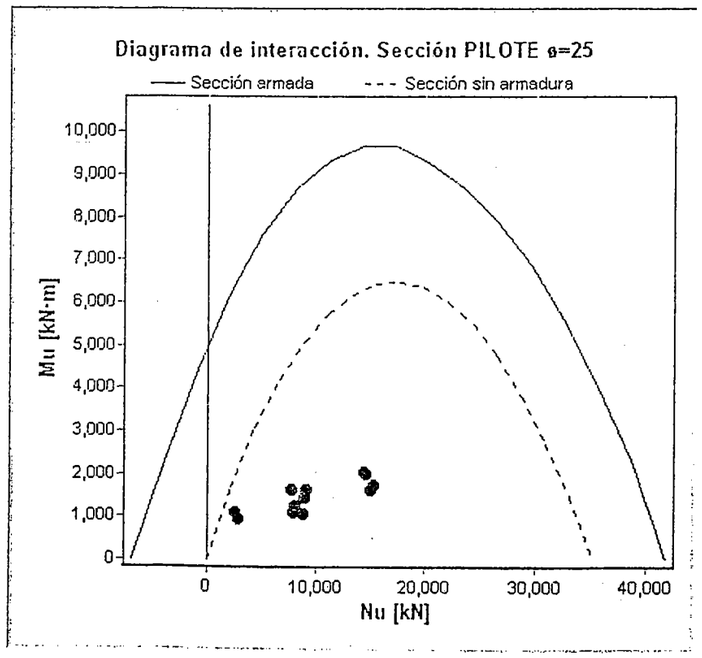


2 Diagrama

ϕ [mm] = 25

Resultados numéricos del diagrama de interacción

x [cm]	1/r [1/m] ·1.E-3	Nu [kN]	Mu [kN·m]
-9999.000	0.0	7043.0	0.0
0.194	6.5	3995.0	2295.8
0.328	7.2	947.1	4412.4
0.435	7.8	-2100.9	6244.4
0.562	6.2	-5148.8	7623.5
0.687	5.1	-8196.8	8646.6
0.809	4.3	-11244.7	9331.7
0.927	3.8	-14292.6	9680.0
1.041	3.4	-17340.6	9671.2
1.150	3.0	-20388.5	9271.9
1.265	2.8	-23436.5	8691.1
1.387	2.5	-26484.4	7912.0
1.519	2.3	-29532.4	6901.0
1.666	2.1	-32580.3	5635.2
1.857	1.8	-35628.3	4081.4
2.331	1.3	-38676.2	2313.2
9999.000	0.4	-41724.1	0.0



Punto	Nd [kN]	Md [kN·m]	γ
1	8178	1252	4.12
2	15006	1609	2.40
3	14504	1978	2.38
4	2831	941	8.88
5	8903	1036	3.99
6	9156	1630	3.53
7	8989	1417	3.72
8	15336	1716	2.33
9	14365	2016	2.39
10	2530	1078	8.47
11	7965	1074	4.35
12	7905	1620	3.94

Coeficientes de seguridad de los pares de esfuerzos de cálculo

Obra: Ehe
Fecha: 10/06/02
Hora: 13:13:20

Cálculo de secciones a flexión compuesta recta

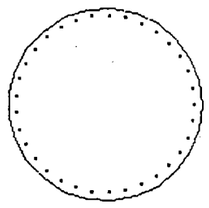
1 Datos

- Materiales

Tipo de hormigón : HA-25
Tipo de acero : B-500-S
fck [MPa] = 25.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

Sección : PILOTE
ϕ [m] = 1.80
r [m] = 0.075
nº barras = 33

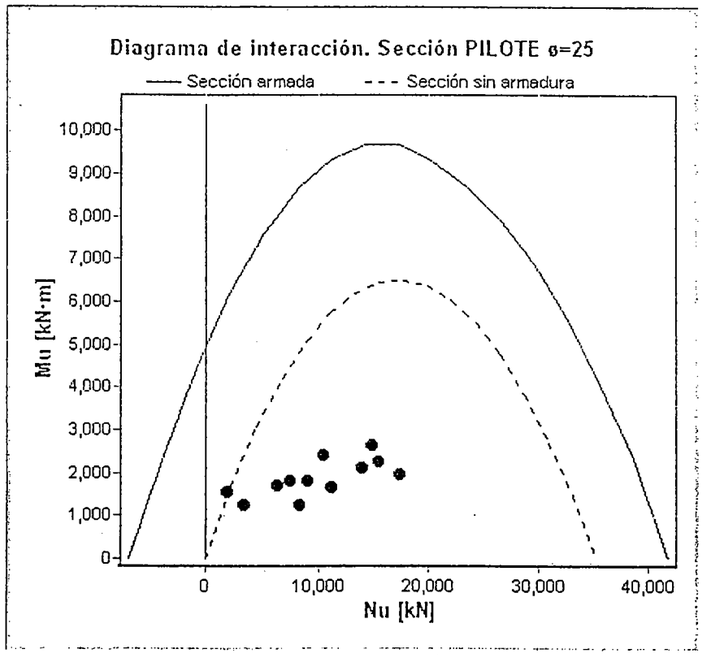


2 Diagrama

ϕ [mm] = 25

Resultados numéricos del diagrama de interacción

x [cm]	1/r [1/m] ·1.E-3	Nu [kN]	Mu [kN·m]
-9999.000	0.0	7043.0	0.0
0.194	6.5	3995.0	2295.8
0.328	7.2	947.1	4412.4
0.435	7.8	-2100.9	6244.4
0.562	6.2	-5148.8	7623.5
0.687	5.1	-8196.8	8646.6
0.809	4.3	-11244.7	9331.7
0.927	3.8	-14292.6	9680.0
1.041	3.4	-17340.6	9671.2
1.150	3.0	-20388.5	9271.9
1.265	2.8	-23436.5	8691.1
1.387	2.5	-26484.4	7912.0
1.519	2.3	-29532.4	6901.0
1.666	2.1	-32580.3	5635.2
1.857	1.8	-35628.3	4081.4
2.331	1.3	-38676.2	2313.2
9999.000	0.4	-41724.1	0.0



Coeficientes de seguridad de los pares de esfuerzos de cálculo

Punto	Nd [kN]	Md [kN·m]	γ
1	11232	1643	3.04
2	17406	1955	2.05
3	15376	2255	2.22
4	3270	1241	7.07
5	8312	1233	4.09
6	7415	1813	3.92
7	6302	1677	4.47
8	14051	2109	2.41
9	14834	2630	2.18
10	1894	1550	6.05
11	9022	1795	3.48
12	10427	2401	2.85


```
 ****************************************
 *                                      *
 *          S T A A D - III             *
 *          Revision 22.3               *
 *          Proprietary Program of      *
 *          Research Engineers, Inc.    *
 *          Date=    JUN 10, 2002       *
 *          Time=    12:45:45           *
 *                                      *
 *                                      *
 ****************************************
```

```
 1. STAAD SPACE 'ENCEPADO EN SERVICIO'
 2. UNIT METER MTON
 3. JOINT COORDINATES
 4.   1  0.00   0.00   0.00   3  0.00  0.00 11.40
 5.  REPEAT 2  3.20 0.00 0.00
 6.  10  0.00 -15.50  0.00  15  0.00 -5.50  0.00
 7.  20  0.00 -15.50  5.70  25  0.00 -5.50  5.70
 8.  30  0.00 -15.50 11.40  35  0.00 -5.50 11.40
 9.  70  6.40 -15.50  0.00  75  6.40 -5.50  0.00
10.  80  6.40 -15.50  5.70  85  6.40 -5.50  5.70
11.  90  6.40 -15.50 11.40  95  6.40 -5.50 11.40
12. MEMBER INCIDENCES
13. 101   1   2 102  1  1
14. REPEAT 2 2 3
15. 107   1   4 108  1  3
16. REPEAT 2 2 1
17.  10  10  11  14  1  1 ; 15  15  1
18.  20  20  21  24  1  1 ; 25  25  2
19.  30  30  31  34  1  1 ; 35  35  3
20.  70  70  71  74  1  1 ; 75  75  7
21.  80  80  81  84  1  1 ; 85  85  8
22.  90  90  91  94  1  1 ; 95  95  9
23. MEMBER PROPERTY PRISMATIC
24.  101 TO 102 105 TO 106 PRI YD 3.500 ZD 4.65
25.  103 TO 104           PRI YD 3.500 ZD 5.70
26.  107 TO 108 111 TO 112 PRI YD 3.500 ZD 5.00
27.  109 TO 110           PRI YD 3.500 ZD 5.00
28.   10 TO 15 20 TO 25    PRI YD 1.80
29.   30 TO 35 70 TO 75    PRI YD 1.80
30.   80 TO 85 90 TO 95    PRI YD 1.80
31. CONSTANT
32. E 2.64E6 ALL
33. POISSON .2 ALL
34. SUPPORT
35.  10 20              FIXED BUT     MX MY MZ  KFX 1670. KFZ 1670.
36.  11 TO 15 21 TO 25  FIXED BUT  FY MX MY MZ  KFX 1670. KFZ 1670.
37.  30 70              FIXED BUT     MX MY MZ  KFX 1670. KFZ 1670.
38.  31 TO 35 71 TO 75  FIXED BUT  FY MX MY MZ  KFX 1670. KFZ 1670.
39.  80 90              FIXED BUT     MX MY MZ  KFX 1670. KFZ 1670.
40.  81 TO 85 91 TO 95  FIXED BUT  FY MX MY MZ  KFX 1670. KFZ 1670.
41. LOAD 2
```



```
42. *CARGAS SOBRE ENCEPADO H2
43. JOINT LOAD
44.  5     FX -36. FY -2069. FZ 38.  MX 1693. MZ 1891.
45. *CARGAS DEL ENCEPADO
46.  5     FY -1312.5
47. LOAD 3
48. *CARGAS SOBRE ENCEPADO H3
49. JOINT LOAD
50.  5     FX -50. FY -3351. FZ 56.  MX 3073. MZ 2759.
51. *CARGAS DEL ENCEPADO
52.  5     FY -1312.5
53. LOAD 4
54. *CARGAS SOBRE ENCEPADO H4
55. JOINT LOAD
56.  5     FX -59. FY -2837. FZ 56.  MX 4505. MZ 3188.
57. *CARGAS DEL ENCEPADO
58.  5     FY -1312.5
59. LOAD 5
60. *CARGAS SOBRE ENCEPADO H51
61. JOINT LOAD
62.  5     FX -98. FY -2734. FZ 49.  MX 3826. MZ 5672.
63. *CARGAS DEL ENCEPADO
64.  5     FY -1312.5
65. LOAD 6
66. *CARGAS SOBRE ENCEPADO H52
67. JOINT LOAD
68.  5     FX -84. FY -3145. FZ 52.  MX 2838. MZ 4624.
69. *CARGAS DEL ENCEPADO
70.  5     FY -1312.5
71. LOAD 7
72. *CARGAS SOBRE ENCEPADO H10
73. JOINT LOAD
74.  5     FX -49. FY -2695. FZ 105. MX 5851. MZ 2633.
75. *CARGAS DEL ENCEPADO
76.  5     FY -1312.5
77. PERFORM ANALYSIS
```

```
    P R O B L E M   S T A T I S T I C S
    -----------------------------------

 NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS =    45/   48/   36
 ORIGINAL/FINAL BAND-WIDTH =   36/    5
 TOTAL PRIMARY LOAD CASES  =    6, TOTAL DEGREES OF FREEDOM =   264
 SIZE OF STIFFNESS MATRIX =    9504 DOUBLE PREC. WORDS
 REQRD/AVAIL. DISK SPACE =  12.13/ 2047.7 MB,  EXMEM = 1951.9 MB

++ Processing Element Stiffness Matrix.              12:45:45
++ Processing Global Stiffness Matrix.               12:45:45
++ Processing Triangular Factorization.              12:45:45
++ Calculating Joint Displacements.                  12:45:45
++ Calculating Member  Forces.                       12:45:45
```

```
78. PRINT ANALYSIS RESULTS
```

JOINT DISPLACEMENT (CM RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
1	2	-.2344	-.1200	.2083	.0001	.0000	.0000
	3	-.3294	-.1595	.3152	.0002	.0000	.0001
	4	-.3867	-.1333	.3356	.0002	.0000	.0001
	5	-.6534	-.1686	.2919	.0002	.0000	.0002
	6	-.5531	-.1793	.2924	.0002	.0000	.0001
	7	-.3207	-.1039	.5923	.0002	.0000	.0001
2	2	-.2346	-.1872	.2083	.0000	.0000	.0000
	3	-.3297	-.2602	.3153	.0001	.0000	.0000
	4	-.3871	-.2424	.3356	.0001	.0000	.0000
	5	-.6540	-.2735	.2920	.0001	.0000	.0002
	6	-.5536	-.2779	.2925	.0001	.0000	.0001
	7	-.3211	-.2275	.5924	.0001	.0000	.0000
3	2	-.2344	-.1599	.2083	-.0001	.0000	.0000
	3	-.3294	-.2300	.3152	-.0001	.0000	.0000
	4	-.3867	-.2325	.3356	-.0001	.0000	.0001
	5	-.6534	-.2531	.2921	-.0001	.0000	.0002
	6	-.5531	-.2444	.2925	-.0001	.0000	.0001
	7	-.3208	-.2378	.5923	.0000	.0000	.0000
4	2	-.2344	-.1079	.2085	.0002	.0000	.0001
	3	-.3294	-.1404	.3154	.0002	.0000	.0001
	4	-.3868	-.1048	.3358	.0002	.0000	.0001
	5	-.6535	-.1090	.2922	.0002	.0000	.0002
	6	-.5531	-.1354	.2927	.0002	.0000	.0002
	7	-.3208	-.0806	.5927	.0003	.0000	.0001
5	2	-.2347	-.1974	.2085	.0001	.0000	.0001
	3	-.3299	-.2722	.3156	.0001	.0000	.0002
	4	-.3873	-.2422	.3359	.0002	.0000	.0002
	5	-.6543	-.2362	.2923	.0001	.0000	.0003
	6	-.5539	-.2602	.2928	.0001	.0000	.0003
	7	-.3212	-.2339	.5929	.0002	.0000	.0002
6	2	-.2344	-.1515	.2084	-.0001	.0000	.0001
	3	-.3294	-.2174	.3154	-.0001	.0000	.0001
	4	-.3868	-.2135	.3358	-.0001	.0000	.0001
	5	-.6535	-.2015	.2921	-.0001	.0000	.0002
	6	-.5531	-.2066	.2926	-.0001	.0000	.0002
	7	-.3208	-.2269	.5926	.0000	.0000	.0001
7	2	-.2344	-.0709	.2084	.0001	.0000	.0001
	3	-.3294	-.0884	.3153	.0002	.0000	.0002
	4	-.3868	-.0508	.3357	.0002	.0000	.0002
	5	-.6534	-.0232	.2921	.0002	.0000	.0003
	6	-.5531	-.0600	.2926	.0002	.0000	.0003
	7	-.3208	-.0358	.5924	.0002	.0000	.0002
8	2	-.2346	-.1312	.2083	.0000	.0000	.0002
	3	-.3298	-.1790	.3153	.0001	.0000	.0002
	4	-.3872	-.1484	.3356	.0001	.0000	.0003
	5	-.6541	-.1075	.2920	.0001	.0000	.0004
	6	-.5537	-.1418	.2925	.0001	.0000	.0003
	7	-.3211	-.1498	.5924	.0001	.0000	.0002

JOINT DISPLACEMENT (CM RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
9	2	-.2344	-.1109	.2083	-.0001	.0000	.0001
	3	-.3294	-.1589	.3151	-.0001	.0000	.0002
	4	-.3867	-.1501	.3355	.0000	.0000	.0002
	5	-.6534	-.1077	.2919	.0000	.0000	.0003
	6	-.5531	-.1251	.2924	-.0001	.0000	.0003
	7	-.3207	-.1697	.5922	.0000	.0000	.0002
10	2	.0230	.0000	-.0449	.0002	.0000	.0002
	3	.0337	.0000	-.0666	.0002	.0000	.0003
	4	.0437	.0000	-.0698	.0002	.0000	.0003
	5	.0833	.0000	-.0648	.0002	.0000	.0005
	6	.0658	.0000	-.0637	.0002	.0000	.0004
	7	.0355	.0000	-.0917	.0005	.0000	.0003
11	2	-.0151	-.0155	-.0145	.0002	.0000	.0002
	3	-.0197	-.0206	-.0204	.0002	.0000	.0003
	4	-.0184	-.0172	-.0204	.0002	.0000	.0003
	5	-.0202	-.0218	-.0224	.0002	.0000	.0005
	6	-.0225	-.0231	-.0210	.0002	.0000	.0004
	7	-.0161	-.0134	-.0001	.0005	.0000	.0003
12	2	-.0534	-.0310	.0164	.0002	.0000	.0002
	3	-.0734	-.0412	.0265	.0002	.0000	.0003
	4	-.0809	-.0344	.0297	.0003	.0000	.0003
	5	-.1246	-.0435	.0206	.0002	.0000	.0005
	6	-.1114	-.0463	.0222	.0002	.0000	.0004
	7	-.0680	-.0268	.0924	.0005	.0000	.0003
13	2	-.0920	-.0465	.0483	.0002	.0000	.0002
	3	-.1275	-.0618	.0749	.0002	.0000	.0003
	4	-.1440	-.0516	.0813	.0003	.0000	.0003
	5	-.2303	-.0653	.0651	.0002	.0000	.0005
	6	-.2014	-.0694	.0669	.0002	.0000	.0005
	7	-.1204	-.0402	.1867	.0005	.0000	.0003
14	2	-.1305	-.0619	.0816	.0002	.0000	.0002
	3	-.1814	-.0823	.1254	.0003	.0000	.0003
	4	-.2072	-.0688	.1351	.0003	.0000	.0003
	5	-.3368	-.0870	.1118	.0002	.0000	.0005
	6	-.2917	-.0925	.1137	.0002	.0000	.0004
	7	-.1729	-.0536	.2826	.0005	.0000	.0003
15	2	-.1673	-.0774	.1163	.0002	.0000	.0002
	3	-.2333	-.1029	.1778	.0003	.0000	.0002
	4	-.2685	-.0860	.1908	.0003	.0000	.0003
	5	-.4410	-.1088	.1605	.0002	.0000	.0005
	6	-.3796	-.1156	.1624	.0002	.0000	.0004
	7	-.2237	-.0670	.3784	.0005	.0000	.0002
20	2	.0158	.0000	-.0227	.0002	.0000	.0002
	3	.0235	.0000	-.0367	.0003	.0000	.0003
	4	.0344	.0000	-.0449	.0003	.0000	.0003
	5	.0767	.0000	-.0386	.0002	.0000	.0005
	6	.0578	.0000	-.0340	.0002	.0000	.0004
	7	.0253	.0000	-.0693	.0005	.0000	.0003

JOINT DISPLACEMENT (CM RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
21	2	-.0234	-.0242	.0109	.0002	.0000	.0002
	3	-.0314	-.0336	.0138	.0003	.0000	.0003
	4	-.0291	-.0313	.0080	.0003	.0000	.0003
	5	-.0279	-.0353	.0075	.0002	.0000	.0005
	6	-.0317	-.0359	.0128	.0002	.0000	.0004
	7	-.0277	-.0294	.0254	.0005	.0000	.0003
22	2	-.0627	-.0483	.0447	.0002	.0000	.0002
	3	-.0865	-.0671	.0646	.0003	.0000	.0003
	4	-.0928	-.0626	.0613	.0003	.0000	.0003
	5	-.1332	-.0706	.0539	.0002	.0000	.0005
	6	-.1218	-.0717	.0600	.0002	.0000	.0005
	7	-.0810	-.0587	.1208	.0005	.0000	.0003
23	2	-.1021	-.0725	.0788	.0002	.0000	.0002
	3	-.1416	-.1007	.1159	.0003	.0000	.0003
	4	-.1569	-.0938	.1155	.0003	.0000	.0003
	5	-.2397	-.1059	.1011	.0002	.0000	.0005
	6	-.2127	-.1076	.1076	.0002	.0000	.0005
	7	-.1345	-.0881	.2173	.0005	.0000	.0003
24	2	-.1408	-.0966	.1129	.0002	.0000	.0002
	3	-.1960	-.1343	.1674	.0003	.0000	.0003
	4	-.2205	-.1251	.1701	.0003	.0000	.0003
	5	-.3465	-.1412	.1486	.0002	.0000	.0005
	6	-.3033	-.1434	.1554	.0002	.0000	.0004
	7	-.1874	-.1174	.3140	.0005	.0000	.0003
25	2	-.1771	-.1208	.1458	.0002	.0000	.0002
	3	-.2472	-.1679	.2174	.0002	.0000	.0002
	4	-.2811	-.1564	.2238	.0003	.0000	.0003
	5	-.4503	-.1765	.1953	.0002	.0000	.0005
	6	-.3907	-.1793	.2018	.0002	.0000	.0004
	7	-.2374	-.1468	.4081	.0005	.0000	.0002
30	2	.0213	.0000	.0031	.0002	.0000	.0002
	3	.0306	.0000	-.0002	.0003	.0000	.0003
	4	.0393	.0000	-.0099	.0003	.0000	.0003
	5	.0795	.0000	-.0039	.0003	.0000	.0005
	6	.0630	.0000	.0018	.0003	.0000	.0004
	7	.0296	.0000	-.0343	.0005	.0000	.0003
31	2	-.0171	-.0206	.0403	.0002	.0000	.0002
	3	-.0232	-.0297	.0554	.0003	.0000	.0003
	4	-.0234	-.0300	.0479	.0003	.0000	.0003
	5	-.0245	-.0327	.0471	.0003	.0000	.0005
	6	-.0257	-.0315	.0537	.0003	.0000	.0004
	7	-.0228	-.0307	.0653	.0005	.0000	.0003
32	2	-.0556	-.0413	.0775	.0002	.0000	.0002
	3	-.0773	-.0594	.1110	.0003	.0000	.0003
	4	-.0865	-.0600	.1057	.0003	.0000	.0003
	5	-.1294	-.0653	.0981	.0003	.0000	.0005
	6	-.1151	-.0631	.1055	.0003	.0000	.0004
	7	-.0755	-.0614	.1653	.0005	.0000	.0003

JOINT DISPLACEMENT (CM RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
33	2	-.0944	-.0619	.1141	.0002	.0000	.0002
	3	-.1317	-.0890	.1659	.0003	.0000	.0003
	4	-.1501	-.0900	.1633	.0003	.0000	.0003
	5	-.2355	-.0980	.1486	.0002	.0000	.0005
	6	-.2053	-.0946	.1567	.0003	.0000	.0005
	7	-.1285	-.0921	.2652	.0005	.0000	.0003
34	2	-.1329	-.0826	.1491	.0002	.0000	.0002
	3	-.1858	-.1187	.2186	.0003	.0000	.0003
	4	-.2134	-.1200	.2191	.0003	.0000	.0003
	5	-.3421	-.1306	.1973	.0002	.0000	.0005
	6	-.2957	-.1261	.2057	.0002	.0000	.0004
	7	-.1811	-.1228	.3631	.0005	.0000	.0003
35	2	-.1696	-.1032	.1800	.0001	.0000	.0002
	3	-.2374	-.1484	.2658	.0002	.0000	.0002
	4	-.2744	-.1500	.2701	.0002	.0000	.0003
	5	-.4461	-.1633	.2413	.0002	.0000	.0005
	6	-.3834	-.1577	.2493	.0002	.0000	.0004
	7	-.2314	-.1534	.4544	.0004	.0000	.0002
70	2	.0422	.0000	-.0430	.0002	.0000	.0002
	3	.0595	.0000	-.0638	.0002	.0000	.0002
	4	.0650	.0000	-.0666	.0002	.0000	.0003
	5	.1046	.0000	-.0591	.0002	.0000	.0005
	6	.0906	.0000	-.0591	.0002	.0000	.0004
	7	.0545	.0000	-.0890	.0005	.0000	.0002
71	2	.0068	-.0092	-.0123	.0002	.0000	.0002
	3	.0098	-.0114	-.0172	.0002	.0000	.0003
	4	.0059	-.0066	-.0167	.0003	.0000	.0003
	5	.0040	-.0030	-.0159	.0002	.0000	.0005
	6	.0058	-.0077	-.0157	.0002	.0000	.0004
	7	.0055	-.0046	.0029	.0005	.0000	.0002
72	2	-.0290	-.0183	.0188	.0002	.0000	.0002
	3	-.0406	-.0228	.0301	.0002	.0000	.0003
	4	-.0539	-.0131	.0338	.0003	.0000	.0003
	5	-.0975	-.0060	.0279	.0002	.0000	.0005
	6	-.0800	-.0155	.0282	.0002	.0000	.0004
	7	-.0439	-.0092	.0958	.0005	.0000	.0003
73	2	-.0657	-.0275	.0509	.0002	.0000	.0002
	3	-.0921	-.0342	.0788	.0002	.0000	.0003
	4	-.1149	-.0197	.0857	.0003	.0000	.0003
	5	-.2012	-.0090	.0730	.0002	.0000	.0005
	6	-.1675	-.0232	.0734	.0002	.0000	.0004
	7	-.0945	-.0139	.1903	.0005	.0000	.0003
74	2	-.1035	-.0366	.0843	.0002	.0000	.0002
	3	-.1452	-.0456	.1293	.0003	.0000	.0003
	4	-.1774	-.0262	.1396	.0003	.0000	.0003
	5	-.3069	-.0120	.1199	.0002	.0000	.0005
	6	-.2569	-.0310	.1203	.0002	.0000	.0004
	7	-.1463	-.0185	.2864	.0005	.0000	.0003

JOINT DISPLACEMENT (CM RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
75	2	-.1419	-.0458	.1189	.0002	.0000	.0002
	3	-.1992	-.0570	.1815	.0003	.0000	.0003
	4	-.2403	-.0328	.1951	.0003	.0000	.0003
	5	-.4129	-.0150	.1682	.0002	.0000	.0005
	6	-.3468	-.0387	.1687	.0002	.0000	.0004
	7	-.1986	-.0231	.3820	.0005	.0000	.0003
80	2	.0528	.0000	-.0227	.0002	.0000	.0002
	3	.0745	.0000	-.0367	.0003	.0000	.0002
	4	.0798	.0000	-.0449	.0003	.0000	.0003
	5	.1210	.0000	-.0386	.0002	.0000	.0005
	6	.1066	.0000	-.0340	.0002	.0000	.0004
	7	.0692	.0000	-.0693	.0005	.0000	.0002
81	2	.0188	-.0169	.0109	.0002	.0000	.0002
	3	.0268	-.0231	.0138	.0003	.0000	.0002
	4	.0227	-.0191	.0080	.0003	.0000	.0003
	5	.0226	-.0139	.0075	.0002	.0000	.0005
	6	.0239	-.0183	.0128	.0002	.0000	.0004
	7	.0223	-.0193	.0254	.0005	.0000	.0002
82	2	-.0157	-.0339	.0447	.0002	.0000	.0002
	3	-.0216	-.0462	.0646	.0003	.0000	.0002
	4	-.0352	-.0383	.0613	.0003	.0000	.0003
	5	-.0769	-.0277	.0539	.0002	.0000	.0005
	6	-.0599	-.0366	.0600	.0002	.0000	.0004
	7	-.0253	-.0387	.1208	.0005	.0000	.0002
83	2	-.0514	-.0508	.0788	.0002	.0000	.0002
	3	-.0718	-.0693	.1159	.0003	.0000	.0003
	4	-.0948	-.0574	.1155	.0003	.0000	.0003
	5	-.1791	-.0416	.1011	.0002	.0000	.0005
	6	-.1459	-.0549	.1076	.0002	.0000	.0004
	7	-.0745	-.0580	.2173	.0005	.0000	.0003
84	2	-.0889	-.0677	.1129	.0002	.0000	.0002
	3	-.1244	-.0924	.1674	.0003	.0000	.0003
	4	-.1569	-.0766	.1701	.0003	.0000	.0003
	5	-.2844	-.0555	.1486	.0002	.0000	.0005
	6	-.2349	-.0732	.1554	.0002	.0000	.0005
	7	-.1259	-.0773	.3140	.0005	.0000	.0003
85	2	-.1281	-.0847	.1458	.0002	.0000	.0002
	3	-.1796	-.1155	.2174	.0002	.0000	.0003
	4	-.2210	-.0957	.2238	.0003	.0000	.0003
	5	-.3917	-.0694	.1953	.0002	.0000	.0005
	6	-.3261	-.0915	.2018	.0002	.0000	.0005
	7	-.1793	-.0967	.4081	.0005	.0000	.0003
90	2	.0440	.0000	.0013	.0002	.0000	.0002
	3	.0626	.0000	-.0029	.0003	.0000	.0002
	4	.0694	.0000	-.0131	.0003	.0000	.0003
	5	.1084	.0000	-.0096	.0003	.0000	.0005
	6	.0934	.0000	-.0028	.0003	.0000	.0004
	7	.0603	.0000	-.0370	.0005	.0000	.0002

JOINT DISPLACEMENT (CM RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
91	2	.0088	-.0143	.0382	.0002	.0000	.0002
	3	.0133	-.0205	.0522	.0003	.0000	.0002
	4	.0110	-.0194	.0442	.0003	.0000	.0003
	5	.0084	-.0139	.0406	.0003	.0000	.0005
	6	.0090	-.0161	.0484	.0003	.0000	.0004
	7	.0122	-.0219	.0623	.0005	.0000	.0002
92	2	-.0268	-.0286	.0750	.0002	.0000	.0002
	3	-.0366	-.0410	.1074	.0003	.0000	.0003
	4	-.0482	-.0387	.1016	.0003	.0000	.0003
	5	-.0927	-.0278	.0908	.0003	.0000	.0005
	6	-.0764	-.0323	.0995	.0003	.0000	.0004
	7	-.0365	-.0438	.1619	.0005	.0000	.0002
93	2	-.0634	-.0429	.1115	.0002	.0000	.0002
	3	-.0879	-.0615	.1621	.0003	.0000	.0003
	4	-.1088	-.0581	.1589	.0003	.0000	.0003
	5	-.1960	-.0417	.1407	.0002	.0000	.0005
	6	-.1636	-.0484	.1503	.0002	.0000	.0004
	7	-.0865	-.0657	.2615	.0005	.0000	.0003
94	2	-.1011	-.0572	.1464	.0002	.0000	.0002
	3	-.1409	-.0820	.2147	.0003	.0000	.0003
	4	-.1711	-.0774	.2145	.0003	.0000	.0003
	5	-.3016	-.0556	.1892	.0002	.0000	.0005
	6	-.2529	-.0646	.1991	.0002	.0000	.0004
	7	-.1381	-.0876	.3593	.0005	.0000	.0003
95	2	-.1396	-.0715	.1774	.0001	.0000	.0002
	3	-.1951	-.1025	.2621	.0002	.0000	.0003
	4	-.2344	-.0968	.2658	.0002	.0000	.0003
	5	-.4078	-.0695	.2337	.0002	.0000	.0005
	6	-.3430	-.0807	.2430	.0002	.0000	.0004
	7	-.1908	-.1095	.4509	.0004	.0000	.0003

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
10	2	-.38	520.16	.75	.00	.00	.00
	3	-.56	691.51	1.11	.00	.00	.00
	4	-.73	577.57	1.17	.00	.00	.00
	5	-1.39	730.69	1.08	.00	.00	.00
	6	-1.10	776.92	1.06	.00	.00	.00
	7	-.59	450.41	1.53	.00	.00	.00
20	2	-.26	811.34	.38	.00	.00	.00
	3	-.39	1127.62	.61	.00	.00	.00
	4	-.57	1050.56	.75	.00	.00	.00
	5	-1.28	1185.52	.64	.00	.00	.00
	6	-.97	1204.57	.57	.00	.00	.00
	7	-.42	986.22	1.16	.00	.00	.00
11	2	.25	.00	.24	.00	.00	.00
	3	.33	.00	.34	.00	.00	.00
	4	.31	.00	.34	.00	.00	.00
	5	.34	.00	.37	.00	.00	.00
	6	.38	.00	.35	.00	.00	.00
	7	.27	.00	.00	.00	.00	.00
12	2	.89	.00	-.27	.00	.00	.00
	3	1.22	.00	-.44	.00	.00	.00
	4	1.35	.00	-.50	.00	.00	.00
	5	2.08	.00	-.34	.00	.00	.00
	6	1.86	.00	-.37	.00	.00	.00
	7	1.14	.00	-1.54	.00	.00	.00
13	2	1.54	.00	-.81	.00	.00	.00
	3	2.13	.00	-1.25	.00	.00	.00
	4	2.40	.00	-1.36	.00	.00	.00
	5	3.85	.00	-1.09	.00	.00	.00
	6	3.36	.00	-1.12	.00	.00	.00
	7	2.01	.00	-3.12	.00	.00	.00
14	2	2.18	.00	-1.36	.00	.00	.00
	3	3.03	.00	-2.09	.00	.00	.00
	4	3.46	.00	-2.26	.00	.00	.00
	5	5.62	.00	-1.87	.00	.00	.00
	6	4.87	.00	-1.90	.00	.00	.00
	7	2.89	.00	-4.72	.00	.00	.00
15	2	2.79	.00	-1.94	.00	.00	.00
	3	3.90	.00	-2.97	.00	.00	.00
	4	4.48	.00	-3.19	.00	.00	.00
	5	7.37	.00	-2.68	.00	.00	.00
	6	6.34	.00	-2.71	.00	.00	.00
	7	3.74	.00	-6.32	.00	.00	.00
21	2	.39	.00	-.18	.00	.00	.00
	3	.52	.00	-.23	.00	.00	.00
	4	.49	.00	-.13	.00	.00	.00
	5	.47	.00	-.12	.00	.00	.00
	6	.53	.00	-.21	.00	.00	.00
	7	.46	.00	-.42	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
22	2	1.05	.00	-.75	.00	.00	.00
	3	1.44	.00	-1.08	.00	.00	.00
	4	1.55	.00	-1.02	.00	.00	.00
	5	2.22	.00	-.90	.00	.00	.00
	6	2.03	.00	-1.00	.00	.00	.00
	7	1.35	.00	-2.02	.00	.00	.00
23	2	1.70	.00	-1.32	.00	.00	.00
	3	2.37	.00	-1.94	.00	.00	.00
	4	2.62	.00	-1.93	.00	.00	.00
	5	4.00	.00	-1.69	.00	.00	.00
	6	3.55	.00	-1.80	.00	.00	.00
	7	2.25	.00	-3.63	.00	.00	.00
24	2	2.35	.00	-1.88	.00	.00	.00
	3	3.27	.00	-2.80	.00	.00	.00
	4	3.68	.00	-2.84	.00	.00	.00
	5	5.79	.00	-2.48	.00	.00	.00
	6	5.07	.00	-2.60	.00	.00	.00
	7	3.13	.00	-5.24	.00	.00	.00
25	2	2.96	.00	-2.43	.00	.00	.00
	3	4.13	.00	-3.63	.00	.00	.00
	4	4.70	.00	-3.74	.00	.00	.00
	5	7.52	.00	-3.26	.00	.00	.00
	6	6.52	.00	-3.37	.00	.00	.00
	7	3.96	.00	-6.82	.00	.00	.00
30	2	-.36	693.25	-.05	.00	.00	.00
	3	-.51	996.93	.00	.00	.00	.00
	4	-.66	1007.69	.17	.00	.00	.00
	5	-1.33	1096.96	.07	.00	.00	.00
	6	-1.05	1059.18	-.03	.00	.00	.00
	7	-.50	1030.84	.57	.00	.00	.00
70	2	-.71	307.42	.72	.00	.00	.00
	3	-.99	383.12	1.07	.00	.00	.00
	4	-1.08	220.25	1.11	.00	.00	.00
	5	-1.75	100.50	.99	.00	.00	.00
	6	-1.51	259.91	.99	.00	.00	.00
	7	-.91	155.08	1.49	.00	.00	.00
31	2	.28	.00	-.67	.00	.00	.00
	3	.39	.00	-.93	.00	.00	.00
	4	.39	.00	-.80	.00	.00	.00
	5	.41	.00	-.79	.00	.00	.00
	6	.43	.00	-.90	.00	.00	.00
	7	.38	.00	-1.09	.00	.00	.00
32	2	.93	.00	-1.29	.00	.00	.00
	3	1.29	.00	-1.85	.00	.00	.00
	4	1.44	.00	-1.77	.00	.00	.00
	5	2.16	.00	-1.64	.00	.00	.00
	6	1.92	.00	-1.76	.00	.00	.00
	7	1.26	.00	-2.76	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
33	2	1.58	.00	-1.91	.00	.00	.00
	3	2.20	.00	-2.77	.00	.00	.00
	4	2.51	.00	-2.73	.00	.00	.00
	5	3.93	.00	-2.48	.00	.00	.00
	6	3.43	.00	-2.62	.00	.00	.00
	7	2.15	.00	-4.43	.00	.00	.00
34	2	2.22	.00	-2.49	.00	.00	.00
	3	3.10	.00	-3.65	.00	.00	.00
	4	3.56	.00	-3.66	.00	.00	.00
	5	5.71	.00	-3.30	.00	.00	.00
	6	4.94	.00	-3.43	.00	.00	.00
	7	3.02	.00	-6.06	.00	.00	.00
35	2	2.83	.00	-3.01	.00	.00	.00
	3	3.97	.00	-4.44	.00	.00	.00
	4	4.58	.00	-4.51	.00	.00	.00
	5	7.45	.00	-4.03	.00	.00	.00
	6	6.40	.00	-4.16	.00	.00	.00
	7	3.87	.00	-7.59	.00	.00	.00
71	2	-.11	.00	.21	.00	.00	.00
	3	-.16	.00	.29	.00	.00	.00
	4	-.10	.00	.28	.00	.00	.00
	5	-.07	.00	.27	.00	.00	.00
	6	-.10	.00	.26	.00	.00	.00
	7	-.09	.00	-.05	.00	.00	.00
72	2	.48	.00	-.31	.00	.00	.00
	3	.68	.00	-.50	.00	.00	.00
	4	.90	.00	-.56	.00	.00	.00
	5	1.63	.00	-.47	.00	.00	.00
	6	1.34	.00	-.47	.00	.00	.00
	7	.73	.00	-1.60	.00	.00	.00
73	2	1.10	.00	-.85	.00	.00	.00
	3	1.54	.00	-1.32	.00	.00	.00
	4	1.92	.00	-1.43	.00	.00	.00
	5	3.36	.00	-1.22	.00	.00	.00
	6	2.80	.00	-1.23	.00	.00	.00
	7	1.58	.00	-3.18	.00	.00	.00
74	2	1.73	.00	-1.41	.00	.00	.00
	3	2.43	.00	-2.16	.00	.00	.00
	4	2.96	.00	-2.33	.00	.00	.00
	5	5.13	.00	-2.00	.00	.00	.00
	6	4.29	.00	-2.01	.00	.00	.00
	7	2.44	.00	-4.78	.00	.00	.00
75	2	2.37	.00	-1.99	.00	.00	.00
	3	3.33	.00	-3.03	.00	.00	.00
	4	4.01	.00	-3.26	.00	.00	.00
	5	6.89	.00	-2.81	.00	.00	.00
	6	5.79	.00	-2.82	.00	.00	.00
	7	3.32	.00	-6.38	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
80	2	-.88	568.83	.38	.00	.00	.00
	3	-1.24	775.80	.61	.00	.00	.00
	4	-1.33	643.06	.75	.00	.00	.00
	5	-2.02	466.06	.64	.00	.00	.00
	6	-1.78	614.77	.57	.00	.00	.00
	7	-1.16	649.45	1.16	.00	.00	.00
90	2	-.73	480.51	-.02	.00	.00	.00
	3	-1.05	688.54	.05	.00	.00	.00
	4	-1.16	650.37	.22	.00	.00	.00
	5	-1.81	466.77	.16	.00	.00	.00
	6	-1.56	542.16	.05	.00	.00	.00
	7	-1.01	735.51	.62	.00	.00	.00
81	2	-.31	.00	-.18	.00	.00	.00
	3	-.45	.00	-.23	.00	.00	.00
	4	-.38	.00	-.13	.00	.00	.00
	5	-.38	.00	-.12	.00	.00	.00
	6	-.40	.00	-.21	.00	.00	.00
	7	-.37	.00	-.42	.00	.00	.00
82	2	.26	.00	-.75	.00	.00	.00
	3	.36	.00	-1.08	.00	.00	.00
	4	.59	.00	-1.02	.00	.00	.00
	5	1.28	.00	-.90	.00	.00	.00
	6	1.00	.00	-1.00	.00	.00	.00
	7	.42	.00	-2.02	.00	.00	.00
83	2	.86	.00	-1.32	.00	.00	.00
	3	1.20	.00	-1.94	.00	.00	.00
	4	1.58	.00	-1.93	.00	.00	.00
	5	2.99	.00	-1.69	.00	.00	.00
	6	2.44	.00	-1.80	.00	.00	.00
	7	1.24	.00	-3.63	.00	.00	.00
84	2	1.48	.00	-1.88	.00	.00	.00
	3	2.08	.00	-2.80	.00	.00	.00
	4	2.62	.00	-2.84	.00	.00	.00
	5	4.75	.00	-2.48	.00	.00	.00
	6	3.92	.00	-2.60	.00	.00	.00
	7	2.10	.00	-5.24	.00	.00	.00
85	2	2.14	.00	-2.43	.00	.00	.00
	3	3.00	.00	-3.63	.00	.00	.00
	4	3.69	.00	-3.74	.00	.00	.00
	5	6.54	.00	-3.26	.00	.00	.00
	6	5.45	.00	-3.37	.00	.00	.00
	7	2.99	.00	-6.82	.00	.00	.00
91	2	-.15	.00	-.64	.00	.00	.00
	3	-.22	.00	-.87	.00	.00	.00
	4	-.18	.00	-.74	.00	.00	.00
	5	-.14	.00	-.68	.00	.00	.00
	6	-.15	.00	-.81	.00	.00	.00
	7	-.20	.00	-1.04	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
92	2	.45	.00	-1.25	.00	.00	.00
	3	.61	.00	-1.79	.00	.00	.00
	4	.80	.00	-1.70	.00	.00	.00
	5	1.55	.00	-1.52	.00	.00	.00
	6	1.28	.00	-1.66	.00	.00	.00
	7	.61	.00	-2.70	.00	.00	.00
93	2	1.06	.00	-1.86	.00	.00	.00
	3	1.47	.00	-2.71	.00	.00	.00
	4	1.82	.00	-2.65	.00	.00	.00
	5	3.27	.00	-2.35	.00	.00	.00
	6	2.73	.00	-2.51	.00	.00	.00
	7	1.44	.00	-4.37	.00	.00	.00
94	2	1.69	.00	-2.44	.00	.00	.00
	3	2.35	.00	-3.59	.00	.00	.00
	4	2.86	.00	-3.58	.00	.00	.00
	5	5.04	.00	-3.16	.00	.00	.00
	6	4.22	.00	-3.32	.00	.00	.00
	7	2.31	.00	-6.00	.00	.00	.00
95	2	2.33	.00	-2.96	.00	.00	.00
	3	3.26	.00	-4.38	.00	.00	.00
	4	3.91	.00	-4.44	.00	.00	.00
	5	6.81	.00	-3.90	.00	.00	.00
	6	5.73	.00	-4.06	.00	.00	.00
	7	3.19	.00	-7.53	.00	.00	.00

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
101	2	1	-2.06	204.27	-1.56	222.37	1.20	-199.69
		2	2.06	-204.27	1.56	-222.37	7.71	1364.02
	3	1	-3.04	273.25	-2.05	313.71	1.34	-272.05
		2	3.04	-273.25	2.05	-313.71	10.32	1829.60
	4	1	-4.15	229.96	-2.81	286.22	2.44	-219.76
		2	4.15	-229.96	2.81	-286.22	13.56	1530.53
	5	1	-7.00	278.07	-6.41	203.28	8.25	-128.53
		2	7.00	-278.07	6.41	-203.28	28.32	1713.50
	6	1	-5.70	297.47	-5.10	246.18	6.16	-195.39
		2	5.70	-297.47	5.10	-246.18	22.91	1890.97
	7	1	-5.32	179.87	-.02	311.87	-3.77	-273.18
		2	5.32	-179.87	.02	-311.87	3.91	1298.42
102	2	2	.88	-271.42	4.56	-170.01	-17.20	-1680.35
		3	-.88	271.42	-4.56	170.01	-8.81	133.27
	3	2	1.36	-388.02	6.47	-219.50	-24.30	-2389.22
		3	-1.36	388.02	-6.47	219.50	-12.58	177.50
	4	2	.37	-383.90	7.24	-149.73	-27.55	-2321.67
		3	-.37	383.90	-7.24	149.73	-13.73	133.46
	5	2	-3.06	-409.59	10.30	-87.27	-40.57	-2387.02
		3	3.06	409.59	-10.30	87.27	-18.13	52.35
	6	2	-1.63	-403.61	9.21	-159.15	-35.89	-2408.11
		3	1.63	403.61	-9.21	159.15	-16.59	107.51
	7	2	2.93	-397.49	8.32	-132.58	-30.12	-2362.12
		3	-2.93	397.49	-8.32	132.58	-17.30	96.41
103	2	4	-8.59	484.73	-6.00	-287.75	9.60	483.97
		5	8.59	-484.73	6.00	287.75	24.58	2279.00
	3	4	-12.79	623.96	-8.33	-419.84	13.35	662.24
		5	12.79	-623.96	8.33	419.84	34.16	2894.33
	4	4	-13.00	448.64	-9.83	-485.12	15.73	578.09
		5	13.00	-448.64	9.83	485.12	40.29	1979.15
	5	4	-11.22	472.09	-16.33	-863.11	26.16	569.34
		5	11.22	-472.09	16.33	863.11	66.94	2121.59
	6	4	-11.83	602.52	-14.00	-703.63	22.41	634.26
		5	11.83	-602.52	14.00	703.63	57.37	2800.09
	7	4	-25.78	337.22	-8.17	-400.66	13.07	523.47
		5	25.78	-337.22	8.17	400.66	33.46	1398.70
104	2	5	11.14	-696.62	6.00	287.75	-24.58	-3429.75
		6	-11.14	696.62	-6.00	-287.75	-9.60	-540.97
	3	5	16.31	-1005.27	8.33	419.84	-34.15	-4978.73
		6	-16.31	1005.27	-8.33	-419.84	-13.35	-751.28
	4	5	16.13	-1001.01	9.83	485.12	-40.30	-5026.16
		6	-16.13	1001.01	-9.83	-485.12	-15.75	-679.63

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	5	5	14.27	-941.58	16.34	863.11	-66.96	-4709.83
		6	-14.27	941.58	-16.34	-863.11	-26.19	-657.17
	6	5	15.19	-954.74	14.00	703.63	-57.27	-4725.19
		6	-15.19	954.74	-14.00	-703.63	-22.41	-716.81
	7	5	28.79	-1062.82	8.16	400.66	-33.46	-5366.88
		6	-28.79	1062.82	-8.16	-400.66	-13.08	-691.21
105	2	7	3.63	138.58	-4.57	-321.66	8.19	-320.37
		8	-3.63	-138.58	4.57	321.66	17.86	1110.26
	3	7	4.87	177.41	-6.48	-458.58	11.72	-448.12
		8	-4.87	-177.41	6.48	458.58	25.21	1459.36
	4	7	5.18	119.21	-7.25	-453.61	12.96	-423.21
		8	-5.18	-119.21	7.25	453.61	28.35	1102.73
	5	7	8.46	81.03	-10.30	-501.10	17.37	-490.50
		8	-8.46	-81.03	10.30	501.10	41.34	952.38
	6	7	7.58	136.84	-9.22	-488.98	15.78	-490.48
		8	-7.58	-136.84	9.22	488.98	36.77	1270.47
	7	7	2.43	88.40	-8.33	-450.12	16.56	-441.21
		8	-2.43	-88.40	8.33	450.12	30.90	945.09
106	2	8	6.58	-205.73	1.57	269.31	-8.37	-1426.59
		9	-6.58	205.73	-1.57	-269.31	-.58	253.95
	3	8	9.26	-292.18	2.06	364.36	-11.23	-2018.99
		9	-9.26	292.18	-2.06	-364.36	-.48	353.57
	4	8	9.69	-273.15	2.81	317.12	-14.37	-1893.87
		9	-9.69	273.15	-2.81	-317.12	-1.68	336.91
	5	8	12.40	-212.56	6.43	385.09	-29.11	-1625.89
		9	-12.40	212.56	-6.43	-385.09	-7.51	414.32
	6	8	11.65	-242.99	5.11	401.94	-23.78	-1787.61
		9	-11.65	242.99	-5.11	-401.94	-5.34	402.59
	7	8	10.67	-306.03	.03	270.83	-4.69	-2008.80
		9	-10.67	306.03	-.03	-270.83	4.50	264.44
107	2	1	5.71	315.89	-1.33	-182.86	-1.20	-168.34
		4	-5.71	-315.89	1.33	182.86	5.46	1179.20
	3	1	8.00	418.25	-2.27	-244.86	-1.34	-239.54
		4	-8.00	-418.25	2.27	244.86	8.61	1577.95
	4	1	8.47	347.61	-1.64	-189.38	-2.44	-204.42
		4	-8.47	-347.61	1.64	189.38	7.68	1316.76
	5	1	11.44	452.62	2.49	-107.33	-8.25	-77.13
		4	-11.44	-452.62	-2.49	107.33	.30	1525.53
	6	1	10.61	479.45	1.01	-172.56	-6.16	-133.39
		4	-10.61	-479.45	-1.01	172.56	2.91	1667.64
	7	1	9.42	270.54	-8.84	-179.42	3.77	-243.06
		4	-9.42	-270.54	8.84	179.42	24.53	1108.80
108	2	4	-.29	-168.84	7.27	301.11	-15.06	-891.45
		7	.29	168.84	-7.27	-301.11	-8.20	351.17

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	3	4	-.33	-205.70	10.52	417.38	-21.95	-1158.11
		7	.33	205.70	-10.52	-417.38	-11.72	499.86
	4	4	-1.37	-101.03	11.37	388.72	-23.42	-831.64
		7	1.37	101.03	-11.37	-388.72	-12.96	508.33
	5	4	-4.92	-19.47	13.71	462.00	-26.48	-662.42
		7	4.92	19.47	-13.71	-462.00	-17.38	600.12
	6	4	-3.40	-123.07	12.84	461.70	-25.33	-964.01
		7	3.40	123.07	-12.84	-461.70	-15.77	570.20
	7	4	1.26	-66.68	16.93	344.06	-37.60	-708.13
		7	-1.26	66.68	-16.93	-344.06	-16.57	494.76
109	2	2	14.32	1287.02	-9.13	-271.13	9.49	455.72
		5	-14.32	-1287.02	9.13	271.13	19.74	3662.74
	3	2	19.86	1788.89	-13.45	-494.30	13.98	620.53
		5	-19.86	-1788.89	13.45	494.30	29.07	5103.91
	4	2	22.51	1664.42	-13.44	-729.00	13.99	529.77
		5	-22.51	-1664.42	13.44	729.00	29.01	4796.36
	5	2	35.43	1873.18	-11.76	-618.88	12.24	425.33
		5	-35.43	-1873.18	11.76	618.88	25.38	5568.85
	6	2	31.06	1905.65	-12.49	-456.45	12.98	528.52
		5	-31.06	-1905.65	12.49	456.45	26.99	5569.55
	7	2	19.08	1563.58	-25.22	-941.41	26.21	526.32
		5	-19.08	-1563.58	25.22	941.41	54.49	4477.13
110	2	5	-9.69	-913.13	9.13	271.13	-19.74	-2347.25
		8	9.69	913.13	-9.13	-271.13	-9.49	-574.77
	3	5	-13.48	-1245.39	13.45	494.30	-29.06	-3184.59
		8	13.48	1245.39	-13.45	-494.30	-13.98	-800.65
	4	5	-16.84	-1035.43	13.43	729.00	-29.01	-2578.60
		8	16.84	1035.43	-13.43	-729.00	-13.98	-734.77
	5	5	-29.90	-759.65	11.76	618.88	-25.38	-1623.06
		8	29.90	759.65	-11.76	-618.88	-12.24	-807.82
	6	5	-24.96	-994.59	12.49	456.45	-26.99	-2352.82
		8	24.96	994.59	-12.49	-456.45	-12.98	-829.88
	7	5	-13.60	-1043.88	25.23	941.41	-54.50	-2645.45
		8	13.60	1043.88	-25.23	-941.41	-26.22	-694.95
111	2	3	2.92	421.84	-8.54	211.36	8.81	-113.80
		6	-2.92	-421.84	8.54	-211.36	18.51	1463.68
	3	3	3.96	608.91	-12.28	289.38	12.57	-141.39
		6	-3.96	-608.91	12.28	-289.38	26.71	2089.90
	4	3	4.59	623.80	-12.93	240.14	13.73	-62.24
		6	-4.59	-623.80	12.93	-240.14	27.66	2058.39
	5	3	8.07	687.37	-15.23	151.25	18.12	43.71
		6	-8.07	-687.37	15.23	-151.25	30.60	2155.86
	6	3	6.85	655.56	-14.52	213.84	16.59	-42.73
		6	-6.85	-655.56	14.52	-213.84	29.88	2140.53

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	7	3	1.87	633.34	-18.44	263.29	17.31	-56.30
		6	-1.87	-633.34	18.44	-263.29	41.70	2082.99
112	2	6	-3.07	-274.78	2.60	-329.61	-8.91	-1175.93
		9	3.07	274.78	-2.60	329.61	.59	296.63
	3	6	-4.37	-396.36	4.03	-461.90	-13.37	-1670.06
		9	4.37	396.36	-4.03	461.90	.49	401.71
	4	6	-5.23	-377.22	3.20	-439.49	-11.91	-1573.27
		9	5.23	377.22	-3.20	439.49	1.69	366.16
	5	6	-8.27	-254.21	-.96	-505.92	-4.44	-1292.76
		9	8.27	254.21	.96	505.92	7.51	479.28
	6	6	-7.14	-299.17	.66	-502.98	-7.46	-1436.90
		9	7.14	299.17	-.66	502.98	5.35	479.54
	7	6	-6.30	-429.48	10.35	-427.93	-28.63	-1682.33
		9	6.30	429.48	-10.35	427.93	-4.51	307.99
10	2	10	520.16	.38	.75	.00	.00	.00
		11	-520.16	-.38	-.75	.00	-1.50	.77
	3	10	691.51	.56	1.11	.00	.00	.00
		11	-691.51	-.56	-1.11	.00	-2.22	1.13
	4	10	577.57	.73	1.17	.00	.00	.00
		11	-577.57	-.73	-1.17	.00	-2.33	1.46
	5	10	730.69	1.39	1.08	.00	.00	.00
		11	-730.69	-1.39	-1.08	.00	-2.16	2.78
	6	10	776.92	1.10	1.06	.00	.00	.00
		11	-776.92	-1.10	-1.06	.00	-2.13	2.20
	7	10	450.41	.59	1.53	.00	.00	.00
		11	-450.41	-.59	-1.53	.00	-3.06	1.19
11	2	11	520.16	.13	.99	.00	1.50	-.77
		12	-520.16	-.13	-.99	.00	-3.48	1.03
	3	11	691.51	.23	1.45	.00	2.22	-1.13
		12	-691.51	-.23	-1.45	.00	-5.13	1.59
	4	11	577.57	.42	1.51	.00	2.23	-1.46
		12	-577.57	-.42	-1.51	.00	-5.34	2.31
	5	11	730.69	1.05	1.46	.00	2.16	-2.78
		12	-730.69	-1.05	-1.46	.00	-5.08	4.89
	6	11	776.92	.72	1.41	.00	2.13	-2.20
		12	-776.92	-.72	-1.41	.00	-4.96	3.64
	7	11	450.41	.32	1.53	.00	3.06	-1.19
		12	-450.41	-.32	-1.53	.00	-6.13	1.83
12	2	12	520.16	-.76	.72	.00	3.48	-1.03
		13	-520.16	.76	-.72	.00	-4.92	-.49
	3	12	691.51	-.99	1.01	.00	5.13	-1.59
		13	-691.51	.99	-1.01	.00	-7.15	-.39
	4	12	577.57	-.93	1.01	.00	5.34	-2.31
		13	-577.57	.93	-1.01	.00	-7.36	.45

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	5	12	730.69	-1.03	1.11	.00	5.08	-4.89
		13	-730.69	1.03	-1.11	.00	-7.30	2.84
	6	12	776.92	-1.14	1.04	.00	4.96	-3.64
		13	-776.92	1.14	-1.04	.00	-7.04	1.37
	7	12	450.41	-.81	-.01	.00	6.13	-1.83
		13	-450.41	.81	.01	.00	-6.11	.21
13	2	13	520.16	-2.30	-.09	.00	4.92	.49
		14	-520.16	2.30	.09	.00	-4.74	-5.09
	3	13	691.51	-3.12	-.24	.00	7.15	.39
		14	-691.51	3.12	.24	.00	-6.66	-6.63
	4	13	577.57	-3.33	-.35	.00	7.36	-.45
		14	-577.57	3.33	.35	.00	-6.67	-6.21
	5	13	730.69	-4.87	.03	.00	7.30	-2.84
		14	-730.69	4.87	-.03	.00	-7.35	-6.91
	6	13	776.92	-4.50	-.07	.00	7.04	-1.37
		14	-776.92	4.50	.07	.00	-6.89	-7.63
	7	13	450.41	-2.82	-3.13	.00	6.11	-.21
		14	-450.41	2.82	3.13	.00	.15	-5.44
14	2	14	520.16	-4.48	-1.45	.00	4.74	5.09
		15	-520.16	4.48	1.45	.00	-1.84	-14.04
	3	14	691.51	-6.15	-2.34	.00	6.66	6.63
		15	-691.51	6.15	2.34	.00	-1.99	-18.92
	4	14	577.57	-6.79	-2.60	.00	6.67	6.21
		15	-577.57	6.79	2.60	.00	-1.46	-19.79
	5	14	730.69	-10.50	-1.84	.00	7.35	6.91
		15	-730.69	10.50	1.84	.00	-3.67	-27.90
	6	14	776.92	-9.37	-1.97	.00	6.89	7.63
		15	-776.92	9.37	1.97	.00	-2.95	-26.38
	7	14	450.41	-5.71	-7.85	.00	-.15	5.44
		15	-450.41	5.71	7.85	.00	15.84	-16.86
15	2	15	520.16	-7.27	-3.39	.00	1.84	14.04
		1	-520.16	7.27	3.39	.00	16.83	-54.03
	3	15	691.51	-10.05	-5.31	.00	1.99	18.92
		1	-691.51	10.05	5.31	.00	27.19	-74.18
	4	15	577.57	-11.27	-5.79	.00	1.46	19.79
		1	-577.57	11.27	5.79	.00	30.38	-81.80
	5	15	730.69	-17.86	-4.52	.00	3.67	27.90
		1	-730.69	17.86	4.52	.00	21.20	-126.15
	6	15	776.92	-15.71	-4.69	.00	2.95	26.38
		1	-776.92	15.71	4.69	.00	22.83	-112.79
	7	15	450.41	-9.45	-14.17	.00	-15.84	16.86
		1	-450.41	9.45	14.17	.00	93.76	-68.81
20	2	20	811.34	.26	.38	.00	.00	.00
		21	-811.34	-.26	-.38	.00	-.76	.53

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	3	20	1127.62	.39	.61	.00	.00	.00
		21	-1127.62	-.39	-.61	.00	-1.23	.78
	4	20	1050.56	.57	.75	.00	.00	.00
		21	-1050.56	-.57	-.75	.00	-1.50	1.15
	5	20	1185.52	1.28	.64	.00	.00	.00
		21	-1185.52	-1.28	-.64	.00	-1.29	2.56
	6	20	1204.57	.97	.57	.00	.00	.00
		21	-1204.57	-.97	-.57	.00	-1.14	1.93
	7	20	986.22	.42	1.16	.00	.00	.00
		21	-986.22	-.42	-1.16	.00	-2.32	.85
21	2	21	811.34	-.13	.20	.00	.76	-.53
		22	-811.34	.13	-.20	.00	-1.15	.27
	3	21	1127.62	-.13	.38	.00	1.23	-.78
		22	-1127.62	.13	-.38	.00	-1.99	.52
	4	21	1050.56	.09	.62	.00	1.50	-1.15
		22	-1050.56	-.09	-.62	.00	-2.73	1.33
	5	21	1185.52	.82	.52	.00	1.29	-2.56
		22	-1185.52	-.82	-.52	.00	-2.33	4.19
	6	21	1204.57	.44	.35	.00	1.14	-1.93
		22	-1204.57	-.44	-.35	.00	-1.94	2.80
	7	21	986.22	-.04	.73	.00	2.32	-.85
		22	-986.22	.04	-.73	.00	-3.78	.77
22	2	22	811.34	-1.18	-.55	.00	1.15	-.27
		23	-811.34	1.18	.55	.00	-.05	-2.08
	3	22	1127.62	-1.58	-.69	.00	1.99	-.52
		23	-1127.62	1.58	.69	.00	-.60	-2.63
	4	22	1050.56	-1.46	-.41	.00	2.73	-1.33
		23	-1050.56	1.46	.41	.00	-1.91	-1.60
	5	22	1185.52	-1.41	-.38	.00	2.33	-4.19
		23	-1185.52	1.41	.38	.00	-1.57	1.38
	6	22	1204.57	-1.60	-.65	.00	1.84	-2.80
		23	-1204.57	1.60	.65	.00	-.55	-.39
	7	22	986.22	-1.39	-1.28	.00	3.78	-.77
		23	-986.22	1.39	1.28	.00	-1.21	-2.02
23	2	23	811.34	-2.88	-1.87	.00	.05	2.08
		24	-811.34	2.88	1.87	.00	3.68	-7.84
	3	23	1127.62	-3.94	-2.63	.00	.60	2.63
		24	-1127.62	3.94	2.63	.00	4.66	-10.51
	4	23	1050.56	-4.08	-2.34	.00	1.91	1.60
		24	-1050.56	4.08	2.34	.00	2.76	-9.76
	5	23	1185.52	-5.41	-2.07	.00	1.57	-1.38
		24	-1185.52	5.41	2.07	.00	2.57	-9.44
	6	23	1204.57	-5.15	-2.45	.00	.55	.39
		24	-1204.57	5.15	2.45	.00	4.35	-10.69

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	7	23	986.22	-3.64	-4.91	.00	1.21	2.02
		24	-986.22	3.64	4.91	.00	8.62	-9.30
24	2	24	811.34	-5.23	-3.75	.00	-3.68	7.84
		25	-811.34	5.23	3.75	.00	11.18	-18.30
	3	24	1127.62	-7.21	-5.43	.00	-4.66	10.51
		25	-1127.62	7.21	5.43	.00	15.51	-24.94
	4	24	1050.56	-7.76	-5.18	.00	-2.76	9.76
		25	-1050.56	7.76	5.18	.00	13.12	-25.29
	5	24	1185.52	-11.20	-4.55	.00	-2.57	9.44
		25	-1185.52	11.20	4.55	.00	11.67	-31.84
	6	24	1204.57	-10.21	-5.04	.00	-4.35	10.70
		25	-1204.57	10.21	5.04	.00	14.43	-31.12
	7	24	986.22	-6.77	-10.16	.00	-8.62	9.30
		25	-986.22	6.77	10.16	.00	28.93	-22.84
25	2	25	811.34	-8.19	-6.19	.00	-11.18	18.30
		2	-811.34	8.19	6.19	.00	45.20	-63.34
	3	25	1127.62	-11.34	-9.06	.00	-15.51	24.94
		2	-1127.62	11.34	9.06	.00	65.33	-87.32
	4	25	1050.56	-12.46	-8.91	.00	-13.12	25.29
		2	-1050.56	12.46	8.91	.00	62.15	-93.82
	5	25	1185.52	-18.72	-7.81	.00	-11.67	31.84
		2	-1185.52	18.72	7.81	.00	54.64	-134.79
	6	25	1204.56	-16.74	-8.41	.00	-14.43	31.12
		2	-1204.56	16.74	8.41	.00	60.69	-123.19
	7	25	986.22	-10.73	-16.97	.00	-28.93	22.84
		2	-986.22	10.73	16.97	.00	122.29	-81.88
30	2	30	693.25	.36	-.05	.00	.00	.00
		31	-693.25	-.36	.05	.00	.11	.71
	3	30	996.93	.51	.00	.00	.00	.00
		31	-996.93	-.51	.00	.00	-.01	1.02
	4	30	1007.69	.66	.17	.00	.00	.00
		31	-1007.69	-.66	-.17	.00	-.33	1.31
	5	30	1096.96	1.33	.07	.00	.00	.00
		31	-1096.96	-1.33	-.07	.00	-.13	2.66
	6	30	1059.18	1.05	-.03	.00	.00	.00
		31	-1059.18	-1.05	.03	.00	.06	2.10
	7	30	1030.84	.49	.57	.00	.00	.00
		31	-1030.84	-.49	-.57	.00	-1.15	.99
31	2	31	693.25	.07	-.73	.00	-.11	-.71
		32	-693.25	-.07	.73	.00	1.56	.85
	3	31	996.93	.12	-.92	.00	.01	-1.02
		32	-996.93	-.12	.92	.00	1.84	1.27
	4	31	1007.69	.26	-.63	.00	.33	-1.31
		32	-1007.69	-.26	.63	.00	.93	1.84

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	5	31	1096.96	.92	-.72	.00	.13	-2.66
		32	-1096.96	-.92	.72	.00	1.31	4.49
	6	31	1059.18	.62	-.93	.00	-.06	-2.10
		32	-1059.18	-.62	.93	.00	1.91	3.35
	7	31	1030.84	.11	-.52	.00	1.15	-.99
		32	-1030.84	-.11	.52	.00	-.11	1.22
32	2	32	693.25	-.86	-2.02	.00	-1.56	-.85
		33	-693.25	.86	2.02	.00	5.60	-.86
	3	32	996.93	-1.17	-2.78	.00	-1.84	-1.27
		33	-996.93	1.17	2.78	.00	7.39	-1.06
	4	32	1007.69	-1.18	-2.40	.00	-.93	-1.84
		33	-1007.69	1.18	2.40	.00	5.73	-.52
	5	32	1096.96	-1.24	-2.36	.00	-1.31	-4.49
		33	-1096.96	1.24	2.36	.00	6.03	2.01
	6	32	1059.18	-1.30	-2.69	.00	-1.91	-3.35
		33	-1059.18	1.30	2.69	.00	7.29	.75
	7	32	1030.84	-1.15	-3.28	.00	.11	-1.22
		33	-1030.84	1.15	3.28	.00	6.44	-1.07
33	2	33	693.25	-2.43	-3.93	.00	-5.60	.86
		34	-693.25	2.43	3.93	.00	13.45	-5.73
	3	33	996.93	-3.37	-5.55	.00	-7.39	1.06
		34	-996.93	3.37	5.55	.00	18.48	-7.79
	4	33	1007.69	-3.69	-5.13	.00	-5.73	.52
		34	-1007.69	3.69	5.13	.00	15.98	-7.90
	5	33	1096.96	-5.18	-4.84	.00	-6.03	-2.01
		34	-1096.96	5.18	4.84	.00	15.71	-8.34
	6	33	1059.18	-4.73	-5.30	.00	-7.29	-.75
		34	-1059.18	4.73	5.30	.00	17.90	-8.71
	7	33	1030.84	-3.29	-7.71	.00	-6.44	1.07
		34	-1030.84	3.29	7.71	.00	21.86	-7.65
34	2	34	693.25	-4.65	-6.41	.00	-13.45	5.73
		35	-693.25	4.65	6.41	.00	26.28	-15.04
	3	34	996.93	-6.47	-9.20	.00	-18.48	7.79
		35	-996.93	6.47	9.20	.00	36.88	-20.73
	4	34	1007.69	-7.25	-8.79	.00	-15.98	7.90
		35	-1007.69	7.25	8.79	.00	33.56	-22.40
	5	34	1096.96	-10.89	-8.14	.00	-15.71	8.34
		35	-1096.96	10.89	8.14	.00	31.98	-30.12
	6	34	1059.18	-9.67	-8.74	.00	-17.90	8.71
		35	-1059.18	9.67	8.74	.00	35.37	-28.04
	7	34	1030.84	-6.32	-13.77	.00	-21.86	7.65
		35	-1030.84	6.32	13.77	.00	49.40	-20.29
35	2	35	693.25	-7.49	-9.42	.00	-26.28	15.04
		3	-693.25	7.49	9.42	.00	78.09	-56.21

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	3	35	996.93	-10.43	-13.64	.00	-36.88	20.73
		3	-996.93	10.43	13.64	.00	111.88	-78.11
	4	35	1007.69	-11.83	-13.30	.00	-33.56	22.40
		3	-1007.69	11.83	13.30	.00	106.68	-87.49
	5	35	1096.96	-18.34	-12.17	.00	-31.98	30.12
		3	-1096.96	18.34	12.17	.00	98.90	-130.98
	6	35	1059.18	-16.07	-12.90	.00	-35.37	28.04
		3	-1059.18	16.07	12.90	.00	106.33	-116.42
	7	35	1030.84	-10.18	-21.36	.00	-49.40	20.29
		3	-1030.84	10.18	21.36	.00	166.88	-76.28
70	2	70	307.42	.71	.72	.00	.00	.00
		71	-307.42	-.71	-.72	.00	-1.44	1.41
	3	70	383.12	.99	1.07	.00	.00	.00
		71	-383.12	-.99	-1.07	.00	-2.13	1.99
	4	70	220.25	1.08	1.11	.00	.00	.00
		71	-220.25	-1.08	-1.11	.00	-2.22	2.17
	5	70	100.50	1.75	.99	.00	.00	.00
		71	-100.50	-1.75	-.99	.00	-1.98	3.49
	6	70	259.91	1.51	.99	.00	.00	.00
		71	-259.91	-1.51	-.99	.00	-1.97	3.03
	7	70	155.08	.91	1.49	.00	.00	.00
		71	-155.08	-.91	-1.49	.00	-2.97	1.82
71	2	71	307.42	.82	.92	.00	1.44	-1.41
		72	-307.42	-.82	-.92	.00	-3.29	3.05
	3	71	383.12	1.16	1.35	.00	2.13	-1.99
		72	-383.12	-1.16	-1.35	.00	-4.84	4.30
	4	71	220.25	1.18	1.39	.00	2.22	-2.17
		72	-220.25	-1.18	-1.39	.00	-5.01	4.54
	5	71	100.50	1.81	1.25	.00	1.98	-3.49
		72	-100.50	-1.81	-1.25	.00	-4.48	7.12
	6	71	259.91	1.61	1.25	.00	1.97	-3.03
		72	-259.91	-1.61	-1.25	.00	-4.47	6.24
	7	71	155.08	1.00	1.44	.00	2.97	-1.82
		72	-155.08	-1.00	-1.44	.00	-5.85	3.82
72	2	72	307.42	.34	.61	.00	3.29	-3.05
		73	-307.42	-.34	-.61	.00	-4.50	3.72
	3	72	383.11	.48	.85	.00	4.84	-4.30
		73	-383.11	-.48	-.85	.00	-6.54	5.26
	4	72	220.25	.28	.83	.00	5.01	-4.54
		73	-220.25	-.28	-.83	.00	-6.66	5.10
	5	72	100.50	.19	.79	.00	4.48	-7.12
		73	-100.50	-.19	-.79	.00	-6.06	7.49
	6	72	259.91	.27	.78	.00	4.47	-6.24
		73	-259.91	-.27	-.78	.00	-6.03	6.79

MEMBER END FORCES STRUCTURE TYPE = SPACE
ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	7	72	155.08	.27	-.16	.00	5.95	-3.82
		73	-155.08	-.27	.16	.00	-5.53	4.36
73	2	73	307.42	-.76	-.24	.00	4.50	-3.72
		74	-307.42	.76	.24	.00	-4.02	2.20
	3	73	383.12	-1.06	-.46	.00	6.54	-5.26
		74	-383.12	1.06	.46	.00	-5.51	3.15
	4	73	220.25	-1.64	-.60	.00	6.56	-5.10
		74	-220.25	1.64	.60	.00	-5.45	1.83
	5	73	100.50	-3.17	-.43	.00	6.06	-7.49
		74	-100.50	3.17	.43	.00	-5.20	1.15
	6	73	259.91	-2.52	-.45	.00	6.03	-6.79
		74	-259.91	2.52	.45	.00	-5.13	1.74
	7	73	155.08	-1.31	-3.34	.00	5.53	-4.36
		74	-155.08	1.31	3.34	.00	1.15	1.74
74	2	74	307.42	-2.49	-1.65	.00	4.02	-2.20
		75	-307.42	2.49	1.65	.00	-.72	-2.78
	3	74	383.12	-3.48	-2.62	.00	5.61	-3.15
		75	-383.12	3.48	2.62	.00	-.36	-3.82
	4	74	220.25	-4.60	-2.94	.00	5.45	-1.83
		75	-220.25	4.60	2.94	.00	.42	-7.36
	5	74	100.50	-8.30	-2.43	.00	5.20	-1.14
		75	-100.50	8.30	2.43	.00	-.33	-15.45
	6	74	259.91	-6.81	-2.46	.00	5.13	-1.74
		75	-259.91	6.81	2.46	.00	-.22	-11.89
	7	74	155.08	-3.75	-8.12	.00	-1.15	-1.74
		75	-155.08	3.75	8.12	.00	17.40	-5.76
75	2	75	307.42	-4.86	-3.63	.00	.72	2.78
		7	-307.42	4.86	3.63	.00	19.26	-29.51
	3	75	383.11	-6.81	-5.66	.00	.36	3.82
		7	-383.11	6.81	5.66	.00	30.74	-41.28
	4	75	220.25	-8.61	-6.19	.00	-.42	7.36
		7	-220.25	8.61	6.19	.00	34.49	-54.72
	5	75	100.50	-15.19	-5.24	.00	.33	15.45
		7	-100.50	15.19	5.24	.00	28.49	-99.03
	6	75	259.91	-12.61	-5.27	.00	.22	11.89
		7	-259.91	12.61	5.27	.00	28.78	-81.22
	7	75	155.08	-7.07	-14.50	.00	-17.40	5.76
		7	-155.08	7.07	14.50	.00	97.15	-44.64
80	2	80	568.83	.88	.38	.00	.00	.00
		81	-568.83	-.88	-.38	.00	-.76	1.76
	3	80	775.80	1.24	.61	.00	.00	.00
		81	-775.80	-1.24	-.61	.00	-1.23	2.49
	4	80	643.06	1.33	.75	.00	.00	.00
		81	-643.06	-1.33	-.75	.00	-1.50	2.66

MEMBER END FORCES STRUCTURE TYPE = SPACE
ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	5	80	466.06	2.02	.64	.00	.00	.00
		81	-466.06	-2.02	-.64	.00	-1.29	4.04
	6	80	614.77	1.78	.57	.00	.00	.00
		81	-614.77	-1.78	-.57	.00	-1.14	3.56
	7	80	649.45	1.16	1.16	.00	.00	.00
		81	-649.45	-1.16	-1.16	.00	-2.32	2.31
81	2	81	568.83	1.19	.20	.00	.76	-1.76
		82	-568.83	-1.19	-.20	.00	-1.15	4.15
	3	81	775.80	1.69	.38	.00	1.23	-2.49
		82	-775.80	-1.69	-.38	.00	-1.99	5.87
	4	81	643.06	1.71	.62	.00	1.50	-2.67
		82	-643.06	-1.71	-.62	.00	-2.73	6.09
	5	81	466.06	2.40	.52	.00	1.29	-4.04
		82	-466.06	-2.40	-.52	.00	-2.33	8.84
	6	81	614.77	2.18	.35	.00	1.14	-3.56
		82	-614.77	-2.18	-.35	.00	-1.84	7.92
	7	81	649.45	1.53	.73	.00	2.32	-2.31
		82	-649.45	-1.53	-.73	.00	-3.78	5.36
82	2	82	568.83	.93	-.55	.00	1.15	-4.15
		83	-568.83	-.93	.55	.00	-.05	6.02
	3	82	775.80	1.33	-.69	.00	1.99	-5.87
		83	-775.80	-1.33	.69	.00	-.60	8.53
	4	82	643.06	1.12	-.41	.00	2.73	-6.09
		83	-643.06	-1.12	.41	.00	-1.91	8.34
	5	82	466.06	1.11	-.38	.00	2.33	-8.84
		83	-466.06	-1.11	.38	.00	-1.57	11.07
	6	82	614.77	1.18	-.65	.00	1.84	-7.92
		83	-614.77	-1.18	.65	.00	-.55	10.28
	7	82	649.45	1.10	-1.29	.00	3.78	-5.36
		83	-649.45	-1.10	1.29	.00	-1.21	7.57
83	2	83	568.83	.07	-1.87	.00	.05	-6.02
		84	-568.83	-.07	1.87	.00	3.68	6.16
	3	83	775.80	.13	-2.63	.00	.60	-8.53
		84	-775.80	-.13	2.63	.00	4.66	8.80
	4	83	643.06	-.46	-2.34	.00	1.91	-8.34
		84	-643.06	.46	2.34	.00	2.76	7.42
	5	83	466.06	-1.88	-2.07	.00	1.57	-11.06
		84	-466.06	1.88	2.07	.00	2.57	7.31
	6	83	614.77	-1.26	-2.45	.00	.55	-10.28
		84	-614.77	1.26	2.45	.00	4.35	7.76
	7	83	649.45	-.14	-4.91	.00	1.21	-7.57
		84	-649.45	.14	4.91	.00	8.62	7.29
84	2	84	568.83	-1.41	-3.75	.00	-3.68	-6.16
		85	-568.83	1.41	3.75	.00	11.18	3.34

MEMBER END FORCES STRUCTURE TYPE = SPACE
ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	3	84	775.80	-1.95	-5.43	.00	-4.66	-8.80
		85	-775.80	1.95	5.43	.00	15.51	4.90
	4	84	643.06	-3.08	-5.18	.00	-2.76	-7.42
		85	-643.06	3.08	5.18	.00	13.12	1.27
	5	84	466.06	-6.63	-4.55	.00	-2.57	-7.31
		85	-466.06	6.63	4.55	.00	11.67	-5.94
	6	84	614.77	-5.18	-5.04	.00	-4.35	-7.76
		85	-614.77	5.18	5.04	.00	14.43	-2.60
	7	84	649.45	-2.24	-10.16	.00	-8.62	-7.29
		85	-649.45	2.24	10.16	.00	28.93	2.81
85	2	85	568.83	-3.55	-6.19	.00	-11.18	-3.34
		8	-568.83	3.55	6.19	.00	45.20	-16.19
	3	85	775.80	-4.95	-9.06	.00	-15.51	-4.90
		8	-775.80	4.95	9.06	.00	65.33	-22.30
	4	85	643.06	-6.77	-8.91	.00	-13.12	-1.27
		8	-643.06	6.77	8.91	.00	62.15	-35.96
	5	85	466.06	-13.17	-7.81	.00	-11.57	5.94
		8	-466.06	13.17	7.81	.00	54.54	-78.36
	6	85	614.77	-10.63	-8.41	.00	-14.43	2.60
		8	-614.77	10.63	8.41	.00	60.69	-61.04
	7	85	649.45	-5.24	-16.97	.00	-28.93	-2.81
		8	-649.45	5.24	16.97	.00	122.29	-26.00
90	2	90	480.51	.73	-.02	.00	.00	.00
		91	-480.51	-.73	.02	.00	.04	1.47
	3	90	688.54	1.05	.05	.00	.00	.00
		91	-688.54	-1.05	-.05	.00	-.10	2.09
	4	90	650.37	1.16	.22	.00	.00	.00
		91	-650.37	-1.16	-.22	.00	-.44	2.32
	5	90	466.77	1.81	.16	.00	.00	.00
		91	-466.77	-1.81	-.16	.00	-.32	3.62
	6	90	542.16	1.56	.05	.00	.00	.00
		91	-542.16	-1.56	-.05	.00	-.09	3.12
	7	90	735.51	1.01	.62	.00	.00	.00
		91	-735.51	-1.01	-.62	.00	-1.23	2.01
91	2	91	480.51	.88	-.66	.00	-.04	-1.47
		92	-480.51	-.88	.66	.00	1.36	3.23
	3	91	688.54	1.27	-.82	.00	.10	-2.09
		92	-688.54	-1.27	.82	.00	1.55	4.63
	4	91	650.37	1.34	-.52	.00	.44	-2.32
		92	-650.37	-1.34	.52	.00	.50	5.00
	5	91	466.77	1.95	-.52	.00	.32	-3.62
		92	-466.77	-1.95	.52	.00	.72	7.52
	6	91	542.16	1.71	-.76	.00	.09	-3.12
		92	-542.16	-1.71	.76	.00	1.43	6.54

MEMBER END FORCES STRUCTURE TYPE = SPACE
ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	7	91	735.51	1.21	-.42	.00	1.23	-2.01
		92	-735.51	-1.21	.42	.00	-.39	4.44
92	2	92	480.51	.43	-1.91	.00	-1.36	-3.23
		93	-480.51	-.43	1.91	.00	5.18	4.09
	3	92	688.54	.66	-2.62	.00	-1.55	-4.63
		93	-688.54	-.66	2.62	.00	6.78	5.94
	4	92	650.37	.54	-2.22	.00	-.60	-5.00
		93	-650.37	-.54	2.22	.00	5.03	6.08
	5	92	466.77	.40	-2.03	.00	-.72	-7.52
		93	-466.77	-.40	2.03	.00	4.78	8.32
	6	92	542.16	.44	-2.42	.00	-1.43	-6.54
		93	-542.16	-.44	2.42	.00	6.27	7.41
	7	92	735.51	.60	-3.13	.00	.39	-4.44
		93	-735.51	-.60	3.13	.00	5.87	5.64
93	2	93	480.51	-.63	-3.77	.00	-5.18	-4.09
		94	-480.51	.63	3.77	.00	12.73	2.84
	3	93	688.54	-.81	-5.32	.00	-6.78	-5.94
		94	-688.54	.81	5.32	.00	17.43	4.31
	4	93	650.37	-1.28	-4.87	.00	-5.03	-6.08
		94	-650.37	1.28	4.87	.00	14.77	3.52
	5	93	466.77	-2.87	-4.38	.00	-4.78	-8.32
		94	-466.77	2.87	4.38	.00	13.55	2.58
	6	93	542.16	-2.30	-4.93	.00	-6.27	-7.41
		94	-542.16	2.30	4.93	.00	16.14	2.82
	7	93	735.51	-.84	-7.49	.00	-5.87	-5.64
		94	-735.51	.84	7.49	.00	20.85	3.96
94	2	94	480.51	-2.31	-6.22	.00	-12.73	-2.84
		95	-480.51	2.31	6.22	.00	25.16	-1.78
	3	94	688.54	-3.17	-8.91	.00	-17.43	-4.31
		95	-688.54	3.17	8.91	.00	35.25	-2.02
	4	94	650.37	-4.14	-8.45	.00	-14.77	-3.52
		95	-650.37	4.14	8.45	.00	31.68	-4.75
	5	94	466.77	-7.91	-7.54	.00	-13.55	-2.58
		95	-466.77	7.91	7.54	.00	28.64	-13.24
	6	94	542.16	-6.52	-8.26	.00	-16.14	-2.82
		95	-542.16	6.52	8.26	.00	32.65	-10.22
	7	94	735.51	-3.15	-13.50	.00	-20.86	-3.96
		95	-735.51	3.15	13.50	.00	47.85	-2.33
95	2	95	480.51	-4.64	-9.18	.00	-25.16	1.78
		9	-480.51	4.64	9.18	.00	75.66	-27.32
	3	95	688.54	-6.42	-13.29	.00	-35.25	2.02
		9	-688.54	6.42	13.29	.00	108.33	-37.35
	4	95	650.37	-8.05	-12.89	.00	-31.68	4.75
		9	-650.37	8.05	12.89	.00	102.58	-49.04

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	5	95	466.77	-14.72	-11.45	.00	-28.64	13.24
		9	-466.77	14.72	11.45	.00	91.60	-94.19
	6	95	542.16	-12.25	-12.31	.00	-32.65	10.22
		9	-542.16	12.25	12.31	.00	100.38	-77.59
	7	95	735.51	-6.33	-21.03	.00	-47.85	2.33
		9	-735.51	6.33	21.03	.00	163.49	-37.16

********** END OF LATEST ANALYSIS RESULT **********

79. FINISH

********** END OF STAAD-III **********

**** DATE= JUN 10,2002 TIME= 12:45:45 ****


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*****************************************
*                                       *
*          S T A A D - III              *
*          Revision 22.3                *
*          Proprietary Program of       *
*          Research Engineers, Inc.     *
*          Date=    12: 6: 17002        *
*          Time=    12: 6:17            *
*                                       *
*                                       *
*****************************************
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```
1. STAAD SPACE 'ENCEPADO EN ROTURA'
2. UNIT METER MTON
3. JOINT COORDINATES
4.   1  0.00   0.00   0.00   3  0.00  0.00 11.40
5.  REPEAT 2  3.20 0.00 0.00
6.  10  0.00 -15.50  0.00  15  0.00 -5.50  0.00
7.  20  0.00 -15.50  5.70  25  0.00 -5.50  5.70
8.  30  0.00 -15.50 11.40  35  0.00 -5.50 11.40
9.  70  6.40 -15.50  0.00  75  6.40 -5.50  0.00
10.  80  6.40 -15.50  5.70  85  6.40 -5.50  5.70
11.  90  6.40 -15.50 11.40  95  6.40 -5.50 11.40
12. MEMBER INCIDENCES
13. 101   1   2 102  1  1
14. REPEAT 2 2 3
15. 107   1   4 108  1  3
16. REPEAT 2 2 1
17.  10  10  11  14  1  1 ; 15  15  1
18.  20  20  21  24  1  1 ; 25  25  2
19.  30  30  31  34  1  1 ; 35  35  3
20.  70  70  71  74  1  1 ; 75  75  7
21.  80  80  81  84  1  1 ; 85  85  8
22.  90  90  91  94  1  1 ; 95  95  9
23. MEMBER PROPERTY PRISMATIC
24.  101 TO 102 105 TO 106 PRI YD 3.500 ZD 4.65
25.  103 TO 104           PRI YD 3.500 ZD 5.70
26.  107 TO 108 111 TO 112 PRI YD 3.500 ZD 5.00
27.  109 TO 110           PRI YD 3.500 ZD 5.00
28.   10 TO 15 20 TO 25    PRI YD 1.80
29.   30 TO 35 70 TO 75    PRI YD 1.80
30.   80 TO 85 90 TO 95    PRI YD 1.80
31. CONSTANT
32. E 2.64E6 ALL
33. POISSON .2 ALL
34. SUPPORT
35.  10 20              FIXED BUT     MX MY MZ  KFX 1670. KFZ 1670.
36.  11 TO 15 21 TO 25  FIXED BUT  FY MX MY MZ  KFX 1670. KFZ 1670.
37.  30 70              FIXED BUT     MX MY MZ  KFX 1670. KFZ 1670.
38.  31 TO 35 71 TO 75  FIXED BUT  FY MX MY MZ  KFX 1670. KFZ 1670.
39.  80 90              FIXED BUT     MX MY MZ  KFX 1670. KFZ 1670.
40.  81 TO 85 91 TO 95  FIXED BUT  FY MX MY MZ  KFX 1670. KFZ 1670.
41. LOAD 2
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42. *CARGAS SOBRE ENCEPADO H2
43. JOINT LOAD
44.  5    FX -52.  FY -2980. FZ 55.  MX 2464. MZ 2792.
45. *CARGAS DEL ENCEPADO
46.  5    FY -1772.
47. LOAD 3
48. *CARGAS SOBRE ENCEPADO H3
49. JOINT LOAD
50.  5    FX -72.  FY -4826. FZ 81.  MX 4535. MZ 4217.
51. *CARGAS DEL ENCEPADO
52.  5    FY -1772.
53. LOAD 4
54. *CARGAS SOBRE ENCEPADO H4
55. JOINT LOAD
56.  5    FX -85.  FY -4086. FZ 81.  MX 6635. MZ 4798.
57. *CARGAS DEL ENCEPADO
58.  5    FY -1772.
59. LOAD 5
60. *CARGAS SOBRE ENCEPADO H51
61. JOINT LOAD
62.  5    FX -103. FY -3937. FZ 71.  MX 5622. MZ 5793.
63. *CARGAS DEL ENCEPADO
64.  5    FY -1772.
65. LOAD 6
66. *CARGAS SOBRE ENCEPADO H52
67. JOINT LOAD
68.  5    FX -121. FY -4529. FZ 75.  MX 4178. MZ 7189.
69. *CARGAS DEL ENCEPADO
70.  5    FY -1772.
71. LOAD 7
72. *CARGAS SOBRE ENCEPADO H10
73. JOINT LOAD
74.  5    FX -71.  FY -3881. FZ 151. MX 8627. MZ 3947.
75. *CARGAS DEL ENCEPADO
76.  5    FY -1772.
77. PERFORM ANALYSIS
```

P R O B L E M S T A T I S T I C S

NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS = 45/ 48/ 36
ORIGINAL/FINAL BAND-WIDTH = 36/ 5
TOTAL PRIMARY LOAD CASES = 6, TOTAL DEGREES OF FREEDOM = 264
SIZE OF STIFFNESS MATRIX = 9504 DOUBLE PREC. WORDS
REQRD/AVAIL. DISK SPACE = 12.13/ 2047.7 MB, EXMEM = 1951.9 MB

```
++ Processing Element Stiffness Matrix.          12: 6:17
++ Processing Global Stiffness Matrix.           12: 6:17
++ Processing Triangular Factorization.          12: 6:17
++ Calculating Joint Displacements.              12: 6:17
++ Calculating Member  Forces.                   12: 6:17
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78. PRINT ANALYSIS RESULTS
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JOINT DISPLACEMENT (CM RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
1	2	-.3403	-.1693	.3017	.0002	.0000	.0001
	3	-.4815	-.2273	.4572	.0003	.0000	.0001
	4	-.5631	-.1887	.4871	.0003	.0000	.0001
	5	-.6818	-.2074	.4242	.0003	.0000	.0002
	6	-.8122	-.2591	.4230	.0003	.0000	.0002
	7	-.4686	-.1454	.8548	.0004	.0000	.0001
2	2	-.3407	-.2649	.3017	.0001	.0000	.0000
	3	-.4820	-.3723	.4573	.0001	.0000	.0000
	4	-.5637	-.3462	.4872	.0002	.0000	.0001
	5	-.6825	-.3538	.4243	.0001	.0000	.0001
	6	-.8130	-.4016	.4231	.0001	.0000	.0002
	7	-.4691	-.3242	.8549	.0002	.0000	.0000
3	2	-.3403	-.2274	.3017	-.0001	.0000	.0000
	3	-.4815	-.3311	.4572	-.0001	.0000	.0001
	4	-.5632	-.3346	.4872	-.0001	.0000	.0001
	5	-.6818	-.3314	.4243	-.0001	.0000	.0002
	6	-.8122	-.3548	.4231	-.0001	.0000	.0002
	7	-.4687	-.3423	.8549	.0000	.0000	.0001
4	2	-.3404	-.1506	.3019	.0002	.0000	.0001
	3	-.4816	-.1964	.4575	.0003	.0000	.0002
	4	-.5632	-.1448	.4874	.0003	.0000	.0002
	5	-.6819	-.1511	.4245	.0003	.0000	.0003
	6	-.8123	-.1895	.4233	.0003	.0000	.0003
	7	-.4687	-.1093	.8553	.0004	.0000	.0002
5	2	-.3408	-.2774	.3020	.0001	.0000	.0002
	3	-.4822	-.3851	.4577	.0002	.0000	.0002
	4	-.5639	-.3420	.4876	.0002	.0000	.0003
	5	-.6827	-.3333	.4246	.0002	.0000	.0003
	6	-.8133	-.3678	.4235	.0002	.0000	.0004
	7	-.4693	-.3300	.8557	.0003	.0000	.0002
6	2	-.3404	-.2140	.3019	-.0001	.0000	.0001
	3	-.4816	-.3098	.4575	-.0002	.0000	.0002
	4	-.5632	-.3046	.4873	-.0001	.0000	.0002
	5	-.6819	-.2869	.4244	-.0001	.0000	.0003
	6	-.8123	-.2939	.4233	-.0002	.0000	.0003
	7	-.4687	-.3244	.8553	.0000	.0000	.0002
7	2	-.3404	-.0971	.3018	.0002	.0000	.0002
	3	-.4815	-.1194	.4574	.0003	.0000	.0003
	4	-.5632	-.0653	.4873	.0003	.0000	.0003
	5	-.6818	-.0584	.4244	.0003	.0000	.0003
	6	-.8122	-.0754	.4232	.0003	.0000	.0004
	7	-.4687	-.0437	.8550	.0003	.0000	.0002
8	2	-.3407	-.1825	.3017	.0001	.0000	.0002
	3	-.4820	-.2490	.4573	.0001	.0000	.0004
	4	-.5638	-.2054	.4872	.0002	.0000	.0004
	5	-.6825	-.1838	.4243	.0001	.0000	.0004
	6	-.8130	-.1918	.4231	.0001	.0000	.0005
	7	-.4691	-.2082	.8549	.0002	.0000	.0003

JOINT DISPLACEMENT (CM RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
9	2	-.3403	-.1551	.3016	-.0001	.0000	.0002
	3	-.4815	-.2231	.4571	-.0001	.0000	.0003
	4	-.5632	-.2113	.4870	.0000	.0000	.0003
	5	-.6818	-.1824	.4241	-.0001	.0000	.0003
	6	-.8122	-.1711	.4229	-.0001	.0000	.0004
	7	-.4686	-.2406	.8547	.0000	.0000	.0003
10	2	.0342	.0000	-.0641	.0002	.0000	.0003
	3	.0513	.0000	-.0958	.0003	.0000	.0004
	4	.0654	.0000	-.1006	.0004	.0000	.0005
	5	.0822	.0000	-.0920	.0003	.0000	.0005
	6	.1004	.0000	-.0916	.0003	.0000	.0006
	7	.0533	.0000	-.1321	.0007	.0000	.0004
11	2	-.0210	-.0218	-.0199	.0002	.0000	.0003
	3	-.0264	-.0293	-.0287	.0003	.0000	.0004
	4	-.0247	-.0243	-.0288	.0004	.0000	.0005
	5	-.0265	-.0268	-.0301	.0003	.0000	.0005
	6	-.0287	-.0334	-.0299	.0003	.0000	.0006
	7	-.0219	-.0188	.0001	.0007	.0000	.0004
12	2	-.0765	-.0437	.0249	.0002	.0000	.0003
	3	-.1046	-.0587	.0395	.0003	.0000	.0004
	4	-.1155	-.0487	.0440	.0004	.0000	.0005
	5	-.1360	-.0535	.0327	.0003	.0000	.0006
	6	-.1589	-.0669	.0328	.0003	.0000	.0007
	7	-.0976	-.0375	.1336	.0007	.0000	.0004
13	2	-.1325	-.0655	.0712	.0002	.0000	.0003
	3	-.1835	-.0880	.1097	.0004	.0000	.0004
	4	-.2072	-.0730	.1190	.0004	.0000	.0005
	5	-.2468	-.0803	.0976	.0003	.0000	.0006
	6	-.2906	-.1003	.0975	.0003	.0000	.0007
	7	-.1740	-.0563	.2696	.0007	.0000	.0004
14	2	-.1882	-.0874	.1195	.0002	.0000	.0003
	3	-.2623	-.1173	.1830	.0004	.0000	.0004
	4	-.2992	-.0974	.1971	.0004	.0000	.0005
	5	-.3581	-.1070	.1654	.0003	.0000	.0006
	6	-.4230	-.1337	.1652	.0003	.0000	.0007
	7	-.2506	-.0750	.4081	.0007	.0000	.0004
15	2	-.2418	-.1092	.1697	.0003	.0000	.0003
	3	-.3383	-.1467	.2589	.0004	.0000	.0004
	4	-.3886	-.1217	.2778	.0004	.0000	.0004
	5	-.4665	-.1338	.2361	.0004	.0000	.0005
	6	-.5524	-.1672	.2356	.0004	.0000	.0006
	7	-.3249	-.0938	.5464	.0007	.0000	.0004
20	2	.0241	.0000	-.0329	.0002	.0000	.0003
	3	.0371	.0000	-.0536	.0004	.0000	.0004
	4	.0524	.0000	-.0656	.0004	.0000	.0005
	5	.0709	.0000	-.0564	.0003	.0000	.0006
	6	.0896	.0000	-.0495	.0003	.0000	.0007
	7	.0390	.0000	-.1009	.0007	.0000	.0004

JOINT DISPLACEMENT (CM RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
21	2	-.0326	-.0342	.0157	.0002	.0000	.0003
	3	-.0427	-.0480	.0195	.0004	.0000	.0004
	4	-.0397	-.0447	.0111	.0004	.0000	.0005
	5	-.0395	-.0457	.0105	.0003	.0000	.0006
	6	-.0412	-.0518	.0182	.0003	.0000	.0007
	7	-.0383	-.0418	.0357	.0007	.0000	.0004
22	2	-.0895	-.0684	.0646	.0002	.0000	.0003
	3	-.1229	-.0961	.0932	.0004	.0000	.0004
	4	-.1322	-.0893	.0885	.0004	.0000	.0005
	5	-.1506	-.0913	.0780	.0003	.0000	.0006
	6	-.1729	-.1036	.0863	.0003	.0000	.0007
	7	-.1159	-.0837	.1733	.0007	.0000	.0004
23	2	-.1465	-.1026	.1140	.0002	.0000	.0003
	3	-.2033	-.1441	.1676	.0004	.0000	.0004
	4	-.2254	-.1340	.1670	.0004	.0000	.0005
	5	-.2627	-.1370	.1464	.0003	.0000	.0006
	6	-.3059	-.1555	.1552	.0003	.0000	.0007
	7	-.1939	-.1255	.3124	.0007	.0000	.0004
24	2	-.2027	-.1367	.1634	.0002	.0000	.0003
	3	-.2826	-.1922	.2423	.0004	.0000	.0004
	4	-.3179	-.1787	.2462	.0004	.0000	.0005
	5	-.3744	-.1826	.2155	.0003	.0000	.0005
	6	-.4388	-.2073	.2243	.0003	.0000	.0007
	7	-.2710	-.1673	.4520	.0007	.0000	.0004
25	2	-.2555	-.1709	.2111	.0002	.0000	.0002
	3	-.3577	-.2402	.3149	.0003	.0000	.0004
	4	-.4063	-.2234	.3242	.0004	.0000	.0004
	5	-.4821	-.2283	.2834	.0003	.0000	.0005
	6	-.5675	-.2591	.2915	.0003	.0000	.0006
	7	-.3443	-.2092	.5878	.0007	.0000	.0003
30	2	.0317	.0000	.0035	.0003	.0000	.0003
	3	.0468	.0000	-.0016	.0004	.0000	.0004
	4	.0589	.0000	-.0158	.0004	.0000	.0005
	5	.0766	.0000	-.0083	.0004	.0000	.0005
	6	.0962	.0000	.0016	.0004	.0000	.0006
	7	.0447	.0000	-.0510	.0007	.0000	.0004
31	2	-.0238	-.0293	.0573	.0003	.0000	.0003
	3	-.0315	-.0427	.0789	.0004	.0000	.0004
	4	-.0322	-.0432	.0679	.0004	.0000	.0005
	5	-.0329	-.0428	.0654	.0004	.0000	.0005
	6	-.0335	-.0458	.0765	.0004	.0000	.0007
	7	-.0317	-.0442	.0926	.0007	.0000	.0004
32	2	-.0797	-.0587	.1109	.0003	.0000	.0003
	3	-.1103	-.0854	.1593	.0004	.0000	.0004
	4	-.1238	-.0864	.1517	.0004	.0000	.0005
	5	-.1431	-.0855	.1391	.0004	.0000	.0006
	6	-.1642	-.0916	.1513	.0004	.0000	.0007
	7	-.1085	-.0883	.2367	.0007	.0000	.0004

JOINT DISPLACEMENT (CM RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
33	2	-.1359	-.0880	.1639	.0003	.0000	.0003
	3	-.1897	-.1282	.2389	.0004	.0000	.0004
	4	-.2162	-.1295	.2351	.0004	.0000	.0005
	5	-.2544	-.1283	.2123	.0004	.0000	.0006
	6	-.2963	-.1373	.2252	.0004	.0000	.0007
	7	-.1859	-.1325	.3807	.0007	.0000	.0004
34	2	-.1918	-.1174	.2145	.0002	.0000	.0003
	3	-.2686	-.1709	.3153	.0004	.0000	.0004
	4	-.3084	-.1727	.3161	.0004	.0000	.0005
	5	-.3659	-.1711	.2830	.0003	.0000	.0005
	6	-.4289	-.1831	.2961	.0003	.0000	.0007
	7	-.2627	-.1767	.5220	.0007	.0000	.0004
35	2	-.2452	-.1467	.2594	.0002	.0000	.0003
	3	-.3444	-.2136	.3839	.0003	.0000	.0004
	4	-.3973	-.2159	.3902	.0003	.0000	.0004
	5	-.4739	-.2138	.3471	.0003	.0000	.0005
	6	-.5580	-.2289	.3593	.0003	.0000	.0006
	7	-.3364	-.2208	.6539	.0006	.0000	.0003
70	2	.0612	.0000	-.0613	.0002	.0000	.0003
	3	.0877	.0000	-.0916	.0003	.0000	.0004
	4	.0952	.0000	-.0958	.0004	.0000	.0004
	5	.1120	.0000	-.0862	.0003	.0000	.0005
	6	.1353	.0000	-.0844	.0003	.0000	.0006
	7	.0797	.0000	-.1282	.0007	.0000	.0004
71	2	.0098	-.0125	-.0167	.0002	.0000	.0003
	3	.0151	-.0154	-.0238	.0003	.0000	.0004
	4	.0092	-.0084	-.0233	.0004	.0000	.0004
	5	.0075	-.0075	-.0235	.0003	.0000	.0005
	6	.0110	-.0097	-.0216	.0003	.0000	.0006
	7	.0082	-.0056	.0046	.0007	.0000	.0004
72	2	-.0423	-.0250	.0285	.0002	.0000	.0003
	3	-.0584	-.0308	.0449	.0003	.0000	.0004
	4	-.0777	-.0169	.0501	.0004	.0000	.0004
	5	-.0982	-.0151	.0401	.0003	.0000	.0005
	6	-.1146	-.0195	.0420	.0003	.0000	.0006
	7	-.0640	-.0113	.1386	.0007	.0000	.0004
73	2	-.0956	-.0376	.0751	.0002	.0000	.0003
	3	-.1337	-.0462	.1156	.0004	.0000	.0004
	4	-.1665	-.0253	.1257	.0004	.0000	.0004
	5	-.2060	-.0226	.1056	.0003	.0000	.0005
	6	-.2429	-.0292	.1075	.0003	.0000	.0006
	7	-.1379	-.0169	.2751	.0007	.0000	.0004
74	2	-.1505	-.0501	.1235	.0002	.0000	.0003
	3	-.2113	-.0616	.1890	.0004	.0000	.0004
	4	-.2575	-.0337	.2039	.0004	.0000	.0005
	5	-.3163	-.0301	.1737	.0003	.0000	.0006
	6	-.3742	-.0389	.1754	.0003	.0000	.0007
	7	-.2136	-.0226	.4138	.0007	.0000	.0004

JOINT DISPLACEMENT (CM RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
75	2	-.2062	-.0626	.1734	.0003	.0000	.0003
	3	-.2902	-.0770	.2646	.0004	.0000	.0004
	4	-.3492	-.0421	.2843	.0004	.0000	.0005
	5	-.4270	-.0377	.2439	.0004	.0000	.0005
	6	-.5063	-.0487	.2453	.0003	.0000	.0006
	7	-.2900	-.0282	.5517	.0007	.0000	.0004
80	2	.0761	.0000	-.0329	.0002	.0000	.0002
	3	.1093	.0000	-.0536	.0004	.0000	.0003
	4	.1165	.0000	-.0656	.0004	.0000	.0004
	5	.1333	.0000	-.0564	.0003	.0000	.0005
	6	.1585	.0000	-.0495	.0003	.0000	.0006
	7	.1008	.0000	-.1009	.0007	.0000	.0003
81	2	.0267	-.0236	.0157	.0002	.0000	.0002
	3	.0396	-.0321	.0195	.0004	.0000	.0004
	4	.0334	-.0265	.0111	.0004	.0000	.0004
	5	.0317	-.0237	.0105	.0003	.0000	.0005
	6	.0374	-.0247	.0182	.0003	.0000	.0006
	7	.0322	-.0269	.0357	.0007	.0000	.0003
82	2	-.0234	-.0471	.0646	.0002	.0000	.0003
	3	-.0312	-.0643	.0932	.0004	.0000	.0004
	4	-.0508	-.0530	.0885	.0004	.0000	.0004
	5	-.0713	-.0474	.0780	.0003	.0000	.0005
	6	-.0853	-.0495	.0863	.0003	.0000	.0006
	7	-.0374	-.0537	.1733	.0007	.0000	.0004
83	2	-.0753	-.0707	.1140	.0002	.0000	.0003
	3	-.1045	-.0964	.1676	.0004	.0000	.0004
	4	-.1376	-.0795	.1670	.0004	.0000	.0004
	5	-.1772	-.0711	.1464	.0003	.0000	.0005
	6	-.2115	-.0742	.1552	.0003	.0000	.0006
	7	-.1092	-.0806	.3124	.0007	.0000	.0004
84	2	-.1297	-.0942	.1634	.0002	.0000	.0003
	3	-.1814	-.1285	.2423	.0004	.0000	.0004
	4	-.2280	-.1060	.2462	.0004	.0000	.0005
	5	-.2868	-.0949	.2155	.0003	.0000	.0006
	6	-.3421	-.0990	.2243	.0003	.0000	.0007
	7	-.1843	-.1074	.4520	.0007	.0000	.0004
85	2	-.1867	-.1178	.2111	.0002	.0000	.0003
	3	-.2620	-.1607	.3149	.0003	.0000	.0004
	4	-.3214	-.1325	.3242	.0004	.0000	.0005
	5	-.3994	-.1186	.2834	.0003	.0000	.0006
	6	-.4761	-.1237	.2915	.0003	.0000	.0007
	7	-.2624	-.1343	.5878	.0007	.0000	.0004
90	2	.0637	.0000	.0008	.0003	.0000	.0003
	3	.0922	.0000	-.0058	.0004	.0000	.0004
	4	.1017	.0000	-.0206	.0004	.0000	.0004
	5	.1176	.0000	-.0141	.0004	.0000	.0005
	6	.1394	.0000	-.0056	.0004	.0000	.0006
	7	.0883	.0000	-.0549	.0007	.0000	.0004

JOINT DISPLACEMENT (CM RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
91	2	.0126	-.0200	.0541	.0003	.0000	.0003
	3	.0203	-.0288	.0740	.0004	.0000	.0004
	4	.0167	-.0273	.0624	.0004	.0000	.0004
	5	.0138	-.0235	.0588	.0004	.0000	.0005
	6	.0158	-.0221	.0682	.0004	.0000	.0006
	7	.0180	-.0310	.0881	.0007	.0000	.0004
92	2	-.0391	-.0400	.1073	.0003	.0000	.0003
	3	-.0526	-.0576	.1539	.0004	.0000	.0004
	4	-.0694	-.0545	.1456	.0004	.0000	.0004
	5	-.0911	-.0471	.1317	.0004	.0000	.0005
	6	-.1093	-.0441	.1421	.0004	.0000	.0006
	7	-.0531	-.0621	.2316	.0007	.0000	.0004
93	2	-.0922	-.0601	.1600	.0003	.0000	.0003
	3	-.1275	-.0864	.2330	.0004	.0000	.0004
	4	-.1575	-.0818	.2285	.0004	.0000	.0004
	5	-.1984	-.0706	.2043	.0004	.0000	.0005
	6	-.2371	-.0662	.2153	.0004	.0000	.0006
	7	-.1261	-.0931	.3753	.0007	.0000	.0004
94	2	-.1469	-.0801	.2105	.0002	.0000	.0003
	3	-.2049	-.1152	.3093	.0004	.0000	.0004
	4	-.2483	-.1090	.3092	.0004	.0000	.0005
	5	-.3084	-.0941	.2747	.0003	.0000	.0006
	6	-.3683	-.0883	.2858	.0003	.0000	.0007
	7	-.2015	-.1242	.5164	.0007	.0000	.0004
95	2	-.2028	-.1001	.2556	.0002	.0000	.0003
	3	-.2842	-.1440	.3781	.0003	.0000	.0004
	4	-.3405	-.1363	.3837	.0003	.0000	.0005
	5	-.4197	-.1177	.3393	.0003	.0000	.0005
	6	-.5007	-.1104	.3495	.0003	.0000	.0007
	7	-.2785	-.1552	.6486	.0006	.0000	.0004

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
10	2	-.57	733.86	1.07	.00	.00	.00
	3	-.86	985.37	1.60	.00	.00	.00
	4	-1.09	817.89	1.68	.00	.00	.00
	5	-1.37	898.93	1.54	.00	.00	.00
	6	-1.68	1123.16	1.53	.00	.00	.00
	7	-.89	630.20	2.21	.00	.00	.00
20	2	-.40	1148.34	.55	.00	.00	.00
	3	-.62	1613.60	.90	.00	.00	.00
	4	-.88	1500.61	1.10	.00	.00	.00
	5	-1.18	1533.63	.94	.00	.00	.00
	6	-1.50	1740.55	.83	.00	.00	.00
	7	-.65	1405.08	1.69	.00	.00	.00
11	2	.35	.00	.33	.00	.00	.00
	3	.44	.00	.48	.00	.00	.00
	4	.41	.00	.48	.00	.00	.00
	5	.44	.00	.50	.00	.00	.00
	6	.48	.00	.50	.00	.00	.00
	7	.37	.00	.00	.00	.00	.00
12	2	1.28	.00	-.42	.00	.00	.00
	3	1.75	.00	-.66	.00	.00	.00
	4	1.93	.00	-.73	.00	.00	.00
	5	2.27	.00	-.55	.00	.00	.00
	6	2.65	.00	-.55	.00	.00	.00
	7	1.63	.00	-2.23	.00	.00	.00
13	2	2.21	.00	-1.19	.00	.00	.00
	3	3.06	.00	-1.83	.00	.00	.00
	4	3.46	.00	-1.99	.00	.00	.00
	5	4.12	.00	-1.63	.00	.00	.00
	6	4.85	.00	-1.63	.00	.00	.00
	7	2.91	.00	-4.50	.00	.00	.00
14	2	3.14	.00	-2.00	.00	.00	.00
	3	4.38	.00	-3.06	.00	.00	.00
	4	5.00	.00	-3.29	.00	.00	.00
	5	5.98	.00	-2.76	.00	.00	.00
	6	7.06	.00	-2.76	.00	.00	.00
	7	4.19	.00	-6.82	.00	.00	.00
15	2	4.04	.00	-2.83	.00	.00	.00
	3	5.65	.00	-4.32	.00	.00	.00
	4	6.49	.00	-4.64	.00	.00	.00
	5	7.79	.00	-3.94	.00	.00	.00
	6	9.23	.00	-3.93	.00	.00	.00
	7	5.43	.00	-9.12	.00	.00	.00
21	2	.54	.00	-.26	.00	.00	.00
	3	.71	.00	-.33	.00	.00	.00
	4	.66	.00	-.19	.00	.00	.00
	5	.66	.00	-.18	.00	.00	.00
	6	.69	.00	-.30	.00	.00	.00
	7	.64	.00	-.60	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
22	2	1.49	.00	-1.08	.00	.00	.00
	3	2.05	.00	-1.56	.00	.00	.00
	4	2.21	.00	-1.48	.00	.00	.00
	5	2.52	.00	-1.30	.00	.00	.00
	6	2.89	.00	-1.44	.00	.00	.00
	7	1.94	.00	-2.89	.00	.00	.00
23	2	2.45	.00	-1.90	.00	.00	.00
	3	3.39	.00	-2.80	.00	.00	.00
	4	3.76	.00	-2.79	.00	.00	.00
	5	4.39	.00	-2.45	.00	.00	.00
	6	5.11	.00	-2.59	.00	.00	.00
	7	3.24	.00	-5.22	.00	.00	.00
24	2	3.38	.00	-2.73	.00	.00	.00
	3	4.72	.00	-4.05	.00	.00	.00
	4	5.31	.00	-4.11	.00	.00	.00
	5	6.25	.00	-3.60	.00	.00	.00
	6	7.33	.00	-3.75	.00	.00	.00
	7	4.53	.00	-7.55	.00	.00	.00
25	2	4.27	.00	-3.53	.00	.00	.00
	3	5.97	.00	-5.26	.00	.00	.00
	4	6.79	.00	-5.41	.00	.00	.00
	5	8.05	.00	-4.73	.00	.00	.00
	6	9.48	.00	-4.87	.00	.00	.00
	7	5.75	.00	-9.82	.00	.00	.00
30	2	-.53	985.57	-.06	.00	.00	.00
	3	-.78	1434.99	.03	.00	.00	.00
	4	-.98	1450.39	.26	.00	.00	.00
	5	-1.28	1436.45	.14	.00	.00	.00
	6	-1.61	1537.64	-.03	.00	.00	.00
	7	-.75	1483.43	.85	.00	.00	.00
70	2	-1.02	420.66	1.02	.00	.00	.00
	3	-1.46	517.52	1.53	.00	.00	.00
	4	-1.59	283.14	1.60	.00	.00	.00
	5	-1.87	252.98	1.44	.00	.00	.00
	6	-2.26	326.98	1.41	.00	.00	.00
	7	-1.33	189.43	2.14	.00	.00	.00
31	2	.40	.00	-.96	.00	.00	.00
	3	.53	.00	-1.32	.00	.00	.00
	4	.54	.00	-1.13	.00	.00	.00
	5	.55	.00	-1.09	.00	.00	.00
	6	.56	.00	-1.28	.00	.00	.00
	7	.53	.00	-1.55	.00	.00	.00
32	2	1.33	.00	-1.85	.00	.00	.00
	3	1.84	.00	-2.66	.00	.00	.00
	4	2.07	.00	-2.53	.00	.00	.00
	5	2.39	.00	-2.32	.00	.00	.00
	6	2.74	.00	-2.53	.00	.00	.00
	7	1.81	.00	-3.95	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
33	2	2.27	.00	-2.74	.00	.00	.00
	3	3.17	.00	-3.99	.00	.00	.00
	4	3.61	.00	-3.93	.00	.00	.00
	5	4.25	.00	-3.55	.00	.00	.00
	6	4.95	.00	-3.76	.00	.00	.00
	7	3.10	.00	-6.36	.00	.00	.00
34	2	3.20	.00	-3.58	.00	.00	.00
	3	4.49	.00	-5.27	.00	.00	.00
	4	5.15	.00	-5.28	.00	.00	.00
	5	6.11	.00	-4.73	.00	.00	.00
	6	7.16	.00	-4.94	.00	.00	.00
	7	4.39	.00	-8.72	.00	.00	.00
35	2	4.09	.00	-4.33	.00	.00	.00
	3	5.75	.00	-6.41	.00	.00	.00
	4	6.63	.00	-6.52	.00	.00	.00
	5	7.91	.00	-5.80	.00	.00	.00
	6	9.32	.00	-6.00	.00	.00	.00
	7	5.62	.00	-10.92	.00	.00	.00
71	2	-.16	.00	.28	.00	.00	.00
	3	-.25	.00	.40	.00	.00	.00
	4	-.15	.00	.39	.00	.00	.00
	5	-.12	.00	.39	.00	.00	.00
	6	-.18	.00	.36	.00	.00	.00
	7	-.14	.00	-.08	.00	.00	.00
72	2	.71	.00	-.48	.00	.00	.00
	3	.98	.00	-.75	.00	.00	.00
	4	1.30	.00	-.84	.00	.00	.00
	5	1.64	.00	-.67	.00	.00	.00
	6	1.91	.00	-.70	.00	.00	.00
	7	1.07	.00	-2.32	.00	.00	.00
73	2	1.60	.00	-1.25	.00	.00	.00
	3	2.23	.00	-1.93	.00	.00	.00
	4	2.78	.00	-2.10	.00	.00	.00
	5	3.44	.00	-1.76	.00	.00	.00
	6	4.06	.00	-1.79	.00	.00	.00
	7	2.30	.00	-4.59	.00	.00	.00
74	2	2.51	.00	-2.06	.00	.00	.00
	3	3.53	.00	-3.16	.00	.00	.00
	4	4.30	.00	-3.41	.00	.00	.00
	5	5.28	.00	-2.90	.00	.00	.00
	6	6.25	.00	-2.93	.00	.00	.00
	7	3.57	.00	-6.91	.00	.00	.00
75	2	3.44	.00	-2.90	.00	.00	.00
	3	4.85	.00	-4.42	.00	.00	.00
	4	5.83	.00	-4.75	.00	.00	.00
	5	7.13	.00	-4.07	.00	.00	.00
	6	8.45	.00	-4.10	.00	.00	.00
	7	4.84	.00	-9.21	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
80	2	-1.27	791.20	.55	.00	.00	.00
	3	-1.82	1079.38	.90	.00	.00	.00
	4	-1.95	890.34	1.10	.00	.00	.00
	5	-2.23	796.50	.94	.00	.00	.00
	6	-2.65	831.21	.83	.00	.00	.00
	7	-1.68	902.20	1.69	.00	.00	.00
90	2	-1.06	672.37	-.01	.00	.00	.00
	3	-1.54	967.14	.10	.00	.00	.00
	4	-1.70	915.63	.34	.00	.00	.00
	5	-1.96	790.51	.23	.00	.00	.00
	6	-2.33	741.46	.09	.00	.00	.00
	7	-1.47	1042.66	.92	.00	.00	.00
81	2	-.45	.00	-.26	.00	.00	.00
	3	-.66	.00	-.33	.00	.00	.00
	4	-.56	.00	-.19	.00	.00	.00
	5	-.53	.00	-.18	.00	.00	.00
	6	-.62	.00	-.30	.00	.00	.00
	7	-.54	.00	-.60	.00	.00	.00
82	2	.39	.00	-1.08	.00	.00	.00
	3	.52	.00	-1.56	.00	.00	.00
	4	.85	.00	-1.48	.00	.00	.00
	5	1.19	.00	-1.30	.00	.00	.00
	6	1.42	.00	-1.44	.00	.00	.00
	7	.62	.00	-2.89	.00	.00	.00
83	2	1.26	.00	-1.90	.00	.00	.00
	3	1.74	.00	-2.80	.00	.00	.00
	4	2.30	.00	-2.79	.00	.00	.00
	5	2.96	.00	-2.45	.00	.00	.00
	6	3.53	.00	-2.59	.00	.00	.00
	7	1.82	.00	-5.22	.00	.00	.00
84	2	2.17	.00	-2.73	.00	.00	.00
	3	3.03	.00	-4.05	.00	.00	.00
	4	3.81	.00	-4.11	.00	.00	.00
	5	4.79	.00	-3.60	.00	.00	.00
	6	5.71	.00	-3.75	.00	.00	.00
	7	3.08	.00	-7.55	.00	.00	.00
85	2	3.12	.00	-3.53	.00	.00	.00
	3	4.38	.00	-5.26	.00	.00	.00
	4	5.37	.00	-5.41	.00	.00	.00
	5	6.67	.00	-4.73	.00	.00	.00
	6	7.95	.00	-4.87	.00	.00	.00
	7	4.38	.00	-9.82	.00	.00	.00
91	2	-.21	.00	-.90	.00	.00	.00
	3	-.34	.00	-1.24	.00	.00	.00
	4	-.28	.00	-1.04	.00	.00	.00
	5	-.23	.00	-.98	.00	.00	.00
	6	-.26	.00	-1.14	.00	.00	.00
	7	-.30	.00	-1.47	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
92	2	.65	.00	-1.79	.00	.00	.00
	3	.88	.00	-2.57	.00	.00	.00
	4	1.16	.00	-2.43	.00	.00	.00
	5	1.52	.00	-2.20	.00	.00	.00
	6	1.82	.00	-2.37	.00	.00	.00
	7	.89	.00	-3.87	.00	.00	.00
93	2	1.54	.00	-2.67	.00	.00	.00
	3	2.13	.00	-3.89	.00	.00	.00
	4	2.63	.00	-3.82	.00	.00	.00
	5	3.31	.00	-3.41	.00	.00	.00
	6	3.96	.00	-3.59	.00	.00	.00
	7	2.11	.00	-6.27	.00	.00	.00
94	2	2.45	.00	-3.52	.00	.00	.00
	3	3.42	.00	-5.17	.00	.00	.00
	4	4.15	.00	-5.16	.00	.00	.00
	5	5.15	.00	-4.59	.00	.00	.00
	6	6.15	.00	-4.77	.00	.00	.00
	7	3.36	.00	-8.62	.00	.00	.00
95	2	3.39	.00	-4.27	.00	.00	.00
	3	4.75	.00	-6.32	.00	.00	.00
	4	5.69	.00	-6.41	.00	.00	.00
	5	7.01	.00	-5.67	.00	.00	.00
	6	8.36	.00	-5.84	.00	.00	.00
	7	4.65	.00	-10.83	.00	.00	.00

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
101	2	1	-3.07	287.79	-2.25	310.26	1.71	-277.69
		2	3.07	-287.79	2.25	-310.26	11.13	1918.12
	3	1	-4.46	389.00	-2.94	438.44	1.89	-376.13
		2	4.46	-389.00	2.94	-438.44	14.84	2593.45
	4	1	-6.08	325.51	-4.04	400.38	3.49	-301.91
		2	6.08	-325.51	4.04	-400.38	19.52	2157.32
	5	1	-7.18	350.36	-5.97	348.16	6.83	-253.06
		2	7.18	-350.36	5.97	-348.16	27.18	2250.10
	6	1	-8.29	429.15	-7.36	333.37	8.89	-256.40
		2	8.29	-429.15	7.36	-333.37	33.05	2702.53
	7	1	-7.77	251.86	-.08	439.41	-5.36	-379.73
		2	7.77	-251.86	.08	-439.41	5.83	1815.36
102	2	2	1.19	-385.35	6.60	-234.08	-24.87	-2378.16
		3	-1.19	385.35	-6.60	234.08	-12.73	181.64
	3	2	1.90	-557.47	9.33	-299.50	-35.06	-3417.48
		3	-1.90	557.47	-9.33	299.50	-18.14	239.89
	4	2	.47	-551.42	10.45	-199.45	-39.75	-3320.87
		3	-.47	551.42	-10.45	199.45	-19.80	177.77
	5	2	-1.47	-543.07	11.59	-177.76	-44.91	-3238.65
		3	1.47	543.07	-11.59	177.76	-21.13	143.13
	6	2	-2.39	-584.56	13.28	-205.34	-51.77	-3462.11
		3	2.39	584.56	-13.28	205.34	-23.93	130.13
	7	2	4.10	-570.65	12.01	-175.30	-43.52	-3379.46
		3	-4.10	570.65	-12.01	175.30	-24.94	126.75
103	2	4	-12.49	675.92	-8.66	-424.86	13.87	678.86
		5	12.49	-675.92	8.66	424.86	35.50	3173.88
	3	4	-18.57	871.38	-12.00	-641.70	19.23	935.14
		5	18.57	-871.38	12.00	641.70	49.19	4031.71
	4	4	-18.87	616.68	-14.17	-730.11	22.69	813.84
		5	18.87	-616.68	14.17	730.11	58.06	2701.24
	5	4	-16.32	652.43	-17.16	-881.52	27.49	801.23
		5	16.32	-652.43	17.16	881.52	70.35	2917.62
	6	4	-17.12	841.58	-20.18	-1093.95	32.33	895.03
		5	17.12	-841.58	20.18	1093.95	82.69	3902.00
	7	4	-37.10	453.01	-11.84	-600.61	18.96	735.18
		5	37.10	-453.01	11.84	600.61	48.51	1846.99
104	2	5	16.07	-984.22	8.66	424.86	-35.50	-4848.58
		6	-16.07	984.22	-8.66	-424.86	-13.87	-761.48
	3	5	23.53	-1433.68	12.00	641.70	-49.19	-7107.23
		6	-23.53	1433.68	-12.00	-641.70	-19.22	-1064.73
	4	5	23.28	-1429.85	14.16	730.11	-58.06	-7188.40
		6	-23.28	1429.85	-14.16	-730.11	-22.68	-961.73

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	5	5	20.61	-1342.05	17.17	881.52	-70.35	-6720.49
		6	-20.61	1342.05	-17.17	-881.52	-27.49	-929.18
	6	5	21.87	-1359.71	20.18	1093.95	-82.69	-6735.54
		6	-21.87	1359.71	-20.18	-1093.95	-32.33	-1014.83
	7	5	41.37	-1521.90	11.83	600.61	-48.49	-7696.58
		6	-41.37	1521.90	-11.83	-600.61	-18.94	-978.26
105	2	7	5.15	190.81	-6.61	-456.86	11.36	-455.86
		8	-5.15	-190.81	6.61	456.86	25.79	1543.46
	3	7	6.91	242.51	-9.35	-659.86	16.34	-645.25
		8	-6.91	-242.51	9.35	659.86	36.36	2027.56
	4	7	7.35	158.84	-10.46	-652.31	18.73	-608.10
		8	-7.35	-158.84	10.46	652.31	40.39	1513.48
	5	7	9.08	149.12	-11.60	-652.34	20.38	-622.75
		8	-9.08	-149.12	11.60	652.34	46.32	1472.73
	6	7	10.80	179.41	-13.30	-710.83	22.79	-715.17
		8	-10.80	-179.41	13.30	710.83	53.91	1737.83
	7	7	3.45	114.75	-12.02	-646.66	23.31	-631.62
		8	-3.45	-114.75	12.02	646.66	44.53	1285.71
106	2	8	9.42	-288.37	2.26	380.68	-12.06	-2003.50
		9	-9.42	288.37	-2.26	-380.68	-.34	359.81
	3	8	13.26	-410.98	2.95	520.92	-16.13	-2851.59
		9	-13.26	410.98	-2.95	-520.92	-.69	509.01
	4	8	13.90	-384.75	4.05	451.38	-20.65	-2677.03
		9	-13.90	384.75	-4.05	-451.38	-2.40	483.96
	5	8	14.81	-341.84	5.98	481.93	-28.29	-2461.29
		9	-14.81	341.84	-5.98	-481.93	-5.78	512.82
	6	8	16.69	-334.83	7.37	582.81	-34.28	-2497.41
		9	-16.69	334.83	-7.37	-582.81	-7.73	588.90
	7	8	15.32	-433.54	.09	382.54	-6.93	-2849.81
		9	-15.32	433.54	-.09	-382.54	6.39	378.63
107	2	1	8.20	446.06	-1.96	-252.14	-1.71	-232.89
		4	-8.20	-446.06	1.96	252.14	7.98	1660.29
	3	1	11.49	596.37	-3.33	-335.73	-1.89	-332.67
		4	-11.49	-596.37	3.33	335.73	12.56	2241.04
	4	1	12.16	492.38	-2.42	-256.91	-3.49	-283.52
		4	-12.16	-492.38	2.42	256.91	11.22	1859.15
	5	1	13.27	548.57	.34	-219.50	-6.83	-210.48
		4	-13.27	-548.57	-.34	219.50	5.74	1965.90
	6	1	15.23	694.02	1.45	-222.75	-8.89	-172.54
		4	-15.23	-694.02	-1.45	222.75	4.27	2393.39
	7	1	13.54	378.33	-12.69	-244.19	5.36	-340.68
		4	-13.54	-378.33	12.69	244.19	35.26	1551.34
108	2	4	-.48	-229.86	10.53	426.72	-21.85	-1235.43
		7	.48	229.86	-10.53	-426.72	-11.86	499.89

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	3	4	-.51	-275.01	15.22	599.42	-31.78	-1599.35
		7	.51	275.01	-15.22	-599.42	-16.93	719.31
	4	4	-2.00	-124.30	16.45	556.93	-33.90	-1129.03
		7	2.00	124.30	-16.45	-556.93	-18.72	731.27
	5	4	-3.90	-103.86	16.66	581.73	-33.22	-1084.38
		7	3.90	103.86	-16.66	-581.73	-20.08	752.03
	6	4	-4.95	-147.56	18.56	672.27	-36.60	-1299.45
		7	4.95	147.56	-18.56	-672.27	-22.78	827.24
	7	4	1.74	-74.68	24.41	490.99	-54.20	-950.73
		7	-1.74	74.68	-24.41	-490.99	-23.91	711.75
109	2	2	20.59	1821.49	-13.22	-394.65	13.73	634.73
		5	-20.59	-1821.49	13.22	394.65	28.56	5194.04
	3	2	28.50	2560.07	-19.46	-729.74	20.23	862.07
		5	-28.50	-2560.07	19.46	729.74	42.04	7330.15
	4	2	32.34	2377.55	-19.43	-1073.92	20.23	733.50
		5	-32.34	-2377.55	19.43	1073.92	41.95	6874.65
	5	2	38.23	2427.06	-17.04	-909.56	17.73	678.28
		5	-38.23	-2427.06	17.04	909.56	36.78	7088.33
	6	2	44.62	2754.25	-18.02	-672.23	18.72	713.62
		5	-44.62	-2754.25	18.02	672.23	38.92	8099.98
	7	2	27.53	2227.60	-36.27	-1388.71	37.70	731.85
		5	-27.53	-2227.60	36.27	1388.71	78.36	6396.47
110	2	5	-14.09	-1270.37	13.22	394.65	-28.57	-3251.75
		8	14.09	1270.37	-13.22	-394.65	-13.73	-813.43
	3	5	-19.47	-1732.88	19.45	729.74	-42.03	-4396.56
		8	19.47	1732.88	-19.45	-729.74	-20.22	-1148.64
	4	5	-24.34	-1433.93	19.43	1073.92	-41.95	-3536.86
		8	24.34	1433.93	-19.43	-1073.92	-20.22	-1051.70
	5	5	-30.43	-1287.46	17.03	909.56	-36.77	-3058.36
		8	30.43	1287.46	-17.03	-909.56	-17.72	-1061.52
	6	5	-36.02	-1345.45	18.02	672.23	-38.94	-3098.88
		8	36.02	1345.45	-18.02	-672.23	-18.73	-1206.58
	7	5	-19.79	-1450.49	36.27	1388.70	-78.35	-3650.69
		8	19.79	1450.49	-36.27	-1388.70	-37.70	-990.88
111	2	3	4.17	600.21	-12.32	293.45	12.73	-153.53
		6	-4.17	-600.21	12.32	-293.45	26.70	2074.22
	3	3	5.65	877.52	-17.71	400.52	18.15	-187.94
		6	-5.65	-877.52	17.71	-400.52	38.53	2995.99
	4	3	6.57	898.96	-18.66	330.86	19.80	-74.23
		6	-6.57	-898.96	18.66	-330.86	39.89	2950.91
	5	3	8.34	893.37	-18.81	283.47	21.13	-32.99
		6	-8.34	-893.37	18.81	-283.47	39.06	2891.78
	6	3	9.83	953.08	-20.93	282.65	23.93	-39.18
		6	-9.83	-953.08	20.93	-282.65	43.03	3089.04

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	7	3	2.69	912.78	-26.54	365.73	24.94	-65.56
		6	-2.69	-912.78	26.54	-365.73	59.98	2986.44
112	2	6	-4.50	-384.01	3.75	-468.03	-12.84	-1649.36
		9	4.50	384.01	-3.75	468.03	.85	420.53
	3	6	-6.33	-556.16	5.81	-664.21	-19.29	-2354.29
		9	6.33	556.16	-5.81	664.21	.69	574.58
	4	6	-7.61	-530.89	4.62	-630.88	-17.30	-2220.80
		9	7.61	530.89	-4.62	630.88	2.41	521.97
	5	6	-8.82	-448.67	1.81	-645.71	-11.57	-2010.27
		9	8.82	448.67	-1.81	645.71	5.79	574.53
	6	6	-10.34	-406.63	.93	-732.18	-10.70	-1995.09
		9	10.34	406.63	-.93	732.18	7.73	693.87
	7	6	-9.14	-609.12	14.82	-612.53	-41.02	-2385.83
		9	9.14	609.12	-14.82	612.53	-6.40	436.63
10	2	10	733.86	.57	1.07	.00	.00	.00
		11	-733.86	-.57	-1.07	.00	-2.14	1.14
	3	10	985.37	.86	1.60	.00	.00	.00
		11	-985.37	-.86	-1.60	.00	-3.20	1.71
	4	10	817.89	1.09	1.68	.00	.00	.00
		11	-817.89	-1.09	-1.68	.00	-3.36	2.19
	5	10	898.93	1.37	1.54	.00	.00	.00
		11	-898.93	-1.37	-1.54	.00	-3.07	2.74
	6	10	1123.16	1.68	1.53	.00	.00	.00
		11	-1123.16	-1.68	-1.53	.00	-3.06	3.35
	7	10	630.20	.89	2.21	.00	.00	.00
		11	-630.20	-.89	-2.21	.00	-4.41	1.78
11	2	11	733.86	.22	1.40	.00	2.14	-1.14
		12	-733.86	-.22	-1.40	.00	-4.35	1.59
	3	11	985.37	.42	2.08	.00	3.20	-1.71
		12	-985.37	-.42	-2.08	.00	-7.36	2.55
	4	11	817.89	.68	2.16	.00	3.36	-2.19
		12	-817.89	-.68	-2.16	.00	-7.68	3.55
	5	11	898.93	.93	2.04	.00	3.07	-2.74
		12	-898.93	-.93	-2.04	.00	-7.15	4.60
	6	11	1123.16	1.20	2.03	.00	3.06	-3.35
		12	-1123.16	-1.20	-2.03	.00	-7.12	5.75
	7	11	630.20	.52	2.21	.00	4.41	-1.78
		12	-630.20	-.52	-2.21	.00	-8.82	2.83
12	2	12	733.86	-1.06	.99	.00	4.95	-1.59
		13	-733.86	1.06	-.99	.00	-6.92	-.53
	3	12	985.37	-1.33	1.42	.00	7.36	-2.55
		13	-985.37	1.33	-1.42	.00	-10.20	-.11
	4	12	817.89	-1.25	1.43	.00	7.58	-3.54
		13	-817.89	1.25	-1.43	.00	-10.53	1.05

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	5	12	898.93	-1.34	1.49	.00	7.15	-4.60
		13	-898.93	1.34	-1.49	.00	-10.14	1.92
	6	12	1123.16	-1.46	1.48	.00	7.12	-5.75
		13	-1123.16	1.46	-1.48	.00	-10.08	2.83
	7	12	630.20	-1.11	-.03	.00	8.82	-2.83
		13	-630.20	1.11	.03	.00	-8.77	.62
13	2	13	733.86	-3.27	-.20	.00	6.92	.53
		14	-733.86	3.27	.20	.00	-6.52	-7.07
	3	13	985.37	-4.39	-.41	.00	10.20	.11
		14	-985.37	4.39	.41	.00	-9.38	-8.90
	4	13	817.89	-4.71	-.56	.00	10.53	-1.05
		14	-817.89	4.71	.56	.00	-9.41	-8.37
	5	13	898.93	-5.46	-.14	.00	10.14	-1.92
		14	-898.93	5.46	.14	.00	-9.86	-9.01
	6	13	1123.16	-6.31	-.15	.00	10.08	-2.83
		14	-1123.16	6.31	.15	.00	-9.78	-9.78
	7	13	630.20	-4.01	-4.53	.00	8.77	-.62
		14	-630.20	4.01	4.53	.00	.28	-7.41
14	2	14	733.86	-6.41	-2.20	.00	6.52	7.07
		15	-733.86	6.41	2.20	.00	-2.12	-19.89
	3	14	985.37	-8.77	-3.47	.00	9.38	8.90
		15	-985.37	8.77	3.47	.00	-2.44	-26.44
	4	14	817.89	-9.71	-3.85	.00	9.41	8.37
		15	-817.89	9.71	3.85	.00	-1.71	-27.78
	5	14	898.93	-11.44	-2.90	.00	9.86	9.01
		15	-898.93	11.44	2.90	.00	-4.07	-31.89
	6	14	1123.16	-13.37	-2.91	.00	9.78	9.78
		15	-1123.16	13.37	2.91	.00	-3.97	-36.53
	7	14	630.20	-8.20	-11.34	.00	-.28	7.41
		15	-630.20	8.20	11.34	.00	22.97	-23.80
15	2	15	733.86	-10.45	-5.03	.00	2.12	19.89
		1	-733.86	10.45	5.03	.00	25.55	-77.38
	3	15	985.37	-14.42	-7.79	.00	2.44	26.44
		1	-985.37	14.42	7.79	.00	40.41	-105.77
	4	15	817.89	-16.20	-8.49	.00	1.71	27.78
		1	-817.89	16.20	8.49	.00	45.00	-116.86
	5	15	898.93	-19.23	-6.84	.00	4.07	31.89
		1	-898.93	19.23	6.84	.00	33.56	-137.68
	6	15	1123.16	-22.60	-6.84	.00	3.97	36.53
		1	-1123.16	22.60	6.84	.00	33.65	-160.83
	7	15	630.20	-13.62	-20.47	.00	-22.97	23.80
		1	-630.20	13.62	20.47	.00	135.55	-98.73
20	2	20	1148.34	.40	.55	.00	.00	.00
		21	-1148.34	-.40	-.55	.00	-1.10	.81

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	7	72	189.43	.40	-.25	.00	8.41	-5.60
		73	-189.43	-.40	.25	.00	-7.91	6.39
73	2	73	420.66	-1.12	-.43	.00	6.31	-5.37
		74	-420.66	1.12	.43	.00	-5.46	3.14
	3	73	517.52	-1.49	-.75	.00	9.28	-7.84
		74	-517.52	1.49	.75	.00	-7.77	4.86
	4	73	283.14	-2.34	-.95	.00	9.48	-7.56
		74	-283.14	2.34	.95	.00	-7.59	2.88
	5	73	252.98	-3.08	-.60	.00	8.87	-8.44
		74	-252.98	3.08	.60	.00	-7.66	2.27
	6	73	326.98	-3.53	-.73	.00	8.50	-10.46
		74	-326.98	3.53	.73	.00	-7.05	3.41
	7	73	189.43	-1.90	-4.85	.00	7.91	-6.39
		74	-189.43	1.90	4.85	.00	1.79	2.58
74	2	74	420.66	-3.63	-2.49	.00	5.46	-3.14
		75	-420.66	3.63	2.49	.00	-.48	-4.12
	3	74	517.52	-5.02	-3.91	.00	7.77	-4.86
		75	-517.52	5.02	3.91	.00	.04	-5.18
	4	74	283.14	-6.64	-4.35	.00	7.59	-2.88
		75	-283.14	6.64	4.35	.00	1.12	-10.39
	5	74	252.98	-8.37	-3.50	.00	7.66	-2.27
		75	-252.98	8.37	3.50	.00	-.66	-14.46
	6	74	326.98	-9.78	-3.65	.00	7.05	-3.41
		75	-326.98	9.78	3.65	.00	.26	-16.14
	7	74	189.43	-5.47	-11.75	.00	-1.79	-2.58
		75	-189.43	5.47	11.75	.00	25.30	-8.36
75	2	75	420.66	-7.07	-5.39	.00	.48	4.12
		7	-420.66	7.07	5.39	.00	29.14	-43.03
	3	75	517.52	-9.87	-8.33	.00	-.04	5.18
		7	-517.52	9.87	8.33	.00	45.83	-59.45
	4	75	283.14	-12.47	-9.10	.00	-1.12	10.39
		7	-283.14	12.47	9.10	.00	51.17	-78.96
	5	75	252.98	-15.50	-7.58	.00	.66	14.46
		7	-252.98	15.50	7.58	.00	41.02	-99.69
	6	75	326.98	-18.23	-7.75	.00	-.26	16.14
		7	-326.98	18.23	7.75	.00	42.90	-116.40
	7	75	189.43	-10.31	-20.97	.00	-25.30	8.36
		7	-189.43	10.31	20.97	.00	140.63	-65.09
80	2	80	791.20	1.27	.55	.00	.00	.00
		81	-791.20	-1.27	-.55	.00	-1.20	2.54
	3	80	1079.38	1.82	.90	.00	.00	.00
		81	-1079.38	-1.82	-.90	.00	-1.79	3.65
	4	80	890.34	1.95	1.10	.00	.00	.00
		81	-890.34	-1.95	-1.10	.00	-2.19	3.89

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	5	80	796.50	2.23	.94	.00	.00	.00
		81	-796.50	-2.23	-.94	.00	-1.88	4.45
	6	80	831.21	2.65	.83	.00	.00	.00
		81	-831.21	-2.65	-.83	.00	-1.65	5.29
	7	80	902.20	1.68	1.69	.00	.00	.00
		81	-902.20	-1.68	-1.69	.00	-3.37	3.37
81	2	81	791.20	1.72	.29	.00	1.10	-2.54
		82	-791.20	-1.72	-.29	.00	-1.67	5.98
	3	81	1079.38	2.49	.57	.00	1.79	-3.65
		82	-1079.38	-2.49	-.57	.00	-2.93	8.62
	4	81	890.34	2.50	.91	.00	2.19	-3.89
		82	-890.34	-2.50	-.91	.00	-4.01	8.90
	5	81	796.50	2.76	.77	.00	1.88	-4.45
		82	-796.50	-2.76	-.77	.00	-3.41	9.96
	6	81	831.21	3.27	.52	.00	1.65	-5.29
		82	-831.21	-3.27	-.52	.00	-2.70	11.84
	7	81	902.20	2.22	1.09	.00	3.37	-3.37
		82	-902.20	-2.22	-1.09	.00	-5.55	7.81
82	2	82	791.20	1.33	-.79	.00	1.67	-5.98
		83	-791.20	-1.33	.79	.00	-.08	8.63
	3	82	1079.38	1.96	-.99	.00	2.93	-8.62
		83	-1079.38	-1.96	.99	.00	-.95	12.55
	4	82	890.34	1.65	-.57	.00	4.01	-8.90
		83	-890.34	-1.65	.57	.00	-2.87	12.21
	5	82	796.50	1.56	-.54	.00	3.42	-9.96
		83	-796.50	-1.56	.54	.00	-2.34	13.09
	6	82	831.21	1.85	-.92	.00	2.70	-11.84
		83	-831.21	-1.85	.92	.00	-.86	15.53
	7	82	902.20	1.60	-1.81	.00	5.55	-7.81
		83	-902.20	-1.60	1.81	.00	-1.94	11.01
83	2	83	791.20	.07	-2.70	.00	.08	-8.63
		84	-791.20	-.07	2.70	.00	5.31	8.77
	3	83	1079.38	.22	-3.79	.00	.95	-12.55
		84	-1079.38	-.22	3.79	.00	6.62	12.99
	4	83	890.34	-.64	-3.36	.00	2.87	-12.21
		84	-890.34	.64	3.36	.00	3.84	10.92
	5	83	796.50	-1.39	-2.98	.00	2.34	-13.09
		84	-796.50	1.39	2.98	.00	3.62	10.31
	6	83	831.21	-1.68	-3.51	.00	.86	-15.53
		84	-831.21	1.68	3.51	.00	6.16	12.16
	7	83	902.20	-.23	-7.02	.00	1.94	-11.01
		84	-902.20	.23	7.02	.00	12.11	10.55
84	2	84	791.20	-2.10	-5.43	.00	-5.31	-8.77
		85	-791.20	2.10	5.43	.00	16.16	4.57

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	3	84	1079.38	-2.81	-7.83	.00	-6.62	-12.99
		85	-1079.38	2.81	7.83	.00	22.28	7.38
	4	84	890.34	-4.45	-7.47	.00	-3.84	-10.92
		85	-890.34	4.45	7.47	.00	18.77	2.02
	5	84	796.50	-6.18	-6.58	.00	-3.62	-10.31
		85	-796.50	6.18	6.58	.00	16.78	-2.06
	6	84	831.21	-7.40	-7.26	.00	-6.16	-12.16
		85	-831.21	7.40	7.26	.00	20.67	-2.64
	7	84	902.20	-3.30	-14.57	.00	-12.11	-10.55
		85	-902.20	3.30	14.57	.00	41.25	3.95
85	2	85	791.20	-5.22	-8.95	.00	-16.16	-4.57
		8	-791.20	5.22	8.95	.00	65.39	-24.12
	3	85	1079.38	-7.18	-13.09	.00	-22.28	-7.37
		8	-1079.38	7.18	13.09	.00	94.39	-32.14
	4	85	890.34	-9.82	-12.88	.00	-18.77	-2.02
		8	-890.34	9.82	12.88	.00	89.63	-51.99
	5	85	796.50	-12.85	-11.31	.00	-16.78	2.06
		8	-796.50	12.85	11.31	.00	78.99	-72.75
	6	85	831.21	-15.35	-12.12	.00	-20.67	2.64
		8	-831.21	15.35	12.12	.00	87.35	-87.06
	7	85	902.20	-7.69	-24.39	.00	-41.25	-3.95
		8	-902.20	7.69	24.39	.00	175.39	-38.32
90	2	90	672.37	1.06	-.01	.00	.00	.00
		91	-672.37	-1.06	.01	.00	.03	2.13
	3	90	967.14	1.54	.10	.00	.00	.00
		91	-967.14	-1.54	-.10	.00	-.19	3.08
	4	90	915.63	1.70	.34	.00	.00	.00
		91	-915.63	-1.70	-.34	.00	-.69	3.40
	5	90	790.51	1.96	.23	.00	.00	.00
		91	-790.51	-1.96	-.23	.00	-.47	3.93
	6	90	741.46	2.33	.09	.00	.00	.00
		91	-741.46	-2.33	-.09	.00	-.19	4.66
	7	90	1042.66	1.47	.92	.00	.00	.00
		91	-1042.66	-1.47	-.92	.00	-1.84	2.95
91	2	91	672.37	1.27	-.92	.00	-.03	-2.13
		92	-672.37	-1.27	.92	.00	1.86	4.67
	3	91	967.14	1.88	-1.14	.00	.19	-3.08
		92	-967.14	-1.88	1.14	.00	2.09	6.84
	4	91	915.63	1.98	-.70	.00	.69	-3.40
		92	-915.63	-1.98	.70	.00	.71	7.35
	5	91	790.51	2.19	-.75	.00	.47	-3.93
		92	-790.51	-2.19	.75	.00	1.02	8.31
	6	91	741.46	2.59	-1.05	.00	.19	-4.66
		92	-741.46	-2.59	1.05	.00	1.91	9.84

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	7	91	1042.66	1.78	-.55	.00	1.84	-2.95
		92	-1042.66	-1.78	.55	.00	-.73	6.50
92	2	92	672.37	.62	-2.71	.00	-1.86	-4.67
		93	-672.37	-.62	2.71	.00	7.27	5.92
	3	92	967.14	1.00	-3.71	.00	-2.09	-6.84
		93	-967.14	-1.00	3.71	.00	9.51	8.84
	4	92	915.63	.82	-3.13	.00	-.71	-7.35
		93	-915.63	-.82	3.13	.00	6.97	8.99
	5	92	790.51	.67	-2.95	.00	-1.02	-8.31
		93	-790.51	-.67	2.95	.00	6.92	9.66
	6	92	741.46	.77	-3.42	.00	-1.91	-9.84
		93	-741.46	-.77	3.42	.00	8.74	11.38
	7	92	1042.66	.89	-4.42	.00	.73	-6.50
		93	-1042.66	-.89	4.42	.00	8.11	8.28
93	2	93	672.37	-.92	-5.38	.00	-7.27	-5.92
		94	-672.37	.92	5.38	.00	18.03	4.08
	3	93	967.14	-1.13	-7.60	.00	-9.51	-8.84
		94	-967.14	1.13	7.60	.00	24.71	6.58
	4	93	915.63	-1.81	-6.94	.00	-6.97	-8.99
		94	-915.63	1.81	6.94	.00	20.86	5.37
	5	93	790.51	-2.64	-6.36	.00	-6.92	-9.66
		94	-790.51	2.64	6.36	.00	19.63	4.38
	6	93	741.46	-3.19	-7.01	.00	-8.74	-11.38
		94	-741.46	3.19	7.01	.00	22.77	4.99
	7	93	1042.67	-1.22	-10.69	.00	-8.11	-8.28
		94	-1042.67	1.22	10.69	.00	29.49	5.85
94	2	94	672.37	-3.37	-8.90	.00	-18.03	-4.08
		95	-672.37	3.37	8.90	.00	35.82	-2.67
	3	94	967.14	-4.55	-12.77	.00	-24.71	-6.58
		95	-967.14	4.55	12.77	.00	50.25	-2.53
	4	94	915.63	-5.96	-12.11	.00	-20.86	-5.37
		95	-915.63	5.96	12.11	.00	45.07	-6.55
	5	94	790.51	-7.79	-10.95	.00	-19.63	-4.38
		95	-790.51	7.79	10.95	.00	41.52	-11.20
	6	94	741.46	-9.34	-11.79	.00	-22.77	-4.99
		95	-741.46	9.34	11.79	.00	46.34	-13.69
	7	94	1042.66	-4.58	-19.31	.00	-29.49	-5.85
		95	-1042.66	4.58	19.31	.00	68.11	-3.31
95	2	95	672.37	-6.76	-13.16	.00	-35.82	2.67
		9	-672.37	6.76	13.16	.00	108.22	-39.85
	3	95	967.14	-9.30	-19.08	.00	-50.25	2.53
		9	-967.14	9.30	19.08	.00	155.20	-53.66
	4	95	915.63	-11.64	-18.52	.00	-45.07	6.55
		9	-915.63	11.64	18.52	.00	146.92	-70.60

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	5	95	790.51	-14.80	-16.61	.00	-41.52	11.20
		9	-790.51	14.80	16.61	.00	132.89	-92.60
	6	95	741.46	-17.70	-17.62	.00	-46.34	13.69
		9	-741.46	17.70	17.62	.00	143.28	-111.07
	7	95	1042.66	-9.23	-30.14	.00	-68.11	3.31
		9	-1042.66	9.23	30.14	.00	233.90	-54.09

********** END OF LATEST ANALYSIS RESULT **********

79. FINISH

********** END OF STAAD-III **********

**** DATE= JUN 10,2002 TIME= 12: 6:17 ****

PILA 4

1

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-4 DE 30.0 M V FRANCOLÍ (SER) XH2

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	30.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	3.2000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	2.4000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	30.000	10.0500	10.0500

DATOS ACCIONES EXTERIORES

1

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	36.0000 T
REACCION VERTICAL TABLERO	=	1299.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

FASE ELASTICA

REACCION DEL TABLERO = 36.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.11068007E-02	.19950534E-01
2	.75498661E-05	.11011383E-02	.18293164E-01
3	.14040938E-04	.10849452E-02	.16652385E-01
4	.19629378E-04	.10596925E-02	.15042858E-01
5	.24445278E-04	.10266365E-02	.13477209E-01
6	.28597558E-04	.98685433E-03	.11966312E-01
7	.32177855E-04	.94127277E-03	.10519545E-01
8	.35263603E-04	.89069168E-03	.91449936E-02
9	.37920515E-04	.83580359E-03	.78496239E-02
10	.40204575E-04	.77720978E-03	.66394357E-02
11	.42163659E-04	.71543360E-03	.55195858E-02
12	.43838851E-04	.65093172E-03	.44944977E-02
13	.45265521E-04	.58410344E-03	.35679539E-02
14	.46474222E-04	.51529863E-03	.27431757E-02
15	.47491415E-04	.44482440E-03	.20228927E-02
16	.48340089E-04	.37295078E-03	.14094022E-02
17	.49040263E-04	.29991551E-03	.90462116E-03
18	.49609418E-04	.22592825E-03	.51013163E-03
19	.50062850E-04	.15117405E-03	.22721988E-03
20	.50413978E-04	.75816429E-04	.56911187E-04
21	.50674594E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1299.0000	36.0000	.0000
2	1319.1900	36.0000	54.0000
3	1339.5600	36.0000	108.0000

4	1360.1100	36.0000	162.0000
5	1380.8400	36.0000	216.0000
6	1401.7500	36.0000	270.0000
7	1422.8400	36.0000	324.0000
8	1444.1100	36.0000	378.0000
9	1465.5600	36.0000	432.0000
10	1487.1900	36.0000	486.0000
11	1509.0000	36.0000	540.0000
12	1530.9900	36.0000	594.0000
13	1553.1600	36.0000	648.0000
14	1575.5100	36.0000	702.0000
15	1598.0400	36.0000	756.0000
16	1620.7500	36.0000	810.0000
17	1643.6400	36.0000	864.0000
18	1666.7100	36.0000	918.0000
19	1689.9600	36.0000	972.0000
20	1713.3900	36.0000	1026.0000
21	1737.0000	36.0000	1080.0000

1

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 36.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.10677877E-02	.19237847E-01
2	.72793791E-05	.10623282E-02	.17638895E-01
3	.13546505E-04	.10467088E-02	.16055942E-01
4	.18947569E-04	.10223382E-02	.14503144E-01
5	.23605342E-04	.99042353E-03	.12992700E-01
6	.27622895E-04	.95200235E-03	.11535127E-01
7	.31087197E-04	.90796978E-03	.10139498E-01
8	.34071954E-04	.85910042E-03	.88136359E-02
9	.36639896E-04	.80606653E-03	.75642792E-02
10	.38844610E-04	.74945315E-03	.63972261E-02
11	.40732044E-04	.68977066E-03	.53174543E-02
12	.42341729E-04	.62746533E-03	.43292255E-02
13	.43707786E-04	.56292820E-03	.34361743E-02
14	.44859754E-04	.49650254E-03	.26413852E-02
15	.45823282E-04	.42849026E-03	.19474599E-02
16	.46620699E-04	.35915728E-03	.13565748E-02
17	.47271493E-04	.28873813E-03	.87053119E-03
18	.47792716E-04	.21743998E-03	.49079988E-03
19	.48199324E-04	.14544595E-03	.21855919E-03
20	.48504457E-04	.72918111E-04	.54728939E-04
21	.48719690E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.10921319E-03	-.10921319E-03	-.10921319E-03
2	-.98895923E-04	-.10639368E-03	-.91762132E-04
3	-.99588697E-04	-.11394799E-03	-.85906727E-04
4	-.10029734E-03	-.12095019E-03	-.80591869E-04
5	-.10101854E-03	-.12745652E-03	-.75760823E-04
6	-.10174962E-03	-.13351595E-03	-.71364432E-04
7	-.10248841E-03	-.13917131E-03	-.67359882E-04
8	-.10323318E-03	-.14446025E-03	-.63709718E-04
9	-.10398252E-03	-.14941599E-03	-.60381040E-04
10	-.10473527E-03	-.15406792E-03	-.57344841E-04
11	-.10549051E-03	-.15844217E-03	-.54575455E-04
12	-.10624750E-03	-.16256200E-03	-.52050091E-04
13	-.10700565E-03	-.16644824E-03	-.49748452E-04
14	-.10776447E-03	-.17011953E-03	-.47652400E-04
15	-.10852358E-03	-.17359264E-03	-.45745687E-04
16	-.10928269E-03	-.17688270E-03	-.44013709E-04
17	-.11004155E-03	-.18000335E-03	-.42443312E-04
18	-.11079998E-03	-.18296698E-03	-.41022614E-04
19	-.11155785E-03	-.18578481E-03	-.39740860E-04
20	-.11231506E-03	-.18846706E-03	-.38588288E-04
21	-.11307154E-03	-.19102305E-03	-.37556022E-04

1

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1299.0000	37.3872	.0000
2	1319.1900	37.4015	56.0933
3	1339.5600	37.4022	112.1976
4	1360.1100	37.3905	168.2935
5	1380.8400	37.3676	224.3633
6	1401.7500	37.3344	280.3909
7	1422.8400	37.2918	336.3616
8	1444.1100	37.2405	392.2618
9	1465.5600	37.1811	448.0789
10	1487.1900	37.1143	503.8013
11	1509.0000	37.0406	559.4183
12	1530.9900	36.9603	614.9198
13	1553.1600	36.8739	670.2962
14	1575.5100	36.7818	725.5389
15	1598.0400	36.6843	780.6393
16	1620.7500	36.5817	835.5896
17	1643.6400	36.4741	890.3822
18	1666.7100	36.3619	945.0101
19	1689.9600	36.2453	999.4664
20	1713.3900	36.1245	1053.7447
21	1737.0000	35.9996	1107.8386

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	-.18673286E-03	.77050074E+07
3	-.35859175E-03	.82818712E+07
4	-.51519852E-03	.88812250E+07
5	-.65636469E-03	.95034081E+07
6	-.78188120E-03	.10148620E+08
7	-.89190257E-03	.10817044E+08
8	-.98684584E-03	.11508859E+08
9	-.10681522E-02	.12224243E+08
10	-.11379353E-02	.12963374E+08
11	-.11992302E-02	.13726427E+08
12	-.12569080E-02	.14513610E+08
13	-.13152158E-02	.15325033E+08
14	-.13812557E-02	.16160902E+08
15	-.14627955E-02	.17021392E+08
16	-.15688686E-02	.17906675E+08
17	-.17097703E-02	.18816925E+08
18	-.18971455E-02	.19752312E+08
19	-.21438527E-02	.20713009E+08
20	-.24642007E-02	.21699185E+08
21	-.28737048E-02	.22711011E+08

1

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-4 DE 30.0 M V FRANCOLÍ (SER) ZH2

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	30.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	3.2000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	2.4000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	30.000	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE = .0000 T/M
CARGA HORIZONTAL UNIFORME = .0530 T/M2
REACCION HORIZONTAL TABLERO = 28.0000 T
REACCION VERTICAL TABLERO = 1299.0000 T
MOMENTO EXTERIOR EN CABEZA = 41.0000 TXM
COEFICIENTE MAYORACION (GS) = 1.0000

1

FASE ELASTICA

REACCION DEL TABLERO = 28.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.10651078E-05	.30365832E-03	.58083328E-02
2	.21210800E-05	.30126868E-03	.53544395E-02
3	.31464593E-05	.29731802E-03	.49053072E-02
4	.41429917E-05	.29185093E-03	.44632437E-02
5	.51123061E-05	.28490946E-03	.40304916E-02
6	.60559232E-05	.27653329E-03	.36092326E-02
7	.69752652E-05	.26675990E-03	.32015904E-02
8	.78716630E-05	.25562470E-03	.28096339E-02
9	.87463635E-05	.24316118E-03	.24353804E-02
10	.96005366E-05	.22940101E-03	.20807986E-02
11	.10435280E-04	.21437414E-03	.17478108E-02
12	.11251627E-04	.19810896E-03	.14382954E-02
13	.12050547E-04	.18063233E-03	.11540896E-02
14	.12832955E-04	.16196971E-03	.89699137E-03
15	.13599712E-04	.14214521E-03	.66876142E-03
16	.14351631E-04	.12118170E-03	.47112526E-03
17	.15089480E-04	.99100865E-04	.30577499E-03
18	.15813982E-04	.75923268E-04	.17437105E-03
19	.16525824E-04	.51668413E-04	.78543815E-04
20	.17225654E-04	.26354804E-04	.19895184E-04
21	.17914085E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1299.0000	28.0000	41.0000
2	1319.1900	28.1614	83.1204
3	1339.5600	28.3275	125.4865
4	1360.1100	28.4985	168.1054
5	1380.8400	28.6742	210.9843
6	1401.7500	28.8546	254.1303
7	1422.8400	29.0399	297.5506
8	1444.1100	29.2299	341.2523
9	1465.5600	29.4246	385.2426
10	1487.1900	29.6242	429.5286
11	1509.0000	29.8285	474.1175
12	1530.9900	30.0376	519.0165
13	1553.1600	30.2514	564.2326
14	1575.5100	30.4701	609.7732
15	1598.0400	30.6935	655.6452
16	1620.7500	30.9216	701.8559
17	1643.6400	31.1546	748.4125
18	1666.7100	31.3923	795.3220
19	1689.9600	31.6347	842.5917
20	1713.3900	31.8820	890.2286
21	1737.0000	32.1340	938.2400

1

FASE FINAL EN ITERACION NUMERO 2

REACCION DEL TABLERO = 28.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.98776240E-06	.28649136E-03	.54839660E-02
2	.19827303E-05	.28426349E-03	.50557133E-02
3	.29496297E-05	.28056422E-03	.46319113E-02
4	.38900944E-05	.27543443E-03	.42147359E-02
5	.48055768E-05	.26891267E-03	.38063040E-02
6	.56974207E-05	.26103543E-03	.34086757E-02
7	.65668779E-05	.25183720E-03	.30238582E-02
8	.74151175E-05	.24135071E-03	.26538082E-02
9	.82432329E-05	.22960694E-03	.23004347E-02
10	.90522483E-05	.21663533E-03	.19656013E-02
11	.98431236E-05	.20246380E-03	.16511286E-02
12	.10616760E-04	.18711889E-03	.13587966E-02
13	.11374002E-04	.17062582E-03	.10903461E-02
14	.12115647E-04	.15300858E-03	.84748119E-03
15	.12842441E-04	.13429002E-03	.63187097E-03
16	.13555089E-04	.11449187E-03	.44515094E-03
17	.14254253E-04	.93634861E-04	.28892480E-03
18	.14940560E-04	.71738751E-04	.16476591E-03
19	.15614598E-04	.48822383E-04	.74218674E-04
20	.16276924E-04	.24903741E-04	.18799895E-04
21	.16928064E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.98224182E-04	-.10094053E-03	-.95557223E-04
2	-.98889768E-04	-.10434228E-03	-.93536396E-04
3	-.99559818E-04	-.10767130E-03	-.91595818E-04
4	-.10023416E-03	-.11093192E-03	-.89730910E-04
5	-.10091265E-03	-.11412799E-03	-.87937595E-04
6	-.10159513E-03	-.11726304E-03	-.86212098E-04
7	-.10228147E-03	-.12034039E-03	-.84550903E-04
8	-.10297154E-03	-.12336312E-03	-.82950725E-04
9	-.10366522E-03	-.12633411E-03	-.81408491E-04
10	-.10436239E-03	-.12925608E-03	-.79921324E-04
11	-.10506296E-03	-.13213155E-03	-.78486526E-04
12	-.10576682E-03	-.13496290E-03	-.77101564E-04
13	-.10647387E-03	-.13775237E-03	-.75764060E-04
14	-.10718403E-03	-.14050206E-03	-.74471780E-04
15	-.10789721E-03	-.14321392E-03	-.73222620E-04
16	-.10861334E-03	-.14588983E-03	-.72014601E-04
17	-.10933234E-03	-.14853154E-03	-.70845857E-04
18	-.11005414E-03	-.15114068E-03	-.69714630E-04
19	-.11077868E-03	-.15371882E-03	-.68619261E-04
20	-.11150588E-03	-.15626742E-03	-.67558185E-04
21	-.11223569E-03	-.15878787E-03	-.66529921E-04

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.29767229E-01	.41441821E+08
2	.24092412E-01	.42183469E+08
3	.17098401E-01	.42913783E+08
4	.97205913E-02	.43641703E+08
5	.22945570E-02	.44368339E+08
6	-.49329026E-02	.45093950E+08
7	-.11734562E-01	.45818626E+08
8	-.17887527E-01	.46542406E+08
9	-.23170407E-01	.47265304E+08
10	-.27358664E-01	.47987331E+08
11	-.30226659E-01	.48708491E+08
12	-.31545736E-01	.49428783E+08
13	-.31082535E-01	.50148209E+08
14	-.28600601E-01	.50866769E+08
15	-.23858987E-01	.51584460E+08
16	-.16611844E-01	.52301283E+08
17	-.66093006E-02	.53017235E+08
18	.64045103E-02	.53732315E+08
19	.22690589E-01	.54446520E+08
20	.42515705E-01	.55159849E+08
21	.66153061E-01	.55872301E+08

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ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1299.0000	28.3945	40.9702
2	1319.1900	28.5588	83.6570
3	1339.5600	28.7258	126.5934
4	1360.1100	28.8954	169.7828
5	1380.8400	29.0675	213.2287
6	1401.7500	29.2422	256.9351
7	1422.8400	29.4194	300.9056
8	1444.1100	29.5990	345.1438
9	1465.5600	29.7809	389.6533
10	1487.1900	29.9653	434.4377
11	1509.0000	30.1519	479.5005
12	1530.9900	30.3408	524.8449
13	1553.1600	30.5319	570.4744
14	1575.5100	30.7251	616.3922
15	1598.0400	30.9205	662.6015
16	1620.7500	31.1179	709.1052
17	1643.6400	31.3173	755.9065
18	1666.7100	31.5187	803.0083
19	1689.9600	31.7219	850.4134
20	1713.3900	31.9270	898.1245
21	1737.0000	32.1338	946.1444

1

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-4 DE 30.0 M V FRANCOLÍ (SER) XH3

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	30.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	3.2000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	2.4000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	30.000	10.0500	10.0500

DATOS ACCIONES EXTERIORES

1

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	50.0000 T
REACCION VERTICAL TABLERO	=	2581.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

FASE ELASTICA

REACCION DEL TABLERO = 50.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.15372232E-02	.27709075E-01
2	.10485925E-04	.15293587E-02	.25407172E-01
3	.19501303E-04	.15068683E-02	.23128312E-01
4	.27263026E-04	.14717951E-02	.20892859E-01
5	.33951775E-04	.14258840E-02	.18718346E-01
6	.39718831E-04	.13706310E-02	.16619878E-01
7	.44691465E-04	.13073233E-02	.14610480E-01
8	.48977226E-04	.12370718E-02	.12701380E-01
9	.52667381E-04	.11608383E-02	.10902255E-01
10	.55839688E-04	.10794580E-02	.92214384E-02
11	.58560638E-04	.99365778E-03	.76660914E-02
12	.60887293E-04	.90407183E-03	.62423579E-02
13	.62868780E-04	.81125477E-03	.49554915E-02
14	.64547530E-04	.71569254E-03	.38099662E-02
15	.65960299E-04	.61781167E-03	.28095732E-02
16	.67139012E-04	.51798719E-03	.19575030E-02
17	.68111477E-04	.41654932E-03	.12564183E-02
18	.68901969E-04	.31378924E-03	.70851615E-03
19	.69531736E-04	.20996396E-03	.31558317E-03
20	.70019414E-04	.10530060E-03	.79043315E-04
21	.70381380E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2581.0000	50.0000	.0000
2	2601.1900	50.0000	75.0000
3	2621.5600	50.0000	150.0000

4	2642.1100	50.0000	225.0000
5	2662.8400	50.0000	300.0000
6	2683.7500	50.0000	375.0000
7	2704.8400	50.0000	450.0000
8	2726.1100	50.0000	525.0000
9	2747.5600	50.0000	600.0000
10	2769.1900	50.0000	675.0000
11	2791.0000	50.0000	750.0000
12	2812.9900	50.0000	825.0000
13	2835.1600	50.0000	900.0000
14	2857.5100	50.0000	975.0000
15	2880.0400	50.0000	1050.0000
16	2902.7500	50.0000	1125.0000
17	2925.6400	50.0000	1200.0000
18	2948.7100	50.0000	1275.0000
19	2971.9600	50.0000	1350.0000
20	2995.3900	50.0000	1425.0000
21	3019.0000	50.0000	1500.0000

FASE FINAL EN ITERACION NUMERO 2

REACCION DEL TABLERO = 50.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.16363093E-02	.29394014E-01
2	.11302327E-04	.16278325E-02	.26943789E-01
3	.21017931E-04	.16035923E-02	.24518398E-01
4	.29372853E-04	.15657992E-02	.22139788E-01
5	.36558692E-04	.15163506E-02	.19826828E-01
6	.42736649E-04	.14568791E-02	.17595748E-01
7	.48043071E-04	.13887943E-02	.15460498E-01
8	.52593778E-04	.13133167E-02	.13433061E-01
9	.56487537E-04	.12315057E-02	.11523715E-01
10	.59808882E-04	.11442834E-02	.97412501E-02
11	.62630411E-04	.10524539E-02	.80931681E-02
12	.65014670E-04	.95672007E-03	.65858406E-02
13	.67015714E-04	.85769729E-03	.52246524E-02
14	.68680386E-04	.75592521E-03	.40141234E-02
15	.70049393E-04	.65187788E-03	.29580144E-02
16	.71158197E-04	.54597219E-03	.20594189E-02
17	.72037766E-04	.43857521E-03	.13208434E-02
18	.72715204E-04	.33001049E-03	.74427714E-03
19	.73214282E-04	.22056337E-03	.33125317E-03
20	.73555892E-04	.11048574E-03	.82902282E-04
21	.73758430E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.21699711E-03	-.21699711E-03	-.21699711E-03
2	-.20158661E-03	-.21322801E-03	-.19051033E-03
3	-.20143232E-03	-.22371132E-03	-.18020421E-03
4	-.20132959E-03	-.23334600E-03	-.17078183E-03
5	-.20126967E-03	-.24221541E-03	-.16215187E-03
6	-.20124540E-03	-.25039255E-03	-.15423509E-03
7	-.20125098E-03	-.25794180E-03	-.14696231E-03
8	-.20128165E-03	-.26492012E-03	-.14027286E-03
9	-.20133352E-03	-.27137807E-03	-.13411335E-03
10	-.20140344E-03	-.27736072E-03	-.12843660E-03
11	-.20148879E-03	-.28290833E-03	-.12320078E-03
12	-.20158746E-03	-.28805697E-03	-.11836868E-03
13	-.20169770E-03	-.29283908E-03	-.11390712E-03
14	-.20181810E-03	-.29728384E-03	-.10978638E-03
15	-.20194749E-03	-.30141763E-03	-.10597982E-03
16	-.20208492E-03	-.30526431E-03	-.10246345E-03
17	-.20222964E-03	-.30884553E-03	-.99215633E-04
18	-.20238101E-03	-.31218097E-03	-.96216813E-04
19	-.20253854E-03	-.31528853E-03	-.93449257E-04
20	-.20270182E-03	-.31818457E-03	-.90896861E-04
21	-.20287053E-03	-.32088402E-03	-.88544963E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2581.0000	53.9676	.0000
2	2601.1900	53.9781	81.3484
3	2621.5600	53.9502	162.6830
4	2642.1100	53.8884	243.9431
5	2662.8400	53.7966	325.0775
6	2683.7500	53.6781	406.0411
7	2704.8400	53.5357	486.7933
8	2726.1100	53.3720	567.2984
9	2747.5600	53.1890	647.5239
10	2769.1900	52.9888	727.4410
11	2791.0000	52.7728	807.0236
12	2812.9900	52.5426	886.2481
13	2835.1600	52.2995	965.0930
14	2857.5100	52.0446	1043.5390
15	2880.0400	51.7788	1121.5682
16	2902.7500	51.5030	1199.1644
17	2925.6400	51.2181	1276.3124
18	2948.7100	50.9247	1352.9986
19	2971.9600	50.6234	1429.2101
20	2995.3900	50.3148	1504.9350
21	3019.0000	49.9994	1580.1623

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	.27965721E-03	.71960650E+07
3	-.10797533E-02	.77391683E+07
4	-.14160835E-02	.83033720E+07
5	-.13488260E-02	.88891853E+07
6	-.12061969E-02	.94968457E+07
7	-.12407190E-02	.10126561E+08
8	-.16385380E-02	.10778530E+08
9	-.25091432E-02	.11452951E+08
10	-.38747899E-02	.12150018E+08
11	-.56615290E-02	.12869925E+08
12	-.76938610E-02	.13612864E+08
13	-.96916701E-02	.14379028E+08
14	-.11268794E-01	.15168606E+08
15	-.11933891E-01	.15981788E+08
16	-.11092066E-01	.16818761E+08
17	-.80473079E-02	.17679714E+08
18	-.20061183E-02	.18564832E+08
19	.79189433E-02	.19474301E+08
20	.22705313E-01	.20408303E+08
21	.43416029E-01	.21367024E+08

1

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-4 DE 30.0 M V FRANCOLÍ (SER) ZH3

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	30.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	3.2000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	2.4000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	30.000	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE = .0000 T/M
CARGA HORIZONTAL UNIFORME = .0320 T/M2
REACCION HORIZONTAL TABLERO = 50.0000 T
REACCION VERTICAL TABLERO = 2581.0000 T
MOMENTO EXTERIOR EN CABEZA = 310.0000 TXM
COEFICIENTE MAYORACION (GS) = 1.0000

1

FASE ELASTICA

REACCION DEL TABLERO = 50.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.80532537E-05	.68654634E-03	.12317573E-01
2	.98263440E-05	.67313664E-03	.11297478E-01
3	.11541442E-04	.65711080E-03	.10299471E-01
4	.13201629E-04	.63855350E-03	.93274115E-02
5	.14809781E-04	.61754494E-03	.83850362E-02
6	.16368583E-04	.59416117E-03	.74759643E-02
7	.17880544E-04	.56847432E-03	.66037042E-02
8	.19348014E-04	.54055290E-03	.57716586E-02
9	.20773194E-04	.51046200E-03	.49831302E-02
10	.22158148E-04	.47826349E-03	.42413264E-02
11	.23504816E-04	.44401627E-03	.35493641E-02
12	.24815018E-04	.40777639E-03	.29102740E-02
13	.26090470E-04	.36959728E-03	.23270046E-02
14	.27332783E-04	.32952984E-03	.18024263E-02
15	.28543480E-04	.28762264E-03	.13393349E-02
16	.29723995E-04	.24392203E-03	.94045509E-03
17	.30875681E-04	.19847228E-03	.60844342E-03
18	.31999818E-04	.15131565E-03	.34589170E-03
19	.33097616E-04	.10249258E-03	.15532969E-03
20	.34170220E-04	.52041700E-04	.39227867E-04
21	.35218713E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2581.0000	50.0000	310.0000
2	2601.1900	50.0974	385.0727
3	2621.5600	50.1978	460.2938
4	2642.1100	50.3010	535.6674
5	2662.8400	50.4070	611.1981
6	2683.7500	50.5160	686.8900
7	2704.8400	50.6278	762.7475
8	2726.1100	50.7426	838.7750
9	2747.5600	50.8602	914.9766
10	2769.1900	50.9806	991.3569
11	2791.0000	51.1040	1067.9200
12	2812.9900	51.2302	1144.6703
13	2835.1600	51.3594	1221.6122
14	2857.5100	51.4914	1298.7498
15	2880.0400	51.6262	1376.0877
16	2902.7500	51.7640	1453.6300
17	2925.6400	51.9046	1531.3811
18	2948.7100	52.0482	1609.3454
19	2971.9600	52.1946	1687.5270
20	2995.3900	52.3438	1765.9305
21	3019.0000	52.4960	1844.5600

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FASE FINAL EN ITERACION NUMERO 2

REACCION DEL TABLERO = 50.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.80097945E-05	.69617054E-03	.12499170E-01
2	.98405450E-05	.68278279E-03	.11464612E-01
3	.11609940E-04	.66669493E-03	.10452172E-01
4	.13321050E-04	.64799668E-03	.94658326E-02
5	.14976734E-04	.62677335E-03	.85094447E-02
6	.16579659E-04	.60310605E-03	.75867346E-02
7	.18132319E-04	.57707207E-03	.67013099E-02
8	.19637042E-04	.54874505E-03	.58566649E-02
9	.21096011E-04	.51819526E-03	.50561861E-02
10	.22511271E-04	.48548980E-03	.43031569E-02
11	.23884738E-04	.45069279E-03	.36007625E-02
12	.25218215E-04	.41386557E-03	.29520937E-02
13	.26513391E-04	.37506687E-03	.23601515E-02
14	.27771860E-04	.33435293E-03	.18278507E-02
15	.28995118E-04	.29177770E-03	.13580233E-02
16	.30184576E-04	.24739293E-03	.95342235E-03
17	.31341564E-04	.20124832E-03	.61672448E-03
18	.32467337E-04	.15339165E-03	.35053342E-03
19	.33563079E-04	.10386884E-03	.15738261E-03
20	.34629909E-04	.52724094E-04	.39737878E-04
21	.35668883E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.20187336E-03	-.22390030E-03	-.18024692E-03
2	-.20166761E-03	-.22872911E-03	-.17509814E-03
3	-.20148743E-03	-.23341476E-03	-.17014059E-03
4	-.20133180E-03	-.23796469E-03	-.16536497E-03
5	-.20119978E-03	-.24238580E-03	-.16076260E-03
6	-.20109045E-03	-.24668452E-03	-.15632537E-03
7	-.20100298E-03	-.25086685E-03	-.15204572E-03
8	-.20093654E-03	-.25493840E-03	-.14791652E-03
9	-.20089037E-03	-.25890440E-03	-.14393114E-03
10	-.20086374E-03	-.26276973E-03	-.14008331E-03
11	-.20085596E-03	-.26653899E-03	-.13636717E-03
12	-.20086638E-03	-.27021647E-03	-.13277721E-03
13	-.20089438E-03	-.27380620E-03	-.12930822E-03
14	-.20093934E-03	-.27731196E-03	-.12595532E-03
15	-.20100071E-03	-.28073729E-03	-.12271390E-03
16	-.20107795E-03	-.28408553E-03	-.11957960E-03
17	-.20117054E-03	-.28735984E-03	-.11654831E-03
18	-.20127797E-03	-.29056315E-03	-.11361616E-03
19	-.20139979E-03	-.29369826E-03	-.11077948E-03
20	-.20153554E-03	-.29676779E-03	-.10803479E-03
21	-.20168478E-03	-.29977421E-03	-.10537880E-03

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.35739764E-01	.38693214E+08
2	.25590223E-01	.39401048E+08
3	.16893571E-01	.40097062E+08
4	.95622465E-02	.40797693E+08
5	.34938523E-02	.41497560E+08
6	-.14138535E-02	.42196670E+08
7	-.52572476E-02	.42895026E+08
8	-.81249404E-02	.43592628E+08
9	-.10095565E-01	.44289472E+08
10	-.11237737E-01	.44985558E+08
11	-.11607890E-01	.45680880E+08
12	-.11250476E-01	.46375437E+08
13	-.10195530E-01	.47069222E+08
14	-.84593945E-02	.47762234E+08
15	-.60425453E-02	.48454468E+08
16	-.29292948E-02	.49145921E+08
17	.91346952E-03	.49836589E+08
18	.55372554E-02	.50526469E+08
19	.11012734E-01	.51215557E+08
20	.17431186E-01	.51903850E+08
21	.24905081E-01	.52591346E+08

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ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2581.0000	51.7720	309.9643
2	2601.1900	51.8484	387.7277
3	2621.5600	51.9204	465.6012
4	2642.1100	51.9880	543.5780
5	2662.8400	52.0514	621.6514
6	2683.7500	52.1105	699.8147
7	2704.8400	52.1654	778.0614
8	2726.1100	52.2161	856.3851
9	2747.5600	52.2626	934.7793
10	2769.1900	52.3049	1013.2376
11	2791.0000	52.3431	1091.7535
12	2812.9900	52.3772	1170.3207
13	2835.1600	52.4071	1248.9328
14	2857.5100	52.4328	1327.5835
15	2880.0400	52.4544	1406.2663
16	2902.7500	52.4719	1484.9750
17	2925.6400	52.4851	1563.7030
18	2948.7100	52.4941	1642.4440
19	2971.9600	52.4989	1721.1915
20	2995.3900	52.4995	1799.9391
21	3019.0000	52.4957	1878.6801

1

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-4 DE 30.0 M V FRANCOLÍ (SER) XH4

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	30.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	3.2000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	2.4000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	30.000	10.0500	10.0500

DATOS ACCIONES EXTERIORES

1

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	59.0000 T
REACCION VERTICAL TABLERO	=	2067.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

FASE ELASTICA

REACCION DEL TABLERO = 59.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.18139234E-02	.32696709E-01
2	.12373392E-04	.18046433E-02	.29980464E-01
3	.23011537E-04	.17781046E-02	.27291408E-01
4	.32170370E-04	.17367182E-02	.24653574E-01
5	.40063094E-04	.16825431E-02	.22087648E-01
6	.46868220E-04	.16173446E-02	.19611456E-01
7	.52735928E-04	.15426415E-02	.17240366E-01
8	.57793126E-04	.14597447E-02	.14987628E-01
9	.62147510E-04	.13697892E-02	.12864661E-01
10	.65890832E-04	.12737605E-02	.10881297E-01
11	.69101553E-04	.11725162E-02	.90459878E-02
12	.71847005E-04	.10668048E-02	.73659824E-02
13	.74185160E-04	.95728063E-03	.58474799E-02
14	.76166085E-04	.84451720E-03	.44957601E-02
15	.77833152E-04	.72901777E-03	.33152963E-02
16	.79224034E-04	.61122488E-03	.23098535E-02
17	.80371542E-04	.49152820E-03	.14825736E-02
18	.81304324E-04	.37027130E-03	.83604905E-03
19	.82047449E-04	.24775747E-03	.37238814E-03
20	.82622908E-04	.12425470E-03	.93271112E-04
21	.83050028E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2067.0000	59.0000	.0000
2	2087.1900	59.0000	88.5000
3	2107.5600	59.0000	177.0000

4	2128.1100	59.0000	265.5000
5	2148.8400	59.0000	354.0000
6	2169.7500	59.0000	442.5000
7	2190.8400	59.0000	531.0000
8	2212.1100	59.0000	619.5000
9	2233.5600	59.0000	708.0000
10	2255.1900	59.0000	796.5000
11	2277.0000	59.0000	885.0000
12	2298.9900	59.0000	973.5000
13	2321.1600	59.0000	1062.0000
14	2343.5100	59.0000	1150.5000
15	2366.0400	59.0000	1239.0000
16	2388.7500	59.0000	1327.5000
17	2411.6400	59.0000	1416.0000
18	2434.7100	59.0000	1504.5000
19	2457.9600	59.0000	1593.0000
20	2481.3900	59.0000	1681.5000
21	2505.0000	59.0000	1770.0000

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 59.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.18544872E-02	.33357292E-01
2	.12734312E-04	.18449365E-02	.30580336E-01
3	.23687828E-04	.18176199E-02	.27831365E-01
4	.33116707E-04	.17750165E-02	.25135120E-01
5	.41236231E-04	.17192518E-02	.22512897E-01
6	.48227368E-04	.16521541E-02	.19983031E-01
7	.54243001E-04	.15753013E-02	.17561312E-01
8	.59412848E-04	.14900594E-02	.15261322E-01
9	.63847425E-04	.13976142E-02	.13094735E-01
10	.67641240E-04	.12989977E-02	.11071565E-01
11	.70875404E-04	.11951102E-02	.92003776E-02
12	.73619762E-04	.10867389E-02	.74884762E-02
13	.75934646E-04	.97457305E-03	.59420583E-02
14	.77872328E-04	.85921782E-03	.45663518E-02
15	.79478221E-04	.74120491E-03	.33657336E-02
16	.80791883E-04	.62100233E-03	.23438319E-02
17	.81847859E-04	.49902252E-03	.15036153E-02
18	.82676383E-04	.37562934E-03	.84747101E-03
19	.83303978E-04	.25114407E-03	.37727327E-03
20	.83753961E-04	.12585062E-03	.94442883E-04
21	.84046864E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.17378265E-03	-.17378265E-03	-.17378265E-03
2	-.15957996E-03	-.17269630E-03	-.14710034E-03
3	-.15981402E-03	-.18492311E-03	-.13588931E-03
4	-.16010139E-03	-.19619861E-03	-.12566002E-03
5	-.16043151E-03	-.20661609E-03	-.11630875E-03
6	-.16079581E-03	-.21625728E-03	-.10774571E-03
7	-.16118735E-03	-.22519409E-03	-.99892760E-04
8	-.16160051E-03	-.23349006E-03	-.92681605E-04
9	-.16203072E-03	-.24120153E-03	-.86052286E-04
10	-.16247429E-03	-.24837866E-03	-.79951974E-04
11	-.16292820E-03	-.25506623E-03	-.74333949E-04
12	-.16339004E-03	-.26130433E-03	-.69156750E-04
13	-.16385785E-03	-.26712897E-03	-.64383463E-04
14	-.16433004E-03	-.27257258E-03	-.59981123E-04
15	-.16480536E-03	-.27766444E-03	-.55920201E-04
16	-.16528281E-03	-.28243104E-03	-.52174174E-04
17	-.16576159E-03	-.28689642E-03	-.48719156E-04
18	-.16624110E-03	-.29108244E-03	-.45533581E-04
19	-.16672086E-03	-.29500898E-03	-.42597928E-04
20	-.16720051E-03	-.29869423E-03	-.39894490E-04
21	-.16767981E-03	-.30215479E-03	-.37407168E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2067.0000	62.8334	.0000
2	2087.1900	62.8508	94.2681
3	2107.5600	62.8308	188.5336
4	2128.1100	62.7773	282.7435
5	2148.8400	62.6942	376.8507
6	2169.7500	62.5845	470.8128
7	2190.8400	62.4509	564.5921
8	2212.1100	62.2958	658.1546
9	2233.5600	62.1212	751.4696
10	2255.1900	61.9289	844.5092
11	2277.0000	61.7206	937.2483
12	2298.9900	61.4977	1029.6639
13	2321.1600	61.2614	1121.7349
14	2343.5100	61.0128	1213.4421
15	2366.0400	60.7529	1304.7679
16	2388.7500	60.4826	1395.6959
17	2411.6400	60.2026	1486.2111
18	2434.7100	59.9137	1576.2997
19	2457.9600	59.6165	1665.9486
20	2481.3900	59.3115	1755.1459
21	2505.0000	58.9993	1843.8802

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	-.23618084E-03	.74018503E+07
3	-.45477586E-03	.79580060E+07
4	-.65311924E-03	.85356708E+07
5	-.82544731E-03	.91351887E+07
6	-.96706777E-03	.97567758E+07
7	-.10742914E-02	.10400634E+08
8	-.11451772E-02	.11066961E+08
9	-.11794571E-02	.11755952E+08
10	-.11787728E-02	.12467804E+08
11	-.11468726E-02	.13202708E+08
12	-.10895370E-02	.13960858E+08
13	-.10148019E-02	.14742446E+08
14	-.93285076E-03	.15547662E+08
15	-.85622729E-03	.16376695E+08
16	-.80095163E-03	.17229541E+08
17	-.78226890E-03	.18106777E+08
18	-.82061509E-03	.19008389E+08
19	-.93798251E-03	.19934565E+08
20	-.11589240E-02	.20885488E+08
21	-.15105938E-02	.21861338E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-4 DE 30.0 M.V FRANCOLÍ (SER) ZH4

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	30.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	3.2000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	2.4000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	30.000	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE = .0000 T/M
CARGA HORIZONTAL UNIFORME = .0320 T/M2
REACCION HORIZONTAL TABLERO = 50.0000 T
REACCION VERTICAL TABLERO = 2067.0000 T
MOMENTO EXTERIOR EN CABEZA = 1694.0000 TXM
COEFICIENTE MAYORACION (GS) = 1.0000

1

FASE ELASTICA

REACCION DEL TABLERO = 50.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.44007135E-04	.16076440E-02	.25426033E-01
2	.45143466E-04	.15407811E-02	.23064501E-01
3	.46243966E-04	.14722405E-02	.20804529E-01
4	.47310581E-04	.14020746E-02	.18648593E-01
5	.48345125E-04	.13303328E-02	.16599093E-01
6	.49349291E-04	.12570620E-02	.14658359E-01
7	.50324665E-04	.11823066E-02	.12828649E-01
8	.51272728E-04	.11061085E-02	.11112160E-01
9	.52194870E-04	.10285078E-02	.95110251E-02
10	.53092394E-04	.94954236E-03	.80273192E-02
11	.53966522E-04	.86924817E-03	.66630624E-02
12	.54818404E-04	.78765948E-03	.54202219E-02
13	.55649122E-04	.70480883E-03	.43007149E-02
14	.56459695E-04	.62072722E-03	.33064109E-02
15	.57251081E-04	.53544414E-03	.24391340E-02
16	.58024187E-04	.44898769E-03	.17006652E-02
17	.58779866E-04	.36138465E-03	.10927442E-02
18	.59518925E-04	.27266056E-03	.61707176E-03
19	.60242130E-04	.18283976E-03	.27531092E-03
20	.60950200E-04	.91945517E-04	.69089192E-04
21	.61643822E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2067.0000	50.0000	1694.0000
2	2087.1900	50.0974	1769.0727
3	2107.5600	50.1978	1844.2938
4	2128.1100	50.3010	1919.6674
5	2148.8400	50.4070	1995.1981
6	2169.7500	50.5160	2070.8900
7	2190.8400	50.6278	2146.7475
8	2212.1100	50.7426	2222.7750
9	2233.5600	50.8602	2298.9766
10	2255.1900	50.9806	2375.3569
11	2277.0000	51.1040	2451.9200
12	2298.9900	51.2302	2528.6703
13	2321.1600	51.3594	2605.6122
14	2343.5100	51.4914	2682.7498
15	2366.0400	51.6262	2760.0877
16	2388.7500	51.7640	2837.6300
17	2411.6400	51.9046	2915.3811
18	2434.7100	52.0482	2993.3454
19	2457.9600	52.1946	3071.5270
20	2481.3900	52.3438	3149.9305
21	2505.0000	52.4960	3228.5600

1

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 50.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.42585051E-04	.15812334E-02	.25083796E-01
2	.43810681E-04	.15164366E-02	.22760314E-01
3	.44994373E-04	.14498328E-02	.20535390E-01
4	.46138197E-04	.13814834E-02	.18411688E-01
5	.47244081E-04	.13114467E-02	.16391783E-01
6	.48313824E-04	.12397783E-02	.14478164E-01
7	.49349103E-04	.11665311E-02	.12673238E-01
8	.50351490E-04	.10917556E-02	.10979335E-01
9	.51322452E-04	.10155002E-02	.93987111E-02
10	.52263365E-04	.93781079E-03	.79335515E-02
11	.53175517E-04	.85873163E-03	.65859736E-02
12	.54060117E-04	.77830491E-03	.53580303E-02
13	.54918302E-04	.69657109E-03	.42517124E-02
14	.55751138E-04	.61356901E-03	.32689512E-02
15	.56559628E-04	.52933594E-03	.24116209E-02
16	.57344716E-04	.44390768E-03	.16815410E-02
17	.58107293E-04	.35731868E-03	.10804782E-02
18	.58848196E-04	.26960206E-03	.61014874E-03
19	.59568216E-04	.18078975E-03	.27221988E-03
20	.60268110E-04	.90912504E-04	.68311963E-04
21	.60948563E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.16137014E-03	-.27847903E-03	-.46390508E-04
2	-.16163854E-03	-.28211791E-03	-.43349700E-04
3	-.16191982E-03	-.28565435E-03	-.40435015E-04
4	-.16221350E-03	-.28909355E-03	-.37640372E-04
5	-.16251912E-03	-.29244034E-03	-.34960096E-04
6	-.16283621E-03	-.29569923E-03	-.32388890E-04
7	-.16316438E-03	-.29887441E-03	-.29921799E-04
8	-.16350321E-03	-.30196981E-03	-.27554187E-04
9	-.16385233E-03	-.30498907E-03	-.25281709E-04
10	-.16421138E-03	-.30793563E-03	-.23100294E-04
11	-.16458001E-03	-.31081268E-03	-.21006115E-04
12	-.16495790E-03	-.31362322E-03	-.18995582E-04
13	-.16534473E-03	-.31637006E-03	-.17065316E-04
14	-.16574021E-03	-.31905584E-03	-.15212137E-04
15	-.16614405E-03	-.32168302E-03	-.13433051E-04
16	-.16655597E-03	-.32425394E-03	-.11725235E-04
17	-.16697572E-03	-.32677077E-03	-.10086025E-04
18	-.16740304E-03	-.32923558E-03	-.85129091E-05
19	-.16783769E-03	-.33165029E-03	-.70035109E-05
20	-.16827945E-03	-.33401676E-03	-.55555579E-05
21	-.16872810E-03	-.33633664E-03	-.41669762E-05

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2067.0000	53.2685	1694.0042
2	2087.1900	53.2626	1773.9022
3	2107.5600	53.2535	1853.7891
4	2128.1100	53.2411	1933.6597
5	2148.8400	53.2253	2013.5093
6	2169.7500	53.2062	2093.3328
7	2190.8400	53.1837	2173.1251
8	2212.1100	53.1578	2252.8812
9	2233.5600	53.1285	2332.5959
10	2255.1900	53.0957	2412.2641
11	2277.0000	53.0594	2491.8805
12	2298.9900	53.0196	2571.4400
13	2321.1600	52.9763	2650.9371
14	2343.5100	52.9293	2730.3665
15	2366.0400	52.8787	2809.7228
16	2388.7500	52.8243	2889.0003
17	2411.6400	52.7663	2968.1936
18	2434.7100	52.7045	3047.2971
19	2457.9600	52.6388	3126.3050
20	2481.3900	52.5692	3205.2120
21	2505.0000	52.4958	3284.0114

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	-.42477144E-02	.39705848E+08
2	-.36352509E-02	.40410472E+08
3	-.31388300E-02	.41114299E+08
4	-.27442570E-02	.41817328E+08
5	-.24383218E-02	.42519556E+08
6	-.22101800E-02	.43221449E+08
7	-.20467540E-02	.43922071E+08
8	-.19381695E-02	.44621882E+08
9	-.18749834E-02	.45320881E+08
10	-.18485656E-02	.46019064E+08
11	-.18511523E-02	.46716430E+08
12	-.18757994E-02	.47412976E+08
13	-.19163473E-02	.48108699E+08
14	-.19674534E-02	.48803599E+08
15	-.20245307E-02	.49497674E+08
16	-.20838421E-02	.50190922E+08
17	-.21423581E-02	.50883342E+08
18	-.21978884E-02	.51574933E+08
19	-.22490136E-02	.52265694E+08
20	-.28685899E-02	.53005990E+08
21	-.30346763E-02	.53707131E+08

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ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-4 DE 30.0 M V FRANCOLÍ (SER) XH51

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	30.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	3.2000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	2.4000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	30.000	10.0500	10.0500

DATOS ACCIONES EXTERIORES

1

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	98.0000 T
REACCION VERTICAL TABLERO	=	1964.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

FASE ELASTICA

REACCION DEL TABLERO = 98.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.30129574E-02	.54309787E-01
2	.20552413E-04	.29975431E-02	.49798058E-01
3	.38222553E-04	.29534619E-02	.45331491E-01
4	.53435530E-04	.28847183E-02	.40950004E-01
5	.66545478E-04	.27947326E-02	.36687957E-01
6	.77848908E-04	.26864368E-02	.32574961E-01
7	.87595271E-04	.25623537E-02	.28636541E-01
8	.95995363E-04	.24246607E-02	.24894705E-01
9	.10322807E-03	.22752431E-02	.21368421E-01
10	.10944579E-03	.21157377E-02	.18074019E-01
11	.11477885E-03	.19475692E-02	.15025539E-01
12	.11933909E-03	.17719808E-02	.12235022E-01
13	.12322281E-03	.15900594E-02	.97127633E-02
14	.12651316E-03	.14027574E-02	.74675338E-02
15	.12928219E-03	.12109109E-02	.55067634E-02
16	.13159246E-03	.10152549E-02	.38367059E-02
17	.13349849E-03	.81643667E-03	.24625798E-02
18	.13504786E-03	.61502690E-03	.13886916E-02
19	.13628220E-03	.41152936E-03	.61854301E-03
20	.13723805E-03	.20638917E-03	.15492490E-03
21	.13794750E-03	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1964.0000	98.0000	.0000
2	1984.1900	98.0000	147.0000
3	2004.5600	98.0000	294.0000

4	2025.1100	98.0000	441.0000
5	2045.8400	98.0000	588.0000
6	2066.7500	98.0000	735.0000
7	2087.8400	98.0000	882.0000
8	2109.1100	98.0000	1029.0000
9	2130.5600	98.0000	1176.0000
10	2152.1900	98.0000	1323.0000
11	2174.0000	98.0000	1470.0000
12	2195.9900	98.0000	1617.0000
13	2218.1600	98.0000	1764.0000
14	2240.5100	98.0000	1911.0000
15	2263.0400	98.0000	2058.0000
16	2285.7500	98.0000	2205.0000
17	2308.6400	98.0000	2352.0000
18	2331.7100	98.0000	2499.0000
19	2354.9600	98.0000	2646.0000
20	2378.3900	98.0000	2793.0000
21	2402.0000	98.0000	2940.0000

FASE FINAL EN ITERACION NUMERO 5

REACCION DEL TABLERO = 98.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.33718958E-02	.63219915E-01
2	.21088666E-04	.33560793E-02	.58169979E-01
3	.39234003E-04	.33108373E-02	.53166390E-01
4	.54862429E-04	.32402650E-02	.48250133E-01
5	.68330394E-04	.31478704E-02	.43456506E-01
6	.79937018E-04	.30366698E-02	.38815924E-01
7	.89934604E-04	.29092661E-02	.34354598E-01
8	.98536960E-04	.27679124E-02	.30095101E-01
9	.10592607E-03	.26145652E-02	.26056857E-01
10	.11225743E-03	.24509276E-02	.22256551E-01
11	.11766447E-03	.22784861E-02	.18708476E-01
12	.12232805E-03	.20984917E-02	.15424869E-01
13	.12693081E-03	.19115476E-02	.12416476E-01
14	.13180210E-03	.17174979E-02	.96937787E-02
15	.13739623E-03	.15155992E-02	.72679070E-02
16	.14536350E-03	.13035294E-02	.51520668E-02
17	.15680813E-03	.10769006E-02	.33645984E-02
18	.16834518E-03	.83303566E-03	.19299830E-02
19	.17974937E-03	.57196475E-03	.87409437E-03
20	.19079564E-03	.29405600E-03	.22250763E-03
21	.20127903E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.16512294E-03	-.16512294E-03	-.16512294E-03
2	-.15135718E-03	-.17307850E-03	-.13069028E-03
3	-.15181368E-03	-.19340172E-03	-.11218733E-03
4	-.15239478E-03	-.21219483E-03	-.95337853E-04
5	-.15307225E-03	-.22960229E-03	-.79958731E-04
6	-.15382336E-03	-.24575094E-03	-.65892644E-04
7	-.15462977E-03	-.26075260E-03	-.53003667E-04
8	-.15547665E-03	-.27470638E-03	-.41173780E-04
9	-.15635205E-03	-.28770037E-03	-.30300034E-04
10	-.15724631E-03	-.29981325E-03	-.20292236E-04
11	-.15815164E-03	-.31111545E-03	-.11071048E-04
12	-.15901234E-03	-.32170864E-03	-.24324316E-05
13	-.15935946E-03	-.33198537E-03	.69199043E-05
14	-.15891955E-03	-.34212447E-03	.17695268E-04
15	-.15725318E-03	-.35235582E-03	.30979650E-04
16	-.15266196E-03	-.36343903E-03	.50846935E-04
17	-.14384768E-03	-.37592372E-03	.80387948E-04
18	-.13408342E-03	-.38828464E-03	.11170053E-03
19	-.12358066E-03	-.40039468E-03	.14424589E-03
20	-.11258713E-03	-.41213628E-03	.17742224E-03
21	-.10136339E-03	-.42340984E-03	.21061910E-03

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1964.0000	104.6214	.0000
2	1984.1900	104.6579	156.9669
3	2004.5600	104.6354	313.9433
4	2025.1100	104.5604	470.8458
5	2045.8400	104.4384	627.5999
6	2066.7500	104.2743	784.1388
7	2087.8400	104.0722	940.4025
8	2109.1100	103.8358	1096.3371
9	2130.5600	103.5683	1251.8934
10	2152.1900	103.2726	1407.0271
11	2174.0000	102.9511	1561.6976
12	2195.9900	102.6058	1715.8690
13	2218.1600	102.2376	1869.5061
14	2240.5100	101.8454	2022.5732
15	2263.0400	101.4272	2175.1028
16	2285.7500	100.9771	2326.8541
17	2308.6400	100.4840	2477.9523
18	2331.7100	99.9403	2628.2734
19	2354.9600	99.3450	2777.7396
20	2378.3900	98.6975	2926.2673
21	2402.0000	97.9982	3073.7781

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	.19597574E-02	.74423356E+07
3	.40151771E-02	.79991663E+07
4	.61528044E-02	.85764870E+07
5	.83618408E-02	.91745731E+07
6	.10630585E-01	.97936613E+07
7	.12946487E-01	.10433984E+08
8	.15295788E-01	.11095773E+08
9	.17663944E-01	.11779260E+08
10	.20035060E-01	.12484674E+08
11	.22391828E-01	.13212247E+08
12	.23626316E-01	.13367179E+08
13	.24148935E-01	.12448940E+08
14	.24683759E-01	.11128617E+08
15	-.44708596E-01	.82400294E+07
16	.13804557E-01	.57568114E+07
17	.19164069E-01	.52662341E+07
18	.23741050E-01	.49559430E+07
19	.28841736E-01	.46979898E+07
20	.39995572E-01	.45162424E+07
21	.57491113E-01	.43955275E+07

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-4 DE 30.0 M V FRANCOLÍ (SER) ZH51

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	30.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	3.2000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	2.4000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	30.000	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE = .0000 T/M
CARGA HORIZONTAL UNIFORME = .0320 T/M2
REACCION HORIZONTAL TABLERO = 43.0000 T
REACCION VERTICAL TABLERO = 1964.0000 T
MOMENTO EXTERIOR EN CABEZA = 1402.0000 TXM
COEFICIENTE MAYORACION (GS) = 1.0000

1

FASE ELASTICA

REACCION DEL TABLERO = 43.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.36421489E-04	.13470265E-02	.21368227E-01
2	.37424225E-04	.12916422E-02	.19389037E-01
3	.38395779E-04	.12347772E-02	.17494040E-01
4	.39337860E-04	.11764769E-02	.15685423E-01
5	.40252058E-04	.11167845E-02	.13965306E-01
6	.41139859E-04	.10557406E-02	.12335745E-01
7	.42002654E-04	.99338368E-03	.10798740E-01
8	.42841743E-04	.92975038E-03	.93562326E-02
9	.43658345E-04	.86487531E-03	.80101102E-02
10	.44453603E-04	.79879135E-03	.67622111E-02
11	.45228590E-04	.73152971E-03	.56143250E-02
12	.45984315E-04	.66312003E-03	.45681960E-02
13	.46721726E-04	.59359050E-03	.36255248E-02
14	.47441717E-04	.52296792E-03	.27879710E-02
15	.48145130E-04	.45127778E-03	.20571549E-02
16	.48832759E-04	.37854436E-03	.14346593E-02
17	.49505353E-04	.30479078E-03	.92203187E-03
18	.50163622E-04	.23003905E-03	.52078607E-03
19	.50808234E-04	.15431016E-03	.23240330E-03
20	.51439824E-04	.77624112E-04	.58334178E-04
21	.52058992E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1964.0000	43.0000	1402.0000
2	1984.1900	43.0974	1466.5727
3	2004.5600	43.1978	1531.2938
4	2025.1100	43.3010	1596.1674
5	2045.8400	43.4070	1661.1981
6	2066.7500	43.5160	1726.3900
7	2087.8400	43.6278	1791.7475
8	2109.1100	43.7426	1857.2750
9	2130.5600	43.8602	1922.9766
10	2152.1900	43.9806	1988.8569
11	2174.0000	44.1040	2054.9200
12	2195.9900	44.2302	2121.1703
13	2218.1600	44.3594	2187.6122
14	2240.5100	44.4914	2254.2498
15	2263.0400	44.6262	2321.0877
16	2285.7500	44.7640	2388.1300
17	2308.6400	44.9046	2455.3811
18	2331.7100	45.0482	2522.8454
19	2354.9600	45.1946	2590.5270
20	2378.3900	45.3438	2658.4305
21	2402.0000	45.4960	2726.5600

1

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 43.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.35038894E-04	.13165790E-02	.20946441E-01
2	.36104080E-04	.12632218E-02	.19011390E-01
3	.37133708E-04	.12082934E-02	.17157561E-01
4	.38129553E-04	.11518460E-02	.15387269E-01
5	.39093266E-04	.10939289E-02	.13702758E-01
6	.40026390E-04	.10345891E-02	.12106194E-01
7	.40930363E-04	.97387157E-03	.10599679E-01
8	.41806530E-04	.91181890E-03	.91852470E-02
9	.42656150E-04	.84847189E-03	.78648696E-02
10	.43480401E-04	.78386947E-03	.66404590E-02
11	.44280389E-04	.71804888E-03	.55138703E-02
12	.45057149E-04	.65104573E-03	.44869037E-02
13	.45811654E-04	.58289412E-03	.35613073E-02
14	.46544819E-04	.51362677E-03	.27387792E-02
15	.47257504E-04	.44327503E-03	.20209692E-02
16	.47950518E-04	.37186901E-03	.14094812E-02
17	.48624622E-04	.29943765E-03	.90587485E-03
18	.49280536E-04	.22600879E-03	.51166703E-03
19	.49918936E-04	.15160918E-03	.22833386E-03
20	.50540462E-04	.76264634E-04	.57311961E-04
21	.51145716E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.15238288E-03	-.24873984E-03	-.57777871E-04
2	-.15268577E-03	-.25197198E-03	-.55204751E-04
3	-.15300015E-03	-.25511785E-03	-.52739137E-04
4	-.15332562E-03	-.25818189E-03	-.50375832E-04
5	-.15366180E-03	-.26116829E-03	-.48109985E-04
6	-.15400832E-03	-.26408089E-03	-.45937067E-04
7	-.15436482E-03	-.26692332E-03	-.43852844E-04
8	-.15473098E-03	-.26969894E-03	-.41853349E-04
9	-.15510647E-03	-.27241089E-03	-.39934868E-04
10	-.15549100E-03	-.27506210E-03	-.38093917E-04
11	-.15588427E-03	-.27765534E-03	-.36327224E-04
12	-.15628602E-03	-.28019318E-03	-.34631716E-04
13	-.15669597E-03	-.28267802E-03	-.33004503E-04
14	-.15711388E-03	-.28511213E-03	-.31442863E-04
15	-.15753950E-03	-.28749763E-03	-.29944234E-04
16	-.15797260E-03	-.28983652E-03	-.28506200E-04
17	-.15841296E-03	-.29213067E-03	-.27126480E-04
18	-.15886037E-03	-.29438184E-03	-.25802923E-04
19	-.15931462E-03	-.29659170E-03	-.24533496E-04
20	-.15977552E-03	-.29876179E-03	-.23316277E-04
21	-.16024288E-03	-.30089360E-03	-.22149446E-04

1

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1964.0000	45.5858	1402.0031
2	1984.1900	45.6040	1470.3952
3	2004.5600	45.6199	1538.8129
4	2025.1100	45.6337	1607.2529
5	2045.8400	45.6452	1675.7119
6	2066.7500	45.6544	1744.1865
7	2087.8400	45.6613	1812.6731
8	2109.1100	45.6658	1881.1684
9	2130.5600	45.6680	1949.6688
10	2152.1900	45.6678	2018.1706
11	2174.0000	45.6651	2086.6704
12	2195.9900	45.6600	2155.1643
13	2218.1600	45.6524	2223.6487
14	2240.5100	45.6422	2292.1198
15	2263.0400	45.6294	2360.5736
16	2285.7500	45.6140	2429.0064
17	2308.6400	45.5959	2497.4140
18	2331.7100	45.5751	2565.7925
19	2354.9600	45.5515	2634.1377
20	2378.3900	45.5251	2702.4455
21	2402.0000	45.4958	2770.7115

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	-.30738000E-02	.39962581E+08
2	-.26303051E-02	.40671942E+08
3	-.22817711E-02	.41380558E+08
4	-.20162430E-02	.42088423E+08
5	-.18225975E-02	.42795535E+08
6	-.16906338E-02	.43501889E+08
7	-.16107178E-02	.44207482E+08
8	-.15741359E-02	.44912310E+08
9	-.15727248E-02	.45616371E+08
10	-.15991871E-02	.46319661E+08
11	-.16501880E-02	.47022645E+08
12	-.17135716E-02	.47724380E+08
13	-.17869505E-02	.48425335E+08
14	-.18658049E-02	.49125505E+08
15	-.19463193E-02	.49824889E+08
16	-.20253469E-02	.50523484E+08
17	-.21005598E-02	.51221287E+08
18	-.21703081E-02	.51918297E+08
19	-.22336684E-02	.52614512E+08
20	-.22905626E-02	.53309930E+08
21	-.23416770E-02	.54004548E+08

1

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-4 DE 30.0 M V FRANCOLÍ (SER) XH52

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	30.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	3.2000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	2.4000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	30.000	10.0500	10.0500

DATOS ACCIONES EXTERIORES

1

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	84.0000 T
REACCION VERTICAL TABLERO	=	2375.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

FASE ELASTICA

REACCION DEL TABLERO = 84.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.25825349E-02	.46551246E-01
2	.17616354E-04	.25693227E-02	.42684050E-01
3	.32762189E-04	.25315388E-02	.38855564E-01
4	.45801883E-04	.24726157E-02	.35100003E-01
5	.57038981E-04	.23954851E-02	.31446820E-01
6	.66727636E-04	.23026601E-02	.27921395E-01
7	.75081661E-04	.21963031E-02	.24545606E-01
8	.82281739E-04	.20782806E-02	.21338318E-01
9	.88481201E-04	.19502084E-02	.18315789E-01
10	.93810676E-04	.18134895E-02	.15492017E-01
11	.98381872E-04	.16693451E-02	.12879034E-01
12	.10229065E-03	.15188407E-02	.10487161E-01
13	.10561955E-03	.13629080E-02	.83252257E-02
14	.10843985E-03	.12023635E-02	.64007432E-02
15	.11081330E-03	.10379236E-02	.47200829E-02
16	.11279354E-03	.87021848E-03	.32886050E-02
17	.11442728E-03	.69980286E-03	.21107827E-02
18	.11575531E-03	.52716592E-03	.11903071E-02
19	.11681332E-03	.35273945E-03	.53017972E-03
20	.11763261E-03	.17690500E-03	.13279277E-03
21	.11824072E-03	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2375.0000	84.0000	.0000
2	2395.1900	84.0000	126.0000
3	2415.5600	84.0000	252.0000

4	2436.1100	84.0000	378.0000
5	2456.8400	84.0000	504.0000
6	2477.7500	84.0000	630.0000
7	2498.8400	84.0000	756.0000
8	2520.1100	84.0000	882.0000
9	2541.5600	84.0000	1008.0000
10	2563.1900	84.0000	1134.0000
11	2585.0000	84.0000	1260.0000
12	2606.9900	84.0000	1386.0000
13	2629.1600	84.0000	1512.0000
14	2651.5100	84.0000	1638.0000
15	2674.0400	84.0000	1764.0000
16	2696.7500	84.0000	1890.0000
17	2719.6400	84.0000	2016.0000
18	2742.7100	84.0000	2142.0000
19	2765.9600	84.0000	2268.0000
20	2789.3900	84.0000	2394.0000
21	2813.0000	84.0000	2520.0000

1

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 84.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.27081417E-02	.48687641E-01
2	.18637305E-04	.26941638E-02	.44632417E-01
3	.34663033E-04	.26541885E-02	.40618148E-01
4	.48453433E-04	.25918512E-02	.36681032E-01
5	.60324020E-04	.25102681E-02	.32852217E-01
6	.70539957E-04	.24121201E-02	.29158511E-01
7	.79325210E-04	.22997212E-02	.25622982E-01
8	.86869804E-04	.21750749E-02	.22265471E-01
9	.93335637E-04	.20399209E-02	.19103012E-01
10	.98861185E-04	.18957732E-02	.16150205E-01
11	.10356532E-03	.17439534E-02	.13419528E-01
12	.10755043E-03	.15856166E-02	.10921603E-01
13	.11090499E-03	.14217750E-02	.86654306E-02
14	.11370569E-03	.12533170E-02	.66585865E-02
15	.11601917E-03	.10810234E-02	.49073975E-02
16	.11790352E-03	.90558134E-03	.34170906E-02
17	.11940948E-03	.72759658E-03	.21919248E-02
18	.12058149E-03	.54760335E-03	.12353051E-02
19	.12145853E-03	.36607333E-03	.54988317E-03
20	.12207490E-03	.18342325E-03	.13764516E-03
21	.12248943E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.19967769E-03	-.19967769E-03	-.19967769E-03
2	-.18464996E-03	-.20384638E-03	-.16638540E-03
3	-.18476455E-03	-.22150736E-03	-.14975489E-03
4	-.18498446E-03	-.23779870E-03	-.13459289E-03
5	-.18528702E-03	-.25284993E-03	-.12074032E-03
6	-.18565394E-03	-.26677489E-03	-.10805999E-03
7	-.18607041E-03	-.27967416E-03	-.96432925E-04
8	-.18652448E-03	-.29163695E-03	-.85755512E-04
9	-.18700648E-03	-.30274267E-03	-.75937070E-04
10	-.18750858E-03	-.31306229E-03	-.66897935E-04
11	-.18802449E-03	-.32265940E-03	-.58567840E-04
12	-.18854913E-03	-.33159120E-03	-.50884582E-04
13	-.18907845E-03	-.33990923E-03	-.43792916E-04
14	-.18960922E-03	-.34766012E-03	-.37243602E-04
15	-.19013889E-03	-.35488611E-03	-.31192628E-04
16	-.19066547E-03	-.36162557E-03	-.25600537E-04
17	-.19118742E-03	-.36791346E-03	-.20431856E-04
18	-.19170359E-03	-.37378164E-03	-.15654611E-04
19	-.19221312E-03	-.37925927E-03	-.11239909E-04
20	-.19271543E-03	-.38437303E-03	-.71615798E-05
21	-.19318348E-03	-.38916657E-03	-.33248548E-05

1

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2375.0000	90.4322	.0000
2	2395.1900	90.4533	135.6714
3	2415.5600	90.4115	271.3262
4	2436.1100	90.3140	406.8758
5	2456.8400	90.1672	542.2415
6	2477.7500	89.9763	677.3536
7	2498.8400	89.7462	812.1496
8	2520.1100	89.4809	946.5737
9	2541.5600	89.1839	1080.5759
10	2563.1900	88.8585	1214.1111
11	2585.0000	88.5073	1347.1386
12	2606.9900	88.1328	1479.6219
13	2629.1600	87.7371	1611.5274
14	2651.5100	87.3221	1742.8249
15	2674.0400	86.8896	1873.4868
16	2696.7500	86.4410	2003.4880
17	2719.6400	85.9776	2132.8053
18	2742.7100	85.5007	2261.4176
19	2765.9600	85.0113	2389.3053
20	2789.3900	84.5105	2516.4507
21	2813.0000	83.9989	2642.8192

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	.52539277E-03	.72787039E+07
3	.10845222E-02	.78255547E+07
4	.15858092E-02	.83930251E+07
5	.20065520E-02	.89814310E+07
6	.23302404E-02	.95910058E+07
7	.25471598E-02	.10221974E+08
8	.26519199E-02	.10874555E+08
9	.26410115E-02	.11548971E+08
10	.25108755E-02	.12245438E+08
11	.22559993E-02	.12964174E+08
12	.18490018E-02	.13705309E+08
13	.13168564E-02	.14469240E+08
14	.61959105E-03	.15256080E+08
15	-.26671415E-03	.16066040E+08
16	-.13723997E-02	.16899331E+08
17	-.27345126E-02	.17756159E+08
18	-.43972387E-02	.18636733E+08
19	-.64120681E-02	.19541258E+08
20	-.88380627E-02	.20469938E+08
21	.59977070E-02	.20269967E+08

1

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-4 DE 30.0 M V FRANCOLÍ (SER) ZH52

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	30.0000	M
NUMERO DE SECCIONES	=	21	
ANCHO EXTERIOR (SECCION 1)	=	2.0000	M
CANTO EXTERIOR (SECCION 1)	=	5.5000	M
ANCHO INTERIOR (SECCION 1)	=	1.2000	M
CANTO INTERIOR (SECCION 1)	=	4.7000	M
ANCHO EXTERIOR (SECCION N)	=	3.2000	M
CANTO EXTERIOR (SECCION N)	=	5.5000	M
ANCHO INTERIOR (SECCION N)	=	2.4000	M
CANTO INTERIOR (SECCION N)	=	4.7000	M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000	KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000	

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000	KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000	

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	30.000	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE = .0000 T/M
CARGA HORIZONTAL UNIFORME = .0320 T/M2
REACCION HORIZONTAL TABLERO = 46.0000 T
REACCION VERTICAL TABLERO = 2375.0000 T
MOMENTO EXTERIOR EN CABEZA = 295.0000 TXM
COEFICIENTE MAYORACION (GS) = 1.0000

1

FASE ELASTICA

REACCION DEL TABLERO = 46.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.76635802E-05	.63868795E-03	.11437131E-01
2	.92904628E-05	.62597241E-03	.10488330E-01
3	.10864442E-04	.61085623E-03	.95604136E-02
4	.12388338E-04	.59341665E-03	.86569232E-02
5	.13864783E-04	.57372681E-03	.77812888E-02
6	.15296233E-04	.55185605E-03	.69368333E-02
7	.16684988E-04	.52787013E-03	.61267782E-02
8	.18033195E-04	.50183150E-03	.53542492E-02
9	.19342872E-04	.47379944E-03	.46222805E-02
10	.20615906E-04	.44383036E-03	.39338194E-02
11	.21854073E-04	.41197788E-03	.32917311E-02
12	.23059040E-04	.37829304E-03	.26988020E-02
13	.24232375E-04	.34282448E-03	.21577438E-02
14	.25375556E-04	.30561853E-03	.16711972E-02
15	.26489974E-04	.26671939E-03	.12417348E-02
16	.27576942E-04	.22616920E-03	.87186457E-03
17	.28637701E-04	.18400822E-03	.56403261E-03
18	.29673419E-04	.14027488E-03	.32062609E-03
19	.30685206E-04	.95005907E-04	.14397580E-03
20	.31674109E-04	.48236421E-04	.36358630E-04
21	.32641119E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2375.0000	46.0000	295.0000
2	2395.1900	46.0974	364.0727
3	2415.5600	46.1978	433.2938
4	2436.1100	46.3010	502.6674
5	2456.8400	46.4070	572.1981
6	2477.7500	46.5160	641.8900
7	2498.8400	46.6278	711.7475
8	2520.1100	46.7426	781.7750
9	2541.5600	46.8602	851.9766
10	2563.1900	46.9806	922.3569
11	2585.0000	47.1040	992.9200
12	2606.9900	47.2302	1063.6703
13	2629.1600	47.3594	1134.6122
14	2651.5100	47.4914	1205.7498
15	2674.0400	47.6262	1277.0877
16	2696.7500	47.7640	1348.6300
17	2719.6400	47.9046	1420.3811
18	2742.7100	48.0482	1492.3454
19	2765.9600	48.1946	1564.5270
20	2789.3900	48.3438	1636.9305
21	2813.0000	48.4960	1709.5600

1

FASE FINAL EN ITERACION NUMERO 2

REACCION DEL TABLERO = 46.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.75340027E-05	.63974297E-03	.11466218E-01
2	.91906216E-05	.62719951E-03	.10515700E-01
3	.10792452E-04	.61221220E-03	.95858413E-02
4	.12342249E-04	.59486118E-03	.86802457E-02
5	.13842581E-04	.57522255E-03	.78024016E-02
6	.15295841E-04	.55336874E-03	.69556856E-02
7	.16704266E-04	.52936866E-03	.61433685E-02
8	.18069949E-04	.50328800E-03	.53686199E-02
9	.19394849E-04	.47518940E-03	.46345135E-02
10	.20680799E-04	.44513266E-03	.39440308E-02
11	.21929522E-04	.41317492E-03	.33000660E-02
12	.23142633E-04	.37937080E-03	.27054292E-02
13	.24321651E-04	.34377259E-03	.21628506E-02
14	.25468003E-04	.30643035E-03	.16749835E-02
15	.26583035E-04	.26739207E-03	.12444076E-02
16	.27668011E-04	.22670379E-03	.87363226E-03
17	.28724126E-04	.18440968E-03	.56509914E-03
18	.29752504E-04	.14055221E-03	.32118489E-03
19	.30754207E-04	.95172180E-04	.14420378E-03
20	.31730240E-04	.48308844E-04	.36410004E-04
21	.32681551E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.18473054E-03	-.20544905E-03	-.16438873E-03
2	-.18467307E-03	-.20994727E-03	-.15985839E-03
3	-.18463706E-03	-.21431630E-03	-.15549744E-03
4	-.18462168E-03	-.21856287E-03	-.15129761E-03
5	-.18462616E-03	-.22269326E-03	-.14725120E-03
6	-.18464976E-03	-.22671332E-03	-.14335099E-03
7	-.18469176E-03	-.23062849E-03	-.13959024E-03
8	-.18475151E-03	-.23444387E-03	-.13596265E-03
9	-.18482839E-03	-.23816422E-03	-.13246229E-03
10	-.18492178E-03	-.24179398E-03	-.12908362E-03
11	-.18503112E-03	-.24533731E-03	-.12582142E-03
12	-.18515588E-03	-.24879812E-03	-.12267077E-03
13	-.18529554E-03	-.25218008E-03	-.11962708E-03
14	-.18544960E-03	-.25548661E-03	-.11668599E-03
15	-.18561760E-03	-.25872094E-03	-.11384340E-03
16	-.18579909E-03	-.26188612E-03	-.11109546E-03
17	-.18599364E-03	-.26498499E-03	-.10843850E-03
18	-.18620086E-03	-.26802024E-03	-.10586910E-03
19	-.18642033E-03	-.27099440E-03	-.10338398E-03
20	-.18665171E-03	-.27390987E-03	-.10098006E-03
21	-.18689461E-03	-.27676888E-03	-.98654420E-04

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.65938492E-01	.39142551E+08
2	.55781516E-01	.39849148E+08
3	.46630333E-01	.40554878E+08
4	.38476827E-01	.41259810E+08
5	.31298357E-01	.41963966E+08
6	.25070123E-01	.42678379E+08
7	.19769499E-01	.43383280E+08
8	.15378678E-01	.44072014E+08
9	.11886364E-01	.44773168E+08
10	.92877015E-02	.45473572E+08
11	.75861802E-02	.46173219E+08
12	.67944168E-02	.46872101E+08
13	.69340707E-02	.47570220E+08
14	.80379386E-02	.48267567E+08
15	.10149523E-01	.48964141E+08
16	.13324744E-01	.49659937E+08
17	.17632228E-01	.50354953E+08
18	.23154420E-01	.51049186E+08
19	.29988595E-01	.51742630E+08
20	.38247173E-01	.52435284E+08
21	.48059228E-01	.53127144E+08

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ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2375.0000	47.5169	294.9341
2	2395.1900	47.5967	366.2840
3	2415.5600	47.6733	437.7507
4	2436.1100	47.7466	509.3293
5	2456.8400	47.8165	581.0146
6	2477.7500	47.8833	652.8017
7	2498.8400	47.9468	724.6856
8	2520.1100	48.0071	796.6614
9	2541.5600	48.0643	868.7243
10	2563.1900	48.1182	940.8693
11	2585.0000	48.1688	1013.0914
12	2606.9900	48.2163	1085.3859
13	2629.1600	48.2606	1157.7478
14	2651.5100	48.3016	1230.1722
15	2674.0400	48.3393	1302.6541
16	2696.7500	48.3737	1375.1885
17	2719.6400	48.4049	1447.7705
18	2742.7100	48.4327	1520.3950
19	2765.9600	48.4571	1593.0568
20	2789.3900	48.4782	1665.7510
21	2813.0000	48.4958	1738.4722

1

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-4 DE 30.0 M V FRANCOLÍ (SER) XH10

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	30.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	3.2000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	2.4000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	30.000	10.0500	10.0500

DATOS ACCIONES EXTERIORES

1

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	49.0000 T
REACCION VERTICAL TABLERO	=	1925.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.0000

FASE ELASTICA

REACCION DEL TABLERO = 49.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.15064787E-02	.27154894E-01
2	.10276207E-04	.14987716E-02	.24899029E-01
3	.19111277E-04	.14767310E-02	.22665746E-01
4	.26717765E-04	.14423592E-02	.20475002E-01
5	.33272739E-04	.13973663E-02	.18343979E-01
6	.38924454E-04	.13432184E-02	.16287480E-01
7	.43797635E-04	.12811768E-02	.14318270E-01
8	.47997681E-04	.12123303E-02	.12447352E-01
9	.51614034E-04	.11376216E-02	.10684210E-01
10	.54722894E-04	.10578689E-02	.90370097E-02
11	.57389425E-04	.97378462E-03	.75127696E-02
12	.59669547E-04	.88599039E-03	.61175108E-02
13	.61611404E-04	.79502968E-03	.48563816E-02
14	.63256579E-04	.70137869E-03	.37337669E-02
15	.64641093E-04	.60545544E-03	.27533817E-02
16	.65796232E-04	.50762744E-03	.19183529E-02
17	.66749247E-04	.40821833E-03	.12312899E-02
18	.67523930E-04	.30751345E-03	.69434582E-03
19	.68141102E-04	.20576468E-03	.30927151E-03
20	.68619025E-04	.10319458E-03	.77462449E-04
21	.68973752E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1925.0000	49.0000	.0000
2	1945.1900	49.0000	73.5000
3	1965.5600	49.0000	147.0000

4	1986.1100	49.0000	220.5000
5	2006.8400	49.0000	294.0000
6	2027.7500	49.0000	367.5000
7	2048.8400	49.0000	441.0000
8	2070.1100	49.0000	514.5000
9	2091.5600	49.0000	588.0000
10	2113.1900	49.0000	661.5000
11	2135.0000	49.0000	735.0000
12	2156.9900	49.0000	808.5000
13	2179.1600	49.0000	882.0000
14	2201.5100	49.0000	955.5000
15	2224.0400	49.0000	1029.0000
16	2246.7500	49.0000	1102.5000
17	2269.6400	49.0000	1176.0000
18	2292.7100	49.0000	1249.5000
19	2315.9600	49.0000	1323.0000
20	2339.3900	49.0000	1396.5000
21	2363.0000	49.0000	1470.0000

1

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 49.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.15229492E-02	.27401195E-01
2	.10445224E-04	.15151152E-02	.25120689E-01
3	.19431313E-04	.14927078E-02	.22863136E-01
4	.27168045E-04	.14577583E-02	.20648836E-01
5	.33831925E-04	.14120083E-02	.18495262E-01
6	.39571307E-04	.13569559E-02	.16417462E-01
7	.44511505E-04	.12938938E-02	.14428399E-01
8	.48758840E-04	.12239411E-02	.12539226E-01
9	.52403880E-04	.11480690E-02	.10759535E-01
10	.55524066E-04	.10671231E-02	.90975560E-02
11	.58185851E-04	.98184061E-03	.75603342E-02
12	.60446449E-04	.89286639E-03	.61538801E-02
13	.62355276E-04	.80076510E-03	.48832986E-02
14	.63955137E-04	.70603229E-03	.37529006E-02
15	.65283216E-04	.60910352E-03	.27662997E-02
16	.66371899E-04	.51036219E-03	.19264963E-02
17	.67249461E-04	.41014617E-03	.12359505E-02
18	.67940650E-04	.30875358E-03	.69664607E-03
19	.68467172E-04	.20644772E-03	.31014638E-03
20	.68848102E-04	.10346126E-03	.77643222E-04
21	.69100244E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.16184403E-03	-.16184403E-03	-.16184403E-03
2	-.14816777E-03	-.15892635E-03	-.13793145E-03
3	-.14847213E-03	-.16906932E-03	-.12884650E-03
4	-.14881433E-03	-.17842750E-03	-.12055957E-03
5	-.14918725E-03	-.18707901E-03	-.11298709E-03
6	-.14958510E-03	-.19509211E-03	-.10605667E-03
7	-.15000320E-03	-.20252678E-03	-.99705200E-04
8	-.15043773E-03	-.20943593E-03	-.93877477E-04
9	-.15088560E-03	-.21586641E-03	-.88524981E-04
10	-.15134428E-03	-.22185984E-03	-.83604918E-04
11	-.15181172E-03	-.22745333E-03	-.79079410E-04
12	-.15228627E-03	-.23268004E-03	-.74914811E-04
13	-.15276655E-03	-.23756973E-03	-.71081143E-04
14	-.15325149E-03	-.24214913E-03	-.67551609E-04
15	-.15374020E-03	-.24644237E-03	-.64302194E-04
16	-.15423197E-03	-.25047122E-03	-.61311309E-04
17	-.15472623E-03	-.25425543E-03	-.58559499E-04
18	-.15522254E-03	-.25781292E-03	-.56029186E-04
19	-.15572054E-03	-.26115998E-03	-.53704451E-04
20	-.15621996E-03	-.26431148E-03	-.51570847E-04
21	-.15672061E-03	-.26728100E-03	-.49615228E-04

1

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1925.0000	51.9317	.0000
2	1945.1900	51.9471	77.9129
3	1965.5600	51.9339	155.8269
4	1986.1100	51.8951	233.7016
5	2006.8400	51.8334	311.5005
6	2027.7500	51.7512	389.1914
7	2048.8400	51.6506	466.7449
8	2070.1100	51.5332	544.1347
9	2091.5600	51.4007	621.3369
10	2113.1900	51.2545	698.3300
11	2135.0000	51.0956	775.0941
12	2156.9900	50.9253	851.6112
13	2179.1600	50.7443	927.8648
14	2201.5100	50.5536	1003.8396
15	2224.0400	50.3539	1079.5216
16	2246.7500	50.1459	1154.8977
17	2269.6400	49.9301	1229.9560
18	2292.7100	49.7072	1304.6853
19	2315.9600	49.4774	1379.0750
20	2339.3900	49.2414	1453.1154
21	2363.0000	48.9994	1526.7974

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	.21929612E-04	.74582600E+07
3	.65988892E-04	.80185228E+07
4	.12720495E-03	.86005672E+07
5	.20503061E-03	.92047678E+07
6	.29914127E-03	.98313384E+07
7	.40846981E-03	.10480475E+08
8	.53088052E-03	.11152367E+08
9	.66328416E-03	.11847206E+08
10	.80127756E-03	.12565177E+08
11	.93881468E-03	.13306469E+08
12	.10683262E-02	.14071266E+08
13	.11804625E-02	.14859754E+08
14	.12641486E-02	.15672117E+08
15	.13064433E-02	.16508538E+08
16	.12924118E-02	.17369199E+08
17	.12053114E-02	.18254282E+08
18	.10262963E-02	.19163967E+08
19	.72277914E-03	.20097566E+08
20	.28694750E-03	.21056621E+08
21	-.32690679E-03	.22040030E+08

1

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-4 DE 30.0 M V FRANCOLÍ (SER) ZH10

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	30.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	3.2000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	2.4000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	30.000	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE = .0000 T/M
CARGA HORIZONTAL UNIFORME = .0530 T/M2
REACCION HORIZONTAL TABLERO = 99.0000 T
REACCION VERTICAL TABLERO = 1925.0000 T
MOMENTO EXTERIOR EN CABEZA = 543.0000 TXM
COEFICIENTE MAYORACION (GS) = 1.0000

1

FASE ELASTICA

REACCION DEL TABLERO = 99.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.14106183E-04	.13100442E-02	.23669074E-01
2	.17648875E-04	.12862279E-02	.21721205E-01
3	.21074425E-04	.12571854E-02	.19813003E-01
4	.24389020E-04	.12230878E-02	.17952177E-01
5	.27598432E-04	.11840972E-02	.16146186E-01
6	.30708050E-04	.11403674E-02	.14402255E-01
7	.33722911E-04	.10920442E-02	.12727381E-01
8	.36647733E-04	.10392662E-02	.11128350E-01
9	.39486934E-04	.98216518E-03	.96117437E-02
10	.42244659E-04	.92086648E-03	.81839529E-02
11	.44924798E-04	.85548939E-03	.68511834E-02
12	.47531010E-04	.78614753E-03	.56194671E-02
13	.50066733E-04	.71294923E-03	.44946691E-02
14	.52535208E-04	.63599777E-03	.34824960E-02
15	.54939488E-04	.55539175E-03	.25885030E-02
16	.57282450E-04	.47122529E-03	.18181010E-02
17	.59566815E-04	.38358835E-03	.11765624E-02
18	.61795150E-04	.29256687E-03	.66902818E-03
19	.63969884E-04	.19824310E-03	.30051294E-03
20	.66093314E-04	.10069570E-03	.75910705E-04
21	.68167616E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1925.0000	99.0000	543.0000
2	1945.1900	99.1614	691.6204
3	1965.5600	99.3275	840.4865
4	1986.1100	99.4985	989.6054
5	2006.8400	99.6742	1138.9843
6	2027.7500	99.8546	1288.6303
7	2048.8400	100.0399	1438.5506
8	2070.1100	100.2299	1588.7523
9	2091.5600	100.4246	1739.2426
10	2113.1900	100.6242	1890.0286
11	2135.0000	100.8285	2041.1175
12	2156.9900	101.0376	2192.5165
13	2179.1600	101.2514	2344.2326
14	2201.5100	101.4701	2496.2732
15	2224.0400	101.6935	2648.6452
16	2246.7500	101.9216	2801.3559
17	2269.6400	102.1546	2954.4125
18	2292.7100	102.3923	3107.8220
19	2315.9600	102.6347	3261.5917
20	2339.3900	102.8820	3415.7286
21	2363.0000	103.1340	3570.2400

1

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 99.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.13535955E-04	.12875347E-02	.23366279E-01
2	.17029631E-04	.12646106E-02	.21451515E-01
3	.20408682E-04	.12365318E-02	.19575024E-01
4	.23678950E-04	.12034661E-02	.17744413E-01
5	.26845872E-04	.11655725E-02	.15967040E-01
6	.29914514E-04	.11230022E-02	.14250034E-01
7	.32889604E-04	.10758991E-02	.12600300E-01
8	.35775556E-04	.10244002E-02	.11024534E-01
9	.38576500E-04	.96863619E-03	.95292317E-02
10	.41296301E-04	.90873159E-03	.81206959E-02
11	.43938579E-04	.84480543E-03	.68050477E-02
12	.46506730E-04	.77697145E-03	.55882336E-02
13	.49003941E-04	.70533844E-03	.44760329E-02
14	.51433207E-04	.63001058E-03	.34740657E-02
15	.53797344E-04	.55108767E-03	.25877987E-02
16	.56099049E-04	.46866537E-03	.18225523E-02
17	.58379938E-04	.38280613E-03	.11835210E-02
18	.60816704E-04	.29340865E-03	.67590306E-03
19	.63509030E-04	.20016435E-03	.30521849E-03
20	.66619225E-04	.10256816E-03	.77585950E-04
21	.70138321E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.14810730E-03	-.18533117E-03	-.11156022E-03
2	-.14846110E-03	-.19529258E-03	-.10248110E-03
3	-.14884868E-03	-.20497255E-03	-.93745236E-04
4	-.14926802E-03	-.21438513E-03	-.85334854E-04
5	-.14971725E-03	-.22354340E-03	-.77233397E-04
6	-.15019464E-03	-.23245955E-03	-.69425448E-04
7	-.15069855E-03	-.24114496E-03	-.61896624E-04
8	-.15122750E-03	-.24961027E-03	-.54633494E-04
9	-.15178005E-03	-.25786543E-03	-.47623502E-04
10	-.15235491E-03	-.26591974E-03	-.40854899E-04
11	-.15295084E-03	-.27378193E-03	-.34316679E-04
12	-.15356669E-03	-.28146020E-03	-.27998519E-04
13	-.15420138E-03	-.28896221E-03	-.21890735E-04
14	-.15485389E-03	-.29629521E-03	-.15984227E-04
15	-.15552327E-03	-.30346596E-03	-.10270440E-04
16	-.15620863E-03	-.31048101E-03	-.47411969E-05
17	-.15685490E-03	-.31739973E-03	.77093309E-06
18	-.15723935E-03	-.32448529E-03	.69657474E-05
19	-.15722563E-03	-.33187547E-03	.14248748E-04
20	-.15655410E-03	-.33975697E-03	.23317812E-04
21	-.15521510E-03	-.34809548E-03	.34158367E-04

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	-.22822602E-01	.40109559E+08
2	-.20235339E-01	.40819743E+08
3	-.17744176E-01	.41527801E+08
4	-.15368751E-01	.42233776E+08
5	-.13128774E-01	.42937685E+08
6	-.11044812E-01	.43639551E+08
7	-.91379336E-02	.44339389E+08
8	-.74298096E-02	.45037215E+08
9	-.59429360E-02	.45733044E+08
10	-.47004215E-02	.46426891E+08
11	-.37172015E-02	.47118773E+08
12	-.30381205E-02	.47808701E+08
13	-.26782931E-02	.48496692E+08
14	-.26647564E-02	.49182761E+08
15	-.30256537E-02	.49866923E+08
16	-.62843086E-02	.50549178E+08
17	.16485965E+00	.48028797E+08
18	.32472258E+00	.43306860E+08
19	.14073377E+00	.37822180E+08
20	.78083049E-01	.31102701E+08
21	.13948731E+00	.29232603E+08

1

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1925.0000	101.4760	543.0228
2	1945.1900	101.6188	695.3458
3	1965.5600	101.7556	847.8785
4	1986.1100	101.8863	1000.6118
5	2006.8400	102.0110	1153.5367
6	2027.7500	102.1296	1306.6440
7	2048.8400	102.2420	1459.9246
8	2070.1100	102.3484	1613.3694
9	2091.5600	102.4486	1766.9692
10	2113.1900	102.5426	1920.7148
11	2135.0000	102.6303	2074.5967
12	2156.9900	102.7118	2228.6056
13	2179.1600	102.7869	2382.7321
14	2201.5100	102.8556	2536.9666
15	2224.0400	102.9177	2691.2994
16	2246.7500	102.9734	2845.7232
17	2269.6400	103.0221	3000.0508
18	2292.7100	103.0633	3154.4575
19	2315.9600	103.0961	3309.2644
20	2339.3900	103.1198	3463.9929
21	2363.0000	103.1335	3618.6242

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-4 DE 30.0 M V FRANCOLÍ (ROT) XH2

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	30.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	3.2000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	2.4000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	30.000	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	36.0000 T
REACCION VERTICAL TABLERO	=	1299.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

1

FASE ELASTICA

REACCION DEL TABLERO = 51.8400 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.15937930E-02	.28728769E-01
2	.10871807E-04	.15856391E-02	.26342156E-01
3	.20218951E-04	.15623211E-02	.23979434E-01
4	.28266305E-04	.15259571E-02	.21661716E-01
5	.35201200E-04	.14783565E-02	.19407181E-01
6	.41180484E-04	.14210702E-02	.17231489E-01
7	.46336111E-04	.13554328E-02	.15148146E-01
8	.50779588E-04	.12825960E-02	.13168791E-01
9	.54605541E-04	.12035572E-02	.11303458E-01
10	.57894588E-04	.11191821E-02	.95607874E-02
11	.60715670E-04	.10302244E-02	.79482036E-02
12	.63127945E-04	.93734167E-03	.64720767E-02
13	.65182351E-04	.84110895E-03	.51378535E-02
14	.66922879E-04	.74203003E-03	.39501730E-02
15	.68387638E-04	.64054714E-03	.29129654E-02
16	.69609728E-04	.53704912E-03	.20295391E-02
17	.70617979E-04	.43187834E-03	.13026545E-02
18	.71437562E-04	.32533668E-03	.73458954E-03
19	.72090504E-04	.21769063E-03	.32719663E-03
20	.72596128E-04	.10917566E-03	.81952109E-04
21	.72971415E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1870.5600	51.8400	.0000
2	1899.6336	51.8400	77.7600
3	1928.9664	51.8400	155.5200
4	1958.5584	51.8400	233.2800
5	1988.4096	51.8400	311.0400
6	2018.5200	51.8400	388.8000
7	2048.8896	51.8400	466.5600
8	2079.5184	51.8400	544.3200
9	2110.4064	51.8400	622.0800
10	2141.5536	51.8400	699.8400
11	2172.9600	51.8400	777.6000
12	2204.6256	51.8400	855.3600
13	2236.5504	51.8400	933.1200
14	2268.7344	51.8400	1010.8800
15	2301.1776	51.8400	1088.6400
16	2333.8800	51.8400	1166.4000
17	2366.8416	51.8400	1244.1600
18	2400.0624	51.8400	1321.9200
19	2433.5424	51.8400	1399.6800
20	2467.2816	51.8400	1477.4400
21	2501.2800	51.8400	1555.2000

1

FASE FINAL EN ITERACION NUMERO 2

REACCION DEL TABLERO = 51.8400 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.16157142E-02	.29104010E-01
2	.11007968E-04	.16074582E-02	.26684567E-01
3	.20491961E-04	.15838333E-02	.24289320E-01
4	.28670158E-04	.15469617E-02	.21939690E-01
5	.35726085E-04	.14986645E-02	.19654148E-01
6	.41814028E-04	.14405094E-02	.17448626E-01
7	.47064351E-04	.13738506E-02	.15336871E-01
8	.51587695E-04	.12998616E-02	.13330739E-01
9	.55478346E-04	.12195621E-02	.11440442E-01
10	.58816958E-04	.11338406E-02	.96747640E-02
11	.61672778E-04	.10434733E-02	.80412431E-02
12	.64105460E-04	.94913959E-03	.65463273E-02
13	.66166554E-04	.85143558E-03	.51955095E-02
14	.67900749E-04	.75088511E-03	.39934438E-02
15	.69346888E-04	.64794938E-03	.29440468E-02
16	.70538830E-04	.54303509E-03	.20505850E-02
17	.71506160E-04	.43650135E-03	.13157512E-02
18	.72274794E-04	.32866563E-03	.74173189E-03
19	.72867462E-04	.21980894E-03	.33026483E-03
20	.73304219E-04	.11018018E-03	.82691099E-04
21	.73602689E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.15726699E-03	-.15726699E-03	-.15726699E-03
2	-.14453055E-03	-.15586875E-03	-.13374274E-03
3	-.14558200E-03	-.16730348E-03	-.12488512E-03
4	-.14666853E-03	-.17791901E-03	-.11685157E-03
5	-.14778253E-03	-.18779575E-03	-.10955562E-03
6	-.14891784E-03	-.19700398E-03	-.10292241E-03
7	-.15006949E-03	-.20560542E-03	-.96886771E-04
8	-.15123343E-03	-.21365454E-03	-.91391699E-04
9	-.15240639E-03	-.22119954E-03	-.86387156E-04
10	-.15358572E-03	-.22828326E-03	-.81829036E-04
11	-.15476930E-03	-.23494391E-03	-.77678324E-04
12	-.15595538E-03	-.24121564E-03	-.73900387E-04
13	-.15714257E-03	-.24712909E-03	-.70464388E-04
14	-.15832978E-03	-.25271182E-03	-.67342781E-04
15	-.15951612E-03	-.25798871E-03	-.64510888E-04
16	-.16070090E-03	-.26298221E-03	-.61946542E-04
17	-.16188359E-03	-.26771270E-03	-.59629778E-04
18	-.16306376E-03	-.27219870E-03	-.57542565E-04
19	-.16424113E-03	-.27645702E-03	-.55668610E-04
20	-.16541547E-03	-.28050309E-03	-.53993056E-04
21	-.16658664E-03	-.28435094E-03	-.52502468E-04

1

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1870.5600	54.8213	.0000
2	1899.6336	54.8520	82.3085
3	1928.9664	54.8534	164.6484
4	1958.5584	54.8284	246.9753
5	1988.4096	54.7792	329.2494
6	2018.5200	54.7080	411.4344
7	2048.8896	54.6166	493.4971
8	2079.5184	54.5066	575.4068
9	2110.4064	54.3794	657.1354
10	2141.5536	54.2361	738.6568
11	2172.9600	54.0779	819.9466
12	2204.6256	53.9057	900.9820
13	2236.5504	53.7204	981.7418
14	2268.7344	53.5227	1062.2060
15	2301.1776	53.3132	1142.3556
16	2333.8800	53.0926	1222.1727
17	2366.8416	52.8613	1301.6403
18	2400.0624	52.6199	1380.7421
19	2433.5424	52.3689	1459.4622
20	2467.2816	52.1084	1537.7865
21	2501.2800	51.8391	1615.7004

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	.12233393E-01	.74763395E+07
3	.17158805E-01	.80338879E+07
4	.16778122E-01	.86127113E+07
5	.12373281E-01	.92131309E+07
6	.51235704E-02	.98353311E+07
7	-.39101382E-02	.10479480E+08
8	-.13768022E-01	.11145743E+08
9	-.23571403E-01	.11834282E+08
10	-.32504133E-01	.12545259E+08
11	-.39795782E-01	.13278834E+08
12	-.44707118E-01	.14035168E+08
13	-.46517314E-01	.14814417E+08
14	-.44513047E-01	.15616742E+08
15	-.37979109E-01	.16442297E+08
16	-.26190409E-01	.17291239E+08
17	-.84052199E-02	.18163724E+08
18	.16140416E-01	.19059904E+08
19	.48611800E-01	.19979479E+08
20	.89084170E-01	.20923464E+08
21	.13878832E+00	.21891582E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-4 DE 30.0 M V FRANCOLÍ (ROT) ZH2

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	30.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	3.2000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	2.4000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	30.000	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0530 T/M2
REACCION HORIZONTAL TABLERO	=	28.0000 T
REACCION VERTICAL TABLERO	=	1299.0000 T
MOMENTO EXTERIOR EN CABEZA	=	41.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

1

FASE ELASTICA

REACCION DEL TABLERO = 40.3200 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.15337552E-05	.43726798E-03	.83639992E-02
2	.30543553E-05	.43382689E-03	.77103929E-02
3	.45309014E-05	.42813795E-03	.70636424E-02
4	.59659081E-05	.42026534E-03	.64270709E-02
5	.73617207E-05	.41026962E-03	.58039079E-02
6	.87205294E-05	.39820793E-03	.51972950E-02
7	.10044382E-04	.38413425E-03	.46102901E-02
8	.11335195E-04	.36809957E-03	.40458728E-02
9	.12594763E-04	.35015210E-03	.35069478E-02
10	.13824773E-04	.33033745E-03	.29963500E-02
11	.15026804E-04	.30869877E-03	.25168475E-02
12	.16202342E-04	.28527691E-03	.20711453E-02
13	.17352787E-04	.26011056E-03	.16618890E-02
14	.18479455E-04	.23323638E-03	.12916676E-02
15	.19583585E-04	.20468910E-03	.96301645E-03
16	.20666349E-04	.17450165E-03	.67842037E-03
17	.21728851E-04	.14270525E-03	.44031599E-03
18	.22772135E-04	.10932951E-03	.25109431E-03
19	.23797187E-04	.74402515E-04	.11310309E-03
20	.24804942E-04	.37950918E-04	.28649065E-04
21	.25796283E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1870.5600	40.3200	59.0400
2	1899.6336	40.5524	119.6934
3	1928.9664	40.7917	180.7006
4	1958.5584	41.0378	242.0718
5	1988.4096	41.2908	303.8174
6	2018.5200	41.5507	365.9477
7	2048.8896	41.8174	428.4728
8	2079.5184	42.0910	491.4033
9	2110.4064	42.3715	554.7493
10	2141.5536	42.6588	618.5212
11	2172.9600	42.9530	682.7292
12	2204.6256	43.2541	747.3837
13	2236.5504	43.5621	812.4950
14	2268.7344	43.8769	878.0734
15	2301.1776	44.1986	944.1291
16	2333.8800	44.5271	1010.6726
17	2366.8416	44.8626	1077.7140
18	2400.0624	45.2049	1145.2637
19	2433.5424	45.5540	1213.3320
20	2467.2816	45.9101	1281.9292
21	2501.2800	46.2730	1351.0656

1

FASE FINAL EN ITERACION NUMERO 2

REACCION DEL TABLERO = 40.3200 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.14656490E-05	.42848183E-03	.82051742E-02
2	.29521576E-05	.42516848E-03	.75646577E-02
3	.43973919E-05	.41965631E-03	.69307682E-02
4	.58037311E-05	.41200547E-03	.63067581E-02
5	.71732820E-05	.40227271E-03	.56957927E-02
6	.85079909E-05	.39051176E-03	.51009541E-02
7	.98096695E-05	.37677351E-03	.45252461E-02
8	.11080008E-04	.36110625E-03	.39715981E-02
9	.12320588E-04	.34355581E-03	.34428689E-02
10	.13532886E-04	.32416570E-03	.29418505E-02
11	.14718289E-04	.30297732E-03	.24712710E-02
12	.15878094E-04	.28003003E-03	.20337980E-02
13	.17013520E-04	.25536132E-03	.16320416E-02
14	.18125711E-04	.22900690E-03	.12685569E-02
15	.19215742E-04	.20100081E-03	.94584670E-03
16	.20284623E-04	.17137553E-03	.66636403E-03
17	.21333306E-04	.14016209E-03	.43251418E-03
18	.22362684E-04	.10739009E-03	.24665704E-03
19	.23373603E-04	.73087880E-04	.11110901E-03
20	.24366856E-04	.37282536E-04	.28144965E-04
21	.25343192E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.14352592E-03	-.14755645E-03	-.13956866E-03
2	-.14451601E-03	-.15263444E-03	-.13654518E-03
3	-.14551451E-03	-.15760734E-03	-.13364155E-03
4	-.14652110E-03	-.16248136E-03	-.13085102E-03
5	-.14753546E-03	-.16726199E-03	-.12816760E-03
6	-.14855732E-03	-.17195430E-03	-.12558575E-03
7	-.14958642E-03	-.17656301E-03	-.12310031E-03
8	-.15062249E-03	-.18109251E-03	-.12070647E-03
9	-.15166532E-03	-.18554693E-03	-.11839973E-03
10	-.15271467E-03	-.18993011E-03	-.11617588E-03
11	-.15377036E-03	-.19424566E-03	-.11403098E-03
12	-.15483219E-03	-.19849695E-03	-.11196133E-03
13	-.15589997E-03	-.20268715E-03	-.10996347E-03
14	-.15697355E-03	-.20681925E-03	-.10803413E-03
15	-.15805275E-03	-.21089604E-03	-.10617025E-03
16	-.15913743E-03	-.21492015E-03	-.10436895E-03
17	-.16022746E-03	-.21889405E-03	-.10262753E-03
18	-.16132269E-03	-.22282007E-03	-.10094344E-03
19	-.16242299E-03	-.22670040E-03	-.99314264E-04
20	-.16352826E-03	-.23053711E-03	-.97737746E-04
21	-.16463837E-03	-.23433214E-03	-.96211747E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	1870.5600	41.1379	59.0005
2	1899.6336	41.3765	120.8626
3	1928.9664	41.6175	183.0865
4	1958.5584	41.8609	245.6750
5	1988.4096	42.1065	308.6314
6	2018.5200	42.3544	371.9589
7	2048.8896	42.6043	435.6607
8	2079.5184	42.8564	499.7399
9	2110.4064	43.1103	564.1992
10	2141.5536	43.3661	629.0415
11	2172.9600	43.6237	694.2693
12	2204.6256	43.8829	759.8851
13	2236.5504	44.1436	825.8913
14	2268.7344	44.4058	892.2899
15	2301.1776	44.6694	959.0829
16	2333.8800	44.9342	1026.2723
17	2366.8416	45.2001	1093.8596
18	2400.0624	45.4670	1161.8463
19	2433.5424	45.7348	1230.2339
20	2467.2816	46.0034	1299.0233
21	2501.2800	46.2726	1368.2157

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.39517633E-01	.40219903E+08
2	.38252253E-01	.40931092E+08
3	.34889766E-01	.41630275E+08
4	.30438002E-01	.42326618E+08
5	.25224453E-01	.43021188E+08
6	.19498555E-01	.43714254E+08
7	.13489857E-01	.44405907E+08
8	.74199280E-02	.45096178E+08
9	.15084034E-02	.45785085E+08
10	-.40264115E-02	.46472636E+08
11	-.89675282E-02	.47158831E+08
12	-.13096045E-01	.47843672E+08
13	-.16193389E-01	.48527156E+08
14	-.18038583E-01	.49209282E+08
15	-.18408944E-01	.49890047E+08
16	-.17079077E-01	.50569449E+08
17	-.13820173E-01	.51247485E+08
18	-.83996403E-02	.51924150E+08
19	-.58026300E-03	.52599442E+08
20	.98804473E-02	.53273356E+08
21	.23231051E-01	.53945889E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-4 DE 30.0 M V FRANCOLÍ (ROT) XH3

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	30.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	3.2000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	2.4000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	30.000	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	50.0000 T
REACCION VERTICAL TABLERO	=	2581.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

1

FASE ELASTICA

REACCION DEL TABLERO = 72.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.22136014E-02	.39901068E-01
2	.15099732E-04	.22022766E-02	.36586328E-01
3	.28081876E-04	.21698904E-02	.33304769E-01
4	.39258757E-04	.21193849E-02	.30085717E-01
5	.48890555E-04	.20532729E-02	.26954418E-01
6	.57195116E-04	.19737087E-02	.23932624E-01
7	.64355709E-04	.18825455E-02	.21039091E-01
8	.70527205E-04	.17813834E-02	.18289987E-01
9	.75841029E-04	.16716072E-02	.15699248E-01
10	.80409150E-04	.15544196E-02	.13278871E-01
11	.84327319E-04	.14308672E-02	.11039172E-01
12	.87677701E-04	.13018634E-02	.89889954E-02
13	.90531043E-04	.11682069E-02	.71359077E-02
14	.92948443E-04	.10305973E-02	.54863513E-02
15	.94982830E-04	.88964881E-03	.40457853E-02
16	.96680177E-04	.74590155E-03	.28188043E-02
17	.98080526E-04	.59983102E-03	.18092423E-02
18	.99218836E-04	.45185650E-03	.10202633E-02
19	.10012570E-03	.30234810E-03	.45443976E-03
20	.10082796E-03	.15163286E-03	.11382237E-03
21	.10134919E-03	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3716.6400	72.0000	.0000
2	3745.7136	72.0000	108.0000
3	3775.0464	72.0000	216.0000
4	3804.6384	72.0000	324.0000
5	3834.4896	72.0000	432.0000
6	3864.6000	72.0000	540.0000
7	3894.9696	72.0000	648.0000
8	3925.5984	72.0000	756.0000
9	3956.4864	72.0000	864.0000
10	3987.6336	72.0000	972.0000
11	4019.0400	72.0000	1080.0000
12	4050.7056	72.0000	1188.0000
13	4082.6304	72.0000	1296.0000
14	4114.8144	72.0000	1404.0000
15	4147.2576	72.0000	1512.0000
16	4179.9600	72.0000	1620.0000
17	4212.9216	72.0000	1728.0000
18	4246.1424	72.0000	1836.0000
19	4279.6224	72.0000	1944.0000
20	4313.3616	72.0000	2052.0000
21	4347.3600	72.0000	2160.0000

1

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 72.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.26220115E-02	.47020087E-01
2	.18221884E-04	.26083451E-02	.43093903E-01
3	.33882565E-04	.25692667E-02	.39207758E-01
4	.47343496E-04	.25083472E-02	.35397024E-01
5	.58910794E-04	.24286565E-02	.31692102E-01
6	.68842639E-04	.23328414E-02	.28119116E-01
7	.77357902E-04	.22231910E-02	.24700495E-01
8	.84642924E-04	.21016904E-02	.21455468E-01
9	.90856970E-04	.19700655E-02	.18400486E-01
10	.96136657E-04	.18298202E-02	.15549582E-01
11	.10059958E-03	.16822681E-02	.12914679E-01
12	.10434726E-03	.15285579E-02	.10505857E-01
13	.10746764E-03	.13696968E-02	.83315808E-02
14	.11003708E-03	.12065682E-02	.63989003E-02
15	.11212207E-03	.10399489E-02	.47136216E-02
16	.11378064E-03	.87052182E-03	.32804576E-02
17	.11506357E-03	.69888866E-03	.21031592E-02
18	.11601538E-03	.52557945E-03	.11846296E-02
19	.11667515E-03	.35106155E-03	.52702515E-03
20	.11707733E-03	.17574719E-03	.13184319E-03
21	.11725225E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.31247583E-03	-.31247583E-03	-.31247583E-03
2	-.29971797E-03	-.31848651E-03	-.28186052E-03
3	-.29955852E-03	-.33547404E-03	-.26533713E-03
4	-.29951571E-03	-.35112012E-03	-.25027848E-03
5	-.29956642E-03	-.36554651E-03	-.23653187E-03
6	-.29969183E-03	-.37886087E-03	-.22396493E-03
7	-.29987668E-03	-.39115900E-03	-.21246225E-03
8	-.30010851E-03	-.40252645E-03	-.20192272E-03
9	-.30037722E-03	-.41303986E-03	-.19225743E-03
10	-.30067460E-03	-.42276816E-03	-.18338788E-03
11	-.30099401E-03	-.43177346E-03	-.17524454E-03
12	-.30133008E-03	-.44011194E-03	-.16776559E-03
13	-.30167850E-03	-.44783449E-03	-.16089589E-03
14	-.30203581E-03	-.45498735E-03	-.15458612E-03
15	-.30239928E-03	-.46161261E-03	-.14879204E-03
16	-.30276676E-03	-.46774869E-03	-.14347386E-03
17	-.30313659E-03	-.47343068E-03	-.13859568E-03
18	-.30350751E-03	-.47869072E-03	-.13412506E-03
19	-.30387857E-03	-.48355831E-03	-.13003259E-03
20	-.30424910E-03	-.48806051E-03	-.12629156E-03
21	-.30461866E-03	-.49222226E-03	-.12287766E-03

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3716.6400	81.7404	.0000
2	3745.7136	81.7653	122.6443
3	3775.0464	81.6942	245.2523
4	3804.6384	81.5386	367.6891
5	3834.4896	81.3082	489.8351
6	3864.6000	81.0114	611.5845
7	3894.9696	80.6556	732.8432
8	3925.5984	80.2472	853.5277
9	3956.4864	79.7919	973.5633
10	3987.6336	79.2946	1092.8832
11	4019.0400	78.7595	1211.4279
12	4050.7056	78.1907	1329.1435
13	4082.6304	77.5913	1445.9820
14	4114.8144	76.9645	1561.8998
15	4147.2576	76.3129	1676.8578
16	4179.9600	75.6388	1790.8206
17	4212.9216	74.9444	1903.7561
18	4246.1424	74.2316	2015.6353
19	4279.6224	73.5020	2126.4318
20	4313.3616	72.7572	2236.1216
21	4347.3600	71.9985	2344.6829

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	.47417067E-02	.67290977E+07
3	.93790681E-02	.72365031E+07
4	.13687133E-01	.77619740E+07
5	.17612391E-01	.83071662E+07
6	.21108153E-01	.88719311E+07
7	.24147594E-01	.94564815E+07
8	.26725923E-01	.10061023E+08
9	.28861585E-01	.10685753E+08
10	.30596859E-01	.11330857E+08
11	.31998108E-01	.11996499E+08
12	.33155813E-01	.12682796E+08
13	.34184179E-01	.13389762E+08
14	.35220515E-01	.14117099E+08
15	.36424316E-01	.14891352E+08
16	.37976096E-01	.15666163E+08
17	.40075953E-01	.16462933E+08
18	.42942013E-01	.17281848E+08
19	.46808628E-01	.18108401E+08
20	.51924590E-01	.18967602E+08
21	.58551111E-01	.19850715E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-4 DE 30.0 M V FRANCOLÍ (ROT) ZH3

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	30.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	3.2000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	2.4000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	30.000	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0320 T/M2
REACCION HORIZONTAL TABLERO	=	50.0000 T
REACCION VERTICAL TABLERO	=	2581.0000 T
MOMENTO EXTERIOR EN CABEZA	=	310.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

1

FASE ELASTICA

REACCION DEL TABLERO = 72.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.11596685E-04	.98862673E-03	.17737305E-01
2	.14149935E-04	.96931676E-03	.16268369E-01
3	.16619676E-04	.94623955E-03	.14831238E-01
4	.19010346E-04	.91951703E-03	.13431473E-01
5	.21326085E-04	.88926471E-03	.12074452E-01
6	.23570759E-04	.85559208E-03	.10765389E-01
7	.25747983E-04	.81860302E-03	.95093340E-02
8	.27861140E-04	.77839618E-03	.83111884E-02
9	.29913399E-04	.73506527E-03	.71757075E-02
10	.31907733E-04	.68869943E-03	.61075101E-02
11	.33846935E-04	.63938342E-03	.51110843E-02
12	.35733626E-04	.58719800E-03	.41907945E-02
13	.37570276E-04	.53222008E-03	.33508866E-02
14	.39359208E-04	.47452296E-03	.25954939E-02
15	.41102611E-04	.41417660E-03	.19286423E-02
16	.42802552E-04	.35124773E-03	.13542553E-02
17	.44460980E-04	.28580008E-03	.87615852E-03
18	.46079738E-04	.21789454E-03	.49808404E-03
19	.47660567E-04	.14758931E-03	.22367475E-03
20	.49205116E-04	.74940047E-04	.56488129E-04
21	.50714947E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3716.6400	72.0000	446.4000
2	3745.7136	72.1403	554.5047
3	3775.0464	72.2848	662.8230
4	3804.6384	72.4334	771.3611
5	3834.4896	72.5861	880.1252
6	3864.6000	72.7430	989.1216
7	3894.9696	72.9041	1098.3564
8	3925.5984	73.0693	1207.8359
9	3956.4864	73.2386	1317.5664
10	3987.6336	73.4121	1427.5539
11	4019.0400	73.5898	1537.8048
12	4050.7056	73.7715	1648.3253
13	4082.6304	73.9575	1759.1215
14	4114.8144	74.1476	1870.1998
15	4147.2576	74.3418	1981.5663
16	4179.9600	74.5402	2093.2272
17	4212.9216	74.7427	2205.1888
18	4246.1424	74.9494	2317.4573
19	4279.6224	75.1602	2430.0389
20	4313.3616	75.3751	2542.9399
21	4347.3600	75.5942	2656.1664

1

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 72.0000 T.

DEFORMACIONES

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-4 DE 30.0 M V FRANCOLÍ (ROT) ZH3

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	30.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	3.2000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	2.4000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	30.000	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0320 T/M2
REACCION HORIZONTAL TABLERO	=	50.0000 T
REACCION VERTICAL TABLERO	=	2581.0000 T
MOMENTO EXTERIOR EN CABEZA	=	310.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

1

FASE ELASTICA

REACCION DEL TABLERO = 72.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.11596685E-04	.98862673E-03	.17737305E-01
2	.14149935E-04	.96931676E-03	.16268369E-01
3	.16619676E-04	.94623955E-03	.14831238E-01
4	.19010346E-04	.91951703E-03	.13431473E-01
5	.21326085E-04	.88926471E-03	.12074452E-01
6	.23570759E-04	.85559208E-03	.10765389E-01
7	.25747983E-04	.81860302E-03	.95093340E-02
8	.27861140E-04	.77839618E-03	.83111884E-02
9	.29913399E-04	.73506527E-03	.71757075E-02
10	.31907733E-04	.68869943E-03	.61075101E-02
11	.33846935E-04	.63938342E-03	.51110843E-02
12	.35733626E-04	.58719800E-03	.41907945E-02
13	.37570276E-04	.53222008E-03	.33508866E-02
14	.39359208E-04	.47452296E-03	.25954939E-02
15	.41102611E-04	.41417660E-03	.19286423E-02
16	.42802552E-04	.35124773E-03	.13542553E-02
17	.44460980E-04	.28580008E-03	.87615852E-03
18	.46079738E-04	.21789454E-03	.49808404E-03
19	.47660567E-04	.14758931E-03	.22367475E-03
20	.49205116E-04	.74940047E-04	.56488129E-04
21	.50714947E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3716.6400	72.0000	446.4000
2	3745.7136	72.1403	554.5047
3	3775.0464	72.2848	662.8230
4	3804.6384	72.4334	771.3611
5	3834.4896	72.5861	880.1252
6	3864.6000	72.7430	989.1216
7	3894.9696	72.9041	1098.3564
8	3925.5984	73.0693	1207.8359
9	3956.4864	73.2386	1317.5664
10	3987.6336	73.4121	1427.5539
11	4019.0400	73.5898	1537.8048
12	4050.7056	73.7715	1648.3253
13	4082.6304	73.9575	1759.1215
14	4114.8144	74.1476	1870.1998
15	4147.2576	74.3418	1981.5663
16	4179.9600	74.5402	2093.2272
17	4212.9216	74.7427	2205.1888
18	4246.1424	74.9494	2317.4573
19	4279.6224	75.1602	2430.0389
20	4313.3616	75.3751	2542.9399
21	4347.3600	75.5942	2656.1664

1

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 72.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.12337637E-04	.10839457E-02	.19470580E-01
2	.15214199E-04	.10632819E-02	.17859620E-01
3	.17993369E-04	.10383762E-02	.16282856E-01
4	.20679883E-04	.10093712E-02	.14746541E-01
5	.23278150E-04	.97640272E-03	.13256724E-01
6	.25792278E-04	.93959990E-03	.11819250E-01
7	.28226103E-04	.89908612E-03	.10439779E-01
8	.30583207E-04	.85497913E-03	.91237886E-02
9	.32866943E-04	.80739152E-03	.78765824E-02
10	.35080448E-04	.75643098E-03	.67033005E-02
11	.37226666E-04	.70220064E-03	.56089244E-02
12	.39308354E-04	.64479938E-03	.45982840E-02
13	.41328104E-04	.58432204E-03	.36760643E-02
14	.43288352E-04	.52085969E-03	.28468104E-02
15	.45191385E-04	.45449989E-03	.21149339E-02
16	.47039359E-04	.38532683E-03	.14847174E-02
17	.48834305E-04	.31342158E-03	.96031950E-03
18	.50578133E-04	.23886226E-03	.54577965E-03
19	.52272650E-04	.16172417E-03	.24502211E-03
20	.53919557E-04	.82080014E-04	.61860180E-04
21	.55520462E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.30019353E-03	-.33412204E-03	-.26688191E-03
2	-.29991159E-03	-.34175063E-03	-.25883325E-03
3	-.29967550E-03	-.34915726E-03	-.25109340E-03
4	-.29948317E-03	-.35635285E-03	-.24364749E-03
5	-.29933265E-03	-.36334756E-03	-.23648164E-03
6	-.29922206E-03	-.37015083E-03	-.22958291E-03
7	-.29914968E-03	-.37677146E-03	-.22293920E-03
8	-.29911384E-03	-.38321765E-03	-.21653918E-03
9	-.29911299E-03	-.38949708E-03	-.21037224E-03
10	-.29914566E-03	-.39561689E-03	-.20442845E-03
11	-.29921046E-03	-.40158379E-03	-.19869847E-03
12	-.29930607E-03	-.40740405E-03	-.19317352E-03
13	-.29943124E-03	-.41308353E-03	-.18784536E-03
14	-.29958477E-03	-.41862774E-03	-.18270622E-03
15	-.29976555E-03	-.42404185E-03	-.17774881E-03
16	-.29997248E-03	-.42933072E-03	-.17296621E-03
17	-.30020456E-03	-.43449889E-03	-.16835193E-03
18	-.30046079E-03	-.43955066E-03	-.16389983E-03
19	-.30074026E-03	-.44449005E-03	-.15960411E-03
20	-.30104208E-03	-.44932086E-03	-.15545928E-03
21	-.30136539E-03	-.45404666E-03	-.15146014E-03

1

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3716.6400	76.0290	446.3988
2	3745.7136	76.1232	560.5148
3	3775.0464	76.2047	674.7625
4	3804.6384	76.2736	789.1229
5	3834.4896	76.3299	903.5773
6	3864.6000	76.3739	1018.1069
7	3894.9696	76.4056	1132.6932
8	3925.5984	76.4252	1247.3180
9	3956.4864	76.4326	1361.9629
10	3987.6336	76.4280	1476.6100
11	4019.0400	76.4114	1591.2411
12	4050.7056	76.3829	1705.8384
13	4082.6304	76.3426	1820.3841
14	4114.8144	76.2903	1934.8602
15	4147.2576	76.2262	2049.2491
16	4179.9600	76.1503	2163.5329
17	4212.9216	76.0626	2277.6941
18	4246.1424	75.9631	2391.7148
19	4279.6224	75.8518	2505.5773
20	4313.3616	75.7286	2619.2640
21	4347.3600	75.5937	2732.7571

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.11752790E-02	.36173611E+08
2	.60823036E-03	.36831674E+08
3	.22215700E-03	.37487627E+08
4	-.74534304E-05	.38142097E+08
5	-.10601161E-03	.38795120E+08
6	-.97683335E-04	.39446712E+08
7	-.58570606E-05	.40096878E+08
8	.14766094E-03	.40745624E+08
9	.34226089E-03	.41392949E+08
10	.55959797E-03	.42038856E+08
11	.78341332E-03	.42683344E+08
12	.10000138E-02	.43326412E+08
13	.11985761E-02	.43968061E+08
14	.13714687E-02	.44608291E+08
15	.15145788E-02	.45247102E+08
16	.16275516E-02	.45884493E+08
17	.17141530E-02	.46520466E+08
18	.17827005E-02	.47155021E+08
19	.18461297E-02	.47788158E+08
20	.19224578E-02	.48419878E+08
21	.20350695E-02	.49050182E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-4 DE 30.0 M V FRANCOLÍ (ROT) XH4

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	30.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	3.2000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	2.4000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	30.000	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	59.0000 T
REACCION VERTICAL TABLERO	=	2067.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

1

FASE ELASTICA

REACCION DEL TABLERO = 84.9600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.26120496E-02	.47083260E-01
2	.17817684E-04	.25986864E-02	.43171867E-01
3	.33136614E-04	.25604706E-02	.39299627E-01
4	.46325333E-04	.25008742E-02	.35501146E-01
5	.57690855E-04	.24228620E-02	.31806213E-01
6	.67490237E-04	.23289762E-02	.28240497E-01
7	.75939737E-04	.22214037E-02	.24826127E-01
8	.83222102E-04	.21020324E-02	.21582185E-01
9	.89492414E-04	.19724965E-02	.18525113E-01
10	.94882798E-04	.18342151E-02	.15669068E-01
11	.99506236E-04	.16884233E-02	.13026222E-01
12	.10345969E-03	.15361989E-02	.10607015E-01
13	.10682663E-03	.13784841E-02	.84203711E-02
14	.10967916E-03	.12161048E-02	.64738946E-02
15	.11207974E-03	.10497856E-02	.47740267E-02
16	.11408261E-03	.88016383E-03	.33261891E-02
17	.11573502E-03	.70780061E-03	.21349059E-02
18	.11707823E-03	.53319067E-03	.12039106E-02
19	.11814833E-03	.35677076E-03	.53623892E-03
20	.11897699E-03	.17892677E-03	.13431040E-03
21	.11959204E-03	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2976.4800	84.9600	.0000
2	3005.5536	84.9600	127.4400
3	3034.8864	84.9600	254.8800
4	3064.4784	84.9600	382.3200
5	3094.3296	84.9600	509.7600
6	3124.4400	84.9600	637.2000
7	3154.8096	84.9600	764.6400
8	3185.4384	84.9600	892.0800
9	3216.3264	84.9600	1019.5200
10	3247.4736	84.9600	1146.9600
11	3278.8800	84.9600	1274.4000
12	3310.5456	84.9600	1401.8400
13	3342.4704	84.9600	1529.2800
14	3374.6544	84.9600	1656.7200
15	3407.0976	84.9600	1784.1600
16	3439.8000	84.9600	1911.6000
17	3472.7616	84.9600	2039.0400
18	3505.9824	84.9600	2166.4800
19	3539.4624	84.9600	2293.9200
20	3573.2016	84.9600	2421.3600
21	3607.2000	84.9600	2548.8000

1

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 84.9600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.29001425E-02	.52118795E-01
2	.19965321E-04	.28851685E-02	.47776069E-01
3	.37142945E-04	.28423373E-02	.43477218E-01
4	.51930617E-04	.27755322E-02	.39261044E-01
5	.64662823E-04	.26880871E-02	.35160942E-01
6	.75621051E-04	.25828742E-02	.31205666E-01
7	.85043399E-04	.24623758E-02	.27419962E-01
8	.93132172E-04	.23287442E-02	.23825106E-01
9	.10005998E-03	.21838500E-02	.20439361E-01
10	.10597466E-03	.20293241E-02	.17278371E-01
11	.11100329E-03	.18665906E-02	.14355492E-01
12	.11525549E-03	.16968965E-02	.11682080E-01
13	.11882609E-03	.15213353E-02	.92677364E-02
14	.12179741E-03	.13408677E-02	.71205270E-02
15	.12424106E-03	.11563389E-02	.52471639E-02
16	.12621954E-03	.96849343E-03	.36531687E-02
17	.12778751E-03	.77798814E-03	.23430135E-02
18	.12899290E-03	.58540283E-03	.13202443E-02
19	.12987780E-03	.39124981E-03	.58758890E-03
20	.13047928E-03	.19598200E-03	.14705227E-03
21	.13083004E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.25024702E-03	-.25024702E-03	-.25024702E-03
2	-.23555091E-03	-.25611519E-03	-.21598490E-03
3	-.23599190E-03	-.27536342E-03	-.19847752E-03
4	-.23655519E-03	-.29315957E-03	-.18254735E-03
5	-.23721446E-03	-.30963682E-03	-.16802524E-03
6	-.23794835E-03	-.32491255E-03	-.15476519E-03
7	-.23873956E-03	-.33909077E-03	-.14264052E-03
8	-.23957406E-03	-.35226399E-03	-.13154074E-03
9	-.24044046E-03	-.36451483E-03	-.12136908E-03
10	-.24132953E-03	-.37591735E-03	-.11204045E-03
11	-.24223383E-03	-.38653810E-03	-.10347972E-03
12	-.24314734E-03	-.39643714E-03	-.95620316E-04
13	-.24406524E-03	-.40566873E-03	-.88403066E-04
14	-.24498370E-03	-.41428210E-03	-.81775182E-04
15	-.24589969E-03	-.42232199E-03	-.75689440E-04
16	-.24681082E-03	-.42982915E-03	-.70103467E-04
17	-.24771528E-03	-.43684080E-03	-.64979139E-04
18	-.24861169E-03	-.44339097E-03	-.60282063E-04
19	-.24949906E-03	-.44951087E-03	-.55981138E-04
20	-.25037668E-03	-.45522916E-03	-.52048169E-04
21	-.25124411E-03	-.46057218E-03	-.48457541E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2976.4800	93.5908	.0000
2	3005.5536	93.6299	140.4274
3	3034.8864	93.5844	280.8487
4	3064.4784	93.4637	421.1443
5	3094.3296	93.2759	561.2075
6	3124.4400	93.0281	700.9432
7	3154.8096	92.7265	840.2660
8	3185.4384	92.3763	979.0992
9	3216.3264	91.9823	1117.3736
10	3247.4736	91.5486	1255.0266
11	3278.8800	91.0789	1392.0014
12	3310.5456	90.5763	1528.2464
13	3342.4704	90.0438	1663.7146
14	3374.6544	89.4838	1798.3628
15	3407.0976	88.8987	1932.1518
16	3439.8000	88.2903	2065.0451
17	3472.7616	87.6607	2197.0096
18	3505.9824	87.0112	2328.0142
19	3539.4624	86.3435	2458.0307
20	3573.2016	85.6588	2587.0324
21	3607.2000	84.9583	2714.9948

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	.14442461E-02	.70325090E+07
3	.28897850E-02	.75591599E+07
4	.42531361E-02	.81052704E+07
5	.55033040E-02	.86711851E+07
6	.66182895E-02	.92571256E+07
7	.75859875E-02	.98632996E+07
8	.84035672E-02	.10489911E+08
9	.90768622E-02	.11137162E+08
10	.96198637E-02	.11805253E+08
11	.10054516E-01	.12494383E+08
12	.10410544E-01	.13204750E+08
13	.10725320E-01	.13936549E+08
14	.11043728E-01	.14689977E+08
15	.11418011E-01	.15465224E+08
16	.11907442E-01	.16262483E+08
17	.12578069E-01	.17081942E+08
18	.13502205E-01	.17923789E+08
19	.14757941E-01	.18788211E+08
20	.16428543E-01	.19675390E+08
21	.18601737E-01	.20574067E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-4 DE 30.0 M V FRANCOLÍ (ROT) ZH4

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	30.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	3.2000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	2.4000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	30.000	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0320 T/M2
REACCION HORIZONTAL TABLERO	=	50.0000 T
REACCION VERTICAL TABLERO	=	2067.0000 T
MOMENTO EXTERIOR EN CABEZA	=	1694.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

1

FASE ELASTICA

REACCION DEL TABLERO = 72.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.63370274E-04	.23150074E-02	.36613488E-01
2	.65006590E-04	.22187248E-02	.33212882E-01
3	.66591311E-04	.21200263E-02	.29958522E-01
4	.68127236E-04	.20189874E-02	.26853973E-01
5	.69616979E-04	.19156793E-02	.23902694E-01
6	.71062979E-04	.18101693E-02	.21108036E-01
7	.72467518E-04	.17025214E-02	.18473255E-01
8	.73832729E-04	.15927963E-02	.16001511E-01
9	.75160613E-04	.14810512E-02	.13695876E-01
10	.76453047E-04	.13673410E-02	.11559340E-01
11	.77711791E-04	.12517174E-02	.95948099E-02
12	.78938502E-04	.11342297E-02	.78051196E-02
13	.80134736E-04	.10149247E-02	.61930295E-02
14	.81301961E-04	.89384720E-03	.47612317E-02
15	.82441557E-04	.77103956E-03	.35123530E-02
16	.83554829E-04	.64654227E-03	.24489579E-02
17	.84643007E-04	.52039389E-03	.15735517E-02
18	.85707253E-04	.39263120E-03	.88858333E-03
19	.86748667E-04	.26328926E-03	.39644772E-03
20	.87768289E-04	.13240154E-03	.99488436E-04
21	.88767104E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2976.4800	72.0000	2439.3600
2	3005.5536	72.1403	2547.4647
3	3034.8864	72.2848	2655.7830
4	3064.4784	72.4334	2764.3211
5	3094.3296	72.5861	2873.0852
6	3124.4400	72.7430	2982.0816
7	3154.8096	72.9041	3091.3164
8	3185.4384	73.0693	3200.7959
9	3216.3264	73.2386	3310.5264
10	3247.4736	73.4121	3420.5139
11	3278.8800	73.5898	3530.7648
12	3310.5456	73.7715	3641.2853
13	3342.4704	73.9575	3752.0815
14	3374.6544	74.1476	3863.1598
15	3407.0976	74.3418	3974.5263
16	3439.8000	74.5402	4086.1872
17	3472.7616	74.7427	4198.1488
18	3505.9824	74.9494	4310.4173
19	3539.4624	75.1602	4422.9989
20	3573.2016	75.3751	4535.8999
21	3607.2000	75.5942	4649.1264

1

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 72.0000 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.64618118E-04	.24218664E-02	.38488329E-01
2	.66584000E-04	.23234648E-02	.34928962E-01
3	.68480813E-04	.22221662E-02	.31519383E-01
4	.70311816E-04	.21180717E-02	.28263861E-01
5	.72080041E-04	.20112778E-02	.25166517E-01
6	.73788312E-04	.19018765E-02	.22231331E-01
7	.75439265E-04	.17899558E-02	.19462148E-01
8	.77035362E-04	.16755999E-02	.16862682E-01
9	.78578902E-04	.15588892E-02	.14436525E-01
10	.80072037E-04	.14399010E-02	.12187153E-01
11	.81516780E-04	.13187094E-02	.10117924E-01
12	.82915020E-04	.11953855E-02	.82320908E-02
13	.84268526E-04	.10699978E-02	.65327995E-02
14	.85578959E-04	.94261224E-03	.50230963E-02
15	.86847881E-04	.81329211E-03	.37059301E-02
16	.88076755E-04	.68209863E-03	.25841566E-02
17	.89266960E-04	.54909084E-03	.16605414E-02
18	.90419795E-04	.41432578E-03	.93776273E-03
19	.91534097E-04	.27786036E-03	.41841420E-03
20	.92623695E-04	.13974201E-03	.10500813E-03
21	.93698987E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.23986756E-03	-.41756738E-03	-.65398639E-04
2	-.24040130E-03	-.42350730E-03	-.60624503E-04
3	-.24095568E-03	-.42927792E-03	-.56057486E-04
4	-.24152970E-03	-.43488720E-03	-.51687796E-04
5	-.24212242E-03	-.44034253E-03	-.47506309E-04
6	-.24273295E-03	-.44565081E-03	-.43504510E-04
7	-.24336046E-03	-.45081844E-03	-.39674448E-04
8	-.24400417E-03	-.45585141E-03	-.36008688E-04
9	-.24466331E-03	-.46075529E-03	-.32500270E-04
10	-.24533718E-03	-.46553528E-03	-.29142677E-04
11	-.24602510E-03	-.47019625E-03	-.25929795E-04
12	-.24672644E-03	-.47474275E-03	-.22855890E-04
13	-.24744059E-03	-.47917904E-03	-.19915571E-04
14	-.24816696E-03	-.48350910E-03	-.17103776E-04
15	-.24890501E-03	-.48773668E-03	-.14415732E-04
16	-.24965420E-03	-.49186528E-03	-.11846965E-04
17	-.25041403E-03	-.49589818E-03	-.93932407E-05
18	-.25118402E-03	-.49983846E-03	-.70505750E-05
19	-.25196316E-03	-.50368192E-03	-.48210954E-05
20	-.25274207E-03	-.50745723E-03	-.26580886E-05
21	-.25350530E-03	-.51117752E-03	-.51803744E-06

1

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2976.4800	79.2093	2439.3102
2	3005.5536	79.1241	2558.0652
3	3034.8864	79.0291	2676.6854
4	3064.4784	78.9243	2795.1560
5	3094.3296	78.8097	2913.4622
6	3124.4400	78.6852	3031.5892
7	3154.8096	78.5508	3149.5220
8	3185.4384	78.4065	3267.2458
9	3216.3264	78.2521	3384.7455
10	3247.4736	78.0877	3502.0059
11	3278.8800	77.9131	3619.0119
12	3310.5456	77.7283	3735.7480
13	3342.4704	77.5333	3852.1990
14	3374.6544	77.3279	3968.3493
15	3407.0976	77.1121	4084.1833
16	3439.8000	76.8858	4199.6851
17	3472.7616	76.6489	4314.8390
18	3505.9824	76.4013	4429.6289
19	3539.4624	76.1430	4543.9216
20	3573.2016	75.8738	4657.9231
21	3607.2000	75.5937	4771.5099

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.49841865E-01	.37587805E+08
2	.45210336E-01	.38241928E+08
3	.40494601E-01	.38894647E+08
4	.35746141E-01	.39546020E+08
5	.31014273E-01	.40196137E+08
6	.26346427E-01	.40855721E+08
7	.21788317E-01	.41504118E+08
8	.17384279E-01	.42151092E+08
9	.13177424E-01	.42796647E+08
10	.92099166E-02	.43440785E+08
11	.55232033E-02	.44083508E+08
12	.21582524E-02	.44724820E+08
13	-.84422050E-03	.45364724E+08
14	-.34435658E-02	.46003223E+08
15	-.56885659E-02	.46639781E+08
16	-.73550254E-02	.47275520E+08
17	-.84946967E-02	.47909858E+08
18	-.90648861E-02	.48542802E+08
19	.10814716E+00	.49198021E+08
20	.12086036E+00	.49749770E+08
21	.13621594E+00	.44992843E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-4 DE 30.0 M V FRANCOLÍ (ROT) XH51

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	30.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	3.2000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	2.4000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	30.000	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	98.0000 T
REACCION VERTICAL TABLERO	=	1964.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

1

FASE ELASTICA

REACCION DEL TABLERO = 141.1200 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.43386587E-02	.78206093E-01
2	.29595475E-04	.43164621E-02	.71709204E-01
3	.55040477E-04	.42529851E-02	.65277347E-01
4	.76947164E-04	.41539944E-02	.58968005E-01
5	.95825488E-04	.40244149E-02	.52830658E-01
6	.11210243E-03	.38684690E-02	.46907944E-01
7	.12613719E-03	.36897893E-02	.41236618E-01
8	.13823332E-03	.34915114E-02	.35848375E-01
9	.14864842E-03	.32763501E-02	.30770526E-01
10	.15760193E-03	.30466623E-02	.26026588E-01
11	.16528155E-03	.28044997E-02	.21636776E-01
12	.17184829E-03	.25516523E-02	.17618431E-01
13	.17744084E-03	.22896855E-02	.13986379E-01
14	.18217895E-03	.20199706E-02	.10753249E-01
15	.18616635E-03	.17437117E-02	.79297393E-02
16	.18949315E-03	.14619670E-02	.55248565E-02
17	.19223783E-03	.11756688E-02	.35461150E-02
18	.19446892E-03	.88563874E-03	.19997160E-02
19	.19624637E-03	.59260227E-03	.89070194E-03
20	.19762279E-03	.29720040E-03	.22309185E-03
21	.19864441E-03	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2828.1600	141.1200	.0000
2	2857.2336	141.1200	211.6800
3	2886.5664	141.1200	423.3600
4	2916.1584	141.1200	635.0400
5	2946.0096	141.1200	846.7200
6	2976.1200	141.1200	1058.4000
7	3006.4896	141.1200	1270.0800
8	3037.1184	141.1200	1481.7600
9	3068.0064	141.1200	1693.4400
10	3099.1536	141.1200	1905.1200
11	3130.5600	141.1200	2116.8000
12	3162.2256	141.1200	2328.4800
13	3194.1504	141.1200	2540.1600
14	3226.3344	141.1200	2751.8400
15	3258.7776	141.1200	2963.5200
16	3291.4800	141.1200	3175.2000
17	3324.4416	141.1200	3386.8800
18	3357.6624	141.1200	3598.5600
19	3391.1424	141.1200	3810.2400
20	3424.8816	141.1200	4021.9200
21	3458.8800	141.1200	4233.6000

1

FASE FINAL EN ITERACION NUMERO 6

REACCION DEL TABLERO = 141.1200 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.55272633E-02	.10507112E+00
2	.33161632E-04	.55023920E-02	.96792658E-01
3	.61713929E-04	.54312354E-02	.88587084E-01
4	.86324052E-04	.53202069E-02	.80518888E-01
5	.10754807E-03	.51748028E-02	.72643651E-01
6	.12585172E-03	.49997530E-02	.65009302E-01
7	.14162738E-03	.47991436E-02	.57657172E-01
8	.15520737E-03	.45765176E-02	.50622880E-01
9	.16687457E-03	.43349561E-02	.43937087E-01
10	.17687080E-03	.40771471E-02	.37626135E-01
11	.18543536E-03	.38054175E-02	.31712606E-01
12	.19368870E-03	.35210744E-02	.26216190E-01
13	.20238899E-03	.32240161E-02	.21155741E-01
14	.21231265E-03	.29129899E-02	.16551125E-01
15	.22663699E-03	.25837777E-02	.12425864E-01
16	.24704108E-03	.22285191E-02	.88128154E-02
17	.26773255E-03	.18424389E-02	.57557172E-02
18	.28819499E-03	.14254933E-02	.33009314E-02
19	.30793604E-03	.97839499E-03	.14943137E-02
20	.32651311E-03	.50255813E-03	.38011571E-03
21	.34356439E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.23777704E-03	-.23777704E-03	-.23777704E-03
2	-.22316390E-03	-.25732038E-03	-.19066550E-03
3	-.22409397E-03	-.28951073E-03	-.16176290E-03
4	-.22532891E-03	-.31942213E-03	-.13555189E-03
5	-.22679821E-03	-.34725205E-03	-.11172178E-03
6	-.22844494E-03	-.37317442E-03	-.90008054E-04
7	-.23022301E-03	-.39734331E-03	-.70184071E-04
8	-.23209500E-03	-.41989593E-03	-.52054450E-04
9	-.23403059E-03	-.44095506E-03	-.35449850E-04
10	-.23600513E-03	-.46063104E-03	-.20222758E-04
11	-.23797553E-03	-.47904150E-03	-.61813211E-05
12	-.23922208E-03	-.49682805E-03	.86994642E-05
13	-.23916008E-03	-.51440911E-03	.25969497E-04
14	-.23704835E-03	-.53216293E-03	.47450607E-04
15	-.22975913E-03	-.55158365E-03	.80733537E-04
16	-.21526893E-03	-.57347850E-03	.13058858E-03
17	-.19899670E-03	-.59524087E-03	.18386085E-03
18	-.18139315E-03	-.61656758E-03	.23937154E-03
19	-.16297462E-03	-.63719611E-03	.29585008E-03
20	-.14427924E-03	-.65690482E-03	.35202069E-03
21	-.12581823E-03	-.67552125E-03	.40670658E-03

1

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2828.1600	156.7451	.0000
2	2857.2336	156.8343	235.2147
3	2886.5664	156.7900	470.4615
4	2916.1584	156.6267	705.5513
5	2946.0096	156.3570	940.3154
6	2976.1200	155.9917	1174.6027
7	3006.4896	155.5403	1408.2770
8	3037.1184	155.0112	1641.2158
9	3068.0064	154.4115	1873.3080
10	3099.1536	153.7476	2104.4527
11	3130.5600	153.0252	2334.5474
12	3162.2256	152.2466	2563.4795
13	3194.1504	151.4103	2791.2083
14	3226.3344	150.5106	3017.6426
15	3258.7776	149.5327	3242.7964
16	3291.4800	148.4484	3466.2164
17	3324.4416	147.2387	3687.9988
18	3357.6624	145.9004	3907.8608
19	3391.1424	144.4325	4125.6176
20	3424.8816	142.8363	4341.0815
21	3458.8800	141.1156	4554.0642

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	-.21137962E-02	.70911760E+07
3	-.45217889E-02	.76167489E+07
4	-.73872966E-02	.81588385E+07
5	-.10864196E-01	.87177660E+07
6	-.15093677E-01	.92938247E+07
7	-.20207880E-01	.98873086E+07
8	-.26332165E-01	.10498670E+08
9	-.33589044E-01	.11127935E+08
10	-.42091793E-01	.11775528E+08
11	-.41361532E-01	.12134046E+08
12	-.41886983E-02	.11264377E+08
13	.25220354E-01	.10086472E+08
14	.47660292E-01	.83758454E+07
15	-.55171806E-01	.50564152E+07
16	.32128003E-01	.46271238E+07
17	.36069459E-01	.42899181E+07
18	.48701655E-01	.40454561E+07
19	.60622172E-01	.38750028E+07
20	.65868696E-01	.37640641E+07
21	.62943219E-01	.37012455E+07

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-4 DE 30.0 M V FRANCOLÍ (ROT) ZH51

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	30.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	3.2000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	2.4000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	30.000	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0320 T/M2
REACCION HORIZONTAL TABLERO	=	43.0000 T
REACCION VERTICAL TABLERO	=	1964.0000 T
MOMENTO EXTERIOR EN CABEZA	=	1402.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

1

FASE ELASTICA

REACCION DEL TABLERO = 61.9200 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.52446945E-04	.19397181E-02	.30770246E-01
2	.53890884E-04	.18599647E-02	.27920213E-01
3	.55289922E-04	.17780791E-02	.25191418E-01
4	.56646518E-04	.16941268E-02	.22587009E-01
5	.57962963E-04	.16081697E-02	.20110040E-01
6	.59241397E-04	.15202664E-02	.17763473E-01
7	.60483822E-04	.14304725E-02	.15550186E-01
8	.61692111E-04	.13388405E-02	.13472975E-01
9	.62868017E-04	.12454205E-02	.11534559E-01
10	.64013189E-04	.11502595E-02	.97375840E-02
11	.65129170E-04	.10534028E-02	.80846280E-02
12	.66217413E-04	.95489284E-03	.65782022E-02
13	.67279285E-04	.85477032E-03	.52207558E-02
14	.68316072E-04	.75307380E-03	.40146783E-02
15	.69328987E-04	.64984000E-03	.29623030E-02
16	.70319173E-04	.54510388E-03	.20659094E-02
17	.71287709E-04	.43889872E-03	.13277259E-02
18	.72235616E-04	.33125623E-03	.74993194E-03
19	.73163858E-04	.22220663E-03	.33466076E-03
20	.74073347E-04	.11177872E-03	.84001217E-04
21	.74964949E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2828.1600	61.9200	2018.8800
2	2857.2336	62.0603	2111.8647
3	2886.5664	62.2048	2205.0630
4	2916.1584	62.3534	2298.4811
5	2946.0096	62.5061	2392.1252
6	2976.1200	62.6630	2486.0016
7	3006.4896	62.8241	2580.1164
8	3037.1184	62.9893	2674.4759
9	3068.0064	63.1586	2769.0864
10	3099.1536	63.3321	2863.9539
11	3130.5600	63.5098	2959.0848
12	3162.2256	63.6915	3054.4853
13	3194.1504	63.8775	3150.1615
14	3226.3344	64.0676	3246.1198
15	3258.7776	64.2618	3342.3663
16	3291.4800	64.4602	3438.9072
17	3324.4416	64.6627	3535.7488
18	3357.6624	64.8694	3632.8973
19	3391.1424	65.0802	3730.3589
20	3424.8816	65.2951	3828.1399
21	3458.8800	65.5142	3926.2464

1

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 61.9200 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.52985389E-04	.20084737E-02	.32007561E-01
2	.54678493E-04	.19277258E-02	.29055094E-01
3	.56313696E-04	.18444817E-02	.26225631E-01
4	.57893765E-04	.17588261E-02	.23522854E-01
5	.59421274E-04	.16708398E-02	.20950318E-01
6	.60898623E-04	.15805999E-02	.18511462E-01
7	.62328052E-04	.14881799E-02	.16209609E-01
8	.63711649E-04	.13936501E-02	.14047977E-01
9	.65051370E-04	.12970778E-02	.12029680E-01
10	.66349041E-04	.11985275E-02	.10157732E-01
11	.67606374E-04	.10980610E-02	.84350554E-02
12	.68824973E-04	.99573745E-03	.68644781E-02
13	.70006341E-04	.89161396E-03	.54487430E-02
14	.71151890E-04	.78574529E-03	.41905088E-02
15	.72262945E-04	.67818416E-03	.30923534E-02
16	.73340751E-04	.56898139E-03	.21567771E-02
17	.74386481E-04	.45818597E-03	.13862055E-02
18	.75401236E-04	.34584518E-03	.78299190E-03
19	.76386054E-04	.23200471E-03	.34941983E-03
20	.77341914E-04	.11670874E-03	.87705519E-04
21	.78269735E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.22570991E-03	-.37141973E-03	-.82649362E-04
2	-.22625508E-03	-.37662094E-03	-.78623153E-04
3	-.22681861E-03	-.38168128E-03	-.74771634E-04
4	-.22739971E-03	-.38660757E-03	-.71086550E-04
5	-.22799764E-03	-.39140615E-03	-.67560204E-04
6	-.22861170E-03	-.39608291E-03	-.64185413E-04
7	-.22924121E-03	-.40064335E-03	-.60955468E-04
8	-.22988555E-03	-.40509258E-03	-.57864094E-04
9	-.23054412E-03	-.40943538E-03	-.54905417E-04
10	-.23121634E-03	-.41367621E-03	-.52073932E-04
11	-.23190169E-03	-.41781922E-03	-.49364480E-04
12	-.23259964E-03	-.42186832E-03	-.46772214E-04
13	-.23330971E-03	-.42582714E-03	-.44292585E-04
14	-.23403141E-03	-.42969911E-03	-.41921311E-04
15	-.23476432E-03	-.43348742E-03	-.39654369E-04
16	-.23550799E-03	-.43719506E-03	-.37487966E-04
17	-.23626203E-03	-.44082485E-03	-.35418530E-04
18	-.23702603E-03	-.44437943E-03	-.33442692E-04
19	-.23779962E-03	-.44786127E-03	-.31557276E-04
20	-.23858245E-03	-.45127271E-03	-.29759279E-04
21	-.23937415E-03	-.45461593E-03	-.28045867E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2828.1600	67.6005	2018.8791
2	2857.2336	67.5684	2120.2568
3	2886.5664	67.5291	2221.5809
4	2916.1584	67.4824	2322.8405
5	2946.0096	67.4284	2424.0245
6	2976.1200	67.3670	2525.1221
7	3006.4896	67.2981	2626.1219
8	3037.1184	67.2217	2727.0128
9	3068.0064	67.1378	2827.7835
10	3099.1536	67.0462	2928.4226
11	3130.5600	66.9470	3028.9185
12	3162.2256	66.8399	3129.2597
13	3194.1504	66.7251	3229.4345
14	3226.3344	66.6023	3329.4310
15	3258.7776	66.4714	3429.2373
16	3291.4800	66.3326	3528.8413
17	3324.4416	66.1855	3628.2309
18	3357.6624	66.0302	3727.3937
19	3391.1424	65.8665	3826.3172
20	3424.8816	65.6944	3924.9889
21	3458.8800	65.5138	4023.3961

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.91049739E-03	.37995426E+08
2	.54859021E-03	.38660119E+08
3	.26042957E-03	.39323521E+08
4	.41821754E-04	.39985631E+08
5	-.11243192E-03	.40646446E+08
6	-.20846347E-03	.41305966E+08
7	-.25298102E-03	.41964189E+08
8	-.25313506E-03	.42621113E+08
9	-.21637518E-03	.43276738E+08
10	-.15012922E-03	.43931063E+08
11	-.61737096E-04	.44584087E+08
12	.41789645E-04	.45235810E+08
13	.15395785E-03	.45886230E+08
14	.26898288E-03	.46535349E+08
15	.38189109E-03	.47183164E+08
16	.48884881E-03	.47829678E+08
17	.58715086E-03	.48474889E+08
18	.67555088E-03	.49118797E+08
19	.75434124E-03	.49761404E+08
20	.82551281E-03	.50402709E+08
21	.89295494E-03	.51042713E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-4 DE 30.0 M V FRANCOLÍ (ROT) XH52

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	30.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	3.2000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	2.4000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	30.000	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	84.0000 T
REACCION VERTICAL TABLERO	=	2375.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

1

FASE ELASTICA

REACCION DEL TABLERO = 120.9600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.37188503E-02	.67033794E-01
2	.25367550E-04	.36998247E-02	.61465032E-01
3	.47177552E-04	.36454158E-02	.55952012E-01
4	.65954712E-04	.35605666E-02	.50544004E-01
5	.82136133E-04	.34494985E-02	.45283421E-01
6	.96087795E-04	.33158306E-02	.40206809E-01
7	.10811759E-03	.31626765E-02	.35345673E-01
8	.11848570E-03	.29927240E-02	.30727178E-01
9	.12741293E-03	.28083001E-02	.26374736E-01
10	.13508737E-03	.26114248E-02	.22308504E-01
11	.14166990E-03	.24038569E-02	.18545808E-01
12	.14729854E-03	.21871306E-02	.15101512E-01
13	.15209215E-03	.19625876E-02	.11988325E-01
14	.15615338E-03	.17314034E-02	.92170702E-02
15	.15957115E-03	.14946100E-02	.67969194E-02
16	.16242270E-03	.12531146E-02	.47355913E-02
17	.16477528E-03	.10077161E-02	.30395271E-02
18	.16668764E-03	.75911892E-03	.17140423E-02
19	.16821118E-03	.50794481E-03	.76345880E-03
20	.16939097E-03	.25474320E-03	.19122159E-03
21	.17026663E-03	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3420.0000	120.9600	.0000
2	3449.0736	120.9600	181.4400
3	3478.4064	120.9600	362.8800
4	3507.9984	120.9600	544.3200
5	3537.8496	120.9600	725.7600
6	3567.9600	120.9600	907.2000
7	3598.3296	120.9600	1088.6400
8	3628.9584	120.9600	1270.0800
9	3659.8464	120.9600	1451.5200
10	3690.9936	120.9600	1632.9600
11	3722.4000	120.9600	1814.4000
12	3754.0656	120.9600	1995.8400
13	3785.9904	120.9600	2177.2800
14	3818.1744	120.9600	2358.7200
15	3850.6176	120.9600	2540.1600
16	3883.3200	120.9600	2721.6000
17	3916.2816	120.9600	2903.0400
18	3949.5024	120.9600	3084.4800
19	3982.9824	120.9600	3265.9200
20	4016.7216	120.9600	3447.3600
21	4050.7200	120.9600	3628.8000

1

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 120.9600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.43079676E-02	.77388824E-01
2	.29711949E-04	.42856836E-02	.70938014E-01
3	.55266329E-04	.42219499E-02	.64552498E-01
4	.77259446E-04	.41225556E-02	.58289995E-01
5	.96190480E-04	.39924681E-02	.52200178E-01
6	.11247867E-03	.38359662E-02	.46325798E-01
7	.12647808E-03	.36567487E-02	.40703637E-01
8	.13848926E-03	.34580232E-02	.35365306E-01
9	.14876846E-03	.32425799E-02	.30337926E-01
10	.15753514E-03	.30128522E-02	.25644708E-01
11	.16497795E-03	.27709674E-02	.21305448E-01
12	.17125970E-03	.25187891E-02	.17336953E-01
13	.17652132E-03	.22579534E-02	.13753410E-01
14	.18088545E-03	.19898983E-02	.10566703E-01
15	.18445834E-03	.17158904E-02	.77866910E-02
16	.18733333E-03	.14370467E-02	.54214491E-02
17	.18959196E-03	.11543527E-02	.34774761E-02
18	.19130585E-03	.86867936E-03	.19598807E-02
19	.19258668E-03	.58075995E-03	.87256105E-03
20	.19363921E-03	.29109053E-03	.21847583E-03
21	.19448150E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.28753588E-03	-.28753588E-03	-.28753588E-03
2	-.27376762E-03	-.30437093E-03	-.24464991E-03
3	-.27414410E-03	-.33272641E-03	-.21832511E-03
4	-.27477832E-03	-.35899112E-03	-.19442850E-03
5	-.27561154E-03	-.38334488E-03	-.17268772E-03
6	-.27659623E-03	-.40594670E-03	-.15286970E-03
7	-.27769391E-03	-.42693805E-03	-.13477367E-03
8	-.27887334E-03	-.44644535E-03	-.11822580E-03
9	-.28010922E-03	-.46458211E-03	-.10307475E-03
10	-.28138105E-03	-.48145068E-03	-.89188185E-04
11	-.28267228E-03	-.49714362E-03	-.76449840E-04
12	-.28396959E-03	-.51174499E-03	-.64757178E-04
13	-.28526234E-03	-.52533133E-03	-.54019409E-04
14	-.286542l0E-03	-.53797288E-03	-.44155592E-04
15	-.28780219E-03	-.54973304E-03	-.35094259E-04
16	-.28903750E-03	-.56067083E-03	-.26770837E-04
17	-.29024414E-03	-.57084024E-03	-.19127636E-04
18	-.29141924E-03	-.58029108E-03	-.12112691E-04
19	-.29252615E-03	-.58910965E-03	-.55719945E-05
20	-.29343102E-03	-.59744458E-03	.90057646E-06
21	-.29412788E-03	-.60529829E-03	.73184543E-05

1

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3420.0000	135.6929	.0000
2	3449.0736	135.7409	203.5882
3	3478.4064	135.6446	407.1395
4	3507.9984	135.4205	610.4508
5	3537.8496	135.0830	813.3415
6	3567.9600	134.6445	1015.6508
7	3598.3296	134.1159	1217.2349
8	3628.9584	133.5065	1417.9649
9	3659.8464	132.8247	1617.7253
10	3690.9936	132.0776	1816.4120
11	3722.4000	131.2718	2013.9311
12	3754.0656	130.4127	2210.1978
13	3785.9904	129.5055	2405.1354
14	3818.1744	128.5546	2598.6771
15	3850.6176	127.5638	2790.7544
16	3883.3200	126.5369	2981.3120
17	3916.2816	125.4768	3170.2970
18	3949.5024	124.3864	3357.6615
19	3982.9824	123.2683	3543.4671
20	4016.7216	122.1246	3727.6562
21	4050.7200	120.9575	3909.8545

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	.68391741E-02	.68506829E+07
3	.12310253E-01	.73626638E+07
4	.15575139E-01	.78921218E+07
5	.16711067E-01	.84394055E+07
6	.16062974E-01	.90047865E+07
7	.14196281E-01	.95885282E+07
8	.11832849E-01	.10190892E+08
9	.97971480E-02	.10812138E+08
10	.89734474E-02	.11452524E+08
11	.10272725E-01	.12112307E+08
12	.14607835E-01	.12791743E+08
13	.22875162E-01	.13491083E+08
14	.32869761E-01	.14210464E+08
15	.50819286E-01	.14950334E+08
16	.74888655E-01	.15710772E+08
17	.10632766E+00	.16439339E+08
18	.14556522E+00	.17236812E+08
19	.87690973E-01	.17530973E+08
20	-.50037539E-01	.17498532E+08
21	.67912676E-01	.17446947E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-4 DE 30.0 M V FRANCOLÍ (ROT) ZH52

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	30.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	3.2000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	2.4000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	30.000	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0320 T/M2
REACCION HORIZONTAL TABLERO	=	46.0000 T
REACCION VERTICAL TABLERO	=	2375.0000 T
MOMENTO EXTERIOR EN CABEZA	=	295.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

1

FASE ELASTICA

REACCION DEL TABLERO = 66.2400 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.11035555E-04	.91971064E-03	.16469468E-01
2	.13378266E-04	.90140027E-03	.15103196E-01
3	.15644796E-04	.87963298E-03	.13766996E-01
4	.17839206E-04	.85451998E-03	.12465969E-01
5	.19965287E-04	.82616661E-03	.11205056E-01
6	.22026576E-04	.79467271E-03	.99890399E-02
7	.24026382E-04	.76013299E-03	.88225607E-02
8	.25967801E-04	.72263735E-03	.77101189E-02
9	.27853735E-04	.68227120E-03	.66560839E-02
10	.29686905E-04	.63911572E-03	.56647000E-02
11	.31469865E-04	.59324814E-03	.47400927E-02
12	.33205017E-04	.54474198E-03	.38862748E-02
13	.34894620E-04	.49366725E-03	.31071511E-02
14	.36540800E-04	.44009069E-03	.24065240E-02
15	.38145562E-04	.38407592E-03	.17880981E-02
16	.39710797E-04	.32568365E-03	.12554850E-02
17	.41238289E-04	.26497183E-03	.81220696E-03
18	.42729724E-04	.20199582E-03	.46170158E-03
19	.44186697E-04	.13680851E-03	.20732515E-03
20	.45610717E-04	.69460446E-04	.52356428E-04
21	.47003212E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3420.0000	66.2400	424.8000
2	3449.0736	66.3803	524.2647
3	3478.4064	66.5248	623.9430
4	3507.9984	66.6734	723.8411
5	3537.8496	66.8261	823.9652
6	3567.9600	66.9830	924.3216
7	3598.3296	67.1441	1024.9164
8	3628.9584	67.3093	1125.7559
9	3659.8464	67.4786	1226.8464
10	3690.9936	67.6521	1328.1939
11	3722.4000	67.8298	1429.8048
12	3754.0656	68.0115	1531.6853
13	3785.9904	68.1975	1633.8415
14	3818.1744	68.3876	1736.2798
15	3850.6176	68.5818	1839.0063
16	3883.3200	68.7802	1942.0272
17	3916.2816	68.9827	2045.3488
18	3949.5024	69.1894	2148.9773
19	3982.9824	69.4002	2252.9189
20	4016.7216	69.6151	2357.1799
21	4050.7200	69.8342	2461.7664

1

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 66.2400 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.11529071E-04	.98888456E-03	.17733471E-01
2	.14110502E-04	.96965488E-03	.16264083E-01
3	.16606008E-04	.94661750E-03	.14826411E-01
4	.19019793E-04	.91989815E-03	.13426071E-01
5	.21355771E-04	.88961648E-03	.12068497E-01
6	.23617589E-04	.85588646E-03	.10758946E-01
7	.25808653E-04	.81881677E-03	.95025077E-02
8	.27932144E-04	.77851118E-03	.83041136E-02
9	.29991039E-04	.73506879E-03	.71685426E-02
10	.31988124E-04	.68858442E-03	.61004282E-02
11	.33926013E-04	.63914881E-03	.51042650E-02
12	.35807155E-04	.58684894E-03	.41844139E-02
13	.37633851E-04	.53176818E-03	.33451086E-02
14	.39408263E-04	.47398660E-03	.25904598E-02
15	.41132422E-04	.41358108E-03	.19244607E-02
16	.42808244E-04	.35062559E-03	.13509915E-02
17	.44437528E-04	.28519126E-03	.87382341E-03
18	.46021974E-04	.21734663E-03	.49662291E-03
19	.47563182E-04	.14715776E-03	.22295564E-03
20	.49062663E-04	.74688380E-04	.56289881E-04
21	.50521844E-04	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.27386983E-03	-.30557478E-03	-.24274134E-03
2	-.27381032E-03	-.31261421E-03	-.23571197E-03
3	-.27378873E-03	-.31945525E-03	-.22895250E-03
4	-.27380337E-03	-.32610780E-03	-.22244993E-03
5	-.27385268E-03	-.33258105E-03	-.21619209E-03
6	-.27393517E-03	-.33888354E-03	-.21016768E-03
7	-.27404946E-03	-.34502325E-03	-.20436609E-03
8	-.27419421E-03	-.35100761E-03	-.19877743E-03
9	-.27436820E-03	-.35684356E-03	-.19339240E-03
10	-.27457024E-03	-.36253758E-03	-.18820230E-03
11	-.27479921E-03	-.36809574E-03	-.18319897E-03
12	-.27505405E-03	-.37352373E-03	-.17837473E-03
13	-.27533377E-03	-.37882686E-03	-.17372237E-03
14	-.27563739E-03	-.38401011E-03	-.16923508E-03
15	-.27596403E-03	-.38907819E-03	-.16490648E-03
16	-.27631280E-03	-.39403547E-03	-.16073054E-03
17	-.27668289E-03	-.39888609E-03	-.15670156E-03
18	-.27707351E-03	-.40363393E-03	-.15281418E-03
19	-.27748390E-03	-.40828265E-03	-.14906331E-03
20	-.27791336E-03	-.41283569E-03	-.14544417E-03
21	-.27836120E-03	-.41729627E-03	-.14195222E-03

1

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	3420.0000	69.6222	424.7994
2	3449.0736	69.7248	529.3110
3	3478.4064	69.8175	633.9690
4	3507.9984	69.9003	738.7586
5	3537.8496	69.9733	843.6651
6	3567.9600	70.0366	948.6738
7	3598.3296	70.0902	1053.7702
8	3628.9584	70.1342	1158.9397
9	3659.8464	70.1685	1264.1680
10	3690.9936	70.1933	1369.4406
11	3722.4000	70.2086	1474.7433
12	3754.0656	70.2142	1580.0616
13	3785.9904	70.2104	1685.3812
14	3818.1744	70.1969	1790.6879
15	3850.6176	70.1739	1895.9672
16	3883.3200	70.1413	2001.2048
17	3916.2816	70.0992	2106.3863
18	3949.5024	70.0473	2211.4974
19	3982.9824	69.9858	2316.5234
20	4016.7216	69.9147	2421.4499
21	4050.7200	69.8337	2526.2623

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.59105862E-03	.36838924E+08
2	.30282765E-03	.37503010E+08
3	.11363514E-03	.38165617E+08
4	.92227563E-05	.38826817E+08
5	-.24719909E-04	.39486640E+08
6	-.23358377E-05	.40145097E+08
7	.62969559E-04	.40802194E+08
8	.15858584E-03	.41457933E+08
9	.27292204E-03	.42112314E+08
10	.39559797E-03	.42765335E+08
11	.51765435E-03	.43416996E+08
12	.63161114E-03	.44067294E+08
13	.73192783E-03	.44716230E+08
14	.81491204E-03	.45363800E+08
15	.87904235E-03	.46010004E+08
16	.92523901E-03	.46654840E+08
17	.95704985E-03	.47298307E+08
18	.98054027E-03	.47940404E+08
19	.10048709E-02	.48581130E+08
20	.10423963E-02	.49220485E+08
21	.11086293E-02	.49858467E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-4 DE 30.0 M V FRANCOLÍ (ROT) XH10

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	30.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	5.5000 M
CANTO EXTERIOR (SECCION 1)	=	2.0000 M
ANCHO INTERIOR (SECCION 1)	=	4.7000 M
CANTO INTERIOR (SECCION 1)	=	1.2000 M
ANCHO EXTERIOR (SECCION N)	=	5.5000 M
CANTO EXTERIOR (SECCION N)	=	3.2000 M
ANCHO INTERIOR (SECCION N)	=	4.7000 M
CANTO INTERIOR (SECCION N)	=	2.4000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	30.000	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0000 T/M2
REACCION HORIZONTAL TABLERO	=	49.0000 T
REACCION VERTICAL TABLERO	=	1925.0000 T
MOMENTO EXTERIOR EN CABEZA	=	.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

FASE ELASTICA

REACCION DEL TABLERO = 70.5600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.21693294E-02	.39103047E-01
2	.14797737E-04	.21582311E-02	.35854602E-01
3	.27520239E-04	.21264926E-02	.32638674E-01
4	.38473582E-04	.20769972E-02	.29484003E-01
5	.47912744E-04	.20122075E-02	.26415329E-01
6	.56051214E-04	.19342345E-02	.23453972E-01
7	.63068595E-04	.18448946E-02	.20618309E-01
8	.69116661E-04	.17457557E-02	.17924187E-01
9	.74324209E-04	.16381750E-02	.15385263E-01
10	.78800967E-04	.15233312E-02	.13013294E-01
11	.82640773E-04	.14022499E-02	.10818388E-01
12	.85924147E-04	.12758262E-02	.88092155E-02
13	.88720422E-04	.11448427E-02	.69931895E-02
14	.91089474E-04	.10099853E-02	.53766243E-02
15	.93083173E-04	.87185583E-03	.39648696E-02
16	.94746574E-04	.73098352E-03	.27624282E-02
17	.96118916E-04	.58783440E-03	.17730575E-02
18	.97234459E-04	.44281937E-03	.99985799E-03
19	.98123186E-04	.29630114E-03	.44535097E-03
20	.98811396E-04	.14860020E-03	.11154593E-03
21	.99322203E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2772.0000	70.5600	.0000
2	2801.0736	70.5600	105.8400
3	2830.4064	70.5600	211.6800
4	2859.9984	70.5600	317.5200
5	2889.8496	70.5600	423.3600
6	2919.9600	70.5600	529.2000
7	2950.3296	70.5600	635.0400
8	2980.9584	70.5600	740.8800
9	3011.8464	70.5600	846.7200
10	3042.9936	70.5600	952.5600
11	3074.4000	70.5600	1058.4000
12	3106.0656	70.5600	1164.2400
13	3137.9904	70.5600	1270.0800
14	3170.1744	70.5600	1375.9200
15	3202.6176	70.5600	1481.7600
16	3235.3200	70.5600	1587.6000
17	3268.2816	70.5600	1693.4400
18	3301.5024	70.5600	1799.2800
19	3334.9824	70.5600	1905.1200
20	3368.7216	70.5600	2010.9600
21	3402.7200	70.5600	2116.8000

FASE FINAL EN ITERACION NUMERO 3

REACCION DEL TABLERO = 70.5600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.00000000E+00	.23652736E-02	.42521393E-01
2	.16259035E-04	.23530794E-02	.38979580E-01
3	.30250901E-04	.23181969E-02	.35473499E-01
4	.42298691E-04	.22637847E-02	.32034754E-01
5	.52674555E-04	.21925548E-02	.28690554E-01
6	.61607570E-04	.21068432E-02	.25464331E-01
7	.69291542E-04	.20086688E-02	.22376256E-01
8	.75891151E-04	.18997818E-02	.19443681E-01
9	.81546902E-04	.17817033E-02	.16681506E-01
10	.86379123E-04	.16557588E-02	.14102504E-01
11	.90491236E-04	.15231060E-02	.11717584E-01
12	.93972423E-04	.13847583E-02	.95360333E-02
13	.96899829E-04	.12416041E-02	.75657126E-02
14	.99340383E-04	.10944239E-02	.58132341E-02
15	.10135231E-03	.94390438E-03	.42841106E-02
16	.10298640E-03	.79065035E-03	.29828882E-02
17	.10428706E-03	.63519525E-03	.19132601E-02
18	.10529320E-03	.47801006E-03	.10781674E-02
19	.10603901E-03	.31951090E-03	.47988689E-03
20	.10655457E-03	.16006572E-03	.12010776E-03
21	.10686639E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.23305540E-03	-.23305540E-03	-.23305540E-03
2	-.21827873E-03	-.23502554E-03	-.20234488E-03
3	-.21879403E-03	-.25085998E-03	-.18824062E-03
4	-.21939340E-03	-.26549898E-03	-.17540276E-03
5	-.22005944E-03	-.27905494E-03	-.16369766E-03
6	-.22077800E-03	-.29162670E-03	-.15300967E-03
7	-.22153763E-03	-.30330165E-03	-.14323819E-03
8	-.22232902E-03	-.31415731E-03	-.13429528E-03
9	-.22314461E-03	-.32426276E-03	-.12610379E-03
10	-.22397826E-03	-.33367974E-03	-.11859573E-03
11	-.22482500E-03	-.34246361E-03	-.11171096E-03
12	-.22568083E-03	-.35066416E-03	-.10539613E-03
13	-.22654252E-03	-.35832628E-03	-.99603739E-04
14	-.22740746E-03	-.36549059E-03	-.94291349E-04
15	-.22827362E-03	-.37219390E-03	-.89420952E-04
16	-.22913937E-03	-.37846965E-03	-.84958405E-04
17	-.23000345E-03	-.38434829E-03	-.80872952E-04
18	-.23086489E-03	-.38985763E-03	-.77136820E-04
19	-.23172299E-03	-.39502307E-03	-.73724869E-04
20	-.23257723E-03	-.39986789E-03	-.70614287E-04
21	-.23342724E-03	-.40441347E-03	-.67784332E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2772.0000	77.1156	.0000
2	2801.0736	77.1501	115.7083
3	2830.4064	77.1203	231.4191
4	2859.9984	77.0332	347.0414
5	2889.8496	76.8949	462.4938
6	2919.9600	76.7106	577.7037
7	2950.3296	76.4849	692.6055
8	2980.9584	76.2219	807.1403
9	3011.8464	75.9250	921.2546
10	3042.9936	75.5973	1034.9000
11	3074.4000	75.2415	1148.0323
12	3106.0656	74.8601	1260.6114
13	3137.9904	74.4551	1372.6003
14	3170.1744	74.0285	1483.9652
15	3202.6176	73.5820	1594.6749
16	3235.3200	73.1170	1704.7007
17	3268.2816	72.6350	1814.0159
18	3301.5024	72.1371	1922.5960
19	3334.9824	71.6244	2030.4179
20	3368.7216	71.0980	2137.4602
21	3402.7200	70.5586	2243.7029

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	.00000000E+00	.66346970E+07
2	.81074616E-03	.71154984E+07
3	.16461983E-02	.76484359E+07
4	.24430067E-02	.82014330E+07
5	.31783677E-02	.87748564E+07
6	.38351126E-02	.93689160E+07
7	.44036608E-02	.99838040E+07
8	.48809124E-02	.10619708E+08
9	.52699140E-02	.11276814E+08
10	.55792080E-02	.11955306E+08
11	.58224428E-02	.12655367E+08
12	.60180750E-02	.13377177E+08
13	.61888216E-02	.14120918E+08
14	.63614377E-02	.14886767E+08
15	.65662838E-02	.15674902E+08
16	.68369345E-02	.16485499E+08
17	.72097926E-02	.17318732E+08
18	.77236039E-02	.18174775E+08
19	.84190540E-02	.19053799E+08
20	.93382366E-02	.19955973E+08
21	.10524145E-01	.20881468E+08

ESTUDIO PANDEO DE PILAS DE PUENTES

PROYECTO : P-4 DE 30.0 M V FRANCOLÍ (ROT) ZH10

DATOS GEOMETRICOS DE LA PILA

ALTURA TOTAL	=	30.0000 M
NUMERO DE SECCIONES	=	21
ANCHO EXTERIOR (SECCION 1)	=	2.0000 M
CANTO EXTERIOR (SECCION 1)	=	5.5000 M
ANCHO INTERIOR (SECCION 1)	=	1.2000 M
CANTO INTERIOR (SECCION 1)	=	4.7000 M
ANCHO EXTERIOR (SECCION N)	=	3.2000 M
CANTO EXTERIOR (SECCION N)	=	5.5000 M
ANCHO INTERIOR (SECCION N)	=	2.4000 M
CANTO INTERIOR (SECCION N)	=	4.7000 M

DATOS DEL ACERO

LIMITE ELASTICO (FYK)	=	5100.0000 KG/CM2
COEFICIENTE MINORACION (GA)	=	1.1000

TENIENDO EN CUENTA LA COMPRESION DEL ACERO

DATOS DEL HORMIGON

RESISTENCIA CARACTER. (FCK)	=	350.0000 KG/CM2
COEFICIENTE MINORACION (GB)	=	1.5000

1

DATOS DE LA ARMADURA

RECUBRIMIENTO = .0500 M

ESC.	LONGITUD M.	AREA FRONTAL POR METRO	AREA LATERAL POR METRO
1	30.000	10.0500	10.0500

DATOS ACCIONES EXTERIORES

CONSTANTE DE MUELLE	=	.0000 T/M
CARGA HORIZONTAL UNIFORME	=	.0530 T/M2
REACCION HORIZONTAL TABLERO	=	99.0000 T
REACCION VERTICAL TABLERO	=	1925.0000 T
MOMENTO EXTERIOR EN CABEZA	=	543.0000 TXM
COEFICIENTE MAYORACION (GS)	=	1.4400

1

FASE ELASTICA

REACCION DEL TABLERO = 142.5600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.20312904E-04	.18864636E-02	.34083466E-01
2	.25414380E-04	.18521682E-02	.31278536E-01
3	.30347172E-04	.18103470E-02	.28530725E-01
4	.35120189E-04	.17612465E-02	.25851135E-01
5	.39741742E-04	.17051000E-02	.23250508E-01
6	.44219591E-04	.16421290E-02	.20739247E-01
7	.48560992E-04	.15725436E-02	.18327428E-01
8	.52772736E-04	.14965433E-02	.16024823E-01
9	.56861186E-04	.14143179E-02	.13840911E-01
10	.60832309E-04	.13260477E-02	.11784892E-01
11	.64691710E-04	.12319047E-02	.98657042E-02
12	.68444654E-04	.11320524E-02	.80920326E-02
13	.72096096E-04	.10266469E-02	.64723235E-02
14	.75650700E-04	.91583679E-03	.50147942E-02
15	.79112862E-04	.79976412E-03	.37274444E-02
16	.82486729E-04	.67856442E-03	.26180654E-02
17	.85776214E-04	.55236722E-03	.16942499E-02
18	.88985016E-04	.42129629E-03	.96340058E-03
19	.92116633E-04	.28547006E-03	.43273864E-03
20	.95174372E-04	.14500180E-03	.10931141E-03
21	.98161367E-04	.00000000E+00	.00000000E+00

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2772.0000	142.5600	781.9200
2	2801.0736	142.7924	995.9334
3	2830.4064	143.0317	1210.3006
4	2859.9984	143.2778	1425.0318
5	2889.8496	143.5308	1640.1374
6	2919.9600	143.7907	1855.6277
7	2950.3296	144.0574	2071.5128
8	2980.9584	144.3310	2287.8033
9	3011.8464	144.6115	2504.5093
10	3042.9936	144.8988	2721.6412
11	3074.4000	145.1930	2939.2092
12	3106.0656	145.4941	3157.2237
13	3137.9904	145.8021	3375.6950
14	3170.1744	146.1169	3594.6334
15	3202.6176	146.4386	3814.0491
16	3235.3200	146.7671	4033.9526
17	3268.2816	147.1026	4254.3540
18	3301.5024	147.4449	4475.2637
19	3334.9824	147.7940	4696.6920
20	3368.7216	148.1501	4918.6492
21	3402.7200	148.5130	5141.1456

1

FASE FINAL EN ITERACION NUMERO 4

REACCION DEL TABLERO = 142.5600 T.

DEFORMACIONES

SECC.	CURVATURA	GIRO (RAD.)	DESPLAZAMIENTO (M.)
1	.20430519E-04	.19706858E-02	.35856049E-01
2	.25780869E-04	.19360272E-02	.32925011E-01
3	.30957323E-04	.18934736E-02	.30051915E-01
4	.35968728E-04	.18432790E-02	.27248411E-01
5	.40823301E-04	.17856850E-02	.24525778E-01
6	.45528678E-04	.17209210E-02	.21894941E-01
7	.50091966E-04	.16492056E-02	.19366490E-01
8	.54519787E-04	.15707467E-02	.16950696E-01
9	.58818316E-04	.14857432E-02	.14657523E-01
10	.62993321E-04	.13943844E-02	.12496644E-01
11	.67050189E-04	.12968518E-02	.10477456E-01
12	.70993961E-04	.11933187E-02	.86090889E-02
13	.74829355E-04	.10839512E-02	.69004173E-02
14	.78560792E-04	.96890859E-03	.53600728E-02
15	.82192418E-04	.84834369E-03	.39964527E-02
16	.85737178E-04	.72239649E-03	.28177329E-02
17	.89430556E-04	.59102069E-03	.18319775E-02
18	.93455434E-04	.45385620E-03	.10475652E-02
19	.98009499E-04	.31025750E-03	.47362605E-03
20	.10333563E-03	.15924865E-03	.12049779E-03
21	.10899590E-03	.00000000E+00	.00000000E+00

DEFORMACIONES AXILES

SECC.	EN EL CENTRO	EN EL HORMIGON	EN EL ACERO
1	-.21832689E-03	-.27451081E-03	-.16316449E-03
2	-.21896097E-03	-.28985836E-03	-.14935262E-03
3	-.21966707E-03	-.30479971E-03	-.13608230E-03
4	-.22044067E-03	-.31935467E-03	-.12332511E-03
5	-.22127757E-03	-.33354164E-03	-.11105465E-03
6	-.22217386E-03	-.34737772E-03	-.99246430E-04
7	-.22312593E-03	-.36087884E-03	-.87877623E-04
8	-.22413040E-03	-.37405981E-03	-.76926974E-04
9	-.22518411E-03	-.38693448E-03	-.66374659E-04
10	-.22628413E-03	-.39951576E-03	-.56202163E-04
11	-.22742769E-03	-.41181571E-03	-.46392181E-04
12	-.22861222E-03	-.42384561E-03	-.36928522E-04
13	-.22983528E-03	-.43561600E-03	-.27796018E-04
14	-.23109459E-03	-.44713677E-03	-.18980455E-04
15	-.23238802E-03	-.45841717E-03	-.10468493E-04
16	-.23370209E-03	-.46947933E-03	-.22117067E-05
17	-.23474887E-03	-.48068290E-03	.67136284E-05
18	-.23528596E-03	-.49228841E-03	.17043707E-04
19	-.23502462E-03	-.50455075E-03	.29601022E-04
20	-.23359667E-03	-.51776965E-03	.45409527E-04
21	-.23157930E-03	-.53131804E-03	.62709641E-04

ESFUERZOS

SECC.	AXIL (T.)	CORTANTE (T.)	MOMENTO (MXT)
1	2772.0000	148.0202	781.9226
2	2801.0736	148.2128	1004.1038
3	2830.4064	148.3883	1226.5610
4	2859.9984	148.5469	1449.2689
5	2889.8496	148.6884	1672.2020
6	2919.9600	148.8130	1895.3347
7	2950.3296	148.9204	2118.6415
8	2980.9584	149.0106	2342.0965
9	3011.8464	149.0837	2565.6741
10	3042.9936	149.1393	2789.3484
11	3074.4000	149.1775	3013.0931
12	3106.0656	149.1982	3236.8820
13	3137.9904	149.2012	3460.6888
14	3170.1744	149.1863	3684.4867
15	3202.6176	149.1534	3908.2489
16	3235.3200	149.1024	4131.9309
17	3268.2816	149.0322	4355.4899
18	3301.5024	148.9413	4578.9643
19	3334.9824	148.8268	4802.3128
20	3368.7216	148.6850	5025.4806
21	3402.7200	148.5118	5248.2765

SECC.	DESEQUILIBRIO DE MOMENTOS	TANGENTE DE LEY MOMENTO-CURVATURA
1	-.26499417E-02	.38255663E+08
2	-.31308188E-02	.38920759E+08
3	-.36680164E-02	.39581334E+08
4	-.42847978E-02	.40237446E+08
5	-.50041558E-02	.40889145E+08
6	-.58493948E-02	.41536472E+08
7	-.68438204E-02	.42179472E+08
8	-.80110756E-02	.42819378E+08
9	-.93749902E-02	.43454118E+08
10	-.10959796E-01	.44084677E+08
11	-.12790070E-01	.44711094E+08
12	-.14890801E-01	.45333410E+08
13	-.17287486E-01	.45951665E+08
14	-.20010648E-01	.46565900E+08
15	-.23076776E-01	.47176158E+08
16	-.91925530E-02	.46657314E+08
17	.36869400E-01	.42272177E+08
18	.46930450E-01	.37611391E+08
19	.29158148E-01	.31495292E+08
20	-.67036287E-04	.27603377E+08
21	.10606955E+00	.24835526E+08

TENSIONES DE LA CIMENTACIÓN SOBRE EL TERRENO
PILA 4

$$\sigma_{med} = \frac{N}{A}$$

$$\sigma_{max} = \frac{N}{A} + \frac{M_x}{W_z} + \frac{M_z}{W_x}$$

	Zapata
a (m)	15,00
b (m)	10,00
h (m)	2,00
A (m^2)	150,00
W_x (m^3)	250,00
W_z (m^3)	375,00
Peso cimentación (KN)	7500

	Base de pila					
	H2	H3	H4	H51	H52	H10
N (KN)	17370	30190	25050	24020	28130	23630
M_x (m·KN)	9465	18790	32840	27710	17385	36190
M_z (m·KN)	11080	15805	18440	30740	26430	15270
F_x (KN)	360	500	590	980	840	490
F_z (KN)	325	525	525	455	485	1035

	Base de pila					
	H2	H3	H4	H51	H52	H10
N (KN)	24870	37690	32550	31520	35630	31130
M_x (m·KN)	10115	19840	33890	28620	18355	38260
M_z (m·KN)	11800	16805	19620	32700	28110	16250

	Base de pila					
	H2	H3	H4	H51	H52	H10
σ_{med} (Kg/cm^2)	1,66	2,51	2,17	2,10	2,38	2,08
σ_{max} (Kg/cm^2)	2,40	3,71	3,86	4,17	3,99	3,75
σ_{min} (Kg/cm^2)	0,92	1,31	0,48	0,03	0,76	0,41

σ_{med} admisible (Kg/cm^2)	4,50
σ_{max} admisible (Kg/cm^2)	5,63

ESFUERZOS EN ROTURA EN BASE DE PILA
PILA 4

	Base de pila					
	H2	H3	H4	H51	H52	H10
N_d (KN)	25015	43475	36075	34590	40510	34030
$M_{x,d}$ (m·KN)	13685	27330	47715	40235	25265	52485
$M_{z,d}$ (m·KN)	16160	23450	37150	45540	39100	22440
$F_{x,d}$ (KN)	520	720	850	1415	1210	705
$F_{z,d}$ (KN)	465	755	755	655	700	1485

Obra: Viaducto rio Francolí
Fecha: 06/06/02
Hora: 9:42:26

Cálculo de secciones a flexión compuesta esviada

1 Datos

- Materiales

Tipo de hormigón : HA-30
Tipo de acero : B-500-S
fck [MPa] = 30.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

Sección : FRANCOLI_P4

Contorno exterior

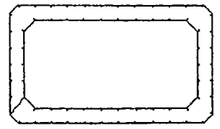
Vértice	X [m]	Y [m]	Lado	nº barras
1	0.000	0.250	1-2	2
2	0.250	0.000	2-3	12
3	5.250	0.000	3-4	2
4	5.500	0.250	4-5	7
5	5.500	2.950	5-6	2
6	5.250	3.200	6-7	12
7	0.250	3.200	7-8	2
8	0.000	2.950	8-1	7

Contorno interior

Vértice	X [m]	Y [m]	Lado	nº barras
1	0.400	0.700	1-2	2
2	0.700	0.400	2-3	10
3	4.800	0.400	3-4	2
4	5.100	0.700	4-5	5
5	5.100	2.500	5-6	2
6	4.800	2.800	6-7	10
7	0.700	2.800	7-8	2
8	0.400	2.500	8-1	5

Recubrimiento exterior [m] : 0.050

Recubrimiento interior [m] : 0.050



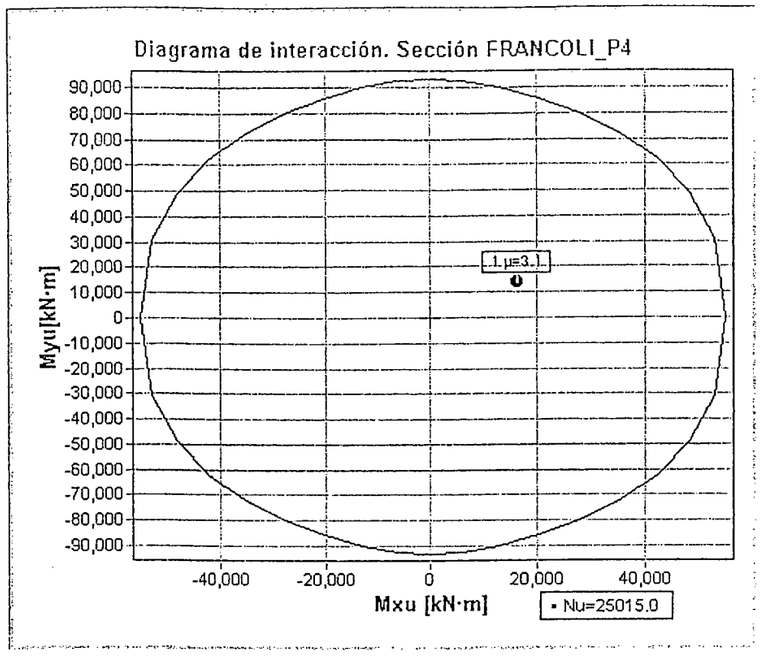
2 Diagrama

ϕ [mm] = 25

Resultados numéricos del diagrama de interacción

Nu [kN]	Mxu [kN·m]	Myu [kN·m]	x [cm]	1/r [1/m] ·1.E-3	β [°]
-25015.0	55638.1	-0.7	0.54	3.8	0.0
-25015.0	53411.4	31266.1	1.05	3.3	10.0
-25015.0	48456.7	49122.9	1.55	2.3	20.0
-25015.0	42352.7	61886.7	1.87	1.9	30.0
-25015.0	35398.1	71957.1	2.01	1.7	40.0
-25015.0	27889.4	79877.4	2.02	1.7	50.0
-25015.0	20212.9	85847.8	1.94	1.8	60.0
-25015.0	12940.8	90021.0	1.76	2.0	70.0
-25015.0	6162.9	92525.2	1.52	2.3	80.0
-25015.0	0.2	93205.4	1.29	2.4	90.0
-25015.0	-6162.3	92525.3	1.52	2.3	100.0
-25015.0	-12940.6	90021.0	1.76	2.0	110.0
-25015.0	-20212.7	85847.9	1.94	1.8	120.0
-25015.0	-27889.3	79877.5	2.02	1.7	130.0
-25015.0	-35398.1	71957.1	2.01	1.7	140.0
-25015.0	-42352.7	61886.7	1.87	1.9	150.0
-25015.0	-48456.7	49122.9	1.55	2.3	160.0
-25015.0	-53411.4	31266.1	1.05	3.3	170.0
-25015.0	-55638.1	-0.7	0.54	3.8	180.0
-25015.0	-53411.4	-31266.3	1.05	3.3	190.0
-25015.0	-48456.3	-49123.8	1.55	2.3	200.0
-25015.0	-42351.6	-61888.6	1.87	1.9	210.0
-25015.0	-35397.7	-71957.6	2.01	1.7	220.0
-25015.0	-27889.3	-79877.5	2.02	1.7	230.0
-25015.0	-20212.7	-85847.9	1.94	1.8	240.0
-25015.0	-12940.6	-90021.0	1.76	2.0	250.0
-25015.0	-6162.3	-92525.3	1.52	2.3	260.0
-25015.0	0.2	-93205.4	1.29	2.4	270.0
-25015.0	6162.9	-92525.2	1.52	2.3	280.0
-25015.0	12940.8	-90021.0	1.76	2.0	290.0
-25015.0	20212.9	-85847.8	1.94	1.8	300.0
-25015.0	27889.4	-79877.4	2.02	1.7	310.0
-25015.0	35397.7	-71957.6	2.01	1.7	320.0
-25015.0	42351.6	-61888.6	1.87	1.9	330.0

-25015.0	48456.3	-49123.8	1.55	2.3	340.0
-25015.0	53411.4	-31266.3	1.05	3.3	350.0



Coeficientes de seguridad de los pares de esfuerzos de cálculo

Punto	Mxd [kN·m]	Myd [kN·m]	γ
1	16160	13685	3.11

Obra: Viaducto río Francolí
Fecha: 06/06/02
Hora: 9:42:52

Cálculo de secciones a flexión compuesta esviada

1 Datos

- Materiales

Tipo de hormigón : HA-30
Tipo de acero : B-500-S
fck [MPa] = 30.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

Sección : FRANCOLI_P4

Contorno exterior

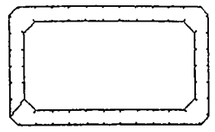
Vértice	X [m]	Y [m]	Lado	nº barras
1	0.000	0.250	1-2	2
2	0.250	0.000	2-3	12
3	5.250	0.000	3-4	2
4	5.500	0.250	4-5	7
5	5.500	2.950	5-6	2
6	5.250	3.200	6-7	12
7	0.250	3.200	7-8	2
8	0.000	2.950	8-1	7

Contorno interior

Vértice	X [m]	Y [m]	Lado	nº barras
1	0.400	0.700	1-2	2
2	0.700	0.400	2-3	10
3	4.800	0.400	3-4	2
4	5.100	0.700	4-5	5
5	5.100	2.500	5-6	2
6	4.800	2.800	6-7	10
7	0.700	2.800	7-8	2
8	0.400	2.500	8-1	5

Recubrimiento exterior [m] : 0.050

Recubrimiento interior [m] : 0.050

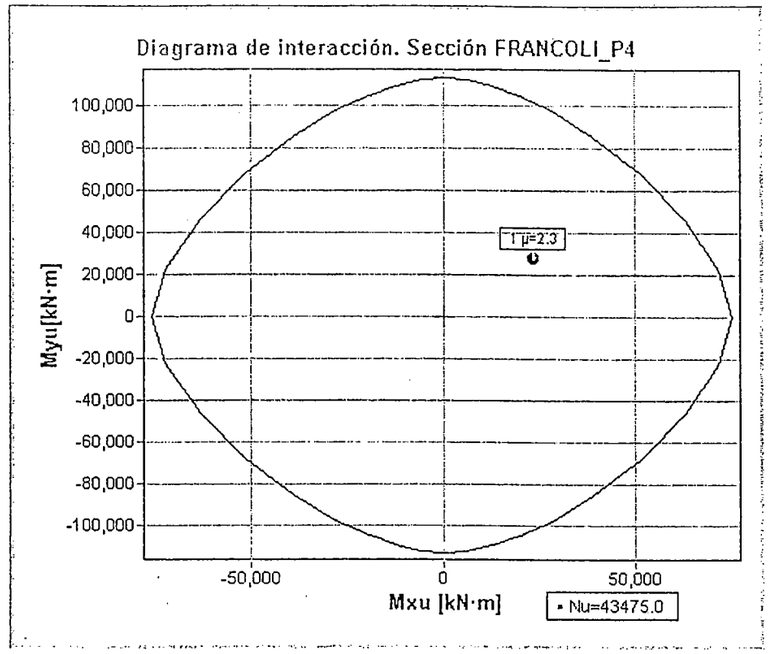


2 Diagrama

ϕ [mm] = 25

Resultados numéricos del diagrama de interacción

Nu [kN]	Mxu [kN·m]	Myu [kN·m]	x [cm]	1/r [1/m] ·1.E-3	β [°]
-43475.0	75115.5	-0.0	1.16	3.0	0.0
-43475.0	71929.0	21887.1	1.72	2.0	10.0
-43475.0	63089.5	45808.6	2.27	1.5	20.0
-43475.0	51438.8	67587.8	2.66	1.3	30.0
-43475.0	39111.3	85288.7	2.86	1.2	40.0
-43475.0	28602.3	97080.6	2.95	1.2	50.0
-43475.0	19837.7	104579.4	2.97	1.2	60.0
-43475.0	12491.6	109060.9	2.90	1.2	70.0
-43475.0	6050.0	111523.4	2.75	1.3	80.0
-43475.0	0.1	112666.1	2.51	1.4	90.0
-43475.0	-6049.8	111523.4	2.75	1.3	100.0
-43475.0	-12490.5	109061.3	2.90	1.2	110.0
-43475.0	-19836.7	104580.0	2.97	1.2	120.0
-43475.0	-28600.7	97081.9	2.95	1.2	130.0
-43475.0	-39111.3	85288.7	2.86	1.2	140.0
-43475.0	-51438.8	67587.8	2.66	1.3	150.0
-43475.0	-63089.5	45808.6	2.27	1.5	160.0
-43475.0	-71929.0	21887.1	1.72	2.0	170.0
-43475.0	-75115.5	-0.0	1.16	3.0	180.0
-43475.0	-71928.8	-21887.8	1.72	2.0	190.0
-43475.0	-63089.2	-45809.4	2.27	1.5	200.0
-43475.0	-51437.7	-67589.6	2.66	1.3	210.0
-43475.0	-39111.2	-85288.9	2.86	1.2	220.0
-43475.0	-28600.7	-97081.9	2.95	1.2	230.0
-43475.0	-19836.7	-104580.0	2.97	1.2	240.0
-43475.0	-12490.5	-109061.3	2.90	1.2	250.0
-43475.0	-6049.8	-111523.4	2.75	1.3	260.0
-43475.0	0.1	-112666.1	2.51	1.4	270.0
-43475.0	6050.0	-111523.4	2.75	1.3	280.0
-43475.0	12491.6	-109060.9	2.90	1.2	290.0
-43475.0	19837.7	-104579.4	2.97	1.2	300.0
-43475.0	28602.3	-97080.6	2.95	1.2	310.0
-43475.0	39111.2	-85288.9	2.86	1.2	320.0
-43475.0	51437.7	-67589.6	2.66	1.3	330.0
-43475.0	63089.2	-45809.4	2.27	1.5	340.0
-43475.0	71928.8	-21887.8	1.72	2.0	350.0



Coeficientes de seguridad de los pares de esfuerzos de cálculo

Punto	Mxd [kN·m]	Myd [kN·m]	γ
1	23450	27330	2.30

PRONTUARIO INFORMÁTICO DEL HORMIGÓN ESTRUCTURAL 3.0
Cátedra de Hormigón Estructural ETSICCPM - IECA

Obra: Viaducto río Francolí
Fecha: 06/06/02
Hora: 9:43:29

Cálculo de secciones a flexión compuesta esviada

1 Datos

- Materiales

Tipo de hormigón : HA-30
Tipo de acero : B-500-S
fck [MPa] = 30.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

Sección : FRANCOLI_P4

Contorno exterior

Vértice	X [m]	Y [m]	Lado	nº barras
1	0.000	0.250	1-2	2
2	0.250	0.000	2-3	12
3	5.250	0.000	3-4	2
4	5.500	0.250	4-5	7
5	5.500	2.950	5-6	2
6	5.250	3.200	6-7	12
7	0.250	3.200	7-8	2
8	0.000	2.950	8-1	7

Contorno interior

Vértice	X [m]	Y [m]	Lado	nº barras
1	0.400	0.700	1-2	2
2	0.700	0.400	2-3	10
3	4.800	0.400	3-4	2
4	5.100	0.700	4-5	5
5	5.100	2.500	5-6	2
6	4.800	2.800	6-7	10
7	0.700	2.800	7-8	2
8	0.400	2.500	8-1	5

Recubrimiento exterior [m] : 0.050

Recubrimiento interior [m] : 0.050



2 Diagrama

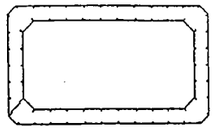
ϕ [mm] = 25

Resultados numéricos del diagrama de interacción

Nu [kN]	Mxu [kN·m]	Myu [kN·m]	x [cm]	1/r [1/m] ·1.E-3	β [°]
-34590.0	67427.7	-0.2	0.71	4.1	0.0
-34590.0	64397.5	25937.4	1.33	2.6	10.0
-34590.0	57430.8	48134.7	1.91	1.8	20.0
-34590.0	48058.8	66428.6	2.28	1.5	30.0
-34590.0	38216.1	80540.8	2.45	1.4	40.0
-34590.0	28507.4	91124.2	2.50	1.4	50.0
-34590.0	19960.1	98198.3	2.46	1.4	60.0
-34590.0	12552.8	102611.0	2.34	1.5	70.0
-34590.0	6047.3	105031.8	2.15	1.6	80.0
-34590.0	0.2	106066.4	1.91	1.8	90.0
-34590.0	-6046.7	105031.9	2.15	1.6	100.0
-34590.0	-12552.2	102611.2	2.34	1.5	110.0
-34590.0	-19959.7	98198.6	2.46	1.4	120.0
-34590.0	-28506.3	91125.1	2.50	1.4	130.0
-34590.0	-38216.1	80540.8	2.45	1.4	140.0
-34590.0	-48058.8	66428.6	2.28	1.5	150.0
-34590.0	-57430.8	48134.7	1.91	1.8	160.0
-34590.0	-64397.5	25937.4	1.33	2.6	170.0
-34590.0	-67427.7	-0.2	0.71	4.1	180.0
-34590.0	-64397.4	-25938.2	1.33	2.6	190.0
-34590.0	-57429.8	-48137.4	1.91	1.8	200.0
-34590.0	-48058.7	-66428.7	2.28	1.5	210.0
-34590.0	-38213.4	-80544.0	2.45	1.4	220.0
-34590.0	-28506.3	-91125.1	2.50	1.4	230.0
-34590.0	-19959.7	-98198.6	2.46	1.4	240.0
-34590.0	-12552.2	-102611.2	2.34	1.5	250.0
-34590.0	-6046.7	-105031.9	2.15	1.6	260.0
-34590.0	0.2	-106066.4	1.91	1.8	270.0
-34590.0	6047.3	-105031.8	2.15	1.6	280.0
-34590.0	12552.8	-102611.0	2.34	1.5	290.0
-34590.0	19960.1	-98198.3	2.46	1.4	300.0
-34590.0	28507.4	-91124.2	2.50	1.4	310.0
-34590.0	38213.4	-80544.0	2.45	1.4	320.0
-34590.0	48058.7	-66428.7	2.28	1.5	330.0

Recubrimiento exterior [m] : 0.050

Recubrimiento interior [m] : 0.050

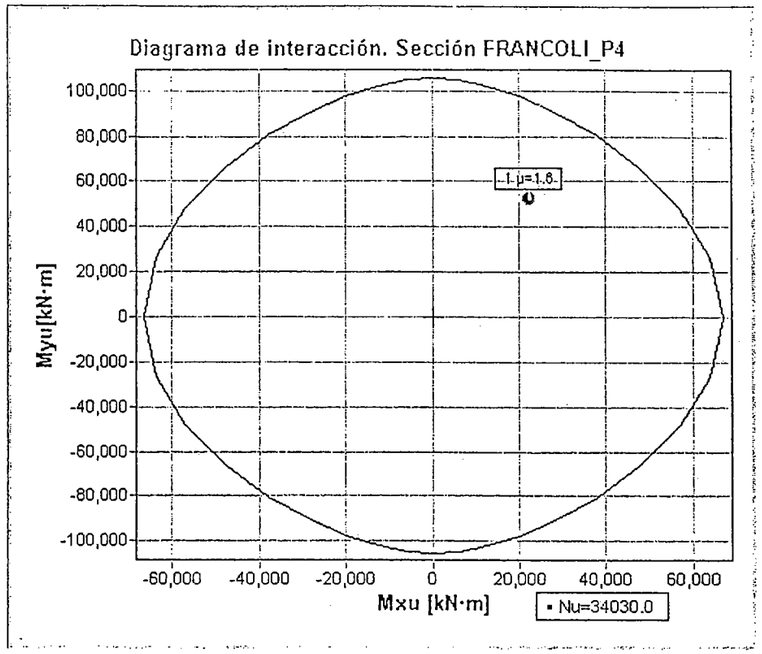


2 Diagrama

ϕ [mm] = 25

Resultados numéricos del diagrama de interacción

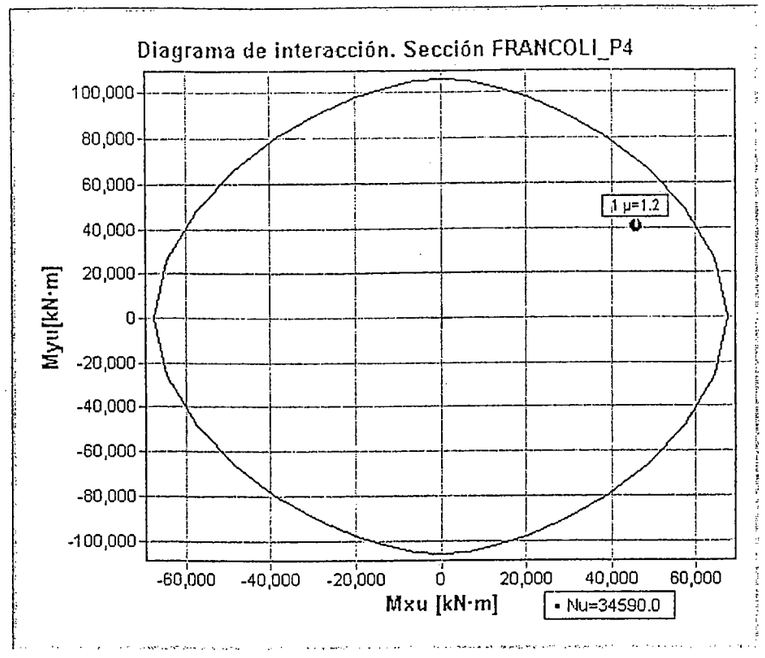
Nu [kN]	Mxu [kN·m]	Myu [kN·m]	x [cm]	1/r [1/m] ·1.E-3	β [°]
-34030.0	66791.1	-0.4	0.69	4.1	0.0
-34030.0	63821.7	26252.9	1.31	2.7	10.0
-34030.0	56966.3	48270.3	1.89	1.9	20.0
-34030.0	47783.6	66268.9	2.26	1.5	30.0
-34030.0	38116.9	80133.8	2.43	1.4	40.0
-34030.0	28491.0	90598.4	2.47	1.4	50.0
-34030.0	19972.8	97624.1	2.43	1.4	60.0
-34030.0	12557.3	102043.5	2.31	1.5	70.0
-34030.0	6049.8	104481.4	2.12	1.7	80.0
-34030.0	0.3	105503.6	1.87	1.9	90.0
-34030.0	-6048.9	104481.5	2.12	1.7	100.0
-34030.0	-12556.0	102044.0	2.31	1.5	110.0
-34030.0	-19972.6	97624.2	2.43	1.4	120.0
-34030.0	-28489.5	90599.6	2.47	1.4	130.0
-34030.0	-38116.9	80133.8	2.43	1.4	140.0
-34030.0	-47783.6	66268.9	2.26	1.5	150.0
-34030.0	-56966.3	48270.3	1.89	1.9	160.0
-34030.0	-63821.7	26252.9	1.31	2.7	170.0
-34030.0	-66791.1	-0.4	0.69	4.1	180.0
-34030.0	-63821.6	-26253.5	1.31	2.7	190.0
-34030.0	-56965.8	-48271.6	1.89	1.9	200.0
-34030.0	-47783.1	-66269.8	2.26	1.5	210.0
-34030.0	-38114.3	-80136.8	2.43	1.4	220.0
-34030.0	-28489.5	-90599.6	2.47	1.4	230.0
-34030.0	-19972.6	-97624.2	2.43	1.4	240.0
-34030.0	-12556.0	-102044.0	2.31	1.5	250.0
-34030.0	-6048.9	-104481.5	2.12	1.7	260.0
-34030.0	0.3	-105503.6	1.87	1.9	270.0
-34030.0	6049.8	-104481.4	2.12	1.7	280.0
-34030.0	12557.3	-102043.5	2.31	1.5	290.0
-34030.0	19972.8	-97624.1	2.43	1.4	300.0
-34030.0	28491.0	-90598.4	2.47	1.4	310.0
-34030.0	38114.3	-80136.8	2.43	1.4	320.0
-34030.0	47783.1	-66269.8	2.26	1.5	330.0
-34030.0	56965.8	-48271.6	1.89	1.9	340.0
-34030.0	63821.6	-26253.5	1.31	2.7	350.0



Coeficientes de seguridad de los pares de esfuerzos de cálculo

Punto	Mxd [kN·m]	Myd [kN·m]	γ
1	22440	52485	1.58

-34590.0	57429.8	-48137.4	1.91	1.8	340.0
-34590.0	64397.4	-25938.2	1.33	2.6	350.0



Coeficientes de seguridad de los pares de esfuerzos de cálculo

Punto	Mxd [kN·m]	Myd [kN·m]	γ
1	45540	40235	1.24

Obra: Viaducto río Francoli
Fecha: 06/06/02
Hora: 9:43:58

Cálculo de secciones a flexión compuesta esviada

1 Datos

- Materiales

Tipo de hormigón : HA-30
Tipo de acero : B-500-S
fck [MPa] = 30.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

Sección : FRANCOLI_P4

Contorno exterior

Vértice	X [m]	Y [m]	Lado	nº barras
1	0.000	0.250	1-2	2
2	0.250	0.000	2-3	12
3	5.250	0.000	3-4	2
4	5.500	0.250	4-5	7
5	5.500	2.950	5-6	2
6	5.250	3.200	6-7	12
7	0.250	3.200	7-8	2
8	0.000	2.950	8-1	7

Contorno interior

Vértice	X [m]	Y [m]	Lado	nº barras
1	0.400	0.700	1-2	2
2	0.700	0.400	2-3	10
3	4.800	0.400	3-4	2
4	5.100	0.700	4-5	5
5	5.100	2.500	5-6	2
6	4.800	2.800	6-7	10
7	0.700	2.800	7-8	2
8	0.400	2.500	8-1	5

ESTRIBO 1

U.T.E. ALT CAMP
L.A.V. MADRID-BARCELONA
SUBTRAMO V
VIADUCTO RIO FRANCOLI

REACCIONES VERTICALES (EN ESTRIBOS)

	ESTRIBO 1 Y 2		N (t)	M (m·t)
	APOYO 1	APOYO 2		
VIGA (T)	59,340	59,340	118,68	0
PRELOSAS (T)	16,800	16,800	33,60	0
LOSA FASE 1 (T)	27,365	27,365	54,73	0
LOSA FASE 2 (T)	14,152	14,152	28,30	0
CARGAS MUERTAS MAX (T)	91,012	91,012	182,02	0
CARGAS MUERTAS MIN (T)	58,533	58,533	117,07	0
SOBRECARGA PASEOS (T)	20,060	-11,960	8,10	51,23
HIPOTESIS 1 (T)	280,190	-73,280	206,91	565,55
TREN 1 VIA RIPADA				
VELOCIDAD 120 Km/h				
COEFICIENTE DE IMPACTO= 1				
COEFICIENTE DE CLASIFICACIÓN= 1.21				
COEFICIENTE DE REDUCCION= 1				
HIPOTESIS 2 (T)	206,910	206,910	413,82	0,00
TREN 2 VIAS RIPADAS				
VELOCIDAD 120 Km/h				
COEFICIENTE DE IMPACTO= 1				
COEFICIENTE DE CLASIFICACIÓN= 1.21				
COEFICIENTE DE REDUCCION= 1				
HIPOTESIS 3 (T)	97,790	-25,580	72,21	197,39
TREN 1 VIA RIPADA				
VELOCIDAD 350 Km/h				
COEFICIENTE DE IMPACTO= 1				
COEFICIENTE DE CLASIFICACIÓN= 1				
COEFICIENTE DE REDUCCION= 0.571				
HIPOTESIS 4 (T)	72,210	72,210	144,42	0,00
TREN 2 VIAS RIPADAS				
VELOCIDAD 350 Km/h				
COEFICIENTE DE IMPACTO= 1				
COEFICIENTE DE CLASIFICACIÓN= 1				
COEFICIENTE DE REDUCCION= 0.571				
MAX (Tn)	508,918	508,918		
MIN (Tn)	90,949	90,949		

REACCIONES HORIZONTALES (EN ESTRIBOS)

TRANSVERSALES	ESTRIBO 1 Y 2
VIENTO (CON SOBRECARGA) (T)	21,98
LAZO (T)	10
HIPOTESIS 1 CENTRIFUGA (T)	3,24
TREN 1 VIA RIPADA	
VELOCIDAD 120 Km/h	
COEFICIENTE DE IMPACTO= 1	
COEFICIENTE DE CLASIFICACIÓN= 1.21	
COEFICIENTE DE REDUCCION= 1	
HIPOTESIS 2 CENTRIFUGA (T)	6,47
TREN 2 VIAS RIPADAS	
VELOCIDAD 120 Km/h	
COEFICIENTE DE IMPACTO= 1	
COEFICIENTE DE CLASIFICACIÓN= 1.21	
COEFICIENTE DE REDUCCION= 1	
HIPOTESIS 3 CENTRIFUGA (T)	9,61
TREN 1 VIA RIPADA	
VELOCIDAD 350 Km/h	
COEFICIENTE DE IMPACTO= 1	
COEFICIENTE DE CLASIFICACIÓN= 1	
COEFICIENTE DE REDUCCION= 0.453	
HIPOTESIS 4 CENTRIFUGA (T)	19,21
TREN 2 VIAS RIPADAS	
VELOCIDAD 350 Km/h	
COEFICIENTE DE IMPACTO= 1	
COEFICIENTE DE CLASIFICACIÓN= 1	
COEFICIENTE DE REDUCCION= 0.453	

LONGITUDINALES

ROZAMIENTO CONSIDERADO EN TEFLÓN: 0.05 DE CARGAS PERMANENTES

	ESTRIBO 2 (FIJO)
FRENADO (T)	445,28
ARRANQUE (T)	121
INTERACCION CARRIL-TABLERO (T)	144

ACCIONES EN CABEZA DE ESTRIBO-1

Reacciones del tablero (t)

			Pptablero	CP Máx	CP Mín	SC Paseo	SC 1 Tren	SC 2 Trenes		
			235,31	182,02	117,07	16,20	171,00	342,00		
	1	2	3	4	5	6	7	8	9	10
α	-	-	1,210	1,210	1,210	1,210	1,210	1,210	1,210	1,210
ϕ	-	-	1,015	1,015	1,015	1,015	1,015	1,015	1,015	1,015
f	-	-	1,000	1,000	1,000	1,000	0,571	0,571	0,571	0,571
En servicio					N (t)					
	1	2	3,1	4,1	5,1	6,1	7,1	8,1	9,1	10,1
Estribo 1:	352	352	640	640	598	598	550	550	526	526
			3,2	4,2	5,2	6,2	7,2	8,2	9,2	10,2
			850	850	766	766	670	670	622	622
Mayoradas					N_d (t)					
	1	2	3,1	4,1	5,1	6,1	7,1	8,1	9,1	10,1
Estribo 1:	476	476	898	898	835	835	763	763	727	727
			3,2	4,2	5,2	6,2	7,2	8,2	9,2	10,2
			1213	1213	1087	1087	943	943	871	871

ACCIONES EN CABEZA DE ESTRIBO-1

Momentos del tablero (m·t)

			Pptablero	CP Máx	CP Mín	SC Paseo	SC 1 Tren	SC 2 Trenes		
			0,00	0,00	0,00	51,23	467,40	0		
	1	2	3	4	5	6	7	8	9	10
α	-	-	1,210	1,210	1,210	1,210	1,210	1,210	1,210	1,210
ϕ	-	-	1,015	1,015	1,015	1,015	1,015	1,015	1,015	1,015
f	-	-	1,000	1,000	1,000	1,000	0,571	0,571	0,571	0,571
En servicio					M_x (t)					
	1	2	3,1	4,1	5,1	6,1	7,1	8,1	9,1	10,1
Estribo 1:	0	0	615	615	500	500	369	369	303	303
			3,2	4,2	5,2	6,2	7,2	8,2	9,2	10,2
			41	41	41	41	41	41	41	41
Mayoradas					$M_{x,d}$ (t)					
	1	2	3,1	4,1	5,1	6,1	7,1	8,1	9,1	10,1
Estribo 1:	0	0	923	923	750	750	553	553	455	455
			3,2	4,2	5,2	6,2	7,2	8,2	9,2	10,2
			61	61	61	61	61	61	61	61

ACCIONES EN CABEZA DE ESTRIBO-1

	Fuerza centrífuga	Fuerza de lazo	Viento (Tablero vacío)	Viento (Con sobrecarga)	Longitudinales
	Fz (t)				Fx (t)
			Viento vacio		5% de cargas verticales Longitudinal Vacio
Estribo 1:			28,38		20,87
	Fc 1 tren v=120 km/h	Lazo		Viento Servicio	1 tren v=120 km/h
Estribo 1:	6,55	10,00		53,40	20,87
	Fc 1 Tren v=350 km/h	Lazo		Viento Servicio	1 tren v=350 km/h
Estribo 1:	51,92	10,00		53,40	20,87
	Fc 2 trenes v=120 km/h	Lazo		Viento Servicio	2 trenes v=120 km/h
Estribo 1:	13,09	10,00		53,40	20,87
	Fc 2 trenes v=350 km/h	Lazo		Viento Servicio	2 trenes v=350 km/h
Estribo 1:	103,84	10,00		53,40	20,87

h sobre cabeza de pila (m)

Fuerza centrífuga	Fuerza de lazo	Viento (Tablero vacío)	Viento (Con sobrecarga)	Longitudinales
Mx (m·t)				Mz (m·t)
5,35	3,55	2,4 Viento vacio	3,775	0% Longitudinal Vacio
0,00	0,00	68,11	0,00	0,00
Fc 1 tren v=120 km/h	Lazo		Viento Servicio	1 tren v=120 km/h
35,04	35,50	0,00	201,59	0,00
Fc 1 Tren v=350 km/h	Lazo		Viento Servicio	1 tren v=350 km/h
277,772	35,50	0,00	201,59	0,00
Fc 2 trenes v=120 km/h	Lazo		Viento Servicio	2 trenes v=120 km/h
70,03	35,50	0,00	201,59	0,00
Fc 2 trenes v=350 km/h	Lazo		Viento Servicio	2 trenes v=350 km/h
555,544	35,50	0,00	201,59	0,00

Aciones en C.D.G. del encepado. Cargas en Servicio

	Dimensiones (m)
Vuelo delan	1,50
Vuelo tras	5,50
Ancho	2,00
Base	9,00
Canto	2,50
Ancho Espald	0,50
Altura Espald	3,00
Altura tieras	13,20
Ancho Estribo	20,00
Dis Q a borde	0,90

Sobrecarga (t/m^2)	3
Ka	0,333
Densidad tierras (t/m^3)	1,8
Densidad hormigón (t/m^3	2,5

σ_{H0} (t/m^2)	1
σ_{H1} (t/m^2)	8,92
σ_{H2} (t/m^2)	10,42

Estribo 1	Fuerzas (t)	Distancias (m)
w1	75,0	1,25
w2	1020,0	2,00
w4	2613,6	1,75
E11	264,0	7,85
E12	1045,4	5,65
E21	446,0	0,00
E22	37,5	0,42

Cargas en cabeza de estribo	
	Distancias (m)
Verticales	2,10
Horizontales	11,45

	N (t)	Fx (t)	Fz (t)	Mx (m·t)	Mz (m·t)
1,1	4060,98	1813,81	17,03	235,84	6502,38
1,2	4060,98	1805,46	28,38	365,82	6406,81
1,3,1	4348,90	1805,46	46,00	1319,40	7011,45
1,4,1	4348,90	1805,46	49,97	1364,78	7011,45
1,5,1	4306,90	1813,81	43,21	1161,28	7018,81
1,6,1	4306,90	1805,46	67,74	1539,75	6923,25
1,7,1	4258,81	1805,46	53,80	1204,13	6822,25
1,8,1	4258,81	1805,46	65,56	1401,70	6822,25
1,9,1	4234,82	1813,81	49,45	1069,07	6867,45
1,10,1	4234,82	1805,46	80,22	1552,32	6771,88

	N (t)	Fx (t)	Fz (t)	Mx (m·t)	Mz (m·t)
1,3,2	4558,92	1805,46	49,96	811,84	7452,48
1,4,2	4558,92	1805,46	57,88	944,89	7452,48
1,5,2	4474,91	1813,81	46,38	755,23	7371,64
1,6,2	4474,91	1805,46	74,07	1186,87	7276,07
1,7,2	4378,73	1805,46	65,56	1073,92	7074,08
1,8,2	4378,73	1805,46	89,08	1469,06	7074,08
1,9,2	4330,76	1813,81	58,86	964,90	7068,92
1,10,2	4330,76	1805,46	99,03	1606,21	6973,35

Acio s en C.D.G. del encepado. Cargas en Se icio

17,5

	N (t)	Fx (t)	Fz (t)	Mx (m·t)	Mz (m·t)
1,1	232,06	103,65	0,97	13,48	371,56
1,2	232,06	103,17	1,62	20,90	366,10
1,3,1	248,51	103,17	2,63	75,39	400,65
1,4,1	248,51	103,17	2,86	77,99	400,65
1,5,1	246,11	103,65	2,47	66,36	401,08
1,6,1	246,11	103,17	3,87	87,99	395,61
1,7,1	243,36	103,17	3,07	68,81	389,84
1,8,1	243,36	103,17	3,75	80,10	389,84
1,9,1	241,99	103,65	2,83	61,09	392,43
1,10,1	241,99	103,17	4,58	88,70	386,96

	N (t)	Fx (t)	Fz (t)	Mx (m·t)	Mz (m·t)
1,3,2	260,51	103,17	2,85	46,39	425,86
1,4,2	260,51	103,17	3,31	53,99	425,86
1,5,2	255,71	103,65	2,65	43,16	421,24
1,6,2	255,71	103,17	4,23	67,82	415,78
1,7,2	250,21	103,17	3,75	61,37	404,23
1,8,2	250,21	103,17	5,09	83,95	404,23
1,9,2	247,47	103,65	3,36	55,14	403,94
1,10,2	247,47	103,17	5,66	91,78	398,48

Aciones en C.D.G. del encepado. Cargas en Rotura

	Dimensiones (m)
Vuelo delan	1,50
Vuelo tras	5,50
Ancho	2,00
Base	9,00
Canto	2,50
Ancho Espald	0,50
Altura Espald	3,00
Altura tieras	13,20
Ancho Estribo	20,00
Dis Q a borde	0,90

Sobrecarga (t/m^2)	3
Ka	0,333
Densidad tierras (t/m^3)	1,8
Densidad hormigón (t/m^3	2,5

σ_{H0} (t/m^2)	1
σ_{H1} (t/m^2)	8,92
σ_{H2} (t/m^2)	10,42

Estribo 1	Fuerzas (t)	Distancias (m)
w1	75,0	1,25
w2	1020,0	2,00
w4	2613,6	1,75
E11	264,0	7,85
E12	1045,4	5,65
E21	446,0	0,00
E22	37,5	0,42

Cargas en cabeza de estribo	
	Distancias (m)
Verticales	2,10
Horizontales	11,45

	N (t)	Fx (t)	Fz (t)	Mx (m·t)	Mz (m·t)
1,1	5482,32	2720,71	25,54	353,76	10008,58
1,2	5482,32	2708,19	42,57	589,59	9865,23
1,3,1	5904,47	2708,19	69,00	1979,11	10751,73
1,4,1	5904,47	2708,19	74,95	2078,97	10751,73
1,5,1	5841,46	2720,71	64,82	1741,92	10762,77
1,6,1	5841,46	2708,19	101,61	2309,62	10619,42
1,7,1	5769,32	2708,19	80,70	1806,20	10467,92
1,8,1	5769,32	2708,19	98,34	2102,55	10467,92
1,9,1	5733,35	2720,71	74,17	1603,60	10535,73
1,10,1	5733,35	2708,19	120,32	2328,49	10392,38

	N (t)	Fx (t)	Fz (t)	Mx (m·t)	Mz (m·t)
1,3,2	6219,49	2708,19	74,94	1217,76	11413,27
1,4,2	6219,49	2708,19	86,82	1417,33	11413,27
1,5,2	6093,48	2720,71	69,56	1132,85	11292,00
1,6,2	6093,48	2708,19	111,11	1780,31	11148,65
1,7,2	5949,20	2708,19	98,34	1610,89	10845,66
1,8,2	5949,20	2708,19	133,62	2203,59	10845,66
1,9,2	5877,25	2720,71	88,28	1447,35	10837,92
1,10,2	5877,25	2708,19	148,55	2409,32	10694,57

17,5

	N (t)	Fx (t)	Fz (t)	Mx (m·t)	Mz (m·t)
1,1	313,28	155,47	1,46	20,21	571,92
1,2	313,28	154,75	2,43	33,69	563,73
1,3,1	337,40	154,75	3,94	113,09	614,38
1,4,1	337,40	154,75	4,28	118,80	614,38
1,5,1	333,80	155,47	3,70	99,54	615,02
1,6,1	333,80	154,75	5,81	131,98	606,82
1,7,1	329,68	154,75	4,61	103,21	598,17
1,8,1	329,68	154,75	5,62	120,15	598,17
1,9,1	327,62	155,47	4,24	91,63	602,04
1,10,1	327,62	154,75	6,88	133,06	593,85

	N (t)	Fx (t)	Fz (t)	Mx (m·t)	Mz (m·t)
1,3,2	355,40	154,75	4,28	69,59	652,19
1,4,2	355,40	154,75	4,96	80,99	652,19
1,5,2	348,20	155,47	3,98	64,73	645,26
1,6,2	348,20	154,75	6,35	101,73	637,07
1,7,2	339,95	154,75	5,62	92,05	619,75
1,8,2	339,95	154,75	7,64	125,92	619,75
1,9,2	335,84	155,47	5,04	82,71	619,31
1,10,2	335,84	154,75	8,49	137,68	611,12


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*************************************************
*                                               *
*          S T A A D - III                      *
*          Revision 22.3                        *
*          Proprietary Program of               *
*          Research Engineers, Inc.             *
*          Date=    SEP  6, 2002                *
*          Time=    12:32:40                    *
*                                               *
*                                               *
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```
1. STAAD SPACE 'ESTRIBO 1 ENCEPADO PILOTES DE 1.00 SERVICIO'
2. UNIT METER MTON
3. JOINT COORDINATES
4.   1  0.00  -14.00  0.00   8  0.00  0.00  0.00
5.  REPEAT  7 0.00 0.00 2.50
6.  REPEAT ALL 3 2.50 0.00 0.00
7.  257 5.00    3.00  0.00 264  5.00  3.00 17.50
8. MEMBER INCIDENCES
9.   1 1 2 7 1 1
10.  REPEAT  7 7 8
11.  REPEAT ALL 3 56 64
12.  2001  8 16 2007  1 8
13.  REPEAT ALL 3 7 64
14.  2029  8  72  2031  1   64
15.  REPEAT ALL 7 3 8
16.  2053 257 258 2059 1 1
17.  2060 136 257
18.  2061 144 258
19.  2062 152 259
20.  2063 160 260
21.  2064 168 261
22.  2065 176 262
23.  2066 184 263
24.  2067 192 264
25. MEMBER PROPERTY PRISMATIC
26.   1   TO 224                PRI YD 1.000
27.  2001 TO 2007 2022 TO 2028 PRI YD 2.500 ZD  2.750
28.  2008 TO 2014              PRI YD 2.500 ZD  3.500
29.  2015 TO 2021              PRI YD 4.000 ZD  3.500
30.  2029 TO 2031 2050 TO 2052 PRI YD 2.500 ZD  2.500
31.  2032 TO 2049              PRI YD 2.500 ZD  2.500
32.  2053 TO 2059              PRI YD 3.000 ZD  2.000
33.  2060 TO 2067              PRI YD 2.000 ZD  2.500
34. CONSTANT
35. E 2.64E6 MEM 2001 TO 2052
36. E 2.64E6 MEM 2053 TO 2067
37. E 2.64E6 MEM 1 TO 224
38. POISSON .2 ALL
39. SUPPORT
40.  1  TO  249  BY 8    FIXED BUT     MX MY MZ  KFX 2500. KFZ 2500.
41.  2  TO  250  BY 8    FIXED BUT  FY MX MY MZ  KFX 5000. KFZ 4168.
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42.  3  TO  251  BY 8    FIXED BUT  FY MX MY MZ  KFX 3335. KFZ 1670.
43.  4  TO  252  BY 8    FIXED BUT  FY MX MY MZ  KFX 1670. KFZ 1670.
44.  5  TO  253  BY 8    FIXED BUT  FY MX MY MZ  KFX 1670. KFZ 1670.
45.  6  TO  254  BY 8    FIXED BUT  FY MX MY MZ  KFX 1670. KFZ 1670.
46.  7  TO  255  BY 8    FIXED BUT  FY MX MY MZ  KFX 1461. KFZ 1461.
47. LOAD 1
48. *CARGAS SOBRE ENCEPADO H3
49. MEMBER LOAD
50.  2008 TO 2021 UNI GY  -138.55
51.  2008 TO 2021 UNI GX    56.28
52.  2008 TO 2021 UMO GZ  -217.11
53. JOINT  LOAD
54.  96  104 160 168 FZ  12.49
55.  96  104 160 168 MX 202.96
56. *PESO PROPIO DEL ENCEPADO
57. MEMBER LOAD
58.  2001 TO 2007 2022 TO 2028 UNI GY  -14.286
59.  2008 TO 2021              UNI GY  -17.857
60. LOAD 2
61. *CARGAS SOBRE ENCEPADO H5
62. MEMBER LOAD
63.  2008 TO 2021 UNI GY  -136.15
64.  2008 TO 2021 UNI GX    56.52
65.  2008 TO 2021 UMO GZ  -214.80
66. JOINT  LOAD
67.  96  104 160 168 FZ  11.60
68.  96  104 160 168 MX 188.81
69. *PESO PROPIO DEL ENCEPADO
70. MEMBER LOAD
71.  2001 TO 2007 2022 TO 2028 UNI GY  -14.286
72.  2008 TO 2021              UNI GY  -17.857
73. PERFORM ANALYSIS
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    P R O B L E M   S T A T I S T I C S
    -----------------------------------

 NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS =   264/  291/  224
 ORIGINAL/FINAL BAND-WIDTH =  121/   31
 TOTAL PRIMARY LOAD CASES  =    2, TOTAL DEGREES OF FREEDOM =  1552
 SIZE OF STIFFNESS MATRIX =  294880 DOUBLE PREC. WORDS
 REQRD/AVAIL. DISK SPACE =  14.03/ 2047.7 MB,  EXMEM = 1948.3 MB

++ Processing Element Stiffness Matrix.          12:32:40
++ Processing Global Stiffness Matrix.           12:32:40
++ Processing Triangular Factorization.          12:32:40
++ Calculating Joint Displacements.              12:32:40
++ Calculating Member  Forces.                   12:32:40
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74. PLOT BENDING FILE
75. *PRINT ANALYSIS RESULTS
76. PRINT SUPPORT REACTIONS
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SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
1	1	5.48	-59.08	.12	.00	.00	.00
	2	5.50	-59.86	.11	.00	.00	.00
9	1	5.48	-42.10	.12	.00	.00	.00
	2	5.50	-43.18	.11	.00	.00	.00
17	1	5.48	-30.18	.13	.00	.00	.00
	2	5.50	-31.50	.12	.00	.00	.00
25	1	5.48	-22.41	.13	.00	.00	.00
	2	5.50	-23.98	.12	.00	.00	.00
33	1	5.48	-18.69	.14	.00	.00	.00
	2	5.50	-20.52	.13	.00	.00	.00
41	1	5.47	-21.22	.15	.00	.00	.00
	2	5.50	-23.16	.14	.00	.00	.00
49	1	5.47	-30.85	.16	.00	.00	.00
	2	5.50	-32.72	.15	.00	.00	.00
57	1	5.47	-46.05	.16	.00	.00	.00
	2	5.50	-47.75	.15	.00	.00	.00
65	1	5.50	106.26	.10	.00	.00	.00
	2	5.52	104.50	.09	.00	.00	.00
73	1	5.50	129.23	.11	.00	.00	.00
	2	5.52	127.07	.10	.00	.00	.00
81	1	5.50	143.80	.12	.00	.00	.00
	2	5.52	141.37	.11	.00	.00	.00
89	1	5.50	153.24	.13	.00	.00	.00
	2	5.52	150.51	.12	.00	.00	.00
97	1	5.50	158.14	.14	.00	.00	.00
	2	5.52	155.07	.13	.00	.00	.00
105	1	5.50	154.75	.15	.00	.00	.00
	2	5.52	151.56	.14	.00	.00	.00
113	1	5.50	142.09	.17	.00	.00	.00
	2	5.52	139.03	.16	.00	.00	.00
121	1	5.50	121.08	.18	.00	.00	.00
	2	5.52	118.28	.17	.00	.00	.00
129	1	5.56	240.63	.11	.00	.00	.00
	2	5.58	238.28	.10	.00	.00	.00
137	1	5.56	261.81	.11	.00	.00	.00
	2	5.59	259.08	.10	.00	.00	.00
145	1	5.57	277.65	.12	.00	.00	.00
	2	5.59	274.61	.11	.00	.00	.00
153	1	5.57	287.78	.13	.00	.00	.00
	2	5.60	284.43	.12	.00	.00	.00
161	1	5.57	291.54	.14	.00	.00	.00
	2	5.60	287.94	.13	.00	.00	.00
169	1	5.57	287.11	.16	.00	.00	.00
	2	5.59	283.41	.15	.00	.00	.00
177	1	5.57	274.62	.17	.00	.00	.00
	2	5.59	270.99	.16	.00	.00	.00
185	1	5.56	256.49	.17	.00	.00	.00
	2	5.58	253.04	.16	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
193	1	5.60	340.51	.10	.00	.00	.00
	2	5.62	338.18	.09	.00	.00	.00
201	1	5.61	360.40	.11	.00	.00	.00
	2	5.63	357.73	.10	.00	.00	.00
209	1	5.62	375.70	.12	.00	.00	.00
	2	5.64	372.73	.11	.00	.00	.00
217	1	5.62	385.08	.13	.00	.00	.00
	2	5.64	381.86	.12	.00	.00	.00
225	1	5.62	387.84	.14	.00	.00	.00
	2	5.65	384.42	.13	.00	.00	.00
233	1	5.62	383.13	.16	.00	.00	.00
	2	5.64	379.64	.15	.00	.00	.00
241	1	5.61	371.29	.17	.00	.00	.00
	2	5.63	367.85	.16	.00	.00	.00
249	1	5.60	354.67	.18	.00	.00	.00
	2	5.63	351.35	.17	.00	.00	.00
2	1	3.70	.00	.09	.00	.00	.00
	2	3.72	.00	.09	.00	.00	.00
10	1	3.71	.00	.09	.00	.00	.00
	2	3.73	.00	.08	.00	.00	.00
18	1	3.72	.00	.08	.00	.00	.00
	2	3.73	.00	.07	.00	.00	.00
26	1	3.72	.00	.07	.00	.00	.00
	2	3.74	.00	.07	.00	.00	.00
34	1	3.73	.00	.06	.00	.00	.00
	2	3.74	.00	.06	.00	.00	.00
42	1	3.72	.00	.05	.00	.00	.00
	2	3.73	.00	.05	.00	.00	.00
50	1	3.72	.00	.04	.00	.00	.00
	2	3.73	.00	.03	.00	.00	.00
58	1	3.71	.00	.03	.00	.00	.00
:	2	3.72	.00	.03	.00	.00	.00
66	1	3.69	.00	.10	.00	.00	.00
	2	3.71	.00	.10	.00	.00	.00
74	1	3.71	.00	.09	.00	.00	.00
	2	3.72	.00	.09	.00	.00	.00
82	1	3.71	.00	.08	.00	.00	.00
	2	3.73	.00	.08	.00	.00	.00
90	1	3.72	.00	.08	.00	.00	.00
	2	3.73	.00	.07	.00	.00	.00
98	1	3.72	.00	.07	.00	.00	.00
	2	3.73	.00	.06	.00	.00	.00
106	1	3.71	.00	.05	.00	.00	.00
	2	3.73	.00	.04	.00	.00	.00
114	1	3.71	.00	.04	.00	.00	.00
	2	3.72	.00	.03	.00	.00	.00
122	1	3.69	.00	.03	.00	.00	.00
	2	3.71	.00	.02	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
130	1	3.66	.00	.09	.00	.00	.00
	2	3.68	.00	.09	.00	.00	.00
138	1	3.67	.00	.09	.00	.00	.00
	2	3.68	.00	.08	.00	.00	.00
146	1	3.67	.00	.08	.00	.00	.00
	2	3.69	.00	.08	.00	.00	.00
154	1	3.68	.00	.07	.00	.00	.00
	2	3.69	.00	.07	.00	.00	.00
162	1	3.68	.00	.06	.00	.00	.00
	2	3.69	.00	.06	.00	.00	.00
170	1	3.67	.00	.05	.00	.00	.00
	2	3.69	.00	.05	.00	.00	.00
178	1	3.67	.00	.04	.00	.00	.00
	2	3.68	.00	.04	.00	.00	.00
186	1	3.66	.00	.04	.00	.00	.00
	2	3.67	.00	.03	.00	.00	.00
194	1	3.64	.00	.09	.00	.00	.00
	2	3.65	.00	.09	.00	.00	.00
202	1	3.64	.00	.09	.00	.00	.00
	2	3.66	.00	.08	.00	.00	.00
210	1	3.65	.00	.08	.00	.00	.00
	2	3.66	.00	.08	.00	.00	.00
218	1	3.65	.00	.07	.00	.00	.00
	2	3.66	.00	.07	.00	.00	.00
226	1	3.65	.00	.06	.00	.00	.00
	2	3.66	.00	.06	.00	.00	.00
234	1	3.64	.00	.05	.00	.00	.00
	2	3.66	.00	.05	.00	.00	.00
242	1	3.64	.00	.04	.00	.00	.00
	2	3.65	.00	.04	.00	.00	.00
250	1	3.64	.00	.04	.00	.00	.00
	2	3.65	.00	.03	.00	.00	.00
3	1	-3.59	.00	-.02	.00	.00	.00
	2	-3.61	.00	-.01	.00	.00	.00
11	1	-3.58	.00	-.02	.00	.00	.00
	2	-3.60	.00	-.02	.00	.00	.00
19	1	-3.57	.00	-.04	.00	.00	.00
	2	-3.59	.00	-.03	.00	.00	.00
27	1	-3.57	.00	-.05	.00	.00	.00
	2	-3.59	.00	-.04	.00	.00	.00
35	1	-3.56	.00	-.06	.00	.00	.00
	2	-3.58	.00	-.05	.00	.00	.00
43	1	-3.56	.00	-.08	.00	.00	.00
	2	-3.59	.00	-.07	.00	.00	.00
51	1	-3.57	.00	-.09	.00	.00	.00
	2	-3.59	.00	-.09	.00	.00	.00
59	1	-3.58	.00	-.10	.00	.00	.00
	2	-3.60	.00	-.10	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
67	1	-3.64	.00	.00	.00	.00	.00
	2	-3.66	.00	.00	.00	.00	.00
75	1	-3.62	.00	-.02	.00	.00	.00
	2	-3.64	.00	-.01	.00	.00	.00
83	1	-3.61	.00	-.03	.00	.00	.00
	2	-3.63	.00	-.03	.00	.00	.00
91	1	-3.61	.00	-.03	.00	.00	.00
	2	-3.63	.00	-.03	.00	.00	.00
99	1	-3.61	.00	-.05	.00	.00	.00
	2	-3.63	.00	-.05	.00	.00	.00
107	1	-3.61	.00	-.08	.00	.00	.00
	2	-3.63	.00	-.08	.00	.00	.00
115	1	-3.62	.00	-.10	.00	.00	.00
	2	-3.64	.00	-.10	.00	.00	.00
123	1	-3.63	.00	-.12	.00	.00	.00
	2	-3.66	.00	-.11	.00	.00	.00
131	1	-3.77	.00	-.01	.00	.00	.00
	2	-3.79	.00	-.01	.00	.00	.00
139	1	-3.77	.00	-.02	.00	.00	.00
	2	-3.79	.00	-.01	.00	.00	.00
147	1	-3.77	.00	-.03	.00	.00	.00
	2	-3.79	.00	-.03	.00	.00	.00
155	1	-3.77	.00	-.04	.00	.00	.00
	2	-3.79	.00	-.04	.00	.00	.00
163	1	-3.78	.00	-.06	.00	.00	.00
	2	-3.79	.00	-.05	.00	.00	.00
171	1	-3.78	.00	-.08	.00	.00	.00
	2	-3.79	.00	-.08	.00	.00	.00
179	1	-3.77	.00	-.10	.00	.00	.00
	2	-3.79	.00	-.09	.00	.00	.00
187	1	-3.78	.00	-.10	.00	.00	.00
	2	-3.80	.00	-.10	.00	.00	.00
195	1	-3.87	.00	-.01	.00	.00	.00
	2	-3.88	.00	.00	.00	.00	.00
203	1	-3.88	.00	-.01	.00	.00	.00
	2	-3.89	.00	-.01	.00	.00	.00
211	1	-3.88	.00	-.03	.00	.00	.00
	2	-3.90	.00	-.02	.00	.00	.00
219	1	-3.89	.00	-.04	.00	.00	.00
	2	-3.90	.00	-.04	.00	.00	.00
227	1	-3.89	.00	-.06	.00	.00	.00
	2	-3.91	.00	-.06	.00	.00	.00
235	1	-3.89	.00	-.08	.00	.00	.00
	2	-3.91	.00	-.08	.00	.00	.00
243	1	-3.88	.00	-.10	.00	.00	.00
	2	-3.90	.00	-.09	.00	.00	.00
251	1	-3.87	.00	-.11	.00	.00	.00
	2	-3.89	.00	-.10	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
4	1	-6.29	.00	-.10	.00	.00	.00
	2	-6.32	.00	-.09	.00	.00	.00
12	1	-6.29	.00	-.12	.00	.00	.00
	2	-6.32	.00	-.11	.00	.00	.00
20	1	-6.28	.00	-.14	.00	.00	.00
	2	-6.32	.00	-.13	.00	.00	.00
28	1	-6.28	.00	-.15	.00	.00	.00
	2	-6.31	.00	-.14	.00	.00	.00
36	1	-6.28	.00	-.18	.00	.00	.00
	2	-6.31	.00	-.16	.00	.00	.00
44	1	-6.28	.00	-.21	.00	.00	.00
	2	-6.31	.00	-.19	.00	.00	.00
52	1	-6.28	.00	-.23	.00	.00	.00
	2	-6.31	.00	-.22	.00	.00	.00
60	1	-6.29	.00	-.25	.00	.00	.00
	2	-6.32	.00	-.24	.00	.00	.00
68	1	-6.35	.00	-.07	.00	.00	.00
	2	-6.38	.00	-.06	.00	.00	.00
76	1	-6.33	.00	-.10	.00	.00	.00
	2	-6.36	.00	-.09	.00	.00	.00
84	1	-6.33	.00	-.13	.00	.00	.00
	2	-6.36	.00	-.12	.00	.00	.00
92	1	-6.33	.00	-.13	.00	.00	.00
	2	-6.36	.00	-.12	.00	.00	.00
100	1	-6.33	.00	-.16	.00	.00	.00
	2	-6.36	.00	-.15	.00	.00	.00
108	1	-6.33	.00	-.22	.00	.00	.00
	2	-6.36	.00	-.20	.00	.00	.00
116	1	-6.33	.00	-.25	.00	.00	.00
	2	-6.36	.00	-.24	.00	.00	.00
124	1	-6.34	.00	-.28	.00	.00	.00
	2	-6.37	.00	-.26	.00	.00	.00
132	1	-6.48	.00	-.09	.00	.00	.00
	2	-6.51	.00	-.08	.00	.00	.00
140	1	-6.48	.00	-.10	.00	.00	.00
	2	-6.51	.00	-.09	.00	.00	.00
148	1	-6.48	.00	-.12	.00	.00	.00
	2	-6.51	.00	-.11	.00	.00	.00
156	1	-6.49	.00	-.14	.00	.00	.00
	2	-6.51	.00	-.13	.00	.00	.00
164	1	-6.49	.00	-.18	.00	.00	.00
	2	-6.52	.00	-.17	.00	.00	.00
172	1	-6.49	.00	-.22	.00	.00	.00
	2	-6.51	.00	-.21	.00	.00	.00
180	1	-6.48	.00	-.25	.00	.00	.00
	2	-6.51	.00	-.23	.00	.00	.00
188	1	-6.48	.00	-.26	.00	.00	.00
	2	-6.51	.00	-.25	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
196	1	-6.57	.00	-.08	.00	.00	.00
	2	-6.59	.00	-.07	.00	.00	.00
204	1	-6.58	.00	-.09	.00	.00	.00
	2	-6.60	.00	-.08	.00	.00	.00
212	1	-6.59	.00	-.12	.00	.00	.00
	2	-6.61	.00	-.11	.00	.00	.00
220	1	-6.60	.00	-.15	.00	.00	.00
	2	-6.62	.00	-.14	.00	.00	.00
228	1	-6.60	.00	-.19	.00	.00	.00
	2	-6.62	.00	-.17	.00	.00	.00
236	1	-6.60	.00	-.22	.00	.00	.00
	2	-6.62	.00	-.21	.00	.00	.00
244	1	-6.59	.00	-.25	.00	.00	.00
	2	-6.61	.00	-.24	.00	.00	.00
252	1	-6.57	.00	-.27	.00	.00	.00
	2	-6.60	.00	-.25	.00	.00	.00
5	1	-12.79	.00	-.24	.00	.00	.00
	2	-12.85	.00	-.22	.00	.00	.00
13	1	-12.79	.00	-.26	.00	.00	.00
	2	-12.85	.00	-.24	.00	.00	.00
21	1	-12.79	.00	-.29	.00	.00	.00
	2	-12.85	.00	-.27	.00	.00	.00
29	1	-12.79	.00	-.31	.00	.00	.00
	2	-12.85	.00	-.29	.00	.00	.00
37	1	-12.78	.00	-.34	.00	.00	.00
	2	-12.84	.00	-.32	.00	.00	.00
45	1	-12.78	.00	-.38	.00	.00	.00
	2	-12.84	.00	-.36	.00	.00	.00
53	1	-12.78	.00	-.42	.00	.00	.00
	2	-12.84	.00	-.40	.00	.00	.00
61	1	-12.78	.00	-.44	.00	.00	.00
	2	-12.84	.00	-.42	.00	.00	.00
69	1	-12.87	.00	-.20	.00	.00	.00
	2	-12.93	.00	-.18	.00	.00	.00
77	1	-12.85	.00	-.23	.00	.00	.00
	2	-12.91	.00	-.21	.00	.00	.00
85	1	-12.85	.00	-.27	.00	.00	.00
	2	-12.91	.00	-.25	.00	.00	.00
93	1	-12.85	.00	-.28	.00	.00	.00
	2	-12.91	.00	-.26	.00	.00	.00
101	1	-12.85	.00	-.32	.00	.00	.00
	2	-12.91	.00	-.30	.00	.00	.00
109	1	-12.85	.00	-.40	.00	.00	.00
	2	-12.91	.00	-.37	.00	.00	.00
117	1	-12.85	.00	-.45	.00	.00	.00
	2	-12.91	.00	-.43	.00	.00	.00
125	1	-12.86	.00	-.49	.00	.00	.00
	2	-12.92	.00	-.46	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
133	1	-13.06	.00	-.21	.00	.00	.00
	2	-13.12	.00	-.19	.00	.00	.00
141	1	-13.07	.00	-.23	.00	.00	.00
	2	-13.12	.00	-.21	.00	.00	.00
149	1	-13.08	.00	-.27	.00	.00	.00
	2	-13.13	.00	-.24	.00	.00	.00
157	1	-13.09	.00	-.30	.00	.00	.00
	2	-13.14	.00	-.28	.00	.00	.00
165	1	-13.09	.00	-.35	.00	.00	.00
	2	-13.15	.00	-.32	.00	.00	.00
173	1	-13.09	.00	-.40	.00	.00	.00
	2	-13.14	.00	-.38	.00	.00	.00
181	1	-13.07	.00	-.45	.00	.00	.00
	2	-13.13	.00	-.42	.00	.00	.00
189	1	-13.07	.00	-.47	.00	.00	.00
	2	-13.12	.00	-.44	.00	.00	.00
197	1	-13.19	.00	-.20	.00	.00	.00
	2	-13.24	.00	-.18	.00	.00	.00
205	1	-13.22	.00	-.22	.00	.00	.00
	2	-13.27	.00	-.20	.00	.00	.00
213	1	-13.23	.00	-.26	.00	.00	.00
	2	-13.29	.00	-.24	.00	.00	.00
221	1	-13.25	.00	-.31	.00	.00	.00
	2	-13.30	.00	-.28	.00	.00	.00
229	1	-13.25	.00	-.36	.00	.00	.00
	2	-13.30	.00	-.33	.00	.00	.00
237	1	-13.24	.00	-.41	.00	.00	.00
	2	-13.30	.00	-.39	.00	.00	.00
245	1	-13.23	.00	-.45	.00	.00	.00
	2	-13.28	.00	-.43	.00	.00	.00
253	1	-13.20	.00	-.47	.00	.00	.00
	2	-13.25	.00	-.45	.00	.00	.00
6	1	-21.14	.00	-.44	.00	.00	.00
	2	-21.23	.00	-.40	.00	.00	.00
14	1	-21.14	.00	-.47	.00	.00	.00
	2	-21.24	.00	-.43	.00	.00	.00
22	1	-21.15	.00	-.50	.00	.00	.00
	2	-21.24	.00	-.46	.00	.00	.00
30	1	-21.15	.00	-.52	.00	.00	.00
	2	-21.24	.00	-.48	.00	.00	.00
38	1	-21.15	.00	-.55	.00	.00	.00
	2	-21.24	.00	-.51	.00	.00	.00
46	1	-21.14	.00	-.60	.00	.00	.00
	2	-21.23	.00	-.56	.00	.00	.00
54	1	-21.13	.00	-.64	.00	.00	.00
	2	-21.23	.00	-.60	.00	.00	.00
62	1	-21.13	.00	-.66	.00	.00	.00
	2	-21.22	.00	-.62	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
70	1	-21.23	.00	-.39	.00	.00	.00
	2	-21.32	.00	-.35	.00	.00	.00
78	1	-21.22	.00	-.43	.00	.00	.00
	2	-21.31	.00	-.39	.00	.00	.00
86	1	-21.23	.00	-.47	.00	.00	.00
	2	-21.32	.00	-.44	.00	.00	.00
94	1	-21.23	.00	-.49	.00	.00	.00
	2	-21.32	.00	-.45	.00	.00	.00
102	1	-21.23	.00	-.53	.00	.00	.00
	2	-21.32	.00	-.50	.00	.00	.00
110	1	-21.22	.00	-.62	.00	.00	.00
	2	-21.32	.00	-.58	.00	.00	.00
118	1	-21.22	.00	-.68	.00	.00	.00
	2	-21.31	.00	-.64	.00	.00	.00
126	1	-21.22	.00	-.72	.00	.00	.00
	2	-21.31	.00	-.68	.00	.00	.00
134	1	-21.46	.00	-.40	.00	.00	.00
	2	-21.54	.00	-.36	.00	.00	.00
142	1	-21.47	.00	-.42	.00	.00	.00
	2	-21.56	.00	-.38	.00	.00	.00
150	1	-21.49	.00	-.46	.00	.00	.00
	2	-21.58	.00	-.42	.00	.00	.00
158	1	-21.50	.00	-.50	.00	.00	.00
	2	-21.59	.00	-.46	.00	.00	.00
166	1	-21.51	.00	-.56	.00	.00	.00
	2	-21.59	.00	-.52	.00	.00	.00
174	1	-21.50	.00	-.63	.00	.00	.00
	2	-21.59	.00	-.59	.00	.00	.00
182	1	-21.48	.00	-.68	.00	.00	.00
	2	-21.57	.00	-.64	.00	.00	.00
190	1	-21.46	.00	-.70	.00	.00	.00
	2	-21.55	.00	-.66	.00	.00	.00
198	1	-21.60	.00	-.39	.00	.00	.00
	2	-21.69	.00	-.35	.00	.00	.00
206	1	-21.64	.00	-.41	.00	.00	.00
	2	-21.72	.00	-.37	.00	.00	.00
214	1	-21.67	.00	-.45	.00	.00	.00
	2	-21.75	.00	-.42	.00	.00	.00
222	1	-21.69	.00	-.51	.00	.00	.00
	2	-21.77	.00	-.47	.00	.00	.00
230	1	-21.69	.00	-.57	.00	.00	.00
	2	-21.78	.00	-.53	.00	.00	.00
238	1	-21.68	.00	-.64	.00	.00	.00
	2	-21.76	.00	-.60	.00	.00	.00
246	1	-21.65	.00	-.69	.00	.00	.00
	2	-21.74	.00	-.65	.00	.00	.00
254	1	-21.62	.00	-.71	.00	.00	.00
	2	-21.70	.00	-.67	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
7	1	-26.09	.00	-.60	.00	.00	.00
	2	-26.20	.00	-.55	.00	.00	.00
15	1	-26.11	.00	-.61	.00	.00	.00
	2	-26.22	.00	-.57	.00	.00	.00
23	1	-26.13	.00	-.63	.00	.00	.00
	2	-26.24	.00	-.59	.00	.00	.00
31	1	-26.14	.00	-.65	.00	.00	.00
	2	-26.25	.00	-.60	.00	.00	.00
39	1	-26.13	.00	-.66	.00	.00	.00
	2	-26.24	.00	-.62	.00	.00	.00
47	1	-26.12	.00	-.69	.00	.00	.00
	2	-26.23	.00	-.64	.00	.00	.00
55	1	-26.11	.00	-.72	.00	.00	.00
	2	-26.21	.00	-.67	.00	.00	.00
63	1	-26.00	.00	-.74	.00	.00	.00
	2	-26.19	.00	-.69	.00	.00	.00
71	1	-26.16	.00	-.55	.00	.00	.00
	2	-26.27	.00	-.51	.00	.00	.00
79	1	-26.17	.00	-.58	.00	.00	.00
	2	-26.28	.00	-.53	.00	.00	.00
87	1	-26.19	.00	-.61	.00	.00	.00
	2	-26.30	.00	-.57	.00	.00	.00
95	1	-26.20	.00	-.62	.00	.00	.00
	2	-26.31	.00	-.58	.00	.00	.00
103	1	-26.20	.00	-.65	.00	.00	.00
	2	-26.31	.00	-.61	.00	.00	.00
111	1	-26.19	.00	-.71	.00	.00	.00
	2	-26.30	.00	-.67	.00	.00	.00
119	1	-26.17	.00	-.76	.00	.00	.00
	2	-26.28	.00	-.71	.00	.00	.00
127	1	-26.16	.00	-.78	.00	.00	.00
	2	-26.26	.00	-.74	.00	.00	.00
135	1	-26.32	.00	-.55	.00	.00	.00
	2	-26.43	.00	-.50	.00	.00	.00
143	1	-26.35	.00	-.57	.00	.00	.00
	2	-26.46	.00	-.52	.00	.00	.00
151	1	-26.38	.00	-.60	.00	.00	.00
	2	-26.48	.00	-.55	.00	.00	.00
159	1	-26.39	.00	-.63	.00	.00	.00
	2	-26.50	.00	-.58	.00	.00	.00
167	1	-26.40	.00	-.67	.00	.00	.00
	2	-26.50	.00	-.63	.00	.00	.00
175	1	-26.38	.00	-.73	.00	.00	.00
	2	-26.49	.00	-.68	.00	.00	.00
183	1	-26.36	.00	-.76	.00	.00	.00
	2	-26.46	.00	-.72	.00	.00	.00
191	1	-26.33	.00	-.78	.00	.00	.00
	2	-26.43	.00	-.73	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
199	1	-26.43	.00	-.54	.00	.00	.00
	2	-26.53	.00	-.49	.00	.00	.00
207	1	-26.47	.00	-.55	.00	.00	.00
	2	-26.57	.00	-.51	.00	.00	.00
215	1	-26.50	.00	-.59	.00	.00	.00
	2	-26.60	.00	-.54	.00	.00	.00
223	1	-26.52	.00	-.63	.00	.00	.00
	2	-26.62	.00	-.59	.00	.00	.00
231	1	-26.52	.00	-.68	.00	.00	.00
	2	-26.62	.00	-.64	.00	.00	.00
239	1	-26.51	.00	-.73	.00	.00	.00
	2	-26.61	.00	-.69	.00	.00	.00
247	1	-26.47	.00	-.77	.00	.00	.00
	2	-26.58	.00	-.73	.00	.00	.00
255	1	-26.43	.00	-.79	.00	.00	.00
	2	-26.54	.00	-.74	.00	.00	.00

********** END OF LATEST ANALYSIS RESULT **********

77. PRINT MEMBER FORCES LIST 7 TO 224 BY 7

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
7	1	7	-59.08	60.73	-1.19	.00	-.24	-57.17
		8	59.08	-60.73	1.19	.00	2.62	178.62
	2	7	-59.86	61.00	-1.08	.00	-.14	-57.52
		8	59.86	-61.00	1.08	.00	2.30	179.52
14	1	15	-42.10	60.72	-1.28	.00	-.56	-56.94
		16	42.10	-60.72	1.28	.00	3.12	178.38
	2	15	-43.18	61.00	-1.17	.00	-.46	-57.30
		16	43.18	-61.00	1.17	.00	2.80	179.29
21	1	23	-30.18	60.73	-1.39	.00	-.95	-56.79
		24	30.18	-60.73	1.39	.00	3.72	178.24
	2	23	-31.50	61.00	-1.28	.00	-.84	-57.15
		24	31.50	-61.00	1.28	.00	3.40	179.15
28	1	31	-22.41	60.72	-1.47	.00	-1.25	-56.69
		32	22.41	-60.72	1.47	.00	4.18	178.13
	2	31	-23.98	61.00	-1.36	.00	-1.15	-57.06
		32	23.98	-61.00	1.36	.00	3.87	179.05
35	1	39	-18.69	60.70	-1.59	.00	-1.67	-56.62
		40	18.69	-60.70	1.59	.00	4.84	178.02
	2	39	-20.52	60.98	-1.48	.00	-1.57	-56.99
		40	20.52	-60.98	1.48	.00	4.52	178.95
42	1	47	-21.22	60.69	-1.75	.00	-2.27	-56.66
		48	21.22	-60.69	1.75	.00	5.78	178.03
	2	47	-23.16	60.96	-1.64	.00	-2.14	-57.03
		48	23.16	-60.96	1.64	.00	5.42	178.96
49	1	55	-30.85	60.68	-1.91	.00	-2.81	-56.80
		56	30.85	-60.68	1.91	.00	6.62	178.16
	2	55	-32.72	60.96	-1.79	.00	-2.67	-57.17
		56	32.72	-60.96	1.79	.00	6.25	179.09
56	1	63	-46.05	60.68	-2.00	.00	-3.12	-57.02
		64	46.05	-60.68	2.00	.00	7.12	178.39
	2	63	-47.75	60.96	-1.88	.00	-2.98	-57.38
		64	47.75	-60.96	1.88	.00	6.74	179.30
63	1	71	106.26	61.06	-1.01	.00	.24	-58.20
		72	-106.26	-61.06	1.01	.00	1.77	180.32
	2	71	104.50	61.33	-.90	.00	.33	-58.55
		72	-104.50	-61.33	.90	.00	1.47	181.21

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
70	1	79	129.23	60.99	-1.15	.00	-.24	-57.77
		80	-129.23	-60.99	1.15	.00	2.54	179.75
	2	79	127.07	61.27	-1.05	.00	-.14	-58.12
		80	-127.07	-61.27	1.05	.00	2.23	180.65
77	1	87	143.80	61.00	-1.32	.00	-.76	-57.62
		88	-143.80	-61.00	1.32	.00	3.39	179.61
	2	87	141.37	61.27	-1.21	.00	-.66	-57.98
		88	-141.37	-61.27	1.21	.00	3.08	180.52
84	1	95	153.24	61.01	-1.35	.00	-.89	-57.55
		96	-153.24	-61.01	1.35	.00	3.60	179.57
	2	95	150.51	61.28	-1.25	.00	-.81	-57.92
		96	-150.51	-61.28	1.25	.00	3.31	180.47
91	1	103	158.14	61.00	-1.52	.00	-1.42	-57.55
		104	-158.14	-61.00	1.52	.00	4.46	179.56
	2	103	155.07	61.28	-1.42	.00	-1.34	-57.91
		104	-155.07	-61.28	1.42	.00	4.17	180.47
98	1	111	154.74	60.99	-1.83	.00	-2.43	-57.59
		112	-154.74	-60.99	1.83	.00	6.08	179.57
	2	111	151.56	61.26	-1.71	.00	-2.30	-57.95
		112	-151.56	-61.26	1.71	.00	5.72	180.48
105	1	119	142.09	60.97	-2.04	.00	-3.13	-57.70
		120	-142.09	-60.97	2.04	.00	7.21	179.65
	2	119	139.03	61.25	-1.92	.00	-2.99	-58.06
		120	-139.03	-61.25	1.92	.00	6.83	180.56
112	1	127	121.08	61.02	-2.18	.00	-3.59	-58.10
		128	-121.08	-61.02	2.18	.00	7.96	180.15
	2	127	118.28	61.30	-2.06	.00	-3.45	-58.45
		128	-118.28	-61.30	2.06	.00	7.56	181.05
119	1	135	240.63	61.87	-1.06	.00	-.06	-60.80
		136	-240.63	-61.87	1.06	.00	2.18	184.63
	2	135	238.28	62.13	-.96	.00	.03	-61.19
		136	-238.28	-62.13	.96	.00	1.88	185.45
126	1	143	261.81	61.91	-1.14	.00	-.29	-60.78
		144	-261.81	-61.91	1.14	.00	2.57	184.59
	2	143	259.08	62.17	-1.03	.00	-.19	-61.09
		144	-259.08	-62.17	1.03	.00	2.25	185.42
133	1	151	277.65	61.96	-1.27	.00	-.70	-60.78
		152	-277.65	-61.96	1.27	.00	3.24	184.69

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	2	151	274.61	62.22	-1.17	.00	-.60	-61.09
		152	-274.61	-62.22	1.17	.00	2.93	185.52
140	1	159	287.78	61.99	-1.41	.00	-1.09	-60.81
		160	-287.78	-61.99	1.41	.00	3.91	184.80
	2	159	284.43	62.25	-1.30	.00	-1.00	-61.12
		160	-284.43	-62.25	1.30	.00	3.60	185.62
147	1	167	291.54	62.01	-1.61	.00	-1.68	-60.86
		168	-291.54	-62.01	1.61	.00	4.89	184.87
	2	167	287.93	62.26	-1.50	.00	-1.58	-61.16
		168	-287.93	-62.26	1.50	.00	4.57	185.69
154	1	175	287.11	61.98	-1.84	.00	-2.42	-60.87
		176	-287.11	-61.98	1.84	.00	6.11	184.83
	2	175	283.41	62.24	-1.73	.00	-2.30	-61.17
		176	-283.41	-62.24	1.73	.00	5.76	185.65
161	1	183	274.62	61.93	-2.02	.00	-2.96	-60.85
		184	-274.62	-61.93	2.02	.00	7.00	184.71
	2	183	271.00	62.19	-1.90	.00	-2.83	-61.15
		184	-271.00	-62.19	1.90	.00	6.63	185.52
168	1	191	256.49	61.89	-2.10	.00	-3.21	-60.93
		192	-256.49	-61.89	2.10	.00	7.41	184.70
	2	191	253.04	62.14	-1.98	.00	-3.07	-61.23
		192	-253.04	-62.14	1.98	.00	7.03	185.52
175	1	199	340.51	62.41	-1.02	.00	.01	-62.71
		200	-340.51	-62.41	1.02	.00	2.03	187.54
	2	199	338.18	62.66	-.92	.00	.11	-62.98
		200	-338.18	-62.66	.92	.00	1.72	188.30
182	1	207	360.40	62.52	-1.10	.00	-.22	-62.87
		208	-360.40	-62.52	1.10	.00	2.42	187.91
	2	207	357.73	62.77	-.99	.00	-.12	-63.14
		208	-357.73	-62.77	.99	.00	2.11	188.67
189	1	215	375.70	62.61	-1.26	.00	-.68	-63.00
		216	-375.70	-62.61	1.26	.00	3.19	188.21
	2	215	372.73	62.85	-1.15	.00	-.58	-63.26
		216	-372.73	-62.85	1.15	.00	2.87	188.97
196	1	223	385.08	62.67	-1.44	.00	-1.22	-63.09
		224	-385.08	-62.67	1.44	.00	4.11	188.43
	2	223	381.86	62.91	-1.33	.00	-1.12	-63.36
		224	-381.86	-62.91	1.33	.00	3.78	189.17

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
203	1	231	387.84	62.68	-1.66	.00	-1.85	-63.16
		232	-387.84	-62.68	1.66	.00	5.16	188.53
	2	231	384.42	62.93	-1.54	.00	-1.74	-63.42
		232	-384.42	-62.93	1.54	.00	4.83	189.27
210	1	239	383.13	62.65	-1.88	.00	-2.51	-63.14
		240	-383.13	-62.65	1.88	.00	6.27	188.44
	2	239	379.64	62.89	-1.76	.00	-2.38	-63.39
		240	-379.64	-62.89	1.76	.00	5.91	189.18
217	1	247	371.29	62.57	-2.06	.00	-3.03	-63.02
		248	-371.29	-62.57	2.06	.00	7.14	188.15
	2	247	367.85	62.81	-1.94	.00	-2.90	-63.28
		248	-367.85	-62.81	1.94	.00	6.78	188.89
224	1	255	354.67	62.46	-2.13	.00	-3.26	-62.85
		256	-354.67	-62.46	2.13	.00	7.52	187.77
	2	255	351.35	62.70	-2.01	.00	-3.12	-63.11
		256	-351.35	-62.70	2.01	.00	7.15	188.52

********** END OF LATEST ANALYSIS RESULT **********

78. PRINT MEMBER FORCES LIST 6 TO 223 BY 7

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
6	1	6	-59.08	34.63	-.59	.00	.94	12.10
		7	59.08	-34.63	.59	.00	.24	57.17
	2	6	-59.86	34.80	-.53	.00	.91	12.08
		7	59.86	-34.80	.53	.00	.14	57.52
13	1	14	-42.10	34.61	-.67	.00	.77	12.28
		15	42.10	-34.61	.67	.00	.56	56.94
	2	14	-43.18	34.77	-.60	.00	.75	12.25
		15	43.18	-34.77	.60	.00	.46	57.30
20	1	22	-30.18	34.60	-.76	.00	.56	12.40
		23	30.18	-34.60	.76	.00	.95	56.79
	2	22	-31.50	34.76	-.69	.00	.54	12.37
		23	31.50	-34.76	.69	.00	.84	57.15
27	1	30	-22.41	34.58	-.82	.00	.40	12.48
		31	22.41	-34.58	.82	.00	1.25	56.69
	2	30	-23.98	34.75	-.76	.00	.38	12.45
		31	23.98	-34.75	.76	.00	1.15	57.06
34	1	38	-18.69	34.57	-.92	.00	.17	12.51
		39	18.69	-34.57	.92	.00	1.67	56.62
	2	38	-20.52	34.74	-.86	.00	.15	12.48
		39	20.52	-34.74	.86	.00	1.57	56.99
41	1	46	-21.22	34.56	-1.06	.00	-.15	12.47
		47	21.22	-34.56	1.06	.00	2.27	56.65
	2	46	-23.16	34.73	-.99	.00	-.16	12.44
		47	23.16	-34.73	.99	.00	2.14	57.03
48	1	54	-30.85	34.58	-1.19	.00	-.43	12.35
		55	30.85	-34.58	1.19	.00	2.81	56.80
	2	54	-32.72	34.74	-1.12	.00	-.43	12.32
		55	32.72	-34.74	1.12	.00	2.67	57.17
55	1	62	-46.05	34.60	-1.26	.00	-.60	12.18
		63	46.05	-34.60	1.26	.00	3.12	57.02
	2	62	-47.75	34.77	-1.19	.00	-.60	12.15
		63	47.75	-34.77	1.19	.00	2.98	57.39
62	1	70	106.26	34.89	-.46	.00	1.15	11.58
		71	-106.26	-34.89	.46	.00	-.24	58.20
	2	70	104.50	35.06	-.40	.00	1.13	11.56
		71	-104.50	-35.06	.40	.00	-.33	58.55

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
69	1	78	129.23	34.82	-.57	.00	.91	11.87
		79	-129.23	-34.82	.57	.00	.24	57.77
	2	78	127.07	34.99	-.51	.00	.88	11.85
		79	-127.07	-34.99	.51	.00	.14	58.12
76	1	86	143.80	34.81	-.70	.00	.64	12.00
		87	-143.80	-34.81	.70	.00	.76	57.62
	2	86	141.37	34.97	-.64	.00	.62	11.97
		87	-141.37	-34.97	.64	.00	.66	57.90
83	1	94	153.24	34.80	-.73	.00	.58	12.06
		95	-153.24	-34.80	.73	.00	.89	57.55
	2	94	150.51	34.97	-.68	.00	.55	12.03
		95	-150.51	-34.97	.68	.00	.81	57.91
90	1	102	158.14	34.80	-.87	.00	.31	12.06
		103	-158.14	-34.80	.87	.00	1.42	57.55
	2	102	155.07	34.97	-.81	.00	.28	12.03
		103	-155.07	-34.97	.81	.00	1.34	57.91
97	1	110	154.75	34.80	-1.11	.00	-.21	12.01
		111	-154.75	-34.80	1.11	.00	2.43	57.59
	2	110	151.56	34.97	-1.04	.00	-.22	11.98
		111	-151.56	-34.97	1.04	.00	2.30	57.95
104	1	118	142.09	34.80	-1.28	.00	-.57	11.91
		119	-142.09	-34.80	1.28	.00	3.13	57.70
	2	118	139.03	34.97	-1.21	.00	-.57	11.88
		119	-139.03	-34.97	1.21	.00	2.99	58.06
111	1	126	121.08	34.87	-1.40	.00	-.80	11.64
		127	-121.08	-34.87	1.40	.00	3.59	58.10
	2	126	118.28	35.03	-1.32	.00	-.80	11.61
		127	-118.28	-35.03	1.32	.00	3.45	58.45
118	1	134	240.63	35.55	-.51	.00	.96	10.22
		135	-240.63	-35.55	.51	.00	.06	60.88
	2	134	238.28	35.70	-.45	.00	.94	10.22
		135	-238.28	-35.70	.45	.00	-.03	61.19
125	1	142	261.81	35.56	-.57	.00	.85	10.33
		143	-261.81	-35.56	.57	.00	.29	60.78
	2	142	259.08	35.71	-.51	.00	.83	10.33
		143	-259.08	-35.71	.51	.00	.19	61.09
132	1	150	277.65	35.58	-.68	.00	.65	10.38
		151	-277.65	-35.58	.68	.00	.70	60.78

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	2	150	274.61	35.73	-.61	.00	.63	10.38
		151	-274.61	-35.73	.61	.00	.60	61.09
139	1	158	287.78	35.60	-.78	.00	.47	10.39
		159	-287.78	-35.60	.78	.00	1.09	60.81
	2	158	284.43	35.75	-.72	.00	.44	10.39
		159	-284.43	-35.75	.72	.00	1.00	61.12
146	1	166	291.54	35.61	-.93	.00	.18	10.37
		167	-291.54	-35.61	.93	.00	1.68	60.86
	2	166	287.93	35.76	-.87	.00	.16	10.37
		167	-287.93	-35.76	.87	.00	1.58	61.16
153	1	174	287.11	35.60	-1.12	.00	-.18	10.33
		175	-287.11	-35.60	1.12	.00	2.42	60.87
	2	174	283.41	35.75	-1.05	.00	-.19	10.34
		175	-283.41	-35.75	1.05	.00	2.30	61.17
160	1	182	274.62	35.57	-1.26	.00	-.45	10.30
		183	-274.62	-35.57	1.26	.00	2.96	60.85
	2	182	270.99	35.73	-1.19	.00	-.45	10.30
		183	-270.99	-35.73	1.19	.00	2.83	61.15
167	1	190	256.49	35.56	-1.32	.00	-.57	10.19
		191	-256.49	-35.56	1.32	.00	3.21	60.93
	2	190	253.04	35.71	-1.25	.00	-.57	10.19
		191	-253.04	-35.71	1.25	.00	3.07	61.23
174	1	198	340.50	35.99	-.49	.00	.98	9.27
		199	-340.50	-35.99	.49	.00	-.01	62.71
	2	198	338.18	36.13	-.43	.00	.96	9.29
		199	-338.18	-36.13	.43	.00	-.11	62.98
181	1	206	360.40	36.06	-.55	.00	.87	9.24
		207	-360.40	-36.06	.55	.00	.22	62.87
	2	206	357.73	36.20	-.49	.00	.85	9.26
		207	-357.73	-36.20	.49	.00	.12	63.14
188	1	214	375.70	36.11	-.67	.00	.65	9.22
		215	-375.70	-36.11	.67	.00	.68	63.00
	2	214	372.73	36.25	-.60	.00	.63	9.25
		215	-372.73	-36.25	.60	.00	.58	63.26
195	1	222	385.08	36.15	-.81	.00	.39	9.20
		223	-385.08	-36.15	.81	.00	1.22	63.09
	2	222	381.86	36.29	-.75	.00	.38	9.22
		223	-381.86	-36.29	.75	.00	1.12	63.36

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
202	1	230	387.84	36.16	-.97	.00	.10	9.17
		231	-387.84	-36.16	.97	.00	1.85	63.16
	2	230	384.43	36.30	-.91	.00	.08	9.19
		231	-384.43	-36.30	.91	.00	1.74	63.42
209	1	238	383.13	36.14	-1.14	.00	-.22	9.15
		239	-383.13	-36.14	1.14	.00	2.51	63.13
	2	238	379.64	36.29	-1.08	.00	-.23	9.18
		239	-379.64	-36.29	1.08	.00	2.38	63.39
216	1	246	371.29	36.09	-1.28	.00	-.47	9.17
		247	-371.29	-36.09	1.28	.00	3.03	63.02
	2	246	367.85	36.23	-1.21	.00	-.48	9.19
		247	-367.85	-36.23	1.21	.00	2.90	63.28
223	1	254	354.67	36.02	-1.34	.00	-.58	9.19
		255	-354.67	-36.02	1.34	.00	3.26	62.85
	2	254	351.35	36.17	-1.27	.00	-.59	9.22
		255	-351.35	-36.17	1.27	.00	3.12	63.11

********** END OF LATEST ANALYSIS RESULT **********

79. FINISH

********** END OF STAAD-III **********

**** DATE= SEP 6,2002 TIME= 12:32:40 ****


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*****************************************************
*                                                   *
*          S T A A D - III                          *
*          Revision 22.3                            *
*          Proprietary.Program of                   *
*          Research Engineers, Inc.                 *
*          Date=    SEP  6, 2002                    *
*          Time=    12:32:35                        *
*                                                   *
*                                                   *
*****************************************************
```

1. STAAD SPACE 'ESTRIBO 1 ENCEPADO PILOTES DE 1.00 ROTURA'
2. UNIT METER MTON
3. JOINT COORDINATES
4. 1 0.00 -14.00 0.00 8 0.00 0.00 0.00
5. REPEAT 7 0.00 0.00 2.50
6. REPEAT ALL 3 2.50 0.00 0.00
7. 257 5.00 3.00 0.00 264 5.00 3.00 17.50
8. MEMBER INCIDENCES
9. 1 1 2 7 1 1
10. REPEAT 7 7 8
11. REPEAT ALL 3 56 64
12. 2001 8 16 2007 1 8
13. REPEAT ALL 3 7 64
14. 2029 8 72 2031 1 64
15. REPEAT ALL 7 3 8
16. 2053 257 258 2059 1 1
17. 2060 136 257
18. 2061 144 258
19. 2062 152 259
20. 2063 160 260
21. 2064 168 261
22. 2065 176 262
23. 2066 184 263
24. 2067 192 264
25. MEMBER PROPERTY PRISMATIC
26. 1 TO 224 PRI YD 1.000
27. 2001 TO 2007 2022 TO 2028 PRI YD 2.500 ZD 2.750
28. 2008 TO 2014 PRI YD 2.500 ZD 3.500
29. 2015 TO 2021 PRI YD 4.000 ZD 3.500
30. 2029 TO 2031 2050 TO 2052 PRI YD 2.500 ZD 2.500
31. 2032 TO 2049 PRI YD 2.500 ZD 2.500
32. 2053 TO 2059 PRI YD 3.000 ZD 2.000
33. 2060 TO 2067 PRI YD 2.000 ZD 2.500
34. CONSTANT
35. E 2.64E6 MEM 2001 TO 2052
36. E 2.64E6 MEM 2053 TO 2067
37. E 2.64E6 MEM 1 TO 224
38. POISSON .2 ALL
39. SUPPORT
40. 1 TO 249 BY 8 FIXED BUT MX MY MZ KFX 2500. KFZ 2500.
41. 2 TO 250 BY 8 FIXED BUT FY MX MY MZ KFX 5000. KFZ 4168.

42. 3 TO 251 BY 8 FIXED BUT FY MX MY MZ KFX 3335. KFZ 1670.
43. 4 TO 252 BY 8 FIXED BUT FY MX MY MZ KFX 1670. KFZ 1670.
44. 5 TO 253 BY 8 FIXED BUT FY MX MY MZ KFX 1670. KFZ 1670.
45. 6 TO 254 BY 8 FIXED BUT FY MX MY MZ KFX 1670. KFZ 1670.
46. 7 TO 255 BY 8 FIXED BUT FY MX MY MZ KFX 1461. KFZ 1461.
47. LOAD 1
48. *CARGAS SOBRE ENCEPADO H3
49. MEMBER LOAD
50. 2008 TO 2021 UNI GY -177.70
51. 2008 TO 2021 UNI GX 77.38
52. 2008 TO 2021 UMO GZ -326.10
53. JOINT LOAD
54. 96 104 160 168 FZ 18.74
55. 96 104 160 168 MX 304.44
56. *PESO PROPIO DEL ENCEPADO
57. MEMBER LOAD
58. 2001 TO 2007 2022 TO 2028 UNI GY -19.286
59. 2008 TO 2021 UNI GY -24.107
60. LOAD 2
61. *CARGAS SOBRE ENCEPADO H5
62. MEMBER LOAD
63. 2008 TO 2021 UNI GY -174.10
64. 2008 TO 2021 UNI GX 77.74
65. 2008 TO 2021 UMO GZ -322.63
66. JOINT LOAD
67. 96 104 160 168 FZ 17.39
68. 96 104 160 168 MX 283.22
69. *PESO PROPIO DEL ENCEPADO
70. MEMBER LOAD
71. 2001 TO 2007 2022 TO 2028 UNI GY -19.286
72. 2008 TO 2021 UNI GY -24.107
73. PERFORM ANALYSIS

P R O B L E M S T A T I S T I C S

NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS = 264/ 291/ 224
ORIGINAL/FINAL BAND-WIDTH = 121/ 31
TOTAL PRIMARY LOAD CASES = 2, TOTAL DEGREES OF FREEDOM = 1552
SIZE OF STIFFNESS MATRIX = 294880 DOUBLE PREC. WORDS
REQRD/AVAIL. DISK SPACE = 14.03/ 2047.7 MB, EXMEM = 1948.3 MB

++ Processing Element Stiffness Matrix. 12:32:35
++ Processing Global Stiffness Matrix. 12:32:35
++ Processing Triangular Factorization. 12:32:35
++ Calculating Joint Displacements. 12:32:35
++ Calculating Member Forces. 12:32:35

74. PLOT BENDING FILE
75. *PRINT ANALYSIS RESULTS
76. PRINT SUPPORT REACTIONS

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
1	1	7.54	-106.63	.18	.00	.00	.00
	2	7.58	-107.81	.17	.00	.00	.00
9	1	7.54	-85.45	.19	.00	.00	.00
	2	7.58	-87.06	.17	.00	.00	.00
17	1	7.54	-70.56	.20	.00	.00	.00
	2	7.58	-72.53	.18	.00	.00	.00
25	1	7.54	-60.36	.20	.00	.00	.00
	2	7.58	-62.72	.19	.00	.00	.00
33	1	7.54	-54.79	.21	.00	.00	.00
	2	7.58	-57.54	.19	.00	.00	.00
41	1	7.54	-57.12	.22	.00	.00	.00
	2	7.58	-60.03	.21	.00	.00	.00
49	1	7.54	-68.58	.23	.00	.00	.00
	2	7.57	-71.37	.22	.00	.00	.00
57	1	7.54	-87.09	.24	.00	.00	.00
	2	7.57	-89.64	.22	.00	.00	.00
65	1	7.57	126.25	.16	.00	.00	.00
	2	7.60	123.60	.15	.00	.00	.00
73	1	7.56	155.72	.18	.00	.00	.00
	2	7.60	152.49	.16	.00	.00	.00
81	1	7.56	174.44	.19	.00	.00	.00
	2	7.60	170.81	.17	.00	.00	.00
89	1	7.57	187.12	.19	.00	.00	.00
	2	7.60	183.03	.18	.00	.00	.00
97	1	7.56	194.48	.20	.00	.00	.00
	2	7.60	189.88	.19	.00	.00	.00
105	1	7.56	190.87	.23	.00	.00	.00
	2	7.60	186.09	.21	.00	.00	.00
113	1	7.56	175.01	.25	.00	.00	.00
	2	7.60	170.42	.23	.00	.00	.00
121	1	7.57	148.48	.26	.00	.00	.00
	2	7.60	144.27	.24	.00	.00	.00
129	1	7.65	319.83	.17	.00	.00	.00
	2	7.68	316.31	.15	.00	.00	.00
137	1	7.65	347.79	.17	.00	.00	.00
	2	7.68	343.69	.16	.00	.00	.00
145	1	7.66	368.81	.18	.00	.00	.00
	2	7.69	364.24	.17	.00	.00	.00
153	1	7.66	382.59	.19	.00	.00	.00
	2	7.69	377.57	.18	.00	.00	.00
161	1	7.66	388.24	.21	.00	.00	.00
	2	7.70	382.82	.20	.00	.00	.00
169	1	7.66	383.00	.23	.00	.00	.00
	2	7.69	377.44	.22	.00	.00	.00
177	1	7.65	367.00	.25	.00	.00	.00
	2	7.69	361.56	.23	.00	.00	.00
185	1	7.65	343.63	.25	.00	.00	.00
	2	7.68	338.44	.24	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
193	1	7.70	469.17	.16	.00	.00	.00
	2	7.73	465.68	.15	.00	.00	.00
201	1	7.71	495.95	.17	.00	.00	.00
	2	7.75	491.94	.15	.00	.00	.00
209	1	7.72	516.66	.18	.00	.00	.00
	2	7.75	512.20	.17	.00	.00	.00
217	1	7.73	529.58	.20	.00	.00	.00
	2	7.76	524.74	.18	.00	.00	.00
225	1	7.73	533.72	.22	.00	.00	.00
	2	7.76	528.59	.20	.00	.00	.00
233	1	7.73	527.81	.24	.00	.00	.00
	2	7.76	522.57	.22	.00	.00	.00
241	1	7.72	512.29	.25	.00	.00	.00
	2	7.75	507.13	.24	.00	.00	.00
249	1	7.71	490.42	.26	.00	.00	.00
	2	7.74	485.43	.24	.00	.00	.00
2	1	5.11	.00	.13	.00	.00	.00
	2	5.13	.00	.13	.00	.00	.00
10	1	5.13	.00	.13	.00	.00	.00
	2	5.15	.00	.12	.00	.00	.00
18	1	5.14	.00	.12	.00	.00	.00
	2	5.15	.00	.11	.00	.00	.00
26	1	5.14	.00	.11	.00	.00	.00
	2	5.16	.00	.10	.00	.00	.00
34	1	5.14	.00	.10	.00	.00	.00
	2	5.16	.00	.09	.00	.00	.00
42	1	5.14	.00	.08	.00	.00	.00
	2	5.16	.00	.07	.00	.00	.00
50	1	5.13	.00	.06	.00	.00	.00
	2	5.15	.00	.06	.00	.00	.00
58	1	5.12	.00	.06	.00	.00	.00
	2	5.13	.00	.05	.00	.00	.00
66	1	5.10	.00	.14	.00	.00	.00
	2	5.12	.00	.14	.00	.00	.00
74	1	5.12	.00	.13	.00	.00	.00
	2	5.14	.00	.12	.00	.00	.00
82	1	5.13	.00	.12	.00	.00	.00
	2	5.15	.00	.11	.00	.00	.00
90	1	5.13	.00	.12	.00	.00	.00
	2	5.15	.00	.11	.00	.00	.00
98	1	5.13	.00	.10	.00	.00	.00
	2	5.15	.00	.10	.00	.00	.00
106	1	5.13	.00	.08	.00	.00	.00
	2	5.15	.00	.07	.00	.00	.00
114	1	5.12	.00	.06	.00	.00	.00
	2	5.14	.00	.05	.00	.00	.00
122	1	5.10	.00	.05	.00	.00	.00
	2	5.12	.00	.04	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
130	1	5.06	.00	.13	.00	.00	.00
	2	5.08	.00	.12	.00	.00	.00
138	1	5.07	.00	.13	.00	.00	.00
	2	5.09	.00	.12	.00	.00	.00
146	1	5.08	.00	.12	.00	.00	.00
	2	5.10	.00	.11	.00	.00	.00
154	1	5.08	.00	.11	.00	.00	.00
	2	5.10	.00	.10	.00	.00	.00
162	1	5.08	.00	.10	.00	.00	.00
	2	5.10	.00	.09	.00	.00	.00
170	1	5.08	.00	.08	.00	.00	.00
	2	5.10	.00	.07	.00	.00	.00
178	1	5.07	.00	.07	.00	.00	.00
	2	5.09	.00	.06	.00	.00	.00
186	1	5.06	.00	.06	.00	.00	.00
	2	5.08	.00	.06	.00	.00	.00
194	1	5.03	.00	.13	.00	.00	.00
	2	5.05	.00	.12	.00	.00	.00
202	1	5.04	.00	.13	.00	.00	.00
	2	5.06	.00	.12	.00	.00	.00
210	1	5.04	.00	.12	.00	.00	.00
	2	5.06	.00	.11	.00	.00	.00
218	1	5.04	.00	.11	.00	.00	.00
	2	5.06	.00	.10	.00	.00	.00
226	1	5.04	.00	.09	.00	.00	.00
	2	5.06	.00	.09	.00	.00	.00
234	1	5.04	.00	.08	.00	.00	.00
	2	5.06	.00	.07	.00	.00	.00
242	1	5.03	.00	.07	.00	.00	.00
	2	5.05	.00	.06	.00	.00	.00
250	1	5.03	.00	.06	.00	.00	.00
	2	5.05	.00	.06	.00	.00	.00
3	1	-4.93	.00	-.03	.00	.00	.00
	2	-4.96	.00	-.03	.00	.00	.00
11	1	-4.91	.00	-.05	.00	.00	.00
	2	-4.94	.00	-.04	.00	.00	.00
19	1	-4.90	.00	-.06	.00	.00	.00
	2	-4.93	.00	-.05	.00	.00	.00
27	1	-4.89	.00	-.07	.00	.00	.00
	2	-4.93	.00	-.06	.00	.00	.00
35	1	-4.89	.00	-.09	.00	.00	.00
	2	-4.92	.00	-.08	.00	.00	.00
43	1	-4.89	.00	-.11	.00	.00	.00
	2	-4.92	.00	-.10	.00	.00	.00
51	1	-4.90	.00	-.13	.00	.00	.00
	2	-4.93	.00	-.12	.00	.00	.00
59	1	-4.91	.00	-.14	.00	.00	.00
	2	-4.95	.00	-.13	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
67	1	-4.99	.00	-.01	.00	.00	.00
	2	-5.02	.00	-.01	.00	.00	.00
75	1	-4.95	.00	-.03	.00	.00	.00
	2	-4.98	.00	-.03	.00	.00	.00
83	1	-4.94	.00	-.05	.00	.00	.00
	2	-4.97	.00	-.05	.00	.00	.00
91	1	-4.94	.00	-.05	.00	.00	.00
	2	-4.97	.00	-.05	.00	.00	.00
99	1	-4.94	.00	-.07	.00	.00	.00
	2	-4.97	.00	-.07	.00	.00	.00
107	1	-4.94	.00	-.12	.00	.00	.00
	2	-4.97	.00	-.11	.00	.00	.00
115	1	-4.95	.00	-.14	.00	.00	.00
	2	-4.98	.00	-.14	.00	.00	.00
123	1	-4.98	.00	-.16	.00	.00	.00
	2	-5.01	.00	-.15	.00	.00	.00
131	1	-5.16	.00	-.02	.00	.00	.00
	2	-5.18	.00	-.02	.00	.00	.00
139	1	-5.15	.00	-.03	.00	.00	.00
	2	-5.17	.00	-.03	.00	.00	.00
147	1	-5.15	.00	-.05	.00	.00	.00
	2	-5.17	.00	-.04	.00	.00	.00
155	1	-5.15	.00	-.06	.00	.00	.00
	2	-5.18	.00	-.06	.00	.00	.00
163	1	-5.15	.00	-.09	.00	.00	.00
	2	-5.18	.00	-.08	.00	.00	.00
171	1	-5.15	.00	-.12	.00	.00	.00
	2	-5.18	.00	-.11	.00	.00	.00
179	1	-5.15	.00	-.14	.00	.00	.00
	2	-5.18	.00	-.13	.00	.00	.00
187	1	-5.16	.00	-.15	.00	.00	.00
	2	-5.19	.00	-.14	.00	.00	.00
195	1	-5.28	.00	-.02	.00	.00	.00
	2	-5.31	.00	-.01	.00	.00	.00
203	1	-5.29	.00	-.03	.00	.00	.00
	2	-5.32	.00	-.02	.00	.00	.00
211	1	-5.30	.00	-.05	.00	.00	.00
	2	-5.32	.00	-.04	.00	.00	.00
219	1	-5.31	.00	-.07	.00	.00	.00
	2	-5.33	.00	-.06	.00	.00	.00
227	1	-5.31	.00	-.09	.00	.00	.00
	2	-5.34	.00	-.09	.00	.00	.00
235	1	-5.31	.00	-.12	.00	.00	.00
	2	-5.33	.00	-.11	.00	.00	.00
243	1	-5.30	.00	-.14	.00	.00	.00
	2	-5.33	.00	-.13	.00	.00	.00
251	1	-5.29	.00	-.15	.00	.00	.00
	2	-5.32	.00	-.14	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
4	1	-8.66	.00	-.17	.00	.00	.00
	2	-8.70	.00	-.16	.00	.00	.00
12	1	-8.65	.00	-.19	.00	.00	.00
	2	-8.69	.00	-.18	.00	.00	.00
20	1	-8.64	.00	-.22	.00	.00	.00
	2	-8.69	.00	-.20	.00	.00	.00
28	1	-8.64	.00	-.23	.00	.00	.00
	2	-8.69	.00	-.22	.00	.00	.00
36	1	-8.63	.00	-.26	.00	.00	.00
	2	-8.68	.00	-.24	.00	.00	.00
44	1	-8.63	.00	-.30	.00	.00	.00
	2	-8.68	.00	-.28	.00	.00	.00
52	1	-8.64	.00	-.34	.00	.00	.00
	2	-8.69	.00	-.32	.00	.00	.00
60	1	-8.65	.00	-.36	.00	.00	.00
	2	-8.69	.00	-.34	.00	.00	.00
68	1	-8.72	.00	-.13	.00	.00	.00
	2	-8.76	.00	-.12	.00	.00	.00
76	1	-8.69	.00	-.17	.00	.00	.00
	2	-8.74	.00	-.15	.00	.00	.00
84	1	-8.68	.00	-.20	.00	.00	.00
	2	-8.73	.00	-.18	.00	.00	.00
92	1	-8.68	.00	-.20	.00	.00	.00
	2	-8.73	.00	-.19	.00	.00	.00
100	1	-8.68	.00	-.24	.00	.00	.00
	2	-8.73	.00	-.22	.00	.00	.00
108	1	-8.68	.00	-.31	.00	.00	.00
	2	-8.73	.00	-.30	.00	.00	.00
116	1	-8.69	.00	-.36	.00	.00	.00
	2	-8.73	.00	-.34	.00	.00	.00
124	1	-8.71	.00	-.40	.00	.00	.00
	2	-8.76	.00	-.37	.00	.00	.00
132	1	-8.88	.00	-.15	.00	.00	.00
	2	-8.93	.00	-.13	.00	.00	.00
140	1	-8.88	.00	-.16	.00	.00	.00
	2	-8.92	.00	-.15	.00	.00	.00
148	1	-8.88	.00	-.19	.00	.00	.00
	2	-8.93	.00	-.18	.00	.00	.00
156	1	-8.89	.00	-.22	.00	.00	.00
	2	-8.93	.00	-.20	.00	.00	.00
164	1	-8.89	.00	-.26	.00	.00	.00
	2	-8.93	.00	-.25	.00	.00	.00
172	1	-8.89	.00	-.32	.00	.00	.00
	2	-8.93	.00	-.30	.00	.00	.00
180	1	-8.89	.00	-.36	.00	.00	.00
	2	-8.93	.00	-.34	.00	.00	.00
188	1	-8.89	.00	-.38	.00	.00	.00
	2	-8.93	.00	-.35	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
196	1	-9.01	.00	-.14	.00	.00	.00
	2	-9.05	.00	-.12	.00	.00	.00
204	1	-9.02	.00	-.16	.00	.00	.00
	2	-9.06	.00	-.14	.00	.00	.00
212	1	-9.03	.00	-.19	.00	.00	.00
	2	-9.07	.00	-.17	.00	.00	.00
220	1	-9.04	.00	-.23	.00	.00	.00
	2	-9.08	.00	-.21	.00	.00	.00
228	1	-9.05	.00	-.28	.00	.00	.00
	2	-9.09	.00	-.26	.00	.00	.00
236	1	-9.04	.00	-.33	.00	.00	.00
	2	-9.08	.00	-.31	.00	.00	.00
244	1	-9.03	.00	-.37	.00	.00	.00
	2	-9.07	.00	-.35	.00	.00	.00
252	1	-9.02	.00	-.38	.00	.00	.00
	2	-9.06	.00	-.36	.00	.00	.00
5	1	-17.61	.00	-.39	.00	.00	.00
	2	-17.70	.00	-.35	.00	.00	.00
13	1	-17.61	.00	-.42	.00	.00	.00
	2	-17.69	.00	-.38	.00	.00	.00
21	1	-17.60	.00	-.45	.00	.00	.00
	2	-17.69	.00	-.42	.00	.00	.00
29	1	-17.60	.00	-.47	.00	.00	.00
	2	-17.69	.00	-.44	.00	.00	.00
37	1	-17.59	.00	-.51	.00	.00	.00
	2	-17.68	.00	-.47	.00	.00	.00
45	1	-17.59	.00	-.56	.00	.00	.00
	2	-17.68	.00	-.52	.00	.00	.00
53	1	-17.59	.00	-.61	.00	.00	.00
	2	-17.68	.00	-.57	.00	.00	.00
61	1	-17.60	.00	-.64	.00	.00	.00
	2	-17.68	.00	-.60	.00	.00	.00
69	1	-17.70	.00	-.33	.00	.00	.00
	2	-17.79	.00	-.30	.00	.00	.00
77	1	-17.67	.00	-.38	.00	.00	.00
	2	-17.76	.00	-.34	.00	.00	.00
85	1	-17.67	.00	-.43	.00	.00	.00
	2	-17.76	.00	-.39	.00	.00	.00
93	1	-17.67	.00	-.43	.00	.00	.00
	2	-17.76	.00	-.40	.00	.00	.00
101	1	-17.67	.00	-.48	.00	.00	.00
	2	-17.75	.00	-.45	.00	.00	.00
109	1	-17.66	.00	-.59	.00	.00	.00
	2	-17.75	.00	-.55	.00	.00	.00
117	1	-17.66	.00	-.65	.00	.00	.00
	2	-17.75	.00	-.61	.00	.00	.00
125	1	-17.69	.00	-.70	.00	.00	.00
	2	-17.78	.00	-.66	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
133	1	-17.94	.00	-.35	.00	.00	.00
	2	-18.03	.00	-.31	.00	.00	.00
141	1	-17.95	.00	-.37	.00	.00	.00
	2	-18.03	.00	-.33	.00	.00	.00
149	1	-17.96	.00	-.41	.00	.00	.00
	2	-18.04	.00	-.38	.00	.00	.00
157	1	-17.97	.00	-.45	.00	.00	.00
	2	-18.05	.00	-.42	.00	.00	.00
165	1	-17.97	.00	-.51	.00	.00	.00
	2	-18.05	.00	-.48	.00	.00	.00
173	1	-17.97	.00	-.59	.00	.00	.00
	2	-18.05	.00	-.55	.00	.00	.00
181	1	-17.96	.00	-.65	.00	.00	.00
	2	-18.04	.00	-.61	.00	.00	.00
189	1	-17.95	.00	-.67	.00	.00	.00
	2	-18.03	.00	-.64	.00	.00	.00
197	1	-18.12	.00	-.33	.00	.00	.00
	2	-18.20	.00	-.30	.00	.00	.00
205	1	-18.15	.00	-.36	.00	.00	.00
	2	-18.23	.00	-.32	.00	.00	.00
213	1	-18.17	.00	-.40	.00	.00	.00
	2	-18.25	.00	-.37	.00	.00	.00
221	1	-18.19	.00	-.46	.00	.00	.00
	2	-18.27	.00	-.43	.00	.00	.00
229	1	-18.20	.00	-.53	.00	.00	.00
	2	-18.27	.00	-.50	.00	.00	.00
237	1	-18.19	.00	-.61	.00	.00	.00
	2	-18.27	.00	-.57	.00	.00	.00
245	1	-18.17	.00	-.66	.00	.00	.00
	2	-18.24	.00	-.62	.00	.00	.00
253	1	-18.14	.00	-.69	.00	.00	.00
	2	-18.21	.00	-.65	.00	.00	.00
6	1	-29.12	.00	-.69	.00	.00	.00
	2	-29.25	.00	-.64	.00	.00	.00
14	1	-29.12	.00	-.73	.00	.00	.00
	2	-29.26	.00	-.67	.00	.00	.00
22	1	-29.13	.00	-.76	.00	.00	.00
	2	-29.27	.00	-.70	.00	.00	.00
30	1	-29.13	.00	-.78	.00	.00	.00
	2	-29.27	.00	-.72	.00	.00	.00
38	1	-29.12	.00	-.82	.00	.00	.00
	2	-29.26	.00	-.76	.00	.00	.00
46	1	-29.11	.00	-.88	.00	.00	.00
	2	-29.25	.00	-.82	.00	.00	.00
54	1	-29.10	.00	-.93	.00	.00	.00
	2	-29.24	.00	-.87	.00	.00	.00
62	1	-29.10	.00	-.96	.00	.00	.00
	2	-29.24	.00	-.90	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
70	1	-29.22	.00	-.62	.00	.00	.00
	2	-29.36	.00	-.56	.00	.00	.00
78	1	-29.20	.00	-.67	.00	.00	.00
	2	-29.34	.00	-.61	.00	.00	.00
86	1	-29.21	.00	-.73	.00	.00	.00
	2	-29.34	.00	-.67	.00	.00	.00
94	1	-29.21	.00	-.73	.00	.00	.00
	2	-29.35	.00	-.68	.00	.00	.00
102	1	-29.21	.00	-.79	.00	.00	.00
	2	-29.35	.00	-.74	.00	.00	.00
110	1	-29.20	.00	-.91	.00	.00	.00
	2	-29.34	.00	-.85	.00	.00	.00
118	1	-29.19	.00	-.99	.00	.00	.00
	2	-29.33	.00	-.93	.00	.00	.00
126	1	-29.21	.00	-1.04	.00	.00	.00
	2	-29.35	.00	-.98	.00	.00	.00
134	1	-29.51	.00	-.63	.00	.00	.00
	2	-29.64	.00	-.57	.00	.00	.00
142	1	-29.52	.00	-.66	.00	.00	.00
	2	-29.65	.00	-.60	.00	.00	.00
150	1	-29.54	.00	-.71	.00	.00	.00
	2	-29.68	.00	-.65	.00	.00	.00
158	1	-29.56	.00	-.76	.00	.00	.00
	2	-29.69	.00	-.70	.00	.00	.00
166	1	-29.57	.00	-.83	.00	.00	.00
	2	-29.70	.00	-.77	.00	.00	.00
174	1	-29.56	.00	-.92	.00	.00	.00
	2	-29.69	.00	-.86	.00	.00	.00
182	1	-29.53	.00	-.99	.00	.00	.00
	2	-29.66	.00	-.93	.00	.00	.00
190	1	-29.51	.00	-1.02	.00	.00	.00
	2	-29.64	.00	-.96	.00	.00	.00
198	1	-29.71	.00	-.61	.00	.00	.00
	2	-29.84	.00	-.55	.00	.00	.00
206	1	-29.75	.00	-.64	.00	.00	.00
	2	-29.88	.00	-.58	.00	.00	.00
214	1	-29.79	.00	-.70	.00	.00	.00
	2	-29.92	.00	-.64	.00	.00	.00
222	1	-29.81	.00	-.77	.00	.00	.00
	2	-29.94	.00	-.71	.00	.00	.00
230	1	-29.82	.00	-.85	.00	.00	.00
	2	-29.95	.00	-.79	.00	.00	.00
238	1	-29.81	.00	-.94	.00	.00	.00
	2	-29.93	.00	-.88	.00	.00	.00
246	1	-29.77	.00	-1.01	.00	.00	.00
	2	-29.90	.00	-.95	.00	.00	.00
254	1	-29.73	.00	-1.04	.00	.00	.00
	2	-29.85	.00	-.97	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
7	1	-35.96	.00	-.92	.00	.00	.00
	2	-36.12	.00	-.85	.00	.00	.00
15	1	-35.98	.00	-.94	.00	.00	.00
	2	-36.15	.00	-.87	.00	.00	.00
23	1	-36.01	.00	-.96	.00	.00	.00
	2	-36.17	.00	-.89	.00	.00	.00
31	1	-36.02	.00	-.97	.00	.00	.00
	2	-36.18	.00	-.90	.00	.00	.00
39	1	-36.01	.00	-.99	.00	.00	.00
	2	-36.17	.00	-.92	.00	.00	.00
47	1	-35.99	.00	-1.03	.00	.00	.00
	2	-36.16	.00	-.96	.00	.00	.00
55	1	-35.97	.00	-1.06	.00	.00	.00
	2	-36.13	.00	-.99	.00	.00	.00
63	1	-35.94	.00	-1.08	.00	.00	.00
	2	-36.11	.00	-1.01	.00	.00	.00
71	1	-36.04	.00	-.85	.00	.00	.00
	2	-36.20	.00	-.78	.00	.00	.00
79	1	-36.05	.00	-.89	.00	.00	.00
	2	-36.21	.00	-.82	.00	.00	.00
87	1	-36.07	.00	-.93	.00	.00	.00
	2	-36.23	.00	-.86	.00	.00	.00
95	1	-36.08	.00	-.94	.00	.00	.00
	2	-36.24	.00	-.87	.00	.00	.00
103	1	-36.08	.00	-.98	.00	.00	.00
	2	-36.24	.00	-.91	.00	.00	.00
111	1	-36.07	.00	-1.06	.00	.00	.00
	2	-36.23	.00	-.99	.00	.00	.00
119	1	-36.04	.00	-1.12	.00	.00	.00
	2	-36.20	.00	-1.04	.00	.00	.00
127	1	-36.03	.00	-1.15	.00	.00	.00
	2	-36.19	.00	-1.08	.00	.00	.00
135	1	-36.24	.00	-.85	.00	.00	.00
	2	-36.40	.00	-.78	.00	.00	.00
143	1	-36.28	.00	-.87	.00	.00	.00
	2	-36.43	.00	-.80	.00	.00	.00
151	1	-36.31	.00	-.91	.00	.00	.00
	2	-36.47	.00	-.84	.00	.00	.00
159	1	-36.33	.00	-.95	.00	.00	.00
	2	-36.49	.00	-.88	.00	.00	.00
167	1	-36.33	.00	-1.01	.00	.00	.00
	2	-36.49	.00	-.94	.00	.00	.00
175	1	-36.32	.00	-1.08	.00	.00	.00
	2	-36.47	.00	-1.00	.00	.00	.00
183	1	-36.28	.00	-1.13	.00	.00	.00
	2	-36.44	.00	-1.05	.00	.00	.00
191	1	-36.25	.00	-1.15	.00	.00	.00
	2	-36.40	.00	-1.08	.00	.00	.00

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
199	1	-36.38	.00	-.83	.00	.00	.00
	2	-36.53	.00	-.76	.00	.00	.00
207	1	-36.43	.00	-.85	.00	.00	.00
	2	-36.59	.00	-.78	.00	.00	.00
215	1	-36.48	.00	-.90	.00	.00	.00
	2	-36.63	.00	-.83	.00	.00	.00
223	1	-36.50	.00	-.96	.00	.00	.00
	2	-36.66	.00	-.88	.00	.00	.00
231	1	-36.51	.00	-1.02	.00	.00	.00
	2	-36.66	.00	-.95	.00	.00	.00
239	1	-36.49	.00	-1.09	.00	.00	.00
	2	-36.64	.00	-1.02	.00	.00	.00
247	1	-36.45	.00	-1.14	.00	.00	.00
	2	-36.60	.00	-1.07	.00	.00	.00
255	1	-36.39	.00	-1.17	.00	.00	.00
	2	-36.55	.00	-1.09	.00	.00	.00

********** END OF LATEST ANALYSIS RESULT **********

77. PRINT MEMBER FORCES LIST 7 TO 224 BY 7

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
7	1	7	-106.63	83.61	-1.89	.00	-.73	-78.40
		8	106.63	-83.61	1.89	.00	4.51	245.63
	2	7	-107.81	84.02	-1.73	.00	-.58	-78.93
		8	107.81	-84.02	1.73	.00	4.04	246.98
14	1	15	-85.45	83.60	-2.01	.00	-1.14	-78.08
		16	85.45	-83.60	2.01	.00	5.16	245.28
	2	15	-87.06	84.01	-1.85	.00	-.99	-78.62
		16	87.06	-84.01	1.85	.00	4.68	246.64
21	1	23	-70.56	83.60	-2.14	.00	-1.61	-77.86
		24	70.56	-83.60	2.14	.00	5.88	245.06
	2	23	-72.53	84.02	-1.97	.00	-1.45	-78.40
		24	72.53	-84.02	1.97	.00	5.39	246.43
28	1	31	-60.36	83.59	-2.22	.00	-1.93	-77.71
		32	60.36	-83.59	2.22	.00	6.37	244.89
	2	31	-62.72	84.01	-2.06	.00	-1.78	-78.26
		32	62.72	-84.01	2.06	.00	5.89	246.27
35	1	39	-54.79	83.56	-2.36	.00	-2.45	-77.60
		40	54.79	-83.56	2.36	.00	7.17	244.73
	2	39	-57.54	83.98	-2.19	.00	-2.29	-78.16
		40	57.54	-83.98	2.19	.00	6.68	246.12
42	1	47	-57.12	83.54	-2.58	.00	-3.22	-77.66
		48	57.12	-83.54	2.58	.00	8.38	244.74
	2	47	-60.03	83.96	-2.40	.00	-3.03	-78.22
		48	60.03	-83.96	2.40	.00	7.84	246.13
49	1	55	-68.58	83.54	-2.77	.00	-3.91	-77.87
		56	68.58	-83.54	2.77	.00	9.45	244.95
	2	55	-71.37	83.95	-2.59	.00	-3.70	-78.43
		56	71.37	-83.95	2.59	.00	8.89	246.34
56	1	63	-87.09	83.55	-2.89	.00	-4.31	-78.18
		64	87.09	-83.55	2.89	.00	10.09	245.27
	2	63	-89.64	83.96	-2.71	.00	-4.10	-78.73
		64	89.64	-83.96	2.71	.00	9.52	246.65
63	1	71	126.25	83.99	-1.64	.00	-.07	-79.59
		72	-126.25	-83.99	1.64	.00	3.35	247.57
	2	71	123.60	84.40	-1.48	.00	.07	-80.11
		72	-123.60	-84.40	1.48	.00	2.90	248.90

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
70	1	79	155.72	83.88	-1.83	.00	-.69	-78.90
		80	-155.72	-83.88	1.83	.00	4.35	246.66
	2	79	152.49	84.29	-1.67	.00	-.54	-79.43
		80	-152.49	-84.29	1.67	.00	3.88	248.01
77	1	87	174.44	83.87	-2.03	.00	-1.34	-78.65
		88	-174.44	-83.87	2.03	.00	5.40	246.40
	2	87	170.81	84.28	-1.87	.00	-1.19	-79.20
		88	-170.81	-84.28	1.87	.00	4.92	247.76
84	1	95	187.12	83.88	-2.05	.00	-1.39	-78.55
		96	-187.12	-83.88	2.05	.00	5.50	246.31
	2	95	183.03	84.29	-1.90	.00	-1.27	-79.09
		96	-183.03	-84.29	1.90	.00	5.07	247.67
91	1	103	194.48	83.88	-2.26	.00	-2.07	-78.54
		104	-194.48	-83.88	2.26	.00	6.60	246.29
	2	103	189.88	84.28	-2.10	.00	-1.94	-79.09
		104	-189.88	-84.28	2.10	.00	6.15	247.66
98	1	111	190.87	83.86	-2.68	.00	-3.45	-78.62
		112	-190.87	-83.86	2.68	.00	8.81	246.34
	2	111	186.09	84.27	-2.50	.00	-3.26	-79.16
		112	-186.09	-84.27	2.50	.00	8.27	247.70
105	1	119	175.01	83.85	-2.96	.00	-4.37	-78.80
		120	-175.01	-83.85	2.96	.00	10.28	246.50
	2	119	170.42	84.26	-2.78	.00	-4.15	-79.34
		120	-170.42	-84.26	2.78	.00	9.70	247.86
112	1	127	148.48	83.94	-3.14	.00	-4.96	-79.43
		128	-148.48	-83.94	3.14	.00	11.24	247.32
	2	127	144.27	84.35	-2.95	.00	-4.74	-79.96
		128	-144.27	-84.35	2.95	.00	10.65	248.67
119	1	135	319.83	85.03	-1.69	.00	-.40	-82.96
		136	-319.83	-85.03	1.69	.00	3.79	253.01
	2	135	316.31	85.41	-1.53	.00	-.25	-83.42
		136	-316.31	-85.41	1.53	.00	3.32	254.24
126	1	143	347.79	85.05	-1.79	.00	-.70	-82.76
		144	-347.79	-85.05	1.79	.00	4.28	252.86
	2	143	343.69	85.44	-1.63	.00	-.55	-83.22
		144	-343.69	-85.44	1.63	.00	3.81	254.10
133	1	151	368.81	85.10	-1.97	.00	-1.21	-82.72
		152	-368.81	-85.10	1.97	.00	5.15	252.93

MEMBER END FORCES STRUCTURE TYPE = SPACE
ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	2	151	364.24	85.49	-1.80	.00	-1.06	-83.18
		152	-364.24	-85.49	1.80	.00	4.67	254.17
140	1	159	382.59	85.15	-2.13	.00	-1.70	-82.75
		160	-382.59	-85.15	2.13	.00	5.96	253.05
	2	159	377.57	85.54	-1.97	.00	-1.55	-83.21
		160	-377.57	-85.54	1.97	.00	5.50	254.29
147	1	167	388.24	85.17	-2.39	.00	-2.47	-82.82
		168	-388.24	-85.17	2.39	.00	7.25	253.16
	2	167	382.82	85.56	-2.22	.00	-2.31	-83.27
		168	-382.82	-85.56	2.22	.00	6.76	254.39
154	1	175	383.00	85.14	-2.71	.00	-3.47	-82.85
		176	-383.00	-85.14	2.71	.00	8.89	253.14
	2	175	377.44	85.53	-2.54	.00	-3.28	-83.31
		176	-377.44	-85.53	2.54	.00	8.36	254.37
161	1	183	367.00	85.08	-2.95	.00	-4.18	-82.87
		184	-367.00	-85.08	2.95	.00	10.07	253.03
	2	183	361.56	85.47	-2.77	.00	-3.98	-83.32
		184	-361.56	-85.47	2.77	.00	9.51	254.26
168	1	191	343.63	85.05	-3.05	.00	-4.51	-83.04
		192	-343.63	-85.05	3.05	.00	10.61	253.13
	2	191	338.44	85.43	-2.87	.00	-4.30	-83.49
		192	-338.44	-85.43	2.87	.00	10.04	254.35
175	1	199	469.17	85.77	-1.63	.00	-.27	-85.48
		200	-469.17	-85.77	1.63	.00	3.52	257.02
	2	199	465.68	86.14	-1.47	.00	-.12	-85.88
		200	-465.68	-86.14	1.47	.00	3.05	258.16
182	1	207	495.96	85.90	-1.73	.00	-.57	-85.66
		208	-495.96	-85.90	1.73	.00	4.04	257.46
	2	207	491.94	86.27	-1.57	.00	-.42	-86.06
		208	-491.94	-86.27	1.57	.00	3.56	258.60
189	1	215	516.66	86.01	-1.94	.00	-1.17	-85.80
		216	-516.66	-86.01	1.94	.00	5.05	257.83
	2	215	512.20	86.38	-1.77	.00	-1.02	-86.20
		216	-512.20	-86.38	1.77	.00	4.56	258.96
196	1	223	529.58	86.09	-2.18	.00	-1.89	-85.93
		224	-529.58	-86.09	2.18	.00	6.25	258.10
	2	223	524.74	86.45	-2.02	.00	-1.73	-86.32
		224	-524.74	-86.45	2.02	.00	5.76	259.23

MEMBER END FORCES STRUCTURE TYPE = SPACE
ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
203	1	231	533.72	86.12	-2.47	.00	-2.72	-86.02
		232	-533.72	-86.12	2.47	.00	7.66	258.25
	2	231	528.59	86.48	-2.30	.00	-2.55	-86.41
		232	-528.59	-86.48	2.30	.00	7.15	259.37
210	1	239	527.81	86.08	-2.77	.00	-3.61	-86.01
		240	-527.81	-86.08	2.77	.00	9.14	258.17
	2	239	522.57	86.44	-2.59	.00	-3.42	-86.40
		240	-522.57	-86.44	2.59	.00	8.60	259.28
217	1	247	512.29	85.97	-3.00	.00	-4.31	-85.88
		248	-512.29	-85.97	3.00	.00	10.32	257.83
	2	247	507.13	86.33	-2.82	.00	-4.11	-86.27
		248	-507.13	-86.33	2.82	.00	9.76	258.94
224	1	255	490.42	85.83	-3.10	.00	-4.61	-85.70
		256	-490.42	-85.83	3.10	.00	10.82	257.36
	2	255	485.43	86.20	-2.92	.00	-4.40	-86.08
		256	-485.43	-86.20	2.92	.00	10.25	258.48

********** END OF LATEST ANALYSIS RESULT **********

78. PRINT MEMBER FORCES LIST 6 TO 223 BY 7

MEMBER END FORCES STRUCTURE TYPE = SPACE
ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
6	1	6	-106.63	47.66	-.97	.00	1.21	16.91
		7	106.63	-47.66	.97	.00	.73	78.40
	2	6	-107.81	47.90	-.88	.00	1.18	16.87
		7	107.81	-47.90	.88	.00	.58	78.93
13	1	14	-85.45	47.62	-1.07	.00	1.00	17.16
		15	85.45	-47.62	1.07	.00	1.14	78.08
	2	14	-87.06	47.87	-.98	.00	.97	17.12
		15	87.06	-47.87	.98	.00	.99	78.62
20	1	22	-70.56	47.60	-1.18	.00	.75	17.34
		23	70.56	-47.60	1.18	.00	1.61	77.86
	2	22	-72.53	47.85	-1.08	.00	.72	17.29
		23	72.53	-47.85	1.08	.00	1.45	78.40
27	1	30	-60.36	47.58	-1.25	.00	.57	17.45
		31	60.36	-47.58	1.25	.00	1.93	77.70
	2	30	-62.72	47.83	-1.16	.00	.53	17.40
		31	62.72	-47.83	1.16	.00	1.78	78.26
34	1	38	-54.79	47.55	-1.37	.00	.28	17.50
		39	54.79	-47.55	1.37	.00	2.45	77.60
	2	38	-57.54	47.81	-1.27	.00	.26	17.45
		39	57.54	-47.81	1.27	.00	2.29	78.16
41	1	46	-57.12	47.55	-1.55	.00	-.13	17.44
		47	57.12	-47.55	1.55	.00	3.22	77.66
	2	46	-60.03	47.80	-1.45	.00	-.14	17.39
		47	60.03	-47.80	1.45	.00	3.03	78.22
48	1	54	-68.58	47.57	-1.71	.00	-.49	17.26
		55	68.58	-47.57	1.71	.00	3.91	77.87
	2	54	-71.37	47.82	-1.60	.00	-.49	17.21
		55	71.37	-47.82	1.60	.00	3.70	78.43
55	1	62	-87.09	47.60	-1.81	.00	-.70	17.02
		63	87.09	-47.60	1.81	.00	4.31	78.18
	2	62	-89.64	47.85	-1.70	.00	-.71	16.98
		63	89.64	-47.85	1.70	.00	4.10	78.73
62	1	70	126.25	47.95	-.79	.00	1.51	16.32
		71	-126.25	-47.95	.79	.00	.07	79.59
	2	70	123.60	48.20	-.70	.00	1.47	16.29
		71	-123.60	-48.20	.70	.00	-.07	80.11

MEMBER END FORCES STRUCTURE TYPE = SPACE
ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
69	1	78	155.72	47.83	-.94	.00	1.19	16.76
		79	-155.72	-47.83	.94	.00	.69	78.90
	2	78	152.49	48.08	-.85	.00	1.16	16.73
		79	-152.49	-48.08	.85	.00	.54	79.43
76	1	86	174.44	47.80	-1.10	.00	.86	16.95
		87	-174.44	-47.80	1.10	.00	1.34	78.65
	2	86	170.81	48.05	-1.01	.00	.83	16.92
		87	-170.81	-48.05	1.01	.00	1.19	79.19
83	1	94	187.12	47.80	-1.12	.00	.84	17.04
		95	-187.12	-47.80	1.12	.00	1.39	78.55
	2	94	183.03	48.05	-1.03	.00	.79	17.00
		95	-183.03	-48.05	1.03	.00	1.27	79.09
90	1	102	194.48	47.80	-1.28	.00	.49	17.05
		103	-194.48	-47.80	1.28	.00	2.07	78.54
	2	102	189.88	48.05	-1.19	.00	.45	17.01
		103	-189.88	-48.05	1.19	.00	1.94	79.09
97	1	110	190.87	47.79	-1.62	.00	-.21	16.97
		111	-190.87	-47.79	1.62	.00	3.45	78.62
	2	110	186.09	48.05	-1.52	.00	-.23	16.93
		111	-186.09	-48.05	1.52	.00	3.26	79.16
104	1	118	175.01	47.81	-1.84	.00	-.68	16.81
		119	-175.01	-47.81	1.84	.00	4.37	78.80
	2	118	170.42	48.06	-1.73	.00	-.68	16.77
		119	-170.42	-48.06	1.73	.00	4.15	79.34
111	1	126	148.48	47.92	-1.99	.00	-.99	16.40
		127	-148.48	-47.92	1.99	.00	4.96	79.43
	2	126	144.27	48.16	-1.88	.00	-.98	16.36
		127	-144.27	-48.16	1.88	.00	4.74	79.96
118	1	134	319.83	48.78	-.85	.00	1.29	14.60
		135	-319.83	-48.78	.85	.00	.40	82.96
	2	134	316.31	49.01	-.76	.00	1.26	14.60
		135	-316.31	-49.01	.76	.00	.25	83.42
125	1	142	347.79	48.77	-.92	.00	1.15	14.79
		143	-347.79	-48.77	.92	.00	.70	82.76
	2	142	343.69	49.00	-.83	.00	1.11	14.79
		143	-343.69	-49.00	.83	.00	.55	83.22
132	1	150	368.81	48.80	-1.06	.00	.90	14.87
		151	-368.81	-48.80	1.06	.00	1.21	82.72

MEMBER END FORCES STRUCTURE TYPE = SPACE
ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
202	1	230	533.72	49.60	-1.45	.00	.17	13.19
		231	-533.72	-49.60	1.45	.00	2.72	86.02
	2	230	528.59	49.82	-1.35	.00	.15	13.22
		231	-528.59	-49.82	1.35	.00	2.55	86.41
209	1	238	527.81	49.59	-1.68	.00	-.26	13.16
		239	-527.81	-49.59	1.68	.00	3.61	86.01
	2	238	522.57	49.80	-1.57	.00	-.27	13.20
		239	-522.57	-49.80	1.57	.00	3.42	86.40
216	1	246	512.29	49.52	-1.86	.00	-.60	13.16
		247	-512.29	-49.52	1.86	.00	4.31	85.88
	2	246	507.13	49.73	-1.75	.00	-.60	13.20
		247	-507.13	-49.73	1.75	.00	4.11	86.27
223	1	254	490.42	49.44	-1.94	.00	-.74	13.18
		255	-490.42	-49.44	1.94	.00	4.61	85.70
	2	254	485.43	49.65	-1.83	.00	-.74	13.22
		255	-485.43	-49.65	1.83	.00	4.40	86.08

********** END OF LATEST ANALYSIS RESULT **********

79. FINISH

********** END OF STAAD-III **********

**** DATE= SEP 6,2002 TIME= 12:32:36 ****

MEMBER END FORCES STRUCTURE TYPE = SPACE
ALL UNITS ARE -- MTON METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	2	150	364.24	49.03	-.96	.00	.87	14.87
		151	-364.24	-49.03	.96	.00	1.06	83.18
139	1	158	382.59	48.82	-1.18	.00	.67	14.89
		159	-382.59	-48.82	1.18	.00	1.70	82.75
	2	158	377.57	49.05	-1.09	.00	.63	14.89
		159	-377.57	-49.05	1.09	.00	1.55	83.21
146	1	166	388.24	48.84	-1.38	.00	.30	14.86
		167	-388.24	-48.84	1.38	.00	2.47	82.82
	2	166	382.82	49.07	-1.29	.00	.27	14.86
		167	-382.82	-49.07	1.29	.00	2.31	83.27
153	1	174	383.00	48.83	-1.64	.00	-.19	14.81
		175	-383.00	-48.83	1.64	.00	3.47	82.85
	2	174	377.44	49.06	-1.54	.00	-.21	14.81
		175	-377.44	-49.06	1.54	.00	3.28	83.31
160	1	182	367.00	48.80	-1.82	.00	-.54	14.73
		183	-367.00	-48.80	1.82	.00	4.18	82.87
	2	182	361.56	49.03	-1.71	.00	-.55	14.74
		183	-361.56	-49.03	1.71	.00	3.98	83.32
167	1	190	343.63	48.80	-1.90	.00	-.70	14.56
		191	-343.63	-48.80	1.90	.00	4.51	83.04
	2	190	338.44	49.03	-1.79	.00	-.71	14.56
		191	-338.44	-49.03	1.79	.00	4.30	83.49
174	1	198	469.17	49.39	-.80	.00	1.34	13.29
		199	-469.17	-49.39	.80	.00	.27	85.48
	2	198	465.68	49.60	-.71	.00	1.30	13.32
		199	-465.68	-49.60	.71	.00	.12	85.88
181	1	206	495.96	49.47	-.88	.00	1.19	13.28
		207	-495.96	-49.47	.88	.00	.57	85.66
	2	206	491.94	49.68	-.79	.00	1.16	13.31
		207	-491.94	-49.68	.79	.00	.42	86.06
188	1	214	516.66	49.53	-1.04	.00	.90	13.27
		215	-516.66	-49.53	1.04	.00	1.17	85.80
	2	214	512.20	49.75	-.95	.00	.87	13.30
		215	-512.20	-49.75	.95	.00	1.02	86.20
195	1	222	529.58	49.58	-1.23	.00	.57	13.24
		223	-529.58	-49.58	1.23	.00	1.89	85.93
	2	222	524.74	49.80	-1.13	.00	.54	13.27
		223	-524.74	-49.80	1.13	.00	1.73	86.32

REACCIONES SOBRE LOS PILOTES CON ACCIONES EN SERVICIO

JOINT	LOAD	R_x (t)	R_y (t)	R_z (t)
1	1	5,48	-59,08	0,12
2	1	3,7	0	0,09
3	1	-3,59	0	-0,02
4	1	-6,29	0	-0,1
5	1	-12,79	0	-0,24
6	1	-21,14	0	-0,44
7	1	-26,09	0	-0,6
9	1	5,48	-42,1	0,12
10	1	3,71	0	0,09
11	1	-3,58	0	-0,02
12	1	-6,29	0	-0,12
13	1	-12,79	0	-0,26
14	1	-21,14	0	-0,47
15	1	-26,11	0	-0,61
17	1	5,48	-30,18	0,13
18	1	3,72	0	0,08
19	1	-3,57	0	-0,04
20	1	-6,28	0	-0,14
21	1	-12,79	0	-0,29
22	1	-21,15	0	-0,5
23	1	-26,13	0	-0,63
25	1	5,48	-22,41	0,13
26	1	3,72	0	0,07
27	1	-3,57	0	-0,05
28	1	-6,28	0	-0,15
29	1	-12,79	0	-0,31
30	1	-21,15	0	-0,52
31	1	-26,14	0	-0,65
33	1	5,48	-18,69	0,14
34	1	3,73	0	0,06
35	1	-3,56	0	-0,06
36	1	-6,28	0	-0,18
37	1	-12,78	0	-0,34
38	1	-21,15	0	-0,55
39	1	-26,13	0	-0,66
41	1	5,47	-21,22	0,15
42	1	3,72	0	0,05
43	1	-3,56	0	-0,08
44	1	-6,28	0	-0,21
45	1	-12,78	0	-0,38
46	1	-21,14	0	-0,6
47	1	-26,12	0	-0,69
49	1	5,47	-30,85	0,16
50	1	3,72	0	0,04
51	1	-3,57	0	-0,09
52	1	-6,28	0	-0,23
53	1	-12,78	0	-0,42
54	1	-21,13	0	-0,64
55	1	-26,11	0	-0,72
57	1	5,47	-46,05	0,16
58	1	3,71	0	0,03
59	1	-3,58	0	-0,1
60	1	-6,29	0	-0,25
61	1	-12,78	0	-0,44
62	1	-21,13	0	-0,66
63	1	-26,08	0	-0,74
65	1	5,5	106,26	0,1
66	1	3,69	0	0,1

REACCIONES SOBRE LOS PILOTES CON ACCIONES EN SERVICIO

JOINT	LOAD	R_x (t)	R_y (t)	R_z (t)
67	1	-3,64	0	0
68	1	-6,35	0	-0,07
69	1	-12,87	0	-0,2
70	1	-21,23	0	-0,39
71	1	-26,16	0	-0,55
73	1	5,5	129,23	0,11
74	1	3,71	0	0,09
75	1	-3,62	0	-0,02
76	1	-6,33	0	-0,1
77	1	-12,85	0	-0,23
78	1	-21,22	0	-0,43
79	1	-26,17	0	-0,58
81	1	5,5	143,8	0,12
82	1	3,71	0	0,08
83	1	-3,61	0	-0,03
84	1	-6,33	0	-0,13
85	1	-12,85	0	-0,27
86	1	-21,23	0	-0,47
87	1	-26,19	0	-0,61
89	1	5,5	153,24	0,13
90	1	3,72	0	0,08
91	1	-3,61	0	-0,03
92	1	-6,33	0	-0,13
93	1	-12,85	0	-0,28
94	1	-21,23	0	-0,49
95	1	-26,2	0	-0,62
97	1	5,5	158,14	0,14
98	1	3,72	0	0,07
99	1	-3,61	0	-0,05
100	1	-6,33	0	-0,16
101	1	-12,85	0	-0,32
102	1	-21,23	0	-0,53
103	1	-26,2	0	-0,65
105	1	5,5	154,75	0,15
106	1	3,71	0	0,05
107	1	-3,61	0	-0,08
108	1	-6,33	0	-0,22
109	1	-12,85	0	-0,4
110	1	-21,22	0	-0,62
111	1	-26,19	0	-0,71
113	1	5,5	142,09	0,17
114	1	3,71	0	0,04
115	1	-3,62	0	-0,1
116	1	-6,33	0	-0,25
117	1	-12,85	0	-0,45
118	1	-21,22	0	-0,68
119	1	-26,17	0	-0,76
121	1	5,5	121,08	0,18
122	1	3,69	0	0,03
123	1	-3,63	0	-0,12
124	1	-6,34	0	-0,28
125	1	-12,86	0	-0,49
126	1	-21,22	0	-0,72
127	1	-26,16	0	-0,78
129	1	5,56	240,63	0,11
130	1	3,66	0	0,09
131	1	-3,77	0	-0,01
132	1	-6,48	0	-0,09

REACCIONES SOBRE LOS PILOTES CON ACCIONES EN SERVICIO

JOINT	LOAD	R_x (t)	R_y (t)	R_z (t)
133	1	-13,06	0	-0,21
134	1	-21,46	0	-0,4
135	1	-26,32	0	-0,55
137	1	5,56	261,81	0,11
138	1	3,67	0	0,09
139	1	-3,77	0	-0,02
140	1	-6,48	0	-0,1
141	1	-13,07	0	-0,23
142	1	-21,47	0	-0,42
143	1	-26,35	0	-0,57
145	1	5,57	277,65	0,12
146	1	3,67	0	0,08
147	1	-3,77	0	-0,03
148	1	-6,48	0	-0,12
149	1	-13,08	0	-0,27
150	1	-21,49	0	-0,46
151	1	-26,38	0	-0,6
153	1	5,57	287,78	0,13
154	1	3,68	0	0,07
155	1	-3,77	0	-0,04
156	1	-6,49	0	-0,14
157	1	-13,09	0	-0,3
158	1	-21,5	0	-0,5
159	1	-26,39	0	-0,63
161	1	5,57	291,54	0,14
162	1	3,68	0	0,06
163	1	-3,78	0	-0,06
164	1	-6,49	0	-0,18
165	1	-13,09	0	-0,35
166	1	-21,51	0	-0,56
167	1	-26,4	0	-0,67
169	1	5,57	287,11	0,16
170	1	3,67	0	0,05
171	1	-3,78	0	-0,08
172	1	-6,49	0	-0,22
173	1	-13,09	0	-0,4
174	1	-21,5	0	-0,63
175	1	-26,38	0	-0,73
177	1	5,57	274,62	0,17
178	1	3,67	0	0,04
179	1	-3,77	0	-0,1
180	1	-6,48	0	-0,25
181	1	-13,07	0	-0,45
182	1	-21,48	0	-0,68
183	1	-26,36	0	-0,76
185	1	5,56	256,49	0,17
186	1	3,66	0	0,04
187	1	-3,78	0	-0,1
188	1	-6,48	0	-0,26
189	1	-13,07	0	-0,47
190	1	-21,46	0	-0,7
191	1	-26,33	0	-0,78
193	1	5,6	340,51	0,1
194	1	3,64	0	0,09
195	1	-3,87	0	-0,01
196	1	-6,57	0	-0,08
197	1	-13,19	0	-0,2
198	1	-21,6	0	-0,39

REACCIONES SOBRE LOS PILOTES CON ACCIONES EN SERVICIO

JOINT	LOAD	R_x (t)	R_y (t)	R_z (t)
199	1	-26,43	0	-0,54
201	1	5,61	360,4	0,11
202	1	3,64	0	0,09
203	1	-3,88	0	-0,01
204	1	-6,58	0	-0,09
205	1	-13,22	0	-0,22
206	1	-21,64	0	-0,41
207	1	-26,47	0	-0,55
209	1	5,62	375,7	0,12
210	1	3,65	0	0,08
211	1	-3,88	0	-0,03
212	1	-6,59	0	-0,12
213	1	-13,23	0	-0,26
214	1	-21,67	0	-0,45
215	1	-26,5	0	-0,59
217	1	5,62	385,08	0,13
218	1	3,65	0	0,07
219	1	-3,89	0	-0,04
220	1	-6,6	0	-0,15
221	1	-13,25	0	-0,31
222	1	-21,69	0	-0,51
223	1	-26,52	0	-0,63
225	1	5,62	387,84	0,14
226	1	3,65	0	0,06
227	1	-3,89	0	-0,06
228	1	-6,6	0	-0,19
229	1	-13,25	0	-0,36
230	1	-21,69	0	-0,57
231	1	-26,52	0	-0,68
233	1	5,62	383,13	0,16
234	1	3,64	0	0,05
235	1	-3,89	0	-0,08
236	1	-6,6	0	-0,22
237	1	-13,24	0	-0,41
238	1	-21,68	0	-0,64
239	1	-26,51	0	-0,73
241	1	5,61	371,29	0,17
242	1	3,64	0	0,04
243	1	-3,88	0	-0,1
244	1	-6,59	0	-0,25
245	1	-13,23	0	-0,45
246	1	-21,65	0	-0,69
247	1	-26,47	0	-0,77
249	1	5,6	354,67	0,18
250	1	3,64	0	0,04
251	1	-3,87	0	-0,11
252	1	-6,57	0	-0,27
253	1	-13,2	0	-0,47
254	1	-21,62	0	-0,71
255	1	-26,43	0	-0,79
	Suma	-1969,83	5974,26	-49,94
	Max	5,62	387,84	0,18
	Min	-26,52	-59,08	-0,79

REACCIONES SOBRE LOS PILOTES CON ACCIONES EN SERVICIO

JOINT	LOAD	R_x (i)	R_y (i)	R_z (i)
1	2	5,5	-59,86	0,11
2	2	3,72	0	0,09
3	2	-3,61	0	-0,01
4	2	-6,32	0	-0,09
5	2	-12,85	0	-0,22
6	2	-21,23	0	-0,4
7	2	-26,2	0	-0,55
9	2	5,5	-43,18	0,11
10	2	3,73	0	0,08
11	2	-3,6	0	-0,02
12	2	-6,32	0	-0,11
13	2	-12,85	0	-0,24
14	2	-21,24	0	-0,43
15	2	-26,22	0	-0,57
17	2	5,5	-31,5	0,12
18	2	3,73	0	0,07
19	2	-3,59	0	-0,03
20	2	-6,32	0	-0,13
21	2	-12,85	0	-0,27
22	2	-21,24	0	-0,46
23	2	-26,24	0	-0,59
25	2	5,5	-23,98	0,12
26	2	3,74	0	0,07
27	2	-3,59	0	-0,04
28	2	-6,31	0	-0,14
29	2	-12,85	0	-0,29
30	2	-21,24	0	-0,48
31	2	-26,25	0	-0,6
33	2	5,5	-20,52	0,13
34	2	3,74	0	0,06
35	2	-3,58	0	-0,05
36	2	-6,31	0	-0,16
37	2	-12,84	0	-0,32
38	2	-21,24	0	-0,51
39	2	-26,24	0	-0,62
41	2	5,5	-23,16	0,14
42	2	3,73	0	0,05
43	2	-3,59	0	-0,07
44	2	-6,31	0	-0,19
45	2	-12,84	0	-0,36
46	2	-21,23	0	-0,56
47	2	-26,23	0	-0,64
49	2	5,5	-32,72	0,15
50	2	3,73	0	0,03
51	2	-3,59	0	-0,09
52	2	-6,31	0	-0,22
53	2	-12,84	0	-0,4
54	2	-21,23	0	-0,6
55	2	-26,21	0	-0,67
57	2	5,5	-47,75	0,15
58	2	3,72	0	0,03
59	2	-3,6	0	-0,1
60	2	-6,32	0	-0,24
61	2	-12,84	0	-0,42
62	2	-21,22	0	-0,62
63	2	-26,19	0	-0,69
65	2	5,52	104,5	0,09
66	2	3,71	0	0,1

REACCIONES SOBRE LOS PILOTES CON ACCIONES EN SERVICIO

JOINT	LOAD	R_x (t)	R_y (t)	R_z (t)
67	2	-3,66	0	0
68	2	-6,38	0	-0,06
69	2	-12,93	0	-0,18
70	2	-21,32	0	-0,35
71	2	-26,27	0	-0,51
73	2	5,52	127,07	0,1
74	2	3,72	0	0,09
75	2	-3,64	0	-0,01
76	2	-6,36	0	-0,09
77	2	-12,91	0	-0,21
78	2	-21,31	0	-0,39
79	2	-26,28	0	-0,53
81	2	5,52	141,37	0,11
82	2	3,73	0	0,08
83	2	-3,63	0	-0,03
84	2	-6,36	0	-0,12
85	2	-12,91	0	-0,25
86	2	-21,32	0	-0,44
87	2	-26,3	0	-0,57
89	2	5,52	150,51	0,12
90	2	3,73	0	0,07
91	2	-3,63	0	-0,03
92	2	-6,36	0	-0,12
93	2	-12,91	0	-0,26
94	2	-21,32	0	-0,45
95	2	-26,31	0	-0,58
97	2	5,52	155,07	0,13
98	2	3,73	0	0,06
99	2	-3,63	0	-0,05
100	2	-6,36	0	-0,15
101	2	-12,91	0	-0,3
102	2	-21,32	0	-0,5
103	2	-26,31	0	-0,61
105	2	5,52	151,56	0,14
106	2	3,73	0	0,04
107	2	-3,63	0	-0,08
108	2	-6,36	0	-0,2
109	2	-12,91	0	-0,37
110	2	-21,32	0	-0,58
111	2	-26,3	0	-0,67
113	2	5,52	139,03	0,16
114	2	3,72	0	0,03
115	2	-3,64	0	-0,1
116	2	-6,36	0	-0,24
117	2	-12,91	0	-0,43
118	2	-21,31	0	-0,64
119	2	-26,28	0	-0,71
121	2	5,52	118,28	0,17
122	2	3,71	0	0,02
123	2	-3,66	0	-0,11
124	2	-6,37	0	-0,26
125	2	-12,92	0	-0,46
126	2	-21,31	0	-0,68
127	2	-26,26	0	-0,74
129	2	5,58	238,28	0,1
130	2	3,68	0	0,09
131	2	-3,79	0	-0,01
132	2	-6,51	0	-0,08

REACCIONES SOBRE LOS PILOTES CON ACCIONES EN SERVICIO

JOINT	LOAD	R_x (t)	R_y (t)	R_z (t)
133	2	-13,12	0	-0,19
134	2	-21,54	0	-0,36
135	2	-26,43	0	-0,5
137	2	5,59	259,08	0,1
138	2	3,68	0	0,08
139	2	-3,79	0	-0,01
140	2	-6,51	0	-0,09
141	2	-13,12	0	-0,21
142	2	-21,56	0	-0,38
143	2	-26,46	0	-0,52
145	2	5,59	274,61	0,11
146	2	3,69	0	0,08
147	2	-3,79	0	-0,03
148	2	-6,51	0	-0,11
149	2	-13,13	0	-0,24
150	2	-21,58	0	-0,42
151	2	-26,48	0	-0,55
153	2	5,6	284,43	0,12
154	2	3,69	0	0,07
155	2	-3,79	0	-0,04
156	2	-6,51	0	-0,13
157	2	-13,14	0	-0,28
158	2	-21,59	0	-0,46
159	2	-26,5	0	-0,58
161	2	5,6	287,94	0,13
162	2	3,69	0	0,06
163	2	-3,79	0	-0,05
164	2	-6,52	0	-0,17
165	2	-13,15	0	-0,32
166	2	-21,59	0	-0,52
167	2	-26,5	0	-0,63
169	2	5,59	283,41	0,15
170	2	3,69	0	0,05
171	2	-3,79	0	-0,08
172	2	-6,51	0	-0,21
173	2	-13,14	0	-0,38
174	2	-21,59	0	-0,59
175	2	-26,49	0	-0,68
177	2	5,59	270,99	0,16
178	2	3,68	0	0,04
179	2	-3,79	0	-0,09
180	2	-6,51	0	-0,23
181	2	-13,13	0	-0,42
182	2	-21,57	0	-0,64
183	2	-26,46	0	-0,72
185	2	5,58	253,04	0,16
186	2	3,67	0	0,03
187	2	-3,8	0	-0,1
188	2	-6,51	0	-0,25
189	2	-13,12	0	-0,44
190	2	-21,55	0	-0,66
191	2	-26,43	0	-0,73
193	2	5,62	338,18	0,09
194	2	3,65	0	0,09
195	2	-3,88	0	0
196	2	-6,59	0	-0,07
197	2	-13,24	0	-0,18
198	2	-21,69	0	-0,35

REACCIONES SOBRE LOS PILOTES CON ACCIONES EN SERVICIO

JOINT	LOAD	R_x (t)	R_y (t)	R_z (t)
199	2	-26,53	0	-0,49
201	2	5,63	357,73	0,1
202	2	3,66	0	0,08
203	2	-3,89	0	-0,01
204	2	-6,6	0	-0,08
205	2	-13,27	0	-0,2
206	2	-21,72	0	-0,37
207	2	-26,57	0	-0,51
209	2	5,64	372,73	0,11
210	2	3,66	0	0,08
211	2	-3,9	0	-0,02
212	2	-6,61	0	-0,11
213	2	-13,29	0	-0,24
214	2	-21,75	0	-0,42
215	2	-26,6	0	-0,54
217	2	5,64	381,86	0,12
218	2	3,66	0	0,07
219	2	-3,9	0	-0,04
220	2	-6,62	0	-0,14
221	2	-13,3	0	-0,28
222	2	-21,77	0	-0,47
223	2	-26,62	0	-0,59
225	2	5,65	384,42	0,13
226	2	3,66	0	0,06
227	2	-3,91	0	-0,06
228	2	-6,62	0	-0,17
229	2	-13,3	0	-0,33
230	2	-21,78	0	-0,53
231	2	-26,62	0	-0,64
233	2	5,64	379,64	0,15
234	2	3,66	0	0,05
235	2	-3,91	0	-0,08
236	2	-6,62	0	-0,21
237	2	-13,3	0	-0,39
238	2	-21,76	0	-0,6
239	2	-26,61	0	-0,69
241	2	5,63	367,85	0,16
242	2	3,65	0	0,04
243	2	-3,9	0	-0,09
244	2	-6,61	0	-0,24
245	2	-13,28	0	-0,43
246	2	-21,74	0	-0,65
247	2	-26,58	0	-0,73
249	2	5,63	351,35	0,17
250	2	3,65	0	0,03
251	2	-3,89	0	-0,1
252	2	-6,6	0	-0,25
253	2	-13,25	0	-0,45
254	2	-21,7	0	-0,67
255	2	-26,54	0	-0,74
	Suma	-1978,21	5890,26	-46,44
	Max	5,65	384,42	0,17
	Min	-26,62	-59,86	-0,74

ESFUERZOS SOBRE LOS PILOTES CON ACCIONES EN ROTURA

MEMBER	LOAD	JOINT	N (t)	M_y (m·t)	M_z (m·t)	M (m·t)
7	1	8	-106,63	4,51	245,63	245,67
14	1	16	-85,45	5,16	245,28	245,33
21	1	24	-70,56	5,88	245,06	245,13
28	1	32	-60,36	6,37	244,89	244,97
35	1	40	-54,79	7,17	244,73	244,84
42	1	48	-57,12	8,38	244,74	244,88
49	1	56	-68,58	9,45	244,95	245,13
56	1	64	-87,09	10,09	245,27	245,48
63	1	72	126,25	3,35	247,57	247,59
70	1	80	155,72	4,35	246,66	246,70
77	1	88	174,44	5,4	246,4	246,46
84	1	96	187,12	5,5	246,31	246,37
91	1	104	194,48	6,6	246,29	246,38
98	1	112	190,87	8,81	246,34	246,50
105	1	120	175,01	10,28	246,5	246,71
112	1	128	148,48	11,24	247,32	247,58
119	1	136	319,83	3,79	253,01	253,04
126	1	144	347,79	4,28	252,86	252,90
133	1	152	368,81	5,15	252,93	252,98
140	1	160	382,59	5,96	253,05	253,12
147	1	168	388,24	7,25	253,16	253,26
154	1	176	383	8,89	253,14	253,30
161	1	184	367	10,07	253,03	253,23
168	1	192	343,63	10,61	253,13	253,35
175	1	200	469,17	3,52	257,02	257,04
182	1	208	495,96	4,04	257,46	257,49
189	1	216	516,66	5,05	257,83	257,88
196	1	224	529,58	6,25	258,1	258,18
203	1	232	533,72	7,66	258,25	258,36
210	1	240	527,81	9,14	258,17	258,33
217	1	248	512,29	10,32	257,83	258,04
224	1	256	490,42	10,82	257,36	257,59
7	2	8	-107,81	4,04	246,98	247,01
14	2	16	-87,06	4,68	246,64	246,68
21	2	24	-72,53	5,39	246,43	246,49
28	2	32	-62,72	5,89	246,27	246,34
35	2	40	-57,54	6,68	246,12	246,21
42	2	48	-60,03	7,84	246,13	246,25
49	2	56	-71,37	8,89	246,34	246,50
56	2	64	-89,64	9,52	246,65	246,83
63	2	72	123,6	2,9	248,9	248,92
70	2	80	152,49	3,88	248,01	248,04
77	2	88	170,81	4,92	247,76	247,81
84	2	96	183,03	5,07	247,67	247,72
91	2	104	189,88	6,15	247,66	247,74
98	2	112	186,09	8,27	247,7	247,84
105	2	120	170,42	9,7	247,86	248,05
112	2	128	144,27	10,65	248,67	248,90
119	2	136	316,31	3,32	254,24	254,26
126	2	144	343,69	3,81	254,1	254,13
133	2	152	364,24	4,67	254,17	254,21
140	2	160	377,57	5,5	254,29	254,35
147	2	168	382,82	6,76	254,39	254,48
154	2	176	377,44	8,36	254,37	254,51
161	2	184	361,56	9,51	254,26	254,44
168	2	192	338,44	10,04	254,35	254,55
175	2	200	465,68	3,05	258,16	258,18
182	2	208	491,94	3,56	258,6	258,62
189	2	216	512,2	4,56	258,96	259,00
196	2	224	524,74	5,76	259,23	259,29
203	2	232	528,59	7,15	259,37	259,47
210	2	240	522,57	8,6	259,28	259,42
217	2	248	507,13	9,76	258,94	259,12
224	2	256	485,43	10,25	258,48	258,68

ESFUERZOS SOBRE LOS PILOTES CON ACCIONES EN ROTURA

MEMBER	LOAD	JOINT	Q_y (t)	Q_z (t)	Q (t)
6	1	6	47,66	-0,97	47,67
13	1	14	47,62	-1,07	47,63
20	1	22	47,6	-1,18	47,61
27	1	30	47,58	-1,25	47,60
34	1	38	47,55	-1,37	47,57
41	1	46	47,55	-1,55	47,58
48	1	54	47,57	-1,71	47,60
55	1	62	47,6	-1,81	47,63
62	1	70	47,95	-0,79	47,96
69	1	78	47,83	-0,94	47,84
76	1	86	47,8	-1,1	47,81
83	1	94	47,8	-1,12	47,81
90	1	102	47,8	-1,28	47,82
97	1	110	47,79	-1,62	47,82
104	1	118	47,81	-1,84	47,85
111	1	126	47,92	-1,99	47,96
118	1	134	48,78	-0,85	48,79
125	1	142	48,77	-0,92	48,78
132	1	150	48,8	-1,06	48,81
139	1	158	48,82	-1,18	48,83
146	1	166	48,84	-1,38	48,86
153	1	174	48,83	-1,64	48,86
160	1	182	48,8	-1,82	48,83
167	1	190	48,8	-1,9	48,84
174	1	198	49,39	-0,8	49,40
181	1	206	49,47	-0,88	49,48
188	1	214	49,53	-1,04	49,54
195	1	222	49,58	-1,23	49,60
202	1	230	49,6	-1,45	49,62
209	1	238	49,59	-1,68	49,62
216	1	246	49,52	-1,86	49,55
223	1	254	49,44	-1,94	49,48
6	2	6	47,9	-0,88	47,91
13	2	14	47,87	-0,98	47,88
20	2	22	47,85	-1,08	47,86
27	2	30	47,83	-1,16	47,84
34	2	38	47,81	-1,27	47,83
41	2	46	47,8	-1,45	47,82
48	2	54	47,82	-1,6	47,85
55	2	62	47,85	-1,7	47,88
62	2	70	48,2	-0,7	48,21
69	2	78	48,08	-0,85	48,09
76	2	86	48,05	-1,01	48,06
83	2	94	48,05	-1,03	48,06
90	2	102	48,05	-1,19	48,06
97	2	110	48,05	-1,52	48,07
104	2	118	48,06	-1,73	48,09
111	2	126	48,16	-1,88	48,20
118	2	134	49,01	-0,76	49,02
125	2	142	49	-0,83	49,01
132	2	150	49,03	-0,96	49,04
139	2	158	49,05	-1,09	49,06
146	2	166	49,07	-1,29	49,09
153	2	174	49,06	-1,54	49,08
160	2	182	49,03	-1,71	49,06
167	2	190	49,03	-1,79	49,06
174	2	198	49,6	-0,71	49,61
181	2	206	49,68	-0,79	49,69
188	2	214	49,75	-0,95	49,76
195	2	222	49,8	-1,13	49,81
202	2	230	49,82	-1,35	49,84
209	2	238	49,8	-1,57	49,82
216	2	246	49,73	-1,75	49,76
223	2	254	49,65	-1,83	49,68

Obra: Viaducto río Francolí
Fecha: 06/09/02
Hora: 12:44:29

Características mecánicas de las secciones

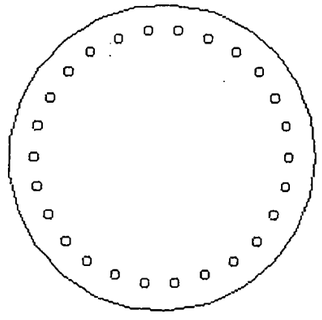
1 Datos

- Materiales

Tipo de hormigón : HA-30
Tipo de acero : B-500-S
fck [MPa] = 30.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

Sección : PILOTE_1
ϕ sección [m] = 1.00
r [m] = 0.086
nº barras = 26
ϕ redondos [mm] = 32



2 Resultados

	Sección bruta	Sección homogeneizada
A [m²]	0.7770	0.924
Ix [m4]	0.0481	0.0606
Iy [m4]	0.0481	0.0606
ix [m]	0.25	0.26
iy [m]	0.25	0.26
x´g [m]	0.50	0.50
y´g [m]	0.50	0.50

	Sección fisurada
Ix [m4]	0.0224
Mfis [kN·m]	351.8
y´fis [m]	0.31

Obra: Ehe
Fecha: 06/09/02
Hora: 12:43:26

Cálculo de secciones a flexión compuesta recta

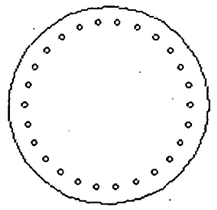
1 Datos

- Materiales

Tipo de hormigón : HA-30
Tipo de acero : B-500-S
fck [MPa] = 30.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

Sección : PILOTE_1
ϕ [m] = 1.00
r [m] = 0.086
nº barras = 26

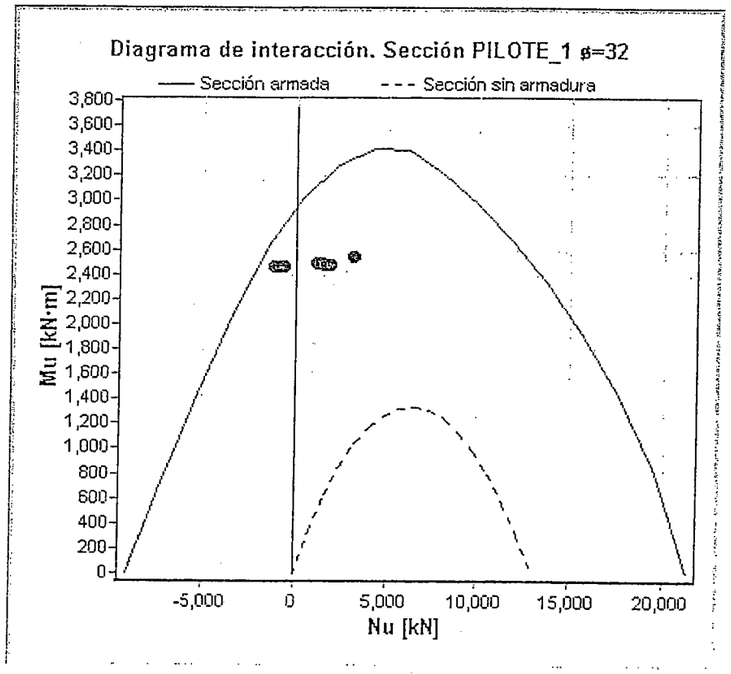


2 Diagrama

ϕ [mm] = 32

Resultados numéricos del diagrama de interacción

x [cm]	1/r [1/m] ·1.E-3	Nu [kN]	Mu [kN·m]
-9999.000	0.0	9091.5	0.0
0.078	12.0	7188.6	730.7
0.156	13.3	5285.8	1437.1
0.212	14.3	3382.9	2084.5
0.268	13.0	1480.1	2631.9
0.336	10.4	-422.8	3023.0
0.404	8.7	-2325.7	3289.0
0.472	7.4	-4228.5	3419.5
0.536	6.5	-6131.4	3400.8
0.594	5.9	-8034.2	3216.8
0.656	5.3	-9937.1	2963.7
0.726	4.8	-11840.0	2678.9
0.805	4.3	-13742.8	2347.0
0.896	3.9	-15645.7	1935.0
1.011	3.4	-17548.5	1442.4
1.316	2.3	-19451.4	843.1
9999.000	0.5	-21354.2	0.0



Punto	Nd [kN]	Md [kN·m]	γ
1	-1078	2470	1.10
2	-896	2468	1.12
3	-871	2467	1.13
4	-725	2465	1.14
5	-714	2465	1.15
6	-627	2463	1.16
7	-600	2463	1.16
8	-575	2462	1.16
9	1236	2489	1.30
10	1443	2489	1.31
11	1525	2480	1.32
12	1704	2480	1.32
13	1708	2478	1.33
14	1830	2477	1.33
15	1861	2478	1.34
16	1899	2477	1.34
17	3163	2543	1.35

Coeficientes de seguridad de los pares de esfuerzos de cálculo

PRONTUARIO INFORMÁTICO DEL HORMIGÓN ESTRUCTURAL 3.0
Cátedra de Hormigón Estructural ETSICCPM - IECA

Obra: Ehe
Fecha: 06/09/02
Hora: 12:43:50

Cálculo de secciones a flexión compuesta recta .

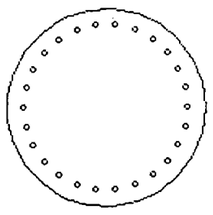
1 Datos

- Materiales

Tipo de hormigón : HA-30
Tipo de acero : B-500-S
fck [MPa] = 30.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

Sección : PILOTE_1
ϕ [m] = 1.00
r [m] = 0.086
nº barras = 26

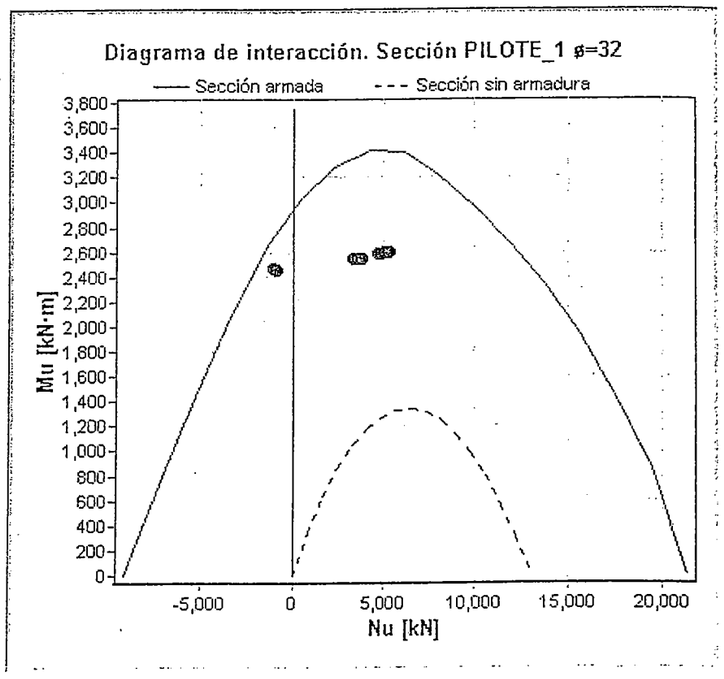


2 Diagrama

ϕ [mm] = 32

Resultados numéricos del diagrama de interacción

x [cm]	1/r [1/m] ·1.E-3	Nu [kN]	Mu [kN·m]
-9999.000	0.0	9091.5	0.0
0.078	12.0	7188.6	730.7
0.156	13.3	5285.8	1437.1
0.212	14.3	3382.9	2084.5
0.268	13.0	1480.1	2631.9
0.336	10.4	-422.8	3023.0
0.404	8.7	-2325.7	3289.0
0.472	7.4	-4228.5	3419.5
0.536	6.5	-6131.4	3400.8
0.594	5.9	-8034.2	3216.8
0.656	5.3	-9937.1	2963.7
0.726	4.8	-11840.0	2678.9
0.805	4.3	-13742.8	2347.0
0.896	3.9	-15645.7	1935.0
1.011	3.4	-17548.5	1442.4
1.316	2.3	-19451.4	843.1
9999.000	0.5	-21354.2	0.0



Coeficientes de seguridad de los pares de esfuerzos de cálculo

Punto	Nd [kN]	Md [kN·m]	γ
1	3384	2545	1.35
2	3437	2541	1.36
3	3616	2544	1.36
4	3642	2542	1.37
5	3774	2545	1.37
6	3776	2543	1.37
7	3828	2545	1.37
8	4657	2582	1.32
9	4854	2587	1.31
10	4919	2586	1.31
11	5071	2591	1.31
12	5122	2590	1.31
13	5226	2594	1.31
14	5247	2593	1.31
15	5286	2595	1.31
16	-1066	2457	1.11
17	-871	2455	1.13

Obra: Ehe
Fecha: 06/09/02
Hora: 12:44:08

Cálculo de secciones a flexión compuesta recta

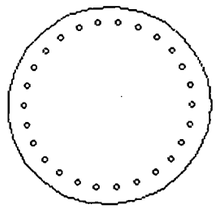
1 Datos

- Materiales

Tipo de hormigón : HA-30
Tipo de acero : B-500-S
fck [MPa] = 30.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

Sección : PILOTE_1
ϕ [m] = 1.00
r [m] = 0.086
nº barras = 26

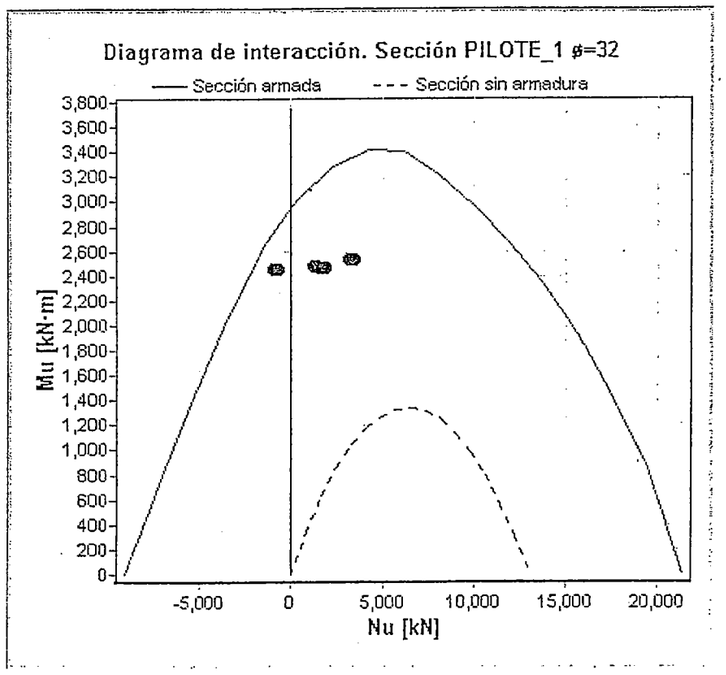


2 Diagrama

ϕ [mm] = 32

Resultados numéricos del diagrama de interacción

x [cm]	1/r [1/m] ·1.E-3	Nu [kN]	Mu [kN·m]
-9999.000	0.0	9091.5	0.0
0.078	12.0	7188.6	730.7
0.156	13.3	5285.8	1437.1
0.212	14.3	3382.9	2084.5
0.268	13.0	1480.1	2631.9
0.336	10.4	-422.8	3023.0
0.404	8.7	-2325.7	3289.0
0.472	7.4	-4228.5	3419.5
0.536	6.5	-6131.4	3400.8
0.594	5.9	-8034.2	3216.8
0.656	5.3	-9937.1	2963.7
0.726	4.8	-11840.0	2678.9
0.805	4.3	-13742.8	2347.0
0.896	3.9	-15645.7	1935.0
1.011	3.4	-17548.5	1442.4
1.316	2.3	-19451.4	843.1
9999.000	0.5	-21354.2	0.0



Punto	Nd [kN]	Md [kN·m]	γ
1	-855	2453	1.13
2	-706	2451	1.15
3	-686	2451	1.15
4	-604	2450	1.17
5	-571	2449	1.17
6	-548	2448	1.17
7	1263	2476	1.31
8	1485	2476	1.32
9	1557	2467	1.33
10	1744	2465	1.33
11	1750	2467	1.33
12	1871	2464	1.35
13	1909	2465	1.35
14	1945	2464	1.35
15	3198	2530	1.35
16	3436	2534	1.36
17	3478	2529	1.37

Coeficientes de seguridad de los pares de esfuerzos de cálculo

Obra: Ehe
Fecha: 06/09/02
Hora: 12:44:22

Cálculo de secciones a flexión compuesta recta

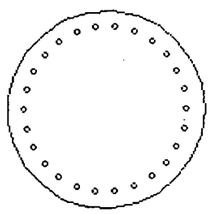
1 Datos

- Materiales

Tipo de hormigón : HA-30
Tipo de acero : B-500-S
fck [MPa] = 30.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

Sección : PILOTE_1
ϕ [m] = 1.00
r [m] = 0.086
nº barras = 26

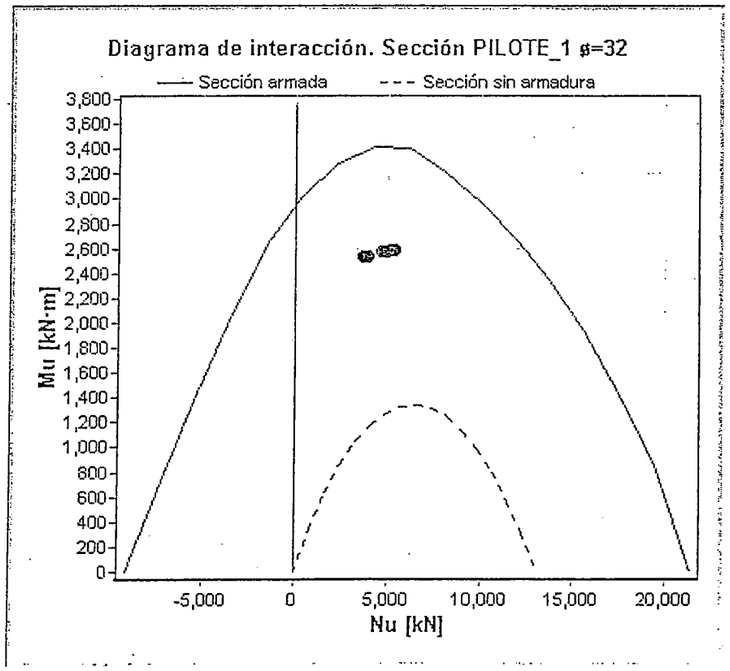


2 Diagrama

ϕ [mm] = 32

Resultados numéricos del diagrama de interacción

x [cm]	1/r [1/m] ·1.E-3	Nu [kN]	Mu [kN·m]
-9999.000	0.0	9091.5	0.0
0.078	12.0	7188.6	730.7
0.156	13.3	5285.8	1437.1
0.212	14.3	3382.9	2084.5
0.268	13.0	1480.1	2631.9
0.336	10.4	-422.8	3023.0
0.404	8.7	-2325.7	3289.0
0.472	7.4	-4228.5	3419.5
0.536	6.5	-6131.4	3400.8
0.594	5.9	-8034.2	3216.8
0.656	5.3	-9937.1	2963.7
0.726	4.8	-11840.0	2678.9
0.805	4.3	-13742.8	2347.0
0.896	3.9	-15645.7	1935.0
1.011	3.4	-17548.5	1442.4
1.316	2.3	-19451.4	843.1
9999.000	0.5	-21354.2	0.0



Coeficientes de seguridad de los pares de esfuerzos de cálculo

Punto	Nd [kN]	Md [kN·m]	γ
1	3670	2532	1.37
2	3688	2530	1.37
3	3826	2531	1.38
4	3830	2533	1.38
5	3882	2533	1.37
6	4692	2570	1.32
7	4904	2576	1.32
8	4960	2575	1.32
9	5123	2580	1.32
10	5167	2579	1.32
11	5278	2583	1.31
12	5296	2582	1.31
13	5337	2584	1.31

Obra: Viaducto río Francolí
Fecha: 09/09/02
Hora: 9:00:11

Cálculo de secciones a cortante

1 Datos

- Materiales

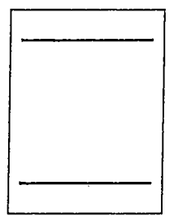
Tipo de hormigón : HA-30
Tipo de acero : B-500-S
fck [MPa] = 30.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Tipo de elemento estructural

Tipo : elemento con armadura a cortante

- Sección

Sección : PILOTE_Q
b0 [m] = 0.75
h [m] = 1.00



2 Comprobación

Tipo de armadura: cercos a 90.0°
separación s [m] = 0.20
ϕ [mm] = 12
nº ramas: 2
Area [cm²/m] = 11.3
ρ [·1.E-3] = 11

Inclinación de las bielas θ[°] = 45
Nd [kN] = 0.0
σyd [MPa] = 0.0

Vu1 [kN] = 3825.0

Vu2 [kN] = 647.5

Vcu [kN] = 303.7

Vsu [kN] = 343.8

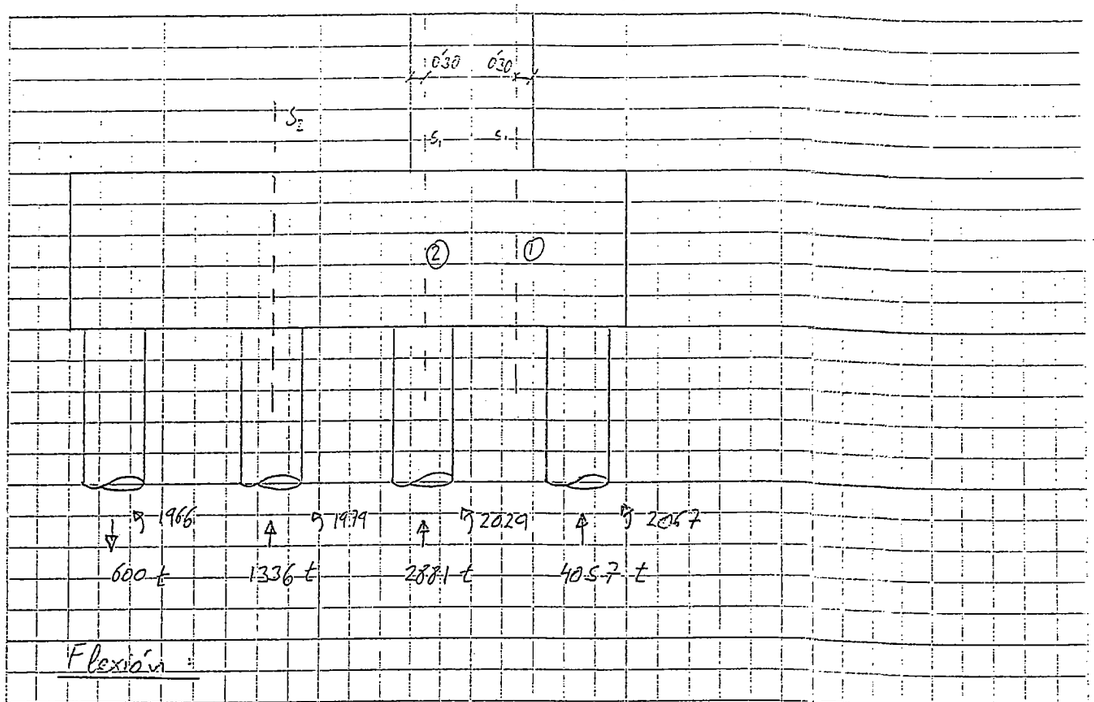
- Resistencia a cortante:

Vu [kN] = 647.5

Proyecto: VIADUCTO FRANCOLÍ

Elaborado: ESTRIBO 1

ENCEPADO DE PILOTES DE 1.60 m



Flexión

① Md = 4057 · 1.05 + 2067 = 6327 mt = 63270 m · KN

② Md = 600 · 8.05 − 1336 · 2.55 − 2881 · 0.05 +

+ 1966 + 1979 + 2029 + 18 · 20 · 13.20 · 5.5 · 3.05 · 1.5 +

+ 3 · 20 · 5.5 · 3.05 · 1.5 = 18920 mt = 189200 m · KN

Cortante

Vd = 600 − 1336 + 18 · 20 · 13.20 · 3.25 · 1.5 +

+ 3 · 20 · 3.25 · 1.5 = 1873 t = 18730 KN

PRONTUARIO INFORMÁTICO DEL HORMIGÓN ESTRUCTURAL 3.0
Cátedra de Hormigón Estructural ETSICCPM - IECA

Obra: Viaducto río Francolí
Fecha: 09/09/02
Hora: 9:56:37

Comprobación de secciones a flexión simple

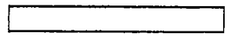
1 Datos

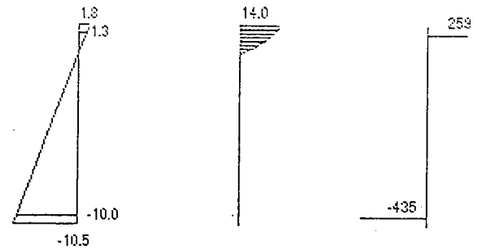
- Materiales

Tipo de hormigón : HA-25
Tipo de acero : B-500-S
fck [MPa] = 25.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

Sección : ESTRI_1
b [m] = 20.00
h [m] = 2.50
ri [m] = 0.100
rs [m] = 0.100





Plano de deformación de agotamiento

x [m] = 0.365
1/r [1/m]·1.E-3 = 4.9
εs ·1.E-3 = 1.8
εi ·1.E-3 = -10.5

Deformación y tensión de armaduras

Profundidad [m]	Armadura [cm²]	Deformación ·1.E-3	Tensión [MPa]
0.100	1061.0	1.3	-259.4
2.400	2120.0	-10.0	434.8

2 Comprobación

At [cm²] = 2120.0
Ac [cm²] = 1061.0

Mu [kN·m] = 209780.9

Obra: Viaducto río Francolí
Fecha: 17/09/02
Hora: 9:31:46

Comprobación de secciones a flexión simple

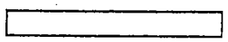
1 Datos

- Materiales

Tipo de hormigón : HA-25
Tipo de acero : B-500-S
fck [MPa] = 25.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

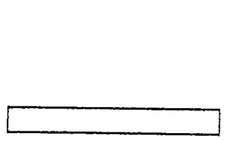
Sección : ESTRI_11
b [m] = 20.00
h [m] = 2.50
ri [m] = 0.100
rs [m] = 0.100

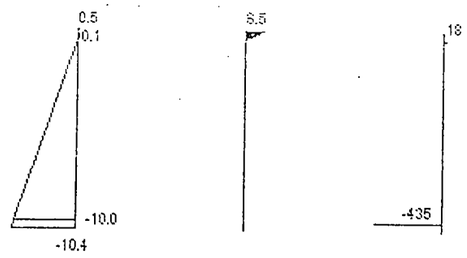


2 Comprobación

At [cm²] = 1061.0
Ac [cm²] = 21020.0

Mu [kN·m] = 108291.2





Plano de deformación de agotamiento

x [m] = 0.121
1/r [1/m]·1.E-3 = 4.4
εs ·1.E-3 = 0.5
εi ·1.E-3 = -10.4

Deformación y tensión de armaduras

Profundidad [m]	Armadura [cm²]	Deformación ·1.E-3	Tensión [MPa]
0.100	21020.0	0.1	-18.1
2.400	1061.0	-10.0	434.8

Obra: Viaducto río Francolí
Fecha: 17/09/02
Hora: 9:28:44

Cálculo de secciones a cortante

1 Datos

- Materiales

Tipo de hormigón : HA-25
Tipo de acero : B-500-S
fck [MPa] = 25.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Tipo de elemento estructural

Tipo : elemento con armadura a cortante

- Sección

Sección : ESTRI_1
b0 [m] = 20.00
h [m] = 2.50

2 Dimensionamiento

Esfuerzo cortante de cálculo Vd [kN] = 18730

Inclinación de las bielas [°] = 45
Inclinación de los cercos [°] = 90.0
ρ [·1.E-3] = 4
Nd [kN] = 0.0
σxd [MPa] = 0.0
σyd [MPa] = 0
θe [°] = 45.0

ϕ [mm]	Separación [mm]	nº ramas	Area [cm²/m]	Tipo	Vsu [kN]	Vu2 [kN]
ø 6	----	----	----	----	----	----
ø 8	----	----	----	----	----	----
ø 10	----	----	----	----	----	----
ø 12	----	----	----	----	----	----

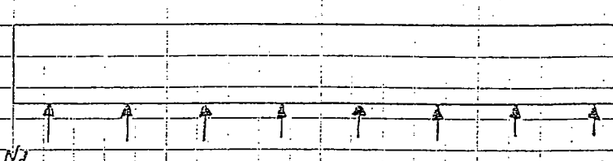
Área estricta [cm²/m] = 166.7
(Cuantía mínima)
Vu1 [kN] = 240000.0
Vcu [kN] = 13326.6

Proyecto: VIADUCTO FRANCOLÍ Hoja de

Elaborado: ESTRIBO 1 Fecha

ENCEPADO DE PILOTES DE 160 cm

Estribo 1:



$N_d = 534\ t$

$q = \frac{8 \cdot 534}{20} = 214\ t/m$

$M_d = \frac{214 \cdot 2'5^2}{10} = 134\ m \cdot t = 1340\ m \cdot KN$

Sección:

$h = 2'50\ m$

$b = 2'00\ m$

$A_s = \frac{0'9}{1000} \cdot 2'50 \cdot 2 = 45\ cm^2 \Rightarrow$

$\Rightarrow \varnothing 20/12'5$

PRONTUARIO INFORMÁTICO DEL HORMIGÓN ESTRUCTURAL 3.0

Cátedra de Hormigón Estructural ETSICCPM - IECA

Obra: Viaducto río Francolí
Fecha: 09/09/02
Hora: 9:53:06

Comprobación de secciones a flexión simple

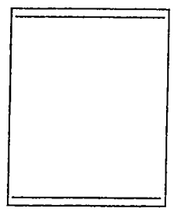
1 Datos

- Materiales

Tipo de hormigón : HA-25
Tipo de acero : B-500-S
fck [MPa] = 25.00
fyk [MPa] = 500.00
γc = 1.50
γs = 1.15

- Sección

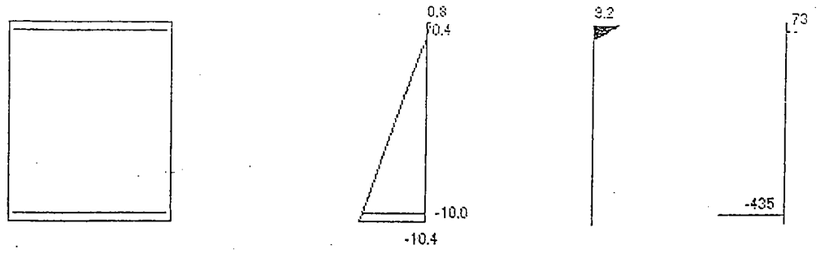
Sección : ESTRI_12
b [m] = 2.00
h [m] = 2.50
ri [m] = 0.100
rs [m] = 0.100



2 Comprobación

At [cm²] = 50.0
Ac [cm²] = 50.0

Mu [kN·m] = 5067.3



Plano de deformación de agotamiento

x [m] = 0.181

1/r [1/m]·1.E-3 = 4.5

εs ·1.E-3 = 0.8

εi ·1.E-3 = -10.4

Deformación y tensión de armaduras

Profundidad [m]	Armadura [cm²]	Deformación ·1.E-3	Tensión [MPa]
0.100	50.0	0.4	-73.4
2.400	50.0	-10.0	434.8

CALCULO DE ESTRIBOS V-01 03/00 PROPIEDAD DE INTECSA

ESTRIBO 1 FRANCOLI

CARACTERISTICAS DEL RELLENO

PESO ESPECIFICO (TN/M3)	= 2.00
ANGULO DE ROZAMIENTO FI	= 30.00
ANGULO ROZAMIENTO TERRENO-MURO	= 0.00
SOBRECARGA (TN/M2)	= 3.00
COEFICIENTE DE EMPUJE ACTIVO	= 0.333
COEFICIENTE MEDIO DE PONDERACION	= 1.500

CARACTERISTICAS DE LOS MATERIALES

RESISTENCIA CARACTERISTICA DEL HORMIGON	= 250. KG/CM2
LIMITE ELASTICO DEL ACERO	= 5100. KG/CM2
RECUBRIMIENTO DE LAS ARMADURAS	= 0.040 M

CARGAS SOBRE EL ESTRIBO

CARGA VERTICAL DE TABLERO PESO PROPIO Y CARGA PERMANENTE	417.0 TN
CARGA VERTICAL DE SOBRECARGAS	349.0 TN
FUERZA LONGITUDINAL DE FRENADO RETRACCION Y TEMPERATURA	21.0 TN
FUERZA TRANSVERSAL DE VIENTO	47.0 TN
MOMENTO TRANSVERSAL DE SOBRECARGAS	225.0 MT
FUERZA LONGITUDINAL DE SISMO	0.0 TN
FUERZA TRANSVERSAL DE SISMO	0.0 TN

GEOMETRIA DEL ESTRIBO
=====================

ANCHURA DEL ESTRIBO	B	=	20.00
ESVIAJE (GRADOS SEXAGESIMALES)	BETA	=	0.00

ALZADO DEL ESTRIBO

ESPESOR DEL FALDON	A3	=	0.50
ALTURA DEL FALDON	A6	=	2.80
DISTANCIA DE APOYO A BORDE ESTRIBO	A5	=	0.95
ESPESOR DEL ESTRIBO	A2	=	2.00
ALTURA TOTAL DEL ESTRIBO	H + C	=	16.50
ALTURA DE TIERRAS	H	=	14.00

ZAPATA

VUELO DELANTERO	A1	=	1.50
VUELO TRASERO	A4	=	5.50
LONGITUD TOTAL	L	=	9.00
CANTO	C	=	2.50
RESGUARDO SOBRE ZAPATA		=	0.30
TENSION MEDIA PEDIDA SOBRE TERRENO		=	30.00 TN/M2

CALCULO DE ESTRIBOS V-01 03/00 PROPIEDAD DE INTECSA

ARMADURAS DEL ALZADO

ARMADURA A CORTANTE A = 9.03 CM2/M MINIMA (8.33 CM2/M)

TRASDOS.	ZONA INFERIOR	AV.= 68.2 CM2/M	(FI 25 A 0.062 M)
U(CALCULO)= 68.2 CM2/M		AH.= 32.0 CM2/M	(FI 25 A 0.150 M)
	8.3 M. SUPERIORES	AV.= 34.1 CM2/M	(FI 25 A 0.125 M)
		AH.= 32.0 CM2/M	(FI 25 A 0.150 M)
INTRADOS		AV.= 6.0 CM2/M	(FI 12 A 0.175 M)
		AH.= 32.0 CM2/M	(FI 25 A 0.150 M)
FALDON	TRASDOS	AV.= 6.9 CM2/M	(FI 12 A 0.150 M)
		AH.= 8.0 CM2/M	(FI 14 A 0.175 M)
	INTRADOS	AV.= 6.9 CM2/M	(FI 12 A 0.150 M)
		AH.= 8.0 CM2/M	(FI 14 A 0.175 M)

ESTRIBO 1 FRANCOLI

CARACTERISTICAS DEL RELLENO

PESO ESPECIFICO (TN/M3)	=	2.00
ANGULO DE ROZAMIENTO FI	=	30.00
ANGULO ROZAMIENTO TERRENO-MURO	=	0.00
SOBRECARGA (TN/M2)	=	3.00
COEFICIENTE DE EMPUJE ACTIVO	=	0.333
COEFICIENTE MEDIO DE PONDERACION	=	1.500

CARACTERISTICAS DE LOS MATERIALES

RESISTENCIA CARACTERISTICA DEL HORMIGON	=	250. KG/CM2
LIMITE ELASTICO DEL ACERO	=	5100. KG/CM2
RECUBRIMIENTO DE LAS ARMADURAS	=	0.040 M

CARGAS SOBRE EL ESTRIBO

CARGA VERTICAL DE TABLERO PESO PROPIO Y CARGA PERMANENTE	417.0 TN
CARGA VERTICAL DE SOBRECARGAS	349.0 TN
FUERZA LONGITUDINAL DE FRENADO RETRACCION Y TEMPERATURA	21.0 TN
FUERZA TRANSVERSAL DE VIENTO	47.0 TN
MOMENTO TRANSVERSAL DE SOBRECARGAS	225.0 MT
FUERZA LONGITUDINAL DE SISMO	0.0 TN
FUERZA TRANSVERSAL DE SISMO	0.0 TN

CALCULO DE ESTRIBOS V-01 03/00 PROPIEDAD DE INTECSA

GEOMETRIA DEL ESTRIBO

ANCHURA DEL ESTRIBO	B	=	20.00
ESVIAJE (GRADOS SEXAGESIMALES)	BETA	=	0.00

ALZADO DEL ESTRIBO

ESPESOR DEL FALDON	A3	=	0.50
ALTURA DEL FALDON	A6	=	2.80
DISTANCIA DE APOYO A BORDE ESTRIBO	A5	=	0.95
ESPESOR DEL ESTRIBO	A2	=	2.00
ALTURA TOTAL DEL ESTRIBO	H + C	=	9.80
ALTURA DE TIERRAS	H	=	7.30

ZAPATA

VUELO DELANTERO	A1	=	1.50
VUELO TRASERO	A4	=	5.50
LONGITUD TOTAL	L	=	9.00
CANTO	C	=	2.50
RESGUARDO SOBRE ZAPATA		=	0.30
TENSION MEDIA PEDIDA SOBRE TERRENO		=	30.00 TN/M2

ARMADURAS DEL ALZADO

TRASDOS.	ZONA INFERIOR	AV.= 29.5 CM2/M	(FI 25 A 0.150 M)
U(CALCULO)=	9.3 CM2/M	AH.= 32.0 CM2/M	(FI 25 A 0.150 M)
	4.1 M. SUPERIORES	AV.= 14.7 CM2/M	(FI 25 A 0.300 M)
		AH.= 32.0 CM2/M	(FI 25 A 0.150 M)
INTRADOS		AV.= 6.0 CM2/M	(FI 12 A 0.175 M)
		AH.= 32.0 CM2/M	(FI 25 A 0.150 M)
FALDON	TRASDOS	AV.= 6.9 CM2/M	(FI 12 A 0.150 M)
		AH.= 8.0 CM2/M	(FI 14 A 0.175 M)
	INTRADOS	AV.= 6.9 CM2/M	(FI 12 A 0.150 M)
		AH.= 8.0 CM2/M	(FI 14 A 0.175 M)

CALCULO DE ESTRIBOS V-01 03/00 PROPIEDAD DE INTECSA

ESTRIBO 1 FRANCOLI

CARACTERISTICAS DEL RELLENO

PESO ESPECIFICO (TN/M3)	= 2.00
ANGULO DE ROZAMIENTO FI	= 30.00
ANGULO ROZAMIENTO TERRENO-MURO	= 0.00
SOBRECARGA (TN/M2)	= 3.00
COEFICIENTE DE EMPUJE ACTIVO	= 0.333
COEFICIENTE MEDIO DE PONDERACION	= 1.500

CARACTERISTICAS DE LOS MATERIALES

RESISTENCIA CARACTERISTICA DEL HORMIGON	= 250. KG/CM2
LIMITE ELASTICO DEL ACERO	= 5100. KG/CM2
RECUBRIMIENTO DE LAS ARMADURAS	= 0.040 M

CARGAS SOBRE EL ESTRIBO

CARGA VERTICAL DE TABLERO PESO PROPIO Y CARGA PERMANENTE	417.0 TN
CARGA VERTICAL DE SOBRECARGAS	181.0 TN
FUERZA LONGITUDINAL DE FRENADO RETRACCION Y TEMPERATURA	21.0 TN
FUERZA TRANSVERSAL DE VIENTO	44.0 TN
MOMENTO TRANSVERSAL DE SOBRECARGAS	667.0 MT
FUERZA LONGITUDINAL DE SISMO	0.0 TN
FUERZA TRANSVERSAL DE SISMO	0.0 TN

GEOMETRIA DEL ESTRIBO
==========

ANCHURA DEL ESTRIBO	B	= 20.00
ESVIAJE (GRADOS SEXAGESIMALES)	BETA	= 0.00

ALZADO DEL ESTRIBO

ESPESOR DEL FALDON	A3	= 0.50
ALTURA DEL FALDON	A6	= 2.80
DISTANCIA DE APOYO A BORDE ESTRIBO	A5	= 0.95
ESPESOR DEL ESTRIBO	A2	= 2.00
ALTURA TOTAL DEL ESTRIBO	H + C	= 16.50
ALTURA DE TIERRAS	H	= 14.00

ZAPATA

VUELO DELANTERO	A1	= 1.50
VUELO TRASERO	A4	= 5.50
LONGITUD TOTAL	L	= 9.00
CANTO	C	= 2.50
RESGUARDO SOBRE ZAPATA		= 0.30
TENSION MEDIA PEDIDA SOBRE TERRENO		= 30.00 TN/M2

CALCULO DE ESTRIBOS V-01 03/00 PROPIEDAD DE INTECSA

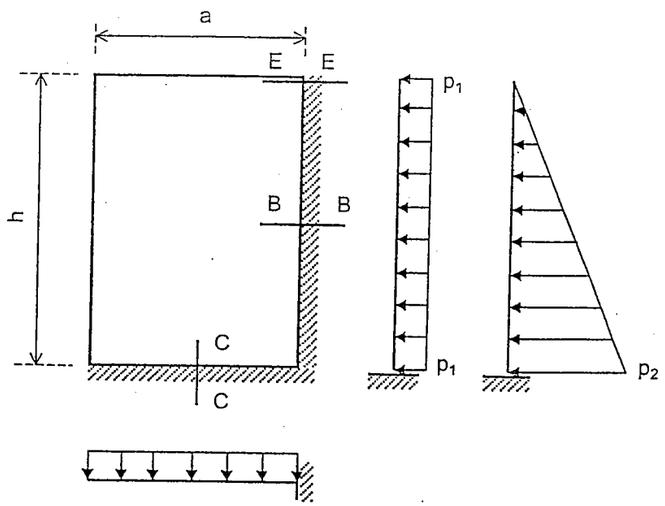
ARMADURAS DEL ALZADO

ARMADURA A CORTANTE A = 9.03 CM2/M MINIMA (8.33 CM2/M)

TRASDOS. U(CALCULO)= 68.2 CM2/M	ZONA INFERIOR	AV.= 68.2 CM2/M	(FI 25 A 0.062 M)
		AH.= 32.0 CM2/M	(FI 25 A 0.150 M)
	8.3 M. SUPERIORES	AV.= 34.1 CM2/M	(FI 25 A 0.125 M)
		AH.= 32.0 CM2/M	(FI 25 A 0.150 M)
INTRADOS		AV.= 6.0 CM2/M	(FI 12 A 0.175 M)
		AH.= 32.0 CM2/M	(FI 25 A 0.150 M)
FALDON	TRASDOS	AV.= 6.9 CM2/M	(FI 12 A 0.150 M)
		AH.= 8.0 CM2/M	(FI 14 A 0.175 M)
	INTRADOS	AV.= 6.9 CM2/M	(FI 12 A 0.150 M)
		AH.= 8.0 CM2/M	(FI 14 A 0.175 M)

ALETA VUELTA

Definición geométrica



Ángulo de rozamiento interno	ϕ =	30 °C
Peso específico del terreno	γ =	2,00 t/m^3
Coeficiente de empuje activo	k =	0,33
Sobrecarga uniforme	p =	3,00 t/m^2

$p_1 = p\ k$

$p_2 = \gamma\ k\ h$

Dimensiones de la losa

a = 5,50 m

h = 13,00 m

Presiones del terreno

p_1 = 1,00 t/m^2

p_2 = 8,67 t/m^2

Dimensionamiento

Relación ancho/canto = a/h = **0,423**

c_1	a_0/h_0	c_{B1}/c_{B2}
0,4286	0,375	0,4021
0,175	0,375	0,1552

$$M_{B-B} = (c_{B1}\ p_1 + c_{B2}\ p_2)\ a^2$$

M_{B-B} = **52,85 mt/m**

c_1	a_0/h_0	c_{C1}/c_{C2}
0,0589	0,375	0,0767
0,0354	0,375	0,0428

$$M_{C-C} = (c_{C1}\ p_1 + c_{C2}\ p_2)\ h^2$$

M_{C-C} = **75,62 mt/m**

Cortante en sección B-B

c_1	a_0/h_0	c_{B1}/c_{B2}
1,102	0,375	1,1066
0,480	0,375	0,4594

$$V_{B-B} = (c_{B1}\ p_1 + c_{B2}\ p_2)\ a$$

V_{B-B} = **27,98 t/m**

Cortante en sección C-C

c_1	a_0/h_0	c_{C1}/c_{C2}
0,5503	0,375	0,6161
0,3632	0,375	0,3875

$$V_{C-C} = (c_{C1}\ p_1 + c_{C2}\ p_2)\ h$$

V_{C-C} = **77,42 t/m**

Armadura de refuerzo en espaldón del estribo

c_1	a_0/h_0	c_{E1}/c_{E2}
0,4565	0,375	0,4462
0,0818	0,375	0,0843

$$M_{E-E} = (c_{E1}\ p_1 + c_{E2}\ p_2)\ a^2$$

M_{E-E} = **35,61 mt/m**

Armado de aletas

Tipo de Hormigón	H - 25	Resistencia característica del hormigón	2550 T/m^2
Tipo de Acero	B 500 S	Coeficiente de minoración del hormigón	1,50
		Límite elástico del acero	5100 kp/cm^2
		Coeficiente de minoración del acero	1,15

Dimensionamiento

$$U_o = 0{,}85 * 0{,}90\, f_{cd}\, b\, d$$

$$M_{TOPE} \leq 0{,}375\, U_o\, d$$

$$U_{s1} = U_0 \left(1 - \sqrt{1 - \frac{2M_d}{U_o\, d}}\right)$$

Espesor de la aleta = 0,60 m

Espesor del espaldón = 0,50 m

Sección	r	U_o	$M_{d/m}$	M_{TOPE}	U_{s1}	$0.04*A_c*f_{cd}$	$A_{s,nec.}$	$A_{mínima}$	$A_{cálculo}$	$A_{s,disp.}$
B-B	0,03	741,29	79,28	158,45	155,37	38,76	35,03	4,80	35,03	39,27
C-C	0,03	741,29	113,43	158,45	236,84	38,76	53,41	5,40	53,41	55,35
E-E	0,03	611,24	53,41	107,73	126,79	31,96	28,59	4,00	28,59	39,27

Esfuerzo Cortante

Resistencia de cálculo de la armadura a cortante: f_{yd} = 4080,00 kp/cm^2

$$V_{su} = V_{rd} - V_{cu}$$

$$V_{cu} = 0{,}10\, \xi\, (100\, \rho_1\, 0.9\, f_{ck})^{1/3}\, b_0\, d$$

$$V_{u2} = 0{,}12\, \xi\, (100\, \rho_1\, 0.9\, f_{ck})^{1/3}\, b_0\, d$$

$$\xi = 1 + \sqrt{\frac{200}{d}}$$

$$\rho_1 = \frac{A_s}{b_0\, d}$$

$$A_{st} = \frac{V_{su}}{0{,}9\, d\, f_{yd}}$$

$$A_{st,min} = 0{,}02\, b_0\, \frac{f_{cd}}{f_{yd}}$$

1. Comprobación de agotamiento por compresión oblícua del alma.

condición: $V_{rd} \leq V_{u1}$

$$V_{rd} \simeq V_{u1}$$

$$V_{u1} = 0.30\, b\, d\, f_{cd}$$

2. Comprobación de agotamiento por tracción del alma.

a) Sin armadura de cortante

condición: $V_{rd} \leq V_{u2}$

b) Con armadura de cortante

condición: $V_{rd} = V_{cu} + V_{su}$

Sección	ξ	ρ_1	V_{u1}	V_{u2}	V_{cu}	V_{rd}	A_{st}	$A_{st,min}$	$A_{st,disp.}$	
B-B	1,59	0,0086	261,63	28,68	24,75	41,98	8,23	8,33	11,17	08 / 30 / 30
C-C	1,59	0,0121	261,63	32,16	27,76	116,13	42,22	8,33	39,27	10 / 20 / 20

NOTA: Se debe procurar no poner cercos. Si saliera armadura de cortante modificar dimensiones de aleta.

Armadura mínima en cara vista.

Horizontal = 6,42 cm^2/m

Vertical = 1,62 cm^2/m

COMPROBACIÓN A FISURACIÓN

LOSA

Recubrimiento = 0,03 m

Es = 21000000 T/m^2

β = 1,7

fck = 25 N/mm^2

$$W_k = \beta \, s_m \, \varepsilon_{sm}$$

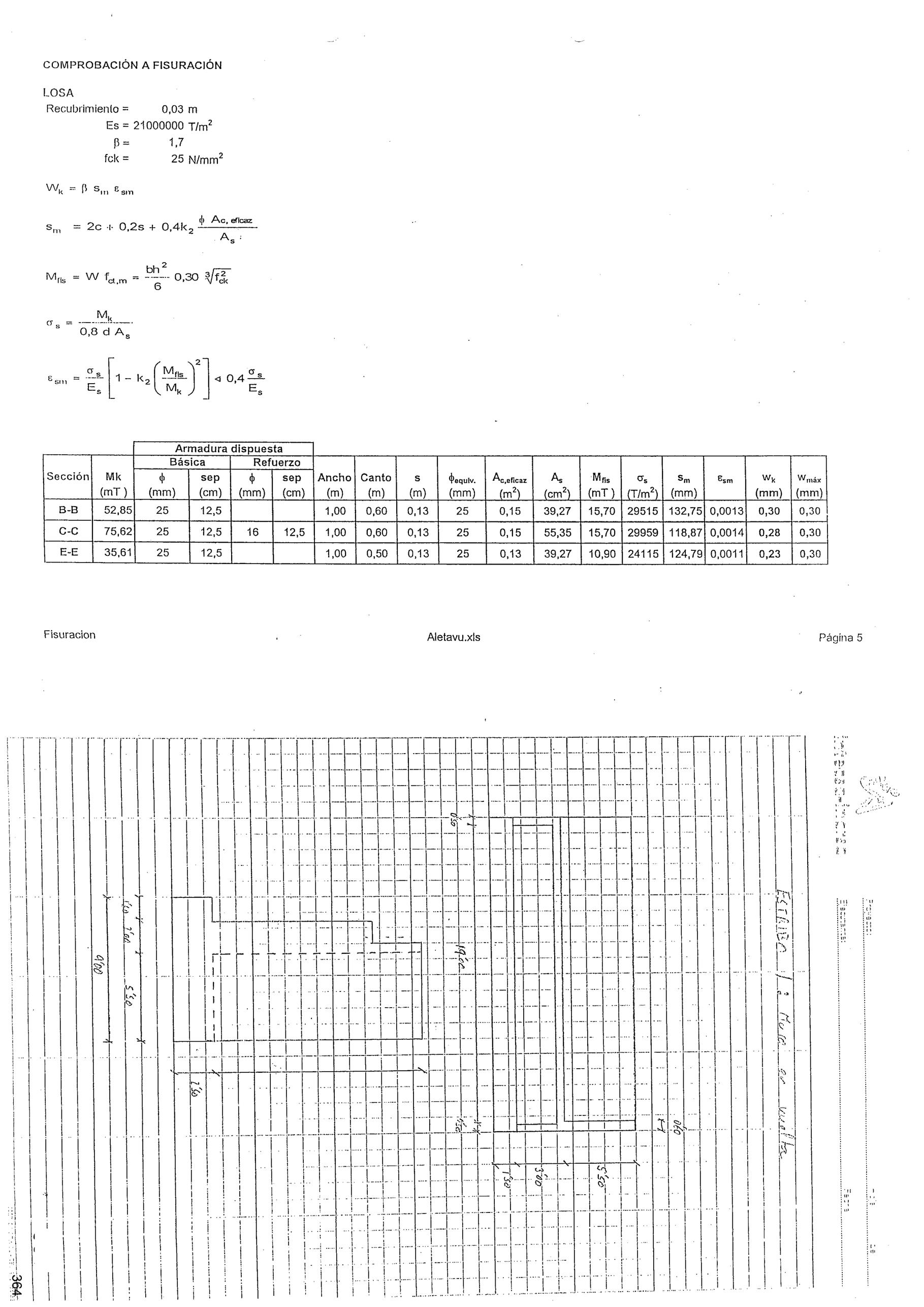
$$s_m = 2c + 0{,}2s + 0{,}4k_2 \frac{\phi \, A_{c,eficaz}}{A_s}$$

$$M_{fis} = W \, f_{ct,m} = \frac{bh^2}{6} \, 0{,}30 \sqrt[3]{f_{ck}^2}$$

$$\sigma_s = \frac{M_k}{0{,}8 \, d \, A_s}$$

$$\varepsilon_{sm} = \frac{\sigma_s}{E_s}\left[1 - k_2\left(\frac{M_{fis}}{M_k}\right)^2\right] \geq 0{,}4\frac{\sigma_s}{E_s}$$

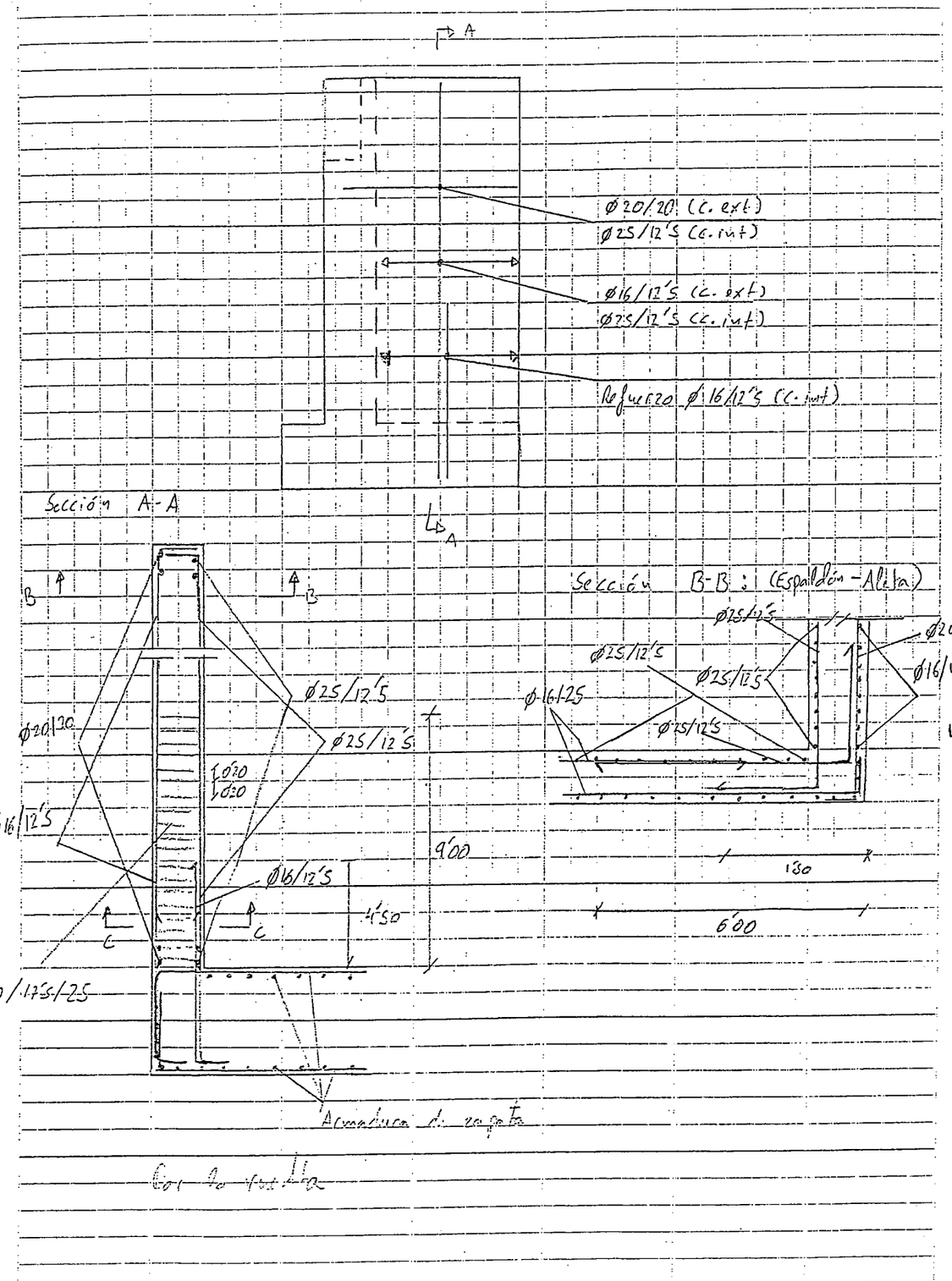
Sección	Mk (mT)	Armadura dispuesta Básica ϕ (mm)	Básica sep (cm)	Refuerzo ϕ (mm)	Refuerzo sep (cm)	Ancho (m)	Canto (m)	s (m)	$\phi_{equiv.}$ (mm)	$A_{c,eficaz}$ (m^2)	A_s (cm^2)	M_{fis} (mT)	σ_s (T/m^2)	s_m (mm)	ε_{sm}	w_k (mm)	$w_{máx}$ (mm)
B-B	52,85	25	12,5			1,00	0,60	0,13	25	0,15	39,27	15,70	29515	132,75	0,0013	0,30	0,30
C-C	75,62	25	12,5	16	12,5	1,00	0,60	0,13	25	0,15	55,35	15,70	29959	118,87	0,0014	0,28	0,30
E-E	35,61	25	12,5			1,00	0,50	0,13	25	0,13	39,27	10,90	24115	124,79	0,0011	0,23	0,30



Proyecto: Hoja de

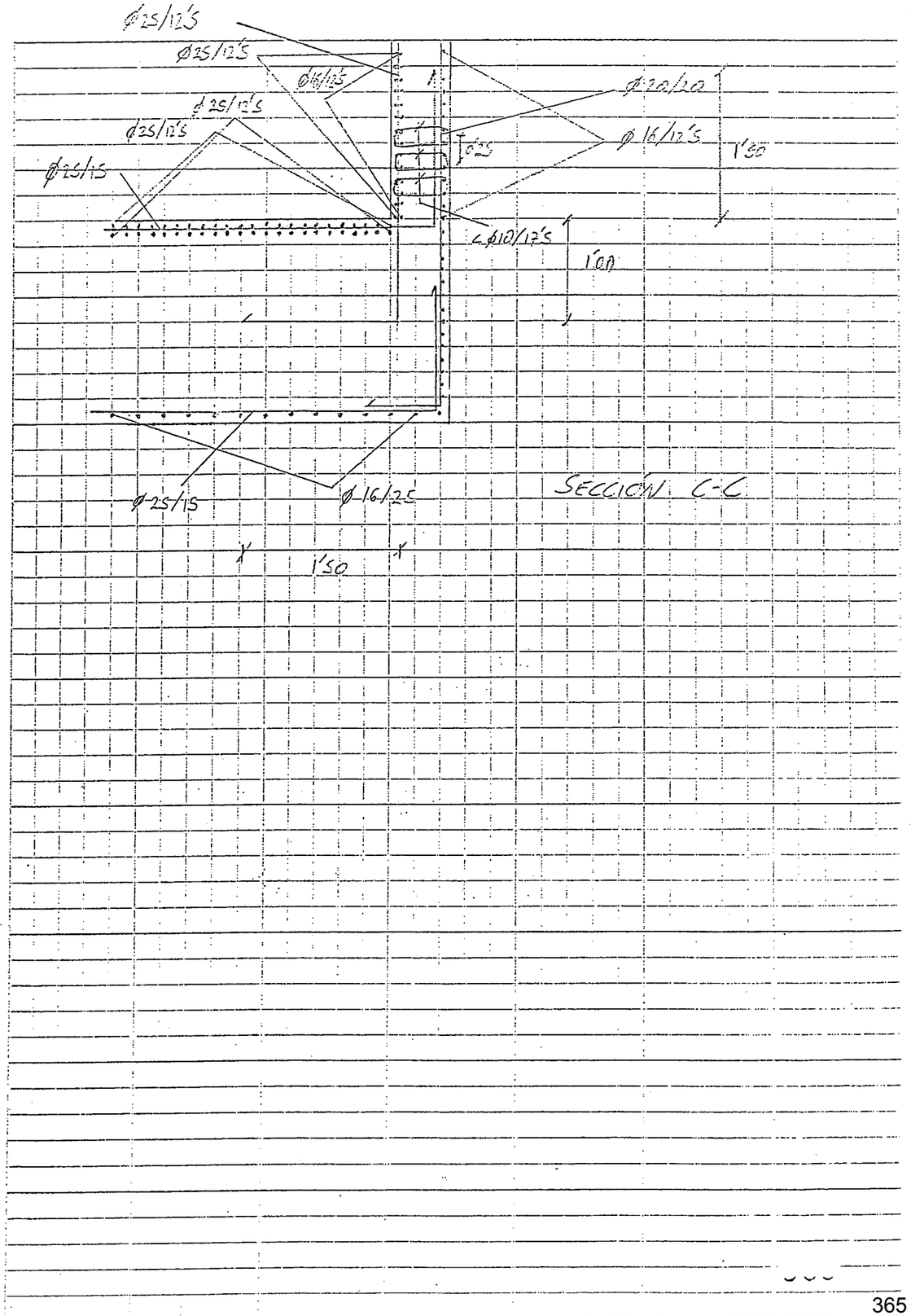
Ejecutante: Fecha

ARMADURA MURO EN VUELTA

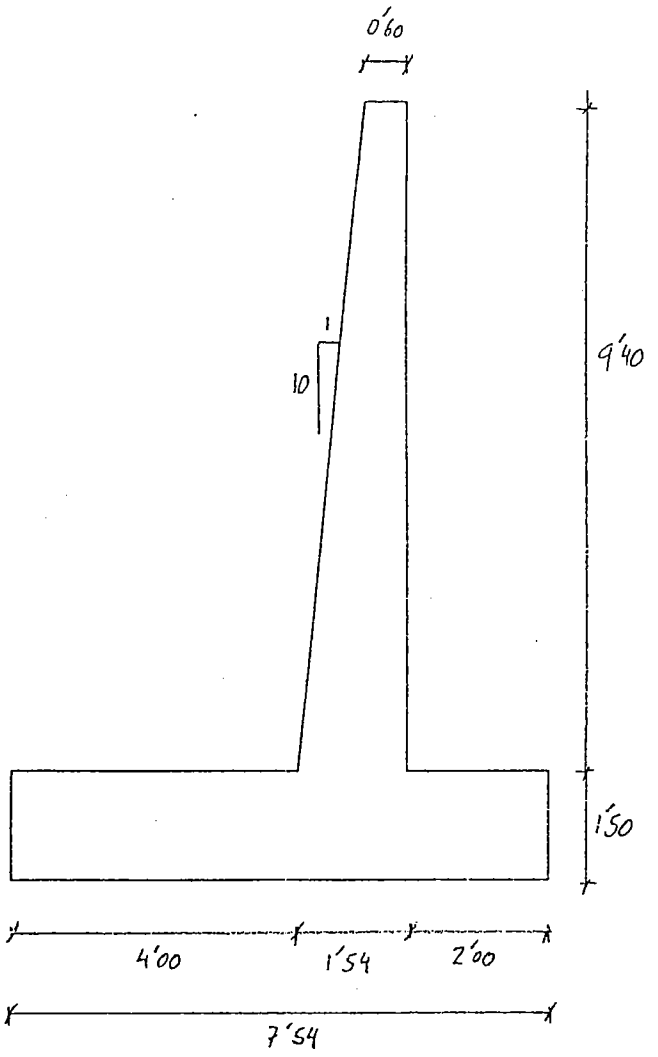


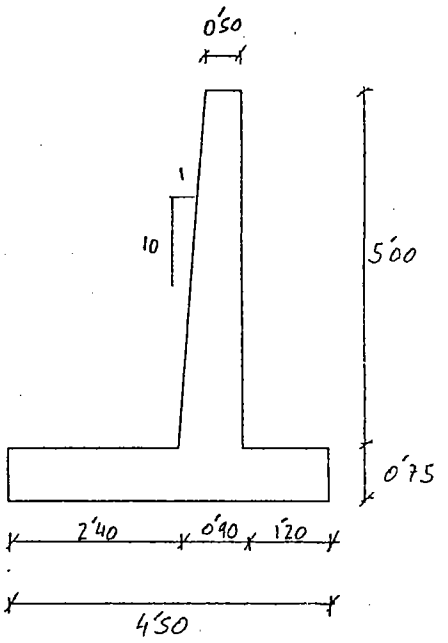
Proyecto: Hoja de

Ejecutante: Fecha

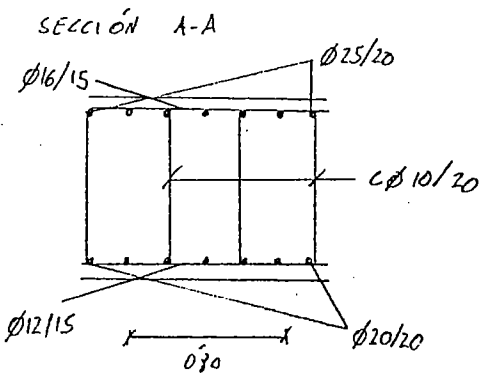


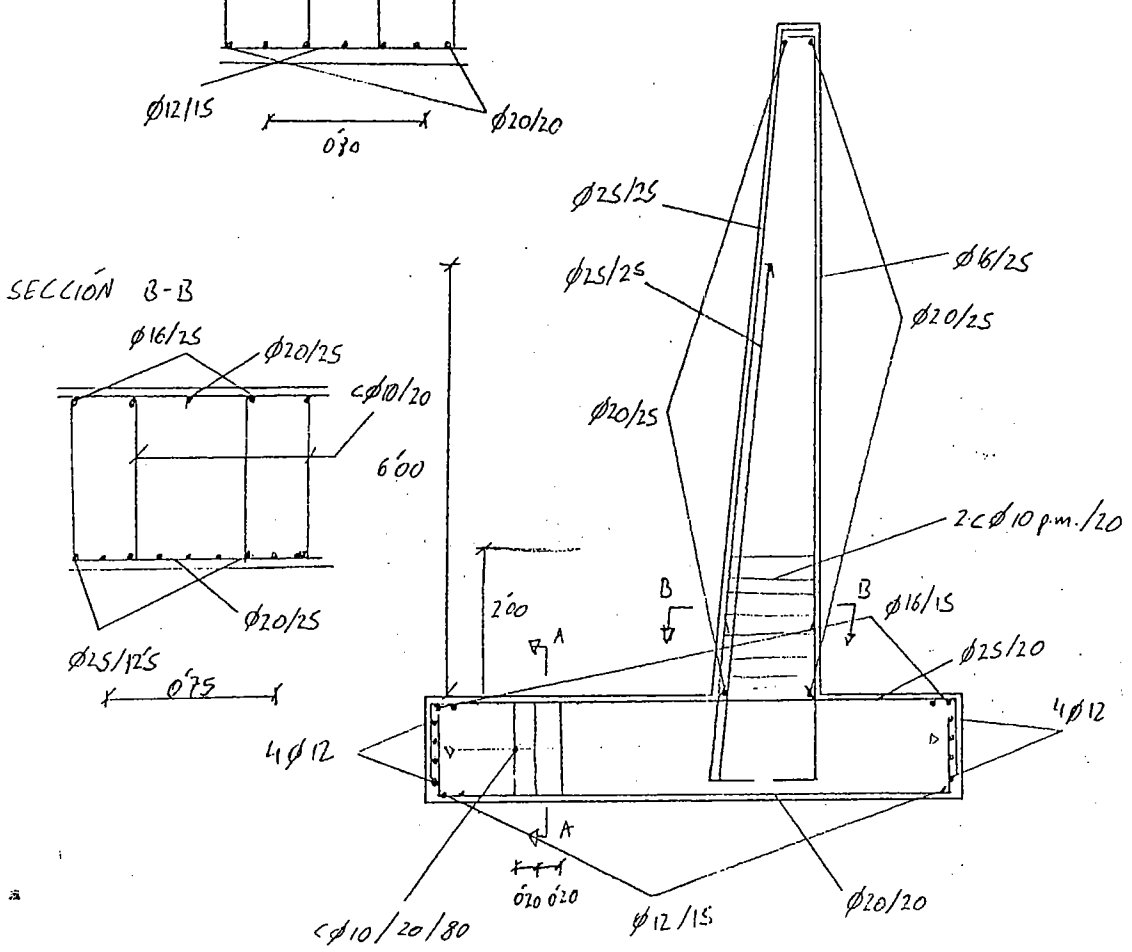
MURO II

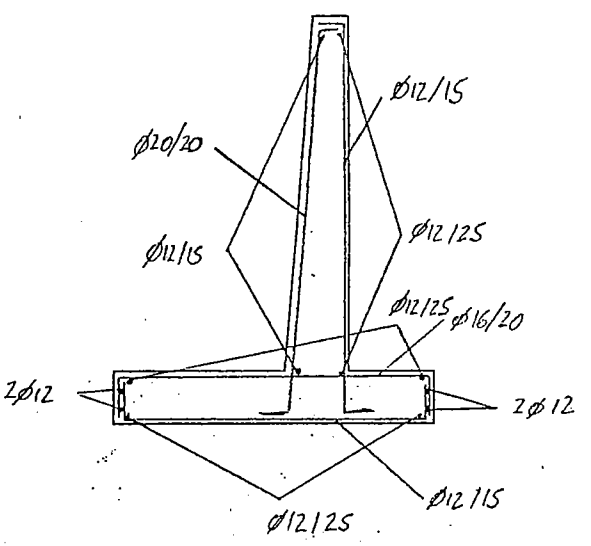




MURO II







CARACTERISTICAS DEL RELLENO

PESO ESPECIFICO (TN/M3)	=	1.80
ANGULO DE ROZAMIENTO FI	=	30.00
ANGULO ROZAMIENTO TERRENO-MURO	=	0.00
ANGULO DE TALUD DEL TERRENO	=	0.00
SOBRECARGA (TN/M2)	=	3.00
PENDIENTE DE INCLINACION DEL TRASDOS	=	0.1000
COEFICIENTE DE EMPUJE ACTIVO	=	0.374
COEFICIENTE DE EMPUJE ACTIVO VERTICAL	=	0.037
COEFICIENTE MEDIO DE PONDERACION	=	1.500

CARACTERISTICAS DE LOS MATERIALES

RESISTENCIA CARACTERISTICA DEL HORMIGON	=	250. KG/CM2
LIMITE ELASTICO DEL ACERO	=	5100. KG/CM2
RECUBRIMIENTO DE LAS ARMADURAS	=	0.050 M

CALCULO DE MUROS V-01 03/00 PROPIEDAD DE INTECSA

GEOMETRIA DEL MURO

ALZADO DEL MURO

ANCHO EN CORONACION	A3	=	0.60
ANCHO EN LA BASE	A2	=	1.54
INCLINACION DEL TRASDOS	CTG(ALFA)	=	0.10000
ALTURA TOTAL	H1	=	9.70
ALTURA DE TIERRAS	H	=	9.40

ZAPATA

VUELO DELANTERO	A1	=	2.00
VUELO TRASERO	A4	=	4.00
LONGITUD TOTAL	L	=	7.54
CANTO	C	=	1.50
RESGUARDO SOBRE ZAPATA		=	0.30
TENSION MEDIA PEDIDA SOBRE TERRENO		=	LIBRE

ARMADURAS DEL ALZADO

ARMADURA A CORTANTE A = 0.78 CM2/M MINIMA (8.33 CM2/M)

TRASDOS. ZONA INFERIOR AV.= 34.3 CM2/M (FI 25 A 0.125 M)
AH.= 12.3 CM2/M (FI 20 A 0.250 M)

COMPROBACION DE FISURACION Mk =115.98 T*M W = 0.299 (Wm = 0.300)

4.9 M. SUPERIORES AV.= 17.2 CM2/M (FI 25 A 0.250 M)
AH.= 10.3 CM2/M (FI 16 A 0.175 M)

INTRADOS AV.= 4.6 CM2/M (FI 12 A 0.225 M)
AH.= 12.3 CM2/M (FI 20 A 0.250 M)

ARMADURA DE ZAPATA

ARMADURA CORTANTE VUELO TRASERO A = 2.95 CM2/M MINIMA (8.33 CM2/M)

CARA INFERIOR. A. PRINCIPAL = 14.3 CM2/M (FI 20 A 0.200 M)
A. DE REPARTO = 7.5 CM2/M (FI 12 A 0.150 M)

CARA SUPERIOR. A. PRINCIPAL = 22.7 CM2/M (FI 20 A 0.125 M)
A. DE REPARTO = 10.5 CM2/M (FI 16 A 0.175 M)

LATERAL A. DE PIEL = (4 FI 12) x 2

TENSIONES EN EL TERRENO (TN/M2) SIN SISMO. (S. ADM.= 24.51)

S1 = 30.63 SA = 24.56 SB = 19.89 S2 = 7.74

COEFICIENTE DE SEGURIDAD AL DESLIZAMIENTO = 1.60
COEFICIENTE DE SEGURIDAD AL VUELCO = 3.06

VOLUMEN DE HORMIGON = 21.69 M3. PESO DE ACERO = 947.0 KG

NOTA: SE DISPONDRAN JUNTAS VERTICALES CADA 7.5 M

CALCUL. DE MUROS V-01 03/00 PROPIEDAD DE INTECSA

GEOMETRIA DEL MURO
==========

ALZADO DEL MURO

ANCHO EN CORONACION	A3	=	0.50
ANCHO EN LA BASE	A2	=	0.90
INCLINACION DEL TRASDOS	CTG(ALFA)	=	0.10000
ALTURA TOTAL	H1	=	5.30
ALTURA DE TIERRAS	H	=	5.00

ZAPATA

VUELO DELANTERO	A1	=	1.20
VUELO TRASERO	A4	=	2.40
LONGITUD TOTAL	L	=	4.50
CANTO	C	=	0.75
RESGUARDO SOBRE ZAPATA		=	0.30
TENSION MEDIA PEDIDA SOBRE TERRENO		=	LIBRE

ARMADURAS DEL ALZADO

TRASDOS. ZONA INFERIOR AV.= 11.7 CM2/M (FI 20 A 0.250 M)
AH.= 7.2 CM2/M (FI 12 A 0.150 M)

COMPROBACION DE FISURACION Mk = 18.78 T*M W = 0.234 (Wm = 0.300)

INTRADOS AV.= 2.7 CM2/M (FI 12 A 0.250 M)
AH.= 7.2 CM2/M (FI 12 A 0.150 M)

ARMADURA DE ZAPATA

CARA INFERIOR. A. PRINCIPAL = 6.8 CM2/M (FI 12 A 0.150 M)
A. DE REPARTO = 2.0 CM2/M (FI 12 A 0.250 M)

CARA SUPERIOR. A. PRINCIPAL = 9.7 CM2/M (FI 16 A 0.200 M)
A. DE REPARTO = 2.9 CM2/M (FI 12 A 0.250 M)

LATERAL A. DE PIEL = (2 FI 12) x 2

TENSIONES EN EL TERRENO (TN/M2) SIN SISMO. (S. ADM.= 13.17)

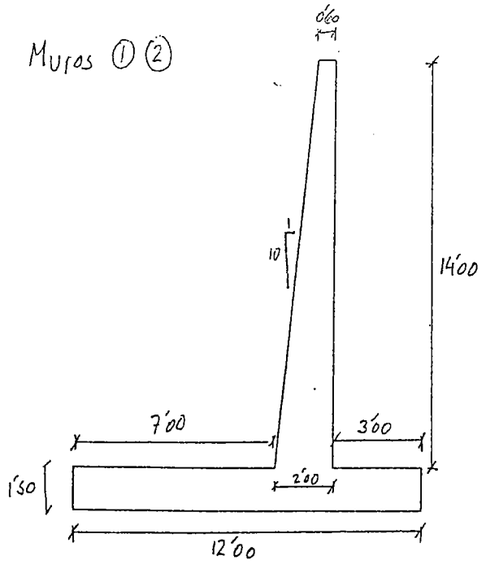
S1 = 16.46 SA = 13.64 SB = 11.52 S2 = 5.88

COEFICIENTE DE SEGURIDAD AL DESLIZAMIENTO = 1.65
COEFICIENTE DE SEGURIDAD AL VUELCO = 3.39

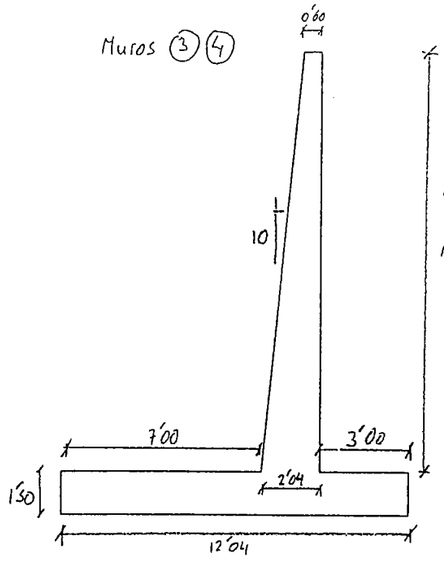
VOLUMEN DE HORMIGON = 7.09 M3. PESO DE ACERO = 258.5 KG

NOTA: SE DISPONDRAN JUNTAS VERTICALES CADA 7.5 M

Muros ① ②



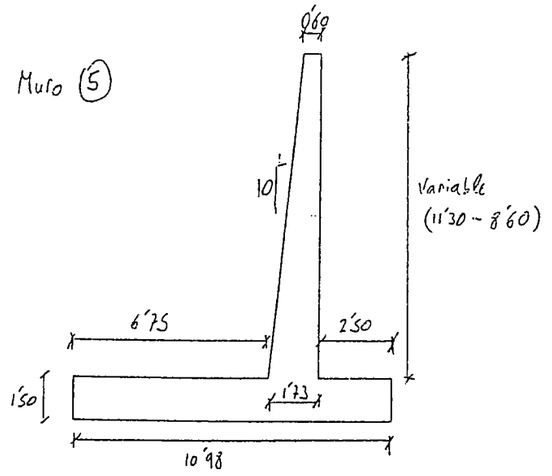
Muros ③ ④



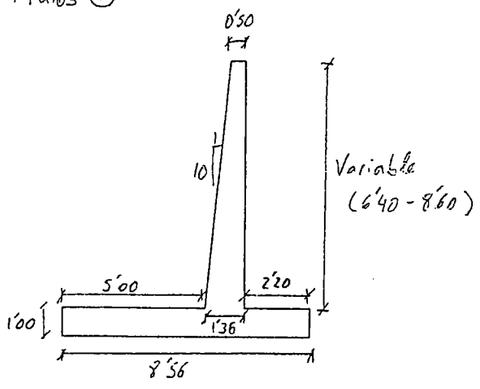
Muro 3 ⇒ 14'40

Muro 4 ⇒ Variable
(11'30 - 14'40)

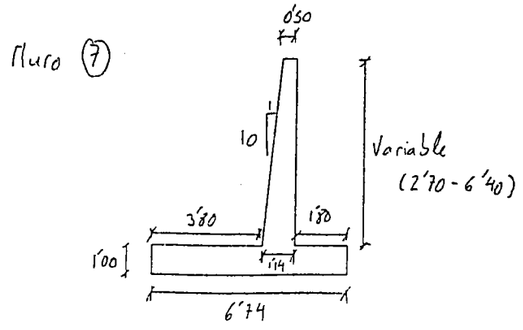
Muro ⑤



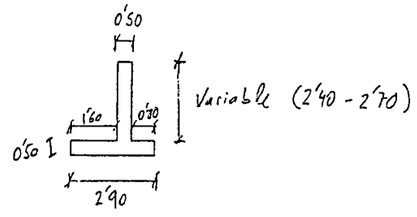
Muros ⑥

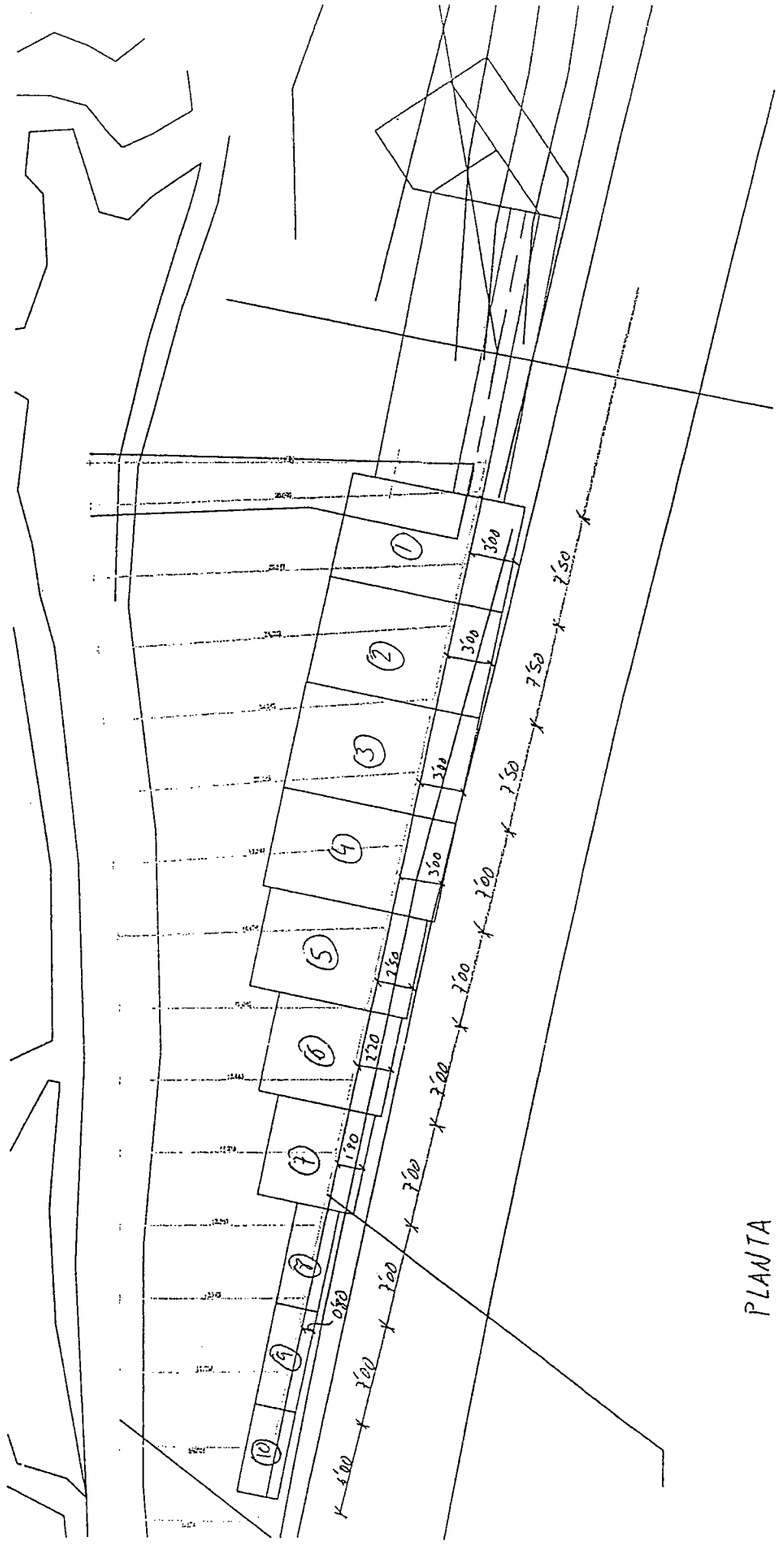


Muro ⑦

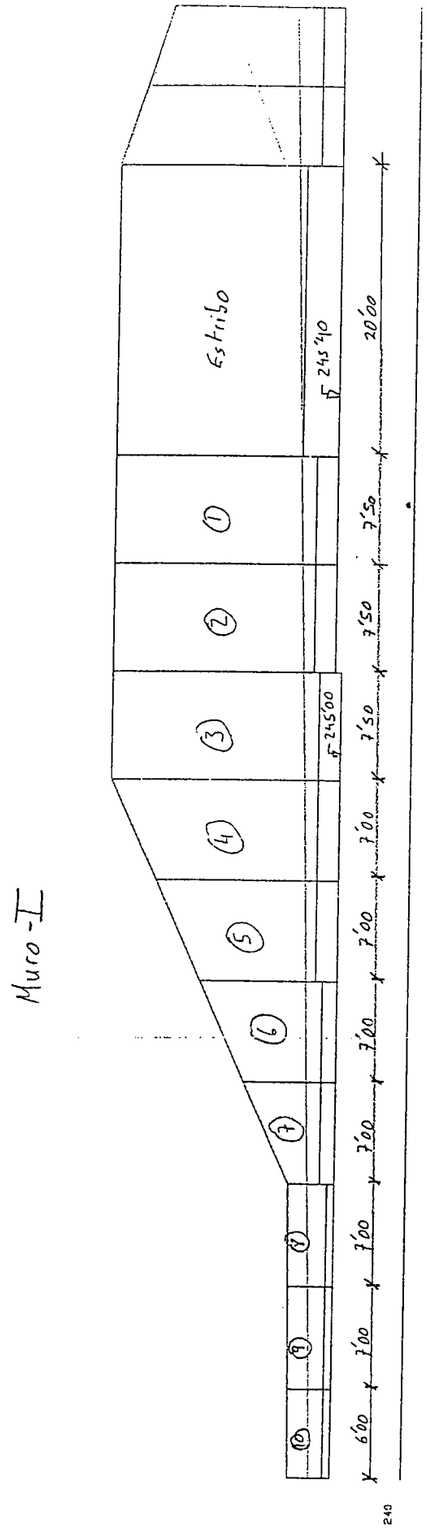


Muros ⑧ ⑨ ⑩





PLANTA
ESCALA 1: 400



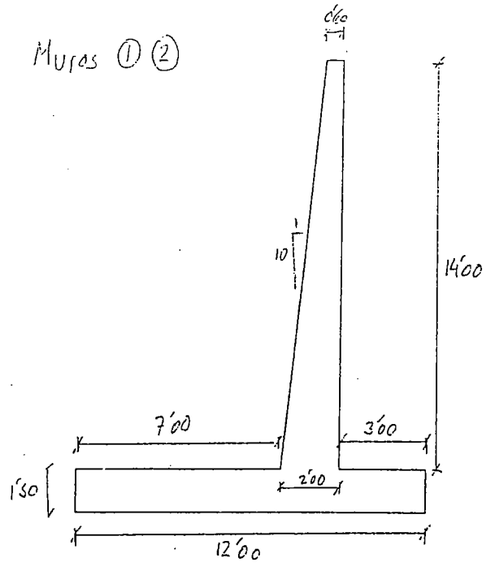
Muro-I

ALZADO DESARROLLADO

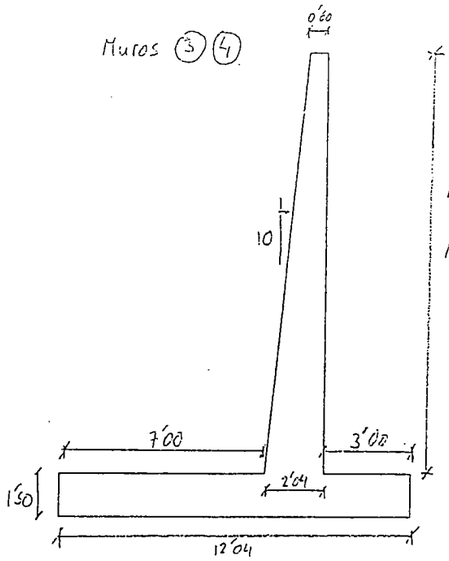
ESCALA 1:400

MURO-I

Muros ① ②



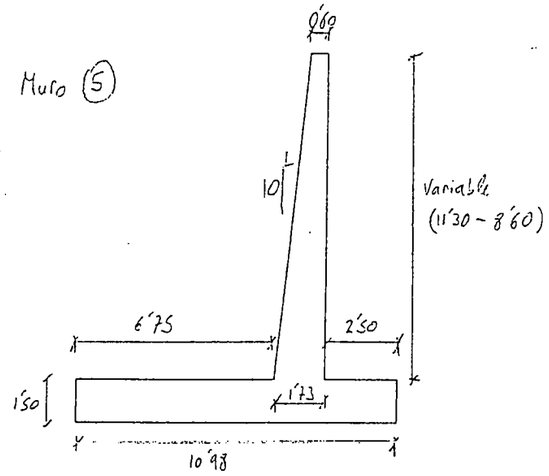
Muros ③ ④



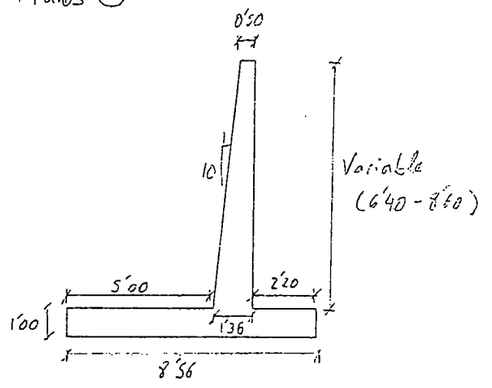
Muro 3 ⇒ 14'40

Muro 4 ⇒ Variable (11'30 - 14'40)

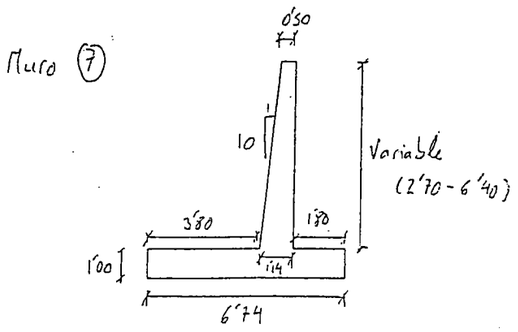
Muro ⑤



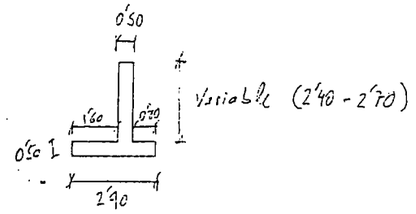
Muros ⑥



Muro ⑦



Muros ⑧ ⑨ ⑩

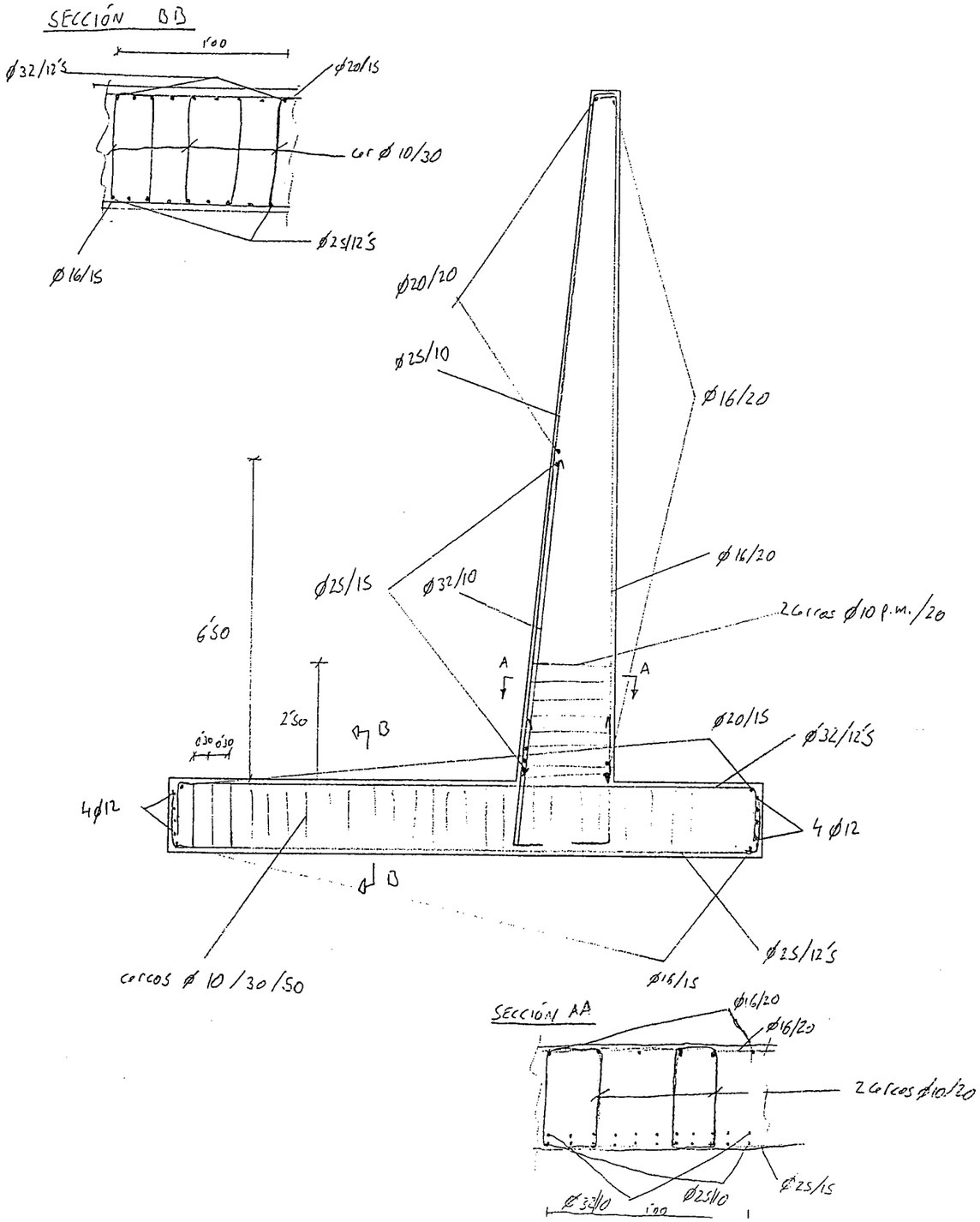


SECCIONES

ESCALA 1:200

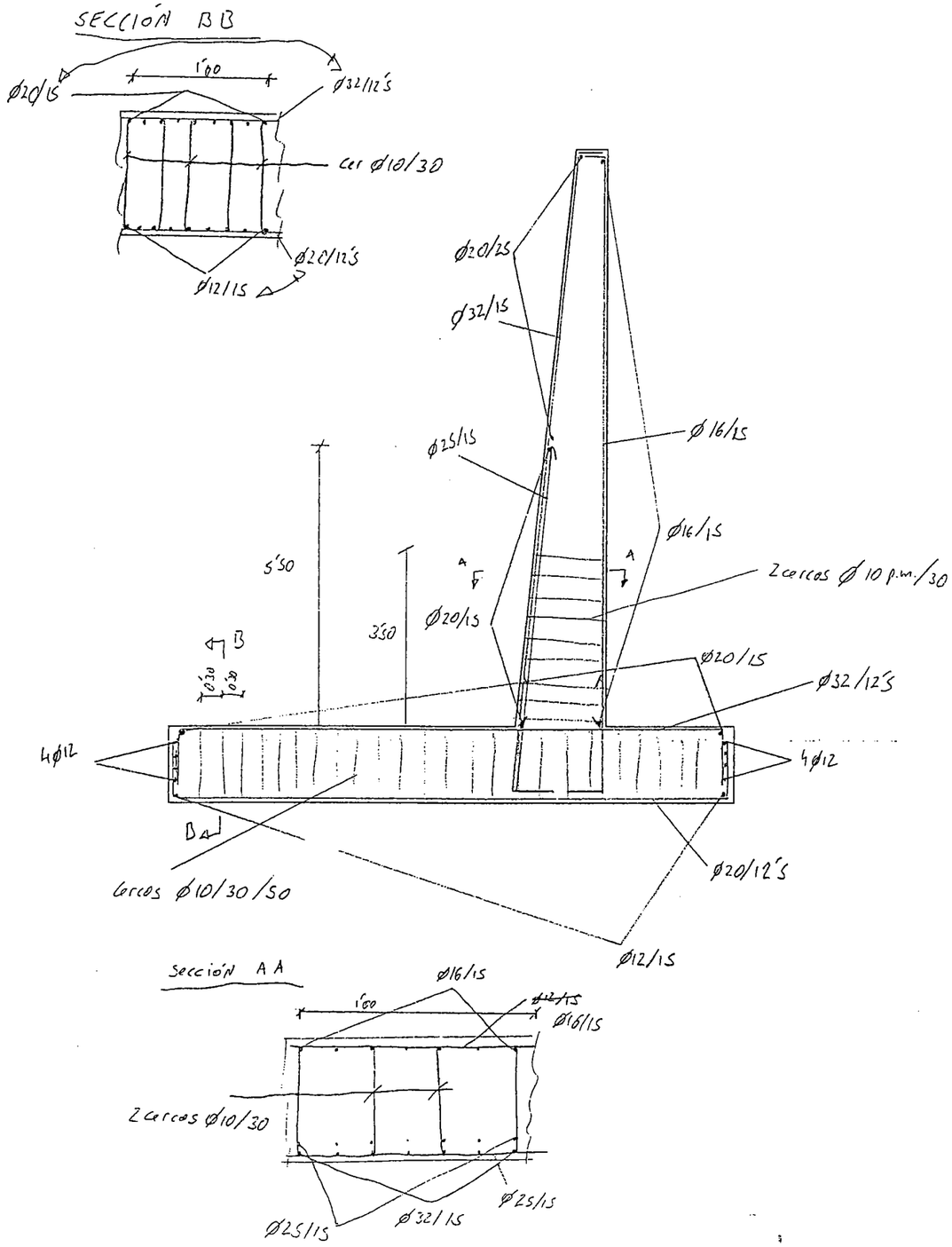
MURO I

MUROS 1-2-3-4



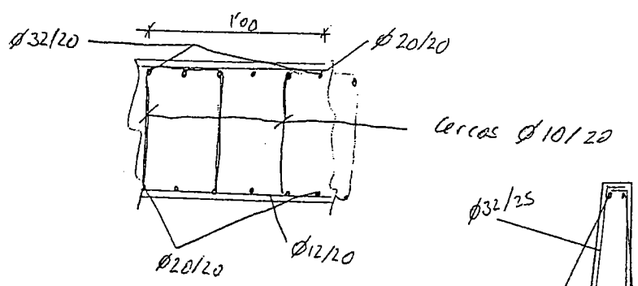
MURO I

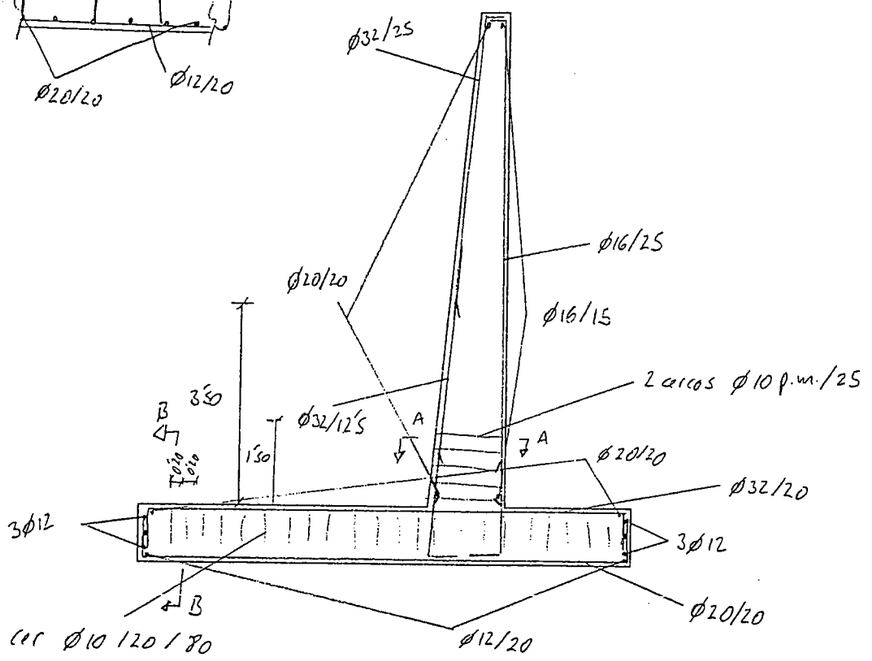
MURO 5



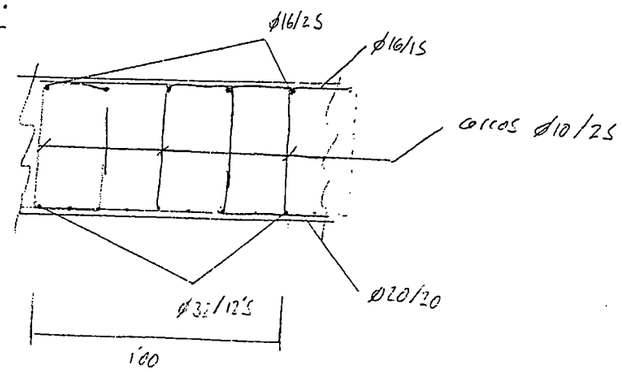
MURO I
MURO 6

SECCIÓN BB



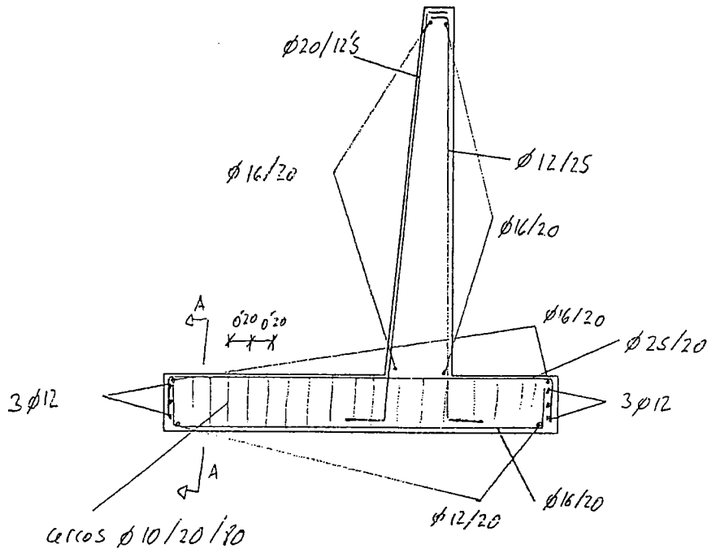


SECCIÓN AA:

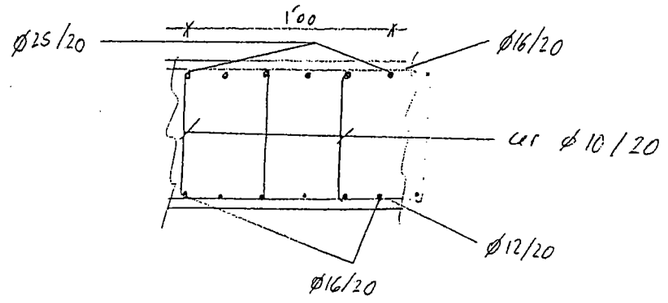


MURO I

MURO 7

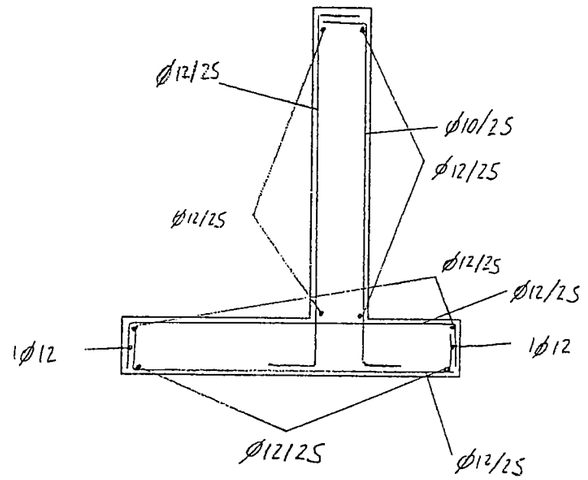


SECCIÓN AA



MURO J

MUROS 8-9-10



CALCULO DE MUROS V-01 03/00 PROPIEDAD DE INTECSA

CARACTERISTICAS DEL RELLENO

PESO ESPECIFICO (TN/M3)	=	1.80
ANGULO DE ROZAMIENTO FI	=	30.00
ANGULO ROZAMIENTO TERRENO-MURO	=	0.00
ANGULO DE TALUD DEL TERRENO	=	0.00
SOBRECARGA (TN/M2)	=	1.00
PENDIENTE DE INCLINACION DEL TRASDOS	=	0.1000
COEFICIENTE DE EMPUJE ACTIVO	=	0.374
COEFICIENTE DE EMPUJE ACTIVO VERTICAL	=	0.037
COEFICIENTE MEDIO DE PONDERACION	=	1.500

CARACTERISTICAS DE LOS MATERIALES

RESISTENCIA CARACTERISTICA DEL HORMIGON	=	250. KG/CM2
LIMITE ELASTICO DEL ACERO	=	5100. KG/CM2
RECUBRIMIENTO DE LAS ARMADURAS	=	0.050 M

CALCULO DE MUROS V-01 03/00 PROPIEDAD DE INTECSA

GEOMETRIA DEL MURO
==========

ALZADO DEL MURO

ANCHO EN CORONACION	A3	=	0.60
ANCHO EN LA BASE	A2	=	2.00
INCLINACION DEL TRASDOS	CTG(ALFA)	=	0.10000
ALTURA TOTAL	H1	=	14.30
ALTURA DE TIERRAS	H	=	14.00

ZAPATA

VUELO DELANTERO	A1	=	3.00
VUELO TRASERO	A4	=	7.00
LONGITUD TOTAL	L	=	12.00
CANTO	C	=	1.50
RESGUARDO SOBRE ZAPATA		=	0.30
TENSION MEDIA PEDIDA SOBRE TERRENO		=	LIBRE

ARMADURAS DEL ALZADO

ARMADURA A CORTANTE A = 1.16 CM2/M MINIMA (8.33 CM2/M)

TRASDOS. ZONA INFERIOR	AV.=115.2 CM2/M	(FI 32 A 0.050 M)
	AH.= 28.8 CM2/M	(FI 25 A 0.150 M)
COMPROBACION DE FISURACION	Mk =369.87 T*M W = 0.169 (Wm = 0.300)	
10.9 M. SUPERIORES	AV.= 57.6 CM2/M	(FI 32 A 0.100 M)
	AH.= 15.6 CM2/M	(FI 20 A 0.200 M)
INTRADOS	AV.= 6.0 CM2/M	(FI 12 A 0.175 M)
	AH.= 3.2 CM2/M	(FI 12 A 0.250 M)

ARMADURA DE ZAPATA

ARMADURA CORTANTE VUELO TRASERO A = 6.94 CM2/M MINIMA (8.33 CM2/M)

ARMADURA CORTANTE VUELO DELANTERO A = 3.99 CM2/M MINIMA (8.33 CM2/M)

CARA INFERIOR.	A. PRINCIPAL = 27.1 CM2/M	(FI 25 A 0.175 M)
	A. DE REPARTO = 8.1 CM2/M	(FI 14 A 0.175 M)
CARA SUPERIOR.	A. PRINCIPAL = 54.6 CM2/M	(FI 32 A 0.125 M)
	A. DE REPARTO = 16.4 CM2/M	(FI 20 A 0.175 M)
LATERAL	A. DE PIEL = (4 FI 12) x 2	

TENSIONES EN EL TERRENO (TN/M2) SIN SISMO. (S. ADM.= 24.22)

S1 = 30.28 SA = 27.38 SB = 25.46 S2 = 18.71

COEFICIENTE DE SEGURIDAD AL DESLIZAMIENTO = 1.96
COEFICIENTE DE SEGURIDAD AL VUELCO = 4.52

VOLUMEN DE HORMIGON = 36.59 M3. PESO DE ACERO = 2999.3 KG

NOTA: SE DISPONDRAN JUNTAS VERTICALES CADA 7.5 M

CALCULO DE MUROS V-01 03/00 PROPIEDAD DE INTECSA

GEOMETRIA DEL MURO
==========

ALZADO DEL MURO

ANCHO EN CORONACION	A3	=	0.60
ANCHO EN LA BASE	A2	=	2.04
INCLINACION DEL TRASDOS	CTG(ALFA)	=	0.10000
ALTURA TOTAL	H1	=	14.70
ALTURA DE TIERRAS	H	=	14.40

ZAPATA

VUELO DELANTERO	A1	=	3.00
VUELO TRASERO	A4	=	7.00
LONGITUD TOTAL	L	=	12.04
CANTO	C	=	1.50
RESGUARDO SOBRE ZAPATA		=	0.30
TENSION MEDIA PEDIDA SOBRE TERRENO		=	LIBRE

ARMADURAS DEL ALZADO

ARMADURA A CORTANTE A = 1.67 CM2/M MINIMA (8.33 CM2/M)

TRASDOS. ZONA INFERIOR	AV.=111.8 CM2/M	(FI 32 A 0.050 M)
	AH.= 28.0 CM2/M	(FI 25 A 0.175 M)
COMPROBACION DE FISURACION	Mk =401.14 T*M W = 0.183 (Wm = 0.300)	
10.8 M. SUPERIORES	AV.= 55.9 CM2/M	(FI 32 A 0.100 M)
	AH.= 15.5 CM2/M	(FI 20 A 0.200 M)
INTRADOS	AV.= 6.1 CM2/M	(FI 12 A 0.175 M)
	AH.= 4.7 CM2/M	(FI 12 A 0.225 M)

ARMADURA DE ZAPATA

ARMADURA CORTANTE VUELO TRASERO A = 7.66 CM2/M MINIMA (8.33 CM2/M)

ARMADURA CORTANTE VUELO DELANTERO A = 4.27 CM2/M MINIMA (8.33 CM2/M)

CARA INFERIOR.	A. PRINCIPAL = 28.7 CM2/M	(FI 25 A 0.150 M)
	A. DE REPARTO = 8.6 CM2/M	(FI 14 A 0.150 M)
CARA SUPERIOR.	A. PRINCIPAL = 59.5 CM2/M	(FI 32 A 0.125 M)
	A. DE REPARTO = 17.8 CM2/M	(FI 20 A 0.175 M)
LATERAL	A. DE PIEL = (4 FI 12) x 2	

TENSIONES EN EL TERRENO (TN/M2) SIN SISMO. (S. ADM.= 25.52)

S1 = 31.91 SA = 28.51 SB = 26.21 S2 = 18.29

COEFICIENTE DE SEGURIDAD AL DESLIZAMIENTO = 1.92
COEFICIENTE DE SEGURIDAD AL VUELCO = 4.33

VOLUMEN DE HORMIGON = 37.46 M3. PESO DE ACERO = 3128.6 KG

NOTA: SE DISPONDRAN JUNTAS VERTICALES CADA 7.5 M

CALCULO DE MUROS V-01 03/00 PROPIEDAD DE INTECSA

CARACTERISTICAS DEL RELLENO

PESO ESPECIFICO (TN/M3)	= 1.80
ANGULO DE ROZAMIENTO FI	= 30.00
ANGULO ROZAMIENTO TERRENO-MURO	= 0.00
ANGULO DE TALUD DEL TERRENO	= 26.57
SOBRECARGA (TN/M2)	= 1.00
PENDIENTE DE INCLINACION DEL TRASDOS	= 0.1000
COEFICIENTE DE EMPUJE ACTIVO	= 0.606
COEFICIENTE DE EMPUJE ACTIVO VERTICAL	= 0.061
COEFICIENTE MEDIO DE PONDERACION	= 1.500

CARACTERISTICAS DE LOS MATERIALES

RESISTENCIA CARACTERISTICA DEL HORMIGON	= 250. KG/CM2
LIMITE ELASTICO DEL ACERO	= 5100. KG/CM2
RECUBRIMIENTO DE LAS ARMADURAS	= 0.050 M

CALCULO DE MUROS V-01 03/00 PROPIEDAD DE INTECSA

GEOMETRIA DEL MURO

ALZADO DEL MURO

ANCHO EN CORONACION	A3	=	0.60
ANCHO EN LA BASE	A2	=	1.73
INCLINACION DEL TRASDOS	CTG(ALFA)	=	0.10000
ALTURA TOTAL	H1	=	11.60
ALTURA DE TIERRAS	H	=	11.30

ZAPATA

VUELO DELANTERO	A1	=	2.50
VUELO TRASERO	A4	=	6.75
LONGITUD TOTAL	L	=	10.98
CANTO	C	=	1.50
RESGUARDO SOBRE ZAPATA		=	0.30
TENSION MEDIA PEDIDA SOBRE TERRENO		=	LIBRE

ARMADURAS DEL ALZADO

ARMADURA A CORTANTE A = 4.14 CM2/M MINIMA (8.33 CM2/M)

TRASDOS. ZONA INFERIOR AV.= 81.8 CM2/M (FI 32 A 0.075 M)
AH.= 20.4 CM2/M (FI 20 A 0.150 M)

COMPROBACION DE FISURACION Mk =304.92 T*M W = 0.279 (Wm = 0.300)

7.1 M. SUPERIORES AV.= 40.9 CM2/M (FI 32 A 0.150 M)
AH.= 12.2 CM2/M (FI 20 A 0.250 M)

INTRADOS AV.= 5.2 CM2/M (FI 12 A 0.200 M)
AH.= 7.2 CM2/M (FI 12 A 0.150 M)

ARMADURA DE ZAPATA

ARMADURA CORTANTE VUELO TRASERO A = 8.03 CM2/M MINIMA (8.33 CM2/M)

ARMADURA CORTANTE VUELO DELANTERO A = 1.17 CM2/M MINIMA (8.33 CM2/M)

CARA INFERIOR. A. PRINCIPAL = 20.5 CM2/M (FI 20 A 0.150 M)
A. DE REPARTO = 6.2 CM2/M (FI 12 A 0.175 M)

CARA SUPERIOR. A. PRINCIPAL = 61.8 CM2/M (FI 32 A 0.125 M)
A. DE REPARTO = 18.5 CM2/M (FI 20 A 0.150 M)

LATERAL A. DE PIEL = (4 FI 12) x 2

TENSIONES EN EL TERRENO (TN/M2) SIN SISMO. (S. ADM.= 24.79)

S1 = 30.98 SA = 27.64 SB = 25.33 S2 = 16.30

COEFICIENTE DE SEGURIDAD AL DESLIZAMIENTO = 1.54
COEFICIENTE DE SEGURIDAD AL VUELCO = 3.96

VOLUMEN DE HORMIGON = 29.98 M3. PESO DE ACERO = 2239.2 KG

NOTA: SE DISPONDRAN JUNTAS VERTICALES CADA 7.5 M

CALCULO DE MUROS V-01 03/00 PROPIEDAD DE INTECSA

GEOMETRIA DEL MURO
==========

ALZADO DEL MURO

ANCHO EN CORONACION	A3	=	0.50
ANCHO EN LA BASE	A2	=	1.36
INCLINACION DEL TRASDOS	CTG(ALFA)	=	0.10000
ALTURA TOTAL	H1	=	8.90
ALTURA DE TIERRAS	H	=	8.60

ZAPATA

VUELO DELANTERO	A1	=	2.20
VUELO TRASERO	A4	=	5.00
LONGITUD TOTAL	L	=	8.56
CANTO	C	=	1.00
RESGUARDO SOBRE ZAPATA		=	0.30
TENSION MEDIA PEDIDA SOBRE TERRENO		=	LIBRE

ARMADURAS DEL ALZADO

ARMADURA A CORTANTE A = 1.09 CM2/M MINIMA (8.33 CM2/M)

TRASDOS. ZONA INFERIOR AV.= 56.9 CM2/M (FI 32 A 0.125 M)
AH.= 14.2 CM2/M (FI 20 A 0.200 M)

COMPROBACION DE FISURACION Mk =136.57 T*M W = 0.284 (Wm = 0.300)

5.6 M. SUPERIORES AV.= 28.4 CM2/M (FI 32 A 0.250 M)
AH.= 10.1 CM2/M (FI 16 A 0.175 M)

INTRADOS AV.= 4.1 CM2/M (FI 12 A 0.250 M)
AH.= 7.5 CM2/M (FI 14 A 0.175 M)

ARMADURA DE ZAPATA

ARMADURA CORTANTE VUELO TRASERO A = 4.91 CM2/M MINIMA (8.33 CM2/M)

ARMADURA CORTANTE VUELO DELANTERO A = 1.92 CM2/M MINIMA (8.33 CM2/M)

CARA INFERIOR. A. PRINCIPAL = 15.4 CM2/M (FI 20 A 0.200 M)
A. DE REPARTO = 4.6 CM2/M (FI 12 A 0.225 M)

CARA SUPERIOR. A. PRINCIPAL = 37.3 CM2/M (FI 25 A 0.125 M)
A. DE REPARTO = 11.2 CM2/M (FI 16 A 0.175 M)

LATERAL A. DE PIEL = (3 FI 12) x 2

TENSIONES EN EL TERRENO (TN/M2) SIN SISMO. (S. ADM.= 16.85)

S1 = 21.07 SA = 19.09 SB = 17.87 S2 = 13.39

COEFICIENTE DE SEGURIDAD AL DESLIZAMIENTO = 1.52
COEFICIENTE DE SEGURIDAD AL VUELCO = 4.09

VOLUMEN DE HORMIGON = 16.84 M3. PESO DE ACERO = 1105.6 KG

NOTA: SE DISPONDRAN JUNTAS VERTICALES CADA 7.5 M

CALCULO DE MUROS V-01 03/00 PROPIEDAD DE INTECSA

GEOMETRIA DEL MURO
==========

ALZADO DEL MURO

ANCHO EN CORONACION	A3	=	0.50
ANCHO EN LA BASE	A2	=	1.14
INCLINACION DEL TRASDOS	CTG(ALFA)	=	0.10000
ALTURA TOTAL	H1	=	6.70
ALTURA DE TIERRAS	H	=	6.40

ZAPATA

VUELO DELANTERO	A1	=	1.80
VUELO TRASERO	A4	=	3.80
LONGITUD TOTAL	L	=	6.74
CANTO	C	=	1.00
RESGUARDO SOBRE ZAPATA		=	0.30
TENSION MEDIA PEDIDA SOBRE TERRENO		=	LIBRE

ARMADURAS DEL ALZADO

TRASDOS. ZONA INFERIOR AV.= 21.5 CM2/M (FI 20 A 0.125 M)
AH.= 9.1 CM2/M (FI 14 A 0.150 M)

COMPROBACION DE FISURACION Mk = 58.90 T*M W = 0.279 (Wm = 0.300)

3.2 M. SUPERIORES AV.= 10.8 CM2/M (FI 20 A 0.250 M)
AH.= 7.9 CM2/M (FI 14 A 0.175 M)

INTRADOS AV.= 3.4 CM2/M (FI 12 A 0.250 M)
AH.= 9.1 CM2/M (FI 14 A 0.150 M)

ARMADURA DE ZAPATA

ARMADURA CORTANTE VUELO TRASERO A = 0.86 CM2/M MINIMA (8.33 CM2/M)

CARA INFERIOR. A. PRINCIPAL = 9.4 CM2/M (FI 14 A 0.150 M)
A. DE REPARTO = 5.4 CM2/M (FI 12 A 0.200 M)

CARA SUPERIOR. A. PRINCIPAL = 16.3 CM2/M (FI 20 A 0.175 M)
A. DE REPARTO = 5.9 CM2/M (FI 12 A 0.175 M)

LATERAL A. DE PIEL = (3 FI 12) x 2

TENSIONES EN EL TERRENO (TN/M2) SIN SISMO. (S. ADM.= 13.20)

S1 = 16.50 SA = 14.93 SB = 13.93 S2 = 10.61

COEFICIENTE DE SEGURIDAD AL DESLIZAMIENTO = 1.53
COEFICIENTE DE SEGURIDAD AL VUELCO = 4.16

VOLUMEN DE HORMIGON = 12.23 M3. PESO DE ACERO = 506.3 KG

NOTA: SE DISPONDRAN JUNTAS VERTICALES CADA 7.5 M

CARACTERISTICAS DEL RELLENO

PESO ESPECIFICO (TN/M3)	=	1.80
ANGULO DE ROZAMIENTO FI	=	30.00
ANGULO ROZAMIENTO TERRENO-MURO	=	0.00
ANGULO DE TALUD DEL TERRENO	=	26.57
SOBRECARGA (TN/M2)	=	1.00
PENDIENTE DE INCLINACION DEL TRASDOS	=	0.0000
COEFICIENTE DE EMPUJE ACTIVO	=	0.536
COEFICIENTE DE EMPUJE ACTIVO VERTICAL	=	0.000
COEFICIENTE MEDIO DE PONDERACION	=	1.500

CARACTERISTICAS DE LOS MATERIALES

RESISTENCIA CARACTERISTICA DEL HORMIGON	=	250. KG/CM2
LIMITE ELASTICO DEL ACERO	=	5100. KG/CM2
RECUBRIMIENTO DE LAS ARMADURAS	=	0.050 M

CALCULO DE MUROS V-01 03/00 PROPIEDAD DE INTECSA

GEOMETRIA DEL MURO

ALZADO DEL MURO

ANCHO EN CORONACION	A3	=	0.50
ANCHO EN LA BASE	A2	=	0.50
INCLINACION DEL TRASDOS	CTG(ALFA)	=	0.00000
ALTURA TOTAL	H1	=	3.00
ALTURA DE TIERRAS	H	=	2.70

ZAPATA

VUELO DELANTERO	A1	=	0.80
VUELO TRASERO	A4	=	1.60
LONGITUD TOTAL	L	=	2.90
CANTO	C	=	0.50
RESGUARDO SOBRE ZAPATA		=	0.30
TENSION MEDIA PEDIDA SOBRE TERRENO		=	LIBRE

ARMADURAS DEL ALZADO

TRASDOS. ZONA INFERIOR	AV.=	4.5 CM2/M (FI 12 A 0.250 M)
	AH.=	4.0 CM2/M (FI 12 A 0.250 M)
COMPROBACION DE FISURACION	Mk =	4.23 T*M W = 0.254 (Wm = 0.300)
INTRADOS	AV.=	1.5 CM2/M (FI 8 A 0.200 M)
	AH.=	4.0 CM2/M (FI 12 A 0.250 M)

ARMADURA DE ZAPATA

CARA INFERIOR.	A. PRINCIPAL	=	2.0 CM2/M (FI 12 A 0.250 M)
	A. DE REPARTO	=	0.6 CM2/M (FI 12 A 0.250 M)
CARA SUPERIOR.	A. PRINCIPAL	=	3.8 CM2/M (FI 12 A 0.250 M)
	A. DE REPARTO	=	1.1 CM2/M (FI 12 A 0.250 M)
LATERAL	A. DE PIEL	=	(1 FI 12) x 2

TENSIONES EN EL TERRENO (TN/M2) SIN SISMO. (S. ADM.= 6.29)

S1 = 7.86 SA = 6.93 SB = 6.35 S2 = 4.49

COEFICIENTE DE SEGURIDAD AL DESLIZAMIENTO	=	1.55
COEFICIENTE DE SEGURIDAD AL VUELCO	=	3.94

VOLUMEN DE HORMIGON = 2.95 M3. PESO DE ACERO = 90.4 KG

NOTA: SE DISPONDRAN JUNTAS VERTICALES CADA 7.5 M

ESTRIBO 2

U.T.E. ALT CAMP
L.A.V. MADRID-BARCELONA
SUBTRAMO V.
VIADUCTO RIO FRANCOLI

REACCIONES VERTICALES (EN ESTRIBOS)

	ESTRIBO 1 Y 2				
	APOYO 1	APOYO 2	N (t)	M (m·t)	
VIGA (T)	59,340	59,340	118,68	0	
PRELOSAS (T)	16,800	16,800	33,60	0	
LOSA FASE 1 (T)	27,365	27,365	54,73	0	
LOSA FASE 2 (T)	14,152	14,152	28,30	0	
CARGAS MUERTAS MAX (T)	91,012	91,012	182,02	0	
CARGAS MUERTAS MIN (T)	58,533	58,533	117,07	0	
SOBRECARGA PASEOS (T)	20,060	-11,960	8,10	51,23	
HIPOTESIS 1 (T)	280,190	-73,280	206,91	565,55	171,00
TREN 1 VIA RIPADA					
VELOCIDAD 120 Km/h					
COEFICIENTE DE IMPACTO= 1					
COEFICIENTE DE CLASIFICACIÓN= 1.21					
COEFICIENTE DE REDUCCION= 1					
HIPOTESIS 2 (T)	206,910	206,910	413,82	0,00	342,00
TREN 2 VIAS RIPADAS					
VELOCIDAD 120 Km/h					
COEFICIENTE DE IMPACTO= 1					
COEFICIENTE DE CLASIFICACIÓN= 1.21					
COEFICIENTE DE REDUCCION= 1					
HIPOTESIS 3 (T)	97,790	-25,580	72,21	197,39	159,40
TREN 1 VIA RIPADA					
VELOCIDAD 350 Km/h					
COEFICIENTE DE IMPACTO= 1					
COEFICIENTE DE CLASIFICACIÓN= 1					
COEFICIENTE DE REDUCCION= 0.571					
HIPOTESIS 4 (T)	72,210	72,210	144,42	0,00	318,81
TREN 2 VIAS RIPADAS					
VELOCIDAD 350 Km/h					
COEFICIENTE DE IMPACTO= 1					
COEFICIENTE DE CLASIFICACIÓN= 1					
COEFICIENTE DE REDUCCION= 0.571					
MAX (Tn)	508,918	508,918			
MIN (Tn)	90,949	90,949			

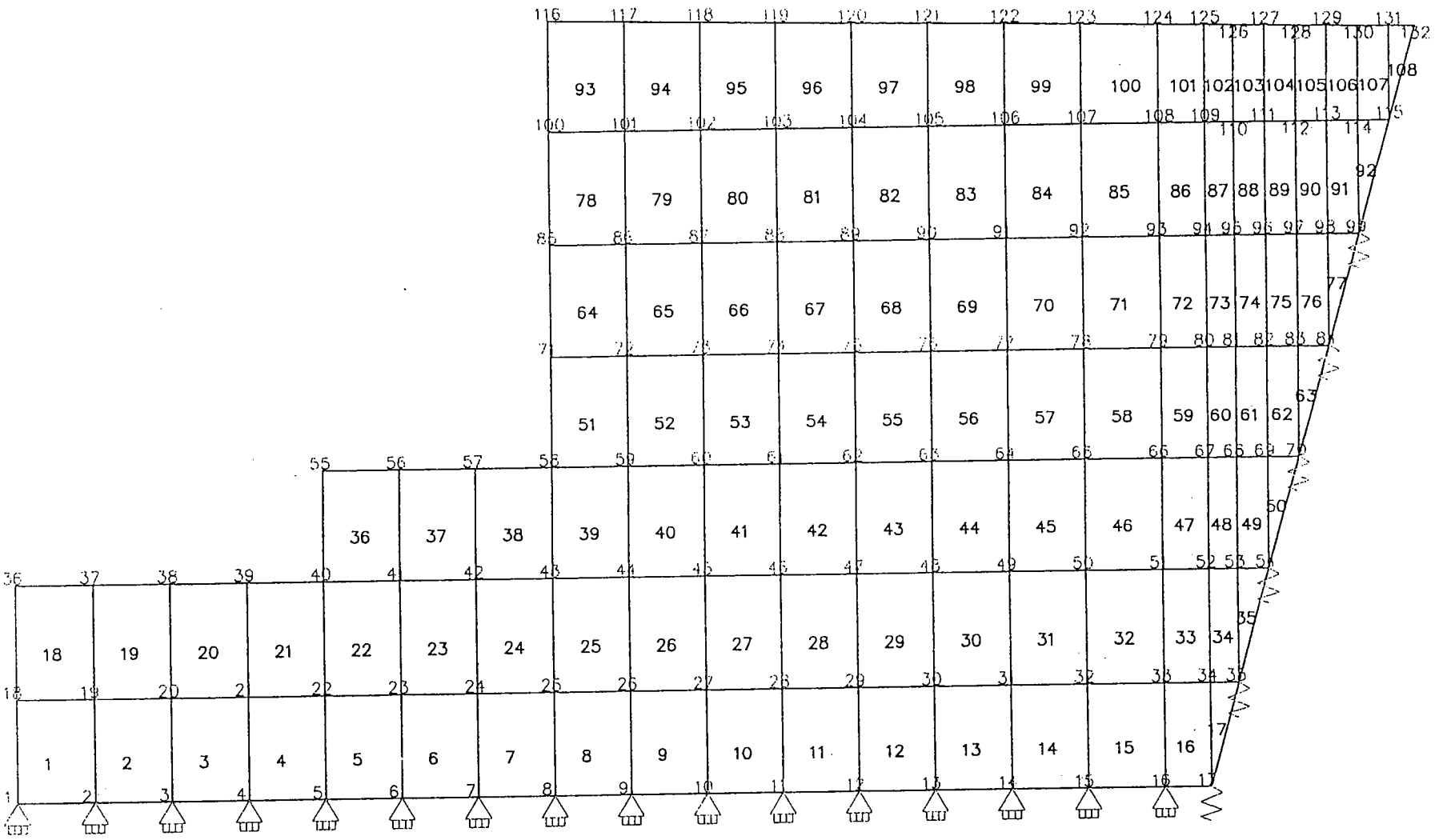
REACCIONES HORIZONTALES (EN ESTRIBOS)

TRANSVERSALES	ESTRIBO 1 Y 2
VIENTO (CON SOBRECARGA) (T)	21,98
LAZO (T)	10
HIPOTESIS 1 CENTRIFUGA (T)	3,24
TREN 1 VIA RIPADA	
VELOCIDAD 120 Km/h	
COEFICIENTE DE IMPACTO= 1	
COEFICIENTE DE CLASIFICACIÓN= 1.21	
COEFICIENTE DE REDUCCION= 1	
HIPOTESIS 2 CENTRIFUGA (T)	6,47
TREN 2 VIAS RIPADAS	
VELOCIDAD 120 Km/h	
COEFICIENTE DE IMPACTO= 1	
COEFICIENTE DE CLASIFICACIÓN= 1.21	
COEFICIENTE DE REDUCCION= 1	
HIPOTESIS 3 CENTRIFUGA (T)	9,61
TREN 1 VIA RIPADA	
VELOCIDAD 350 Km/h	
COEFICIENTE DE IMPACTO= 1	
COEFICIENTE DE CLASIFICACIÓN= 1	
COEFICIENTE DE REDUCCION= 0.453	
HIPOTESIS 4 CENTRIFUGA (T)	19,21
TREN 2 VIAS RIPADAS	
VELOCIDAD 350 Km/h	
COEFICIENTE DE IMPACTO= 1	
COEFICIENTE DE CLASIFICACIÓN= 1	
COEFICIENTE DE REDUCCION= 0.453	

LONGITUDINALES
ROZAMIENTO CONSIDERADO EN TEFLÓN: 0.05 DE CARGAS PERMANENTES

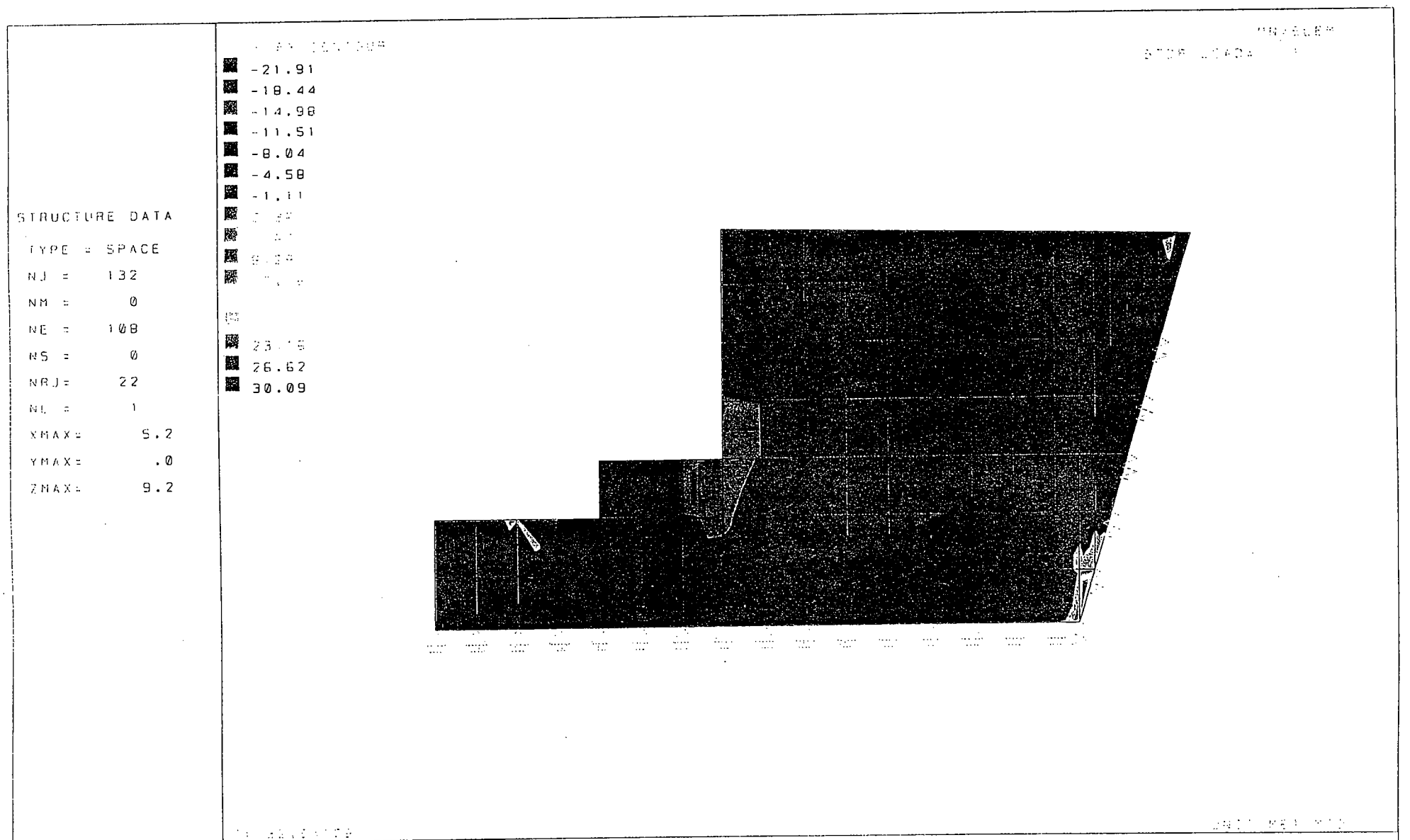
	ESTRIBO 2 (FIJO)
FRENADO (T)	445,28
ARRANQUE (T)	121
INTERACCION CARRIL-TABLERO (T)	144

MN/ELE



UNIT MET MTO

J=132,E=108

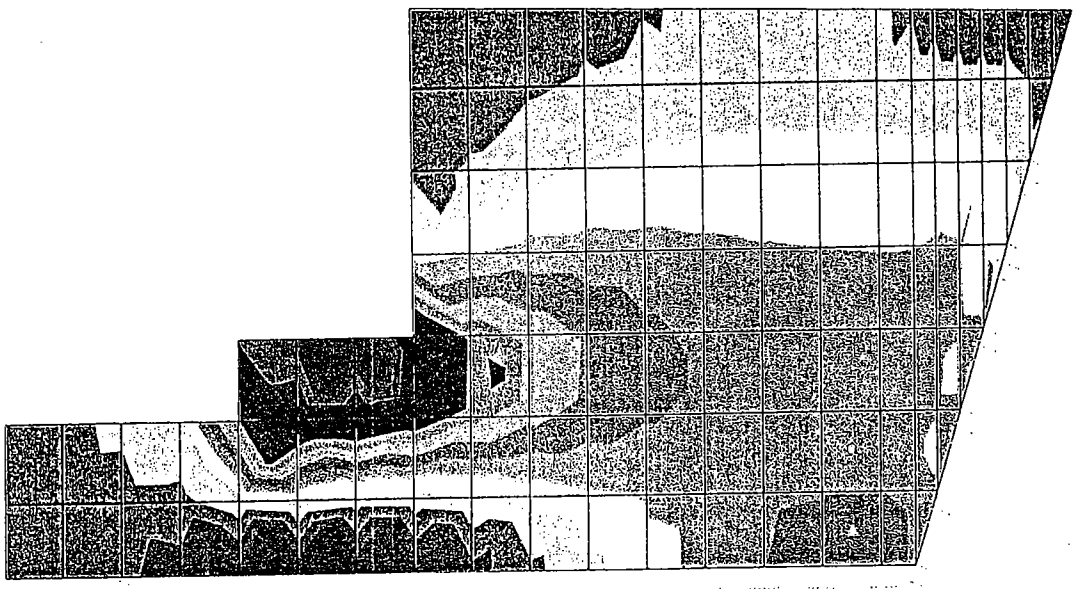


STRUCTURE DATA

TYPE = SPACE
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NM = 0
NE = 108
NS = 0
NRJ= 22
NL = 1
XMAX= 5.2
YMAX= .0
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-55.73
-50.31
-44.89
-39.47
-34.05

9.3
14.72



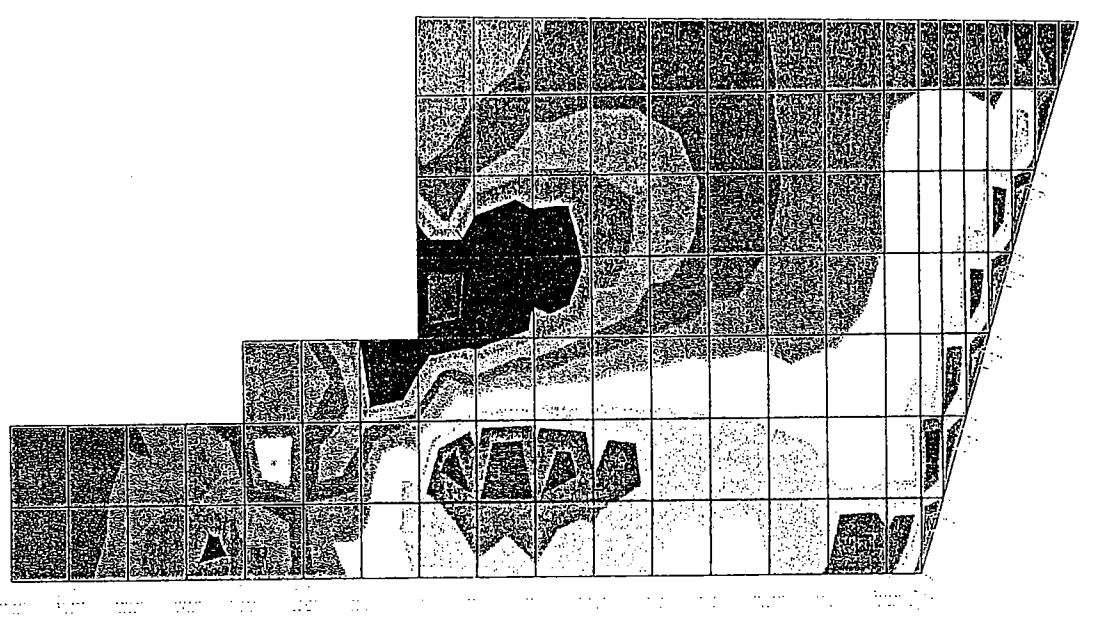
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TITLE: 'ESTRIBO 2 EJECUCI N'

STRUCTURE DATA

TYPE = SPACE
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NE = 109
NS = 0
NRJ= 22
NL = 1
XMAX= 5.2
YMAX= .0
ZMAX= 9.2

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-14.23
-12.45
-10.69
-8.91
-7.14
-5.37

8.82
10.59

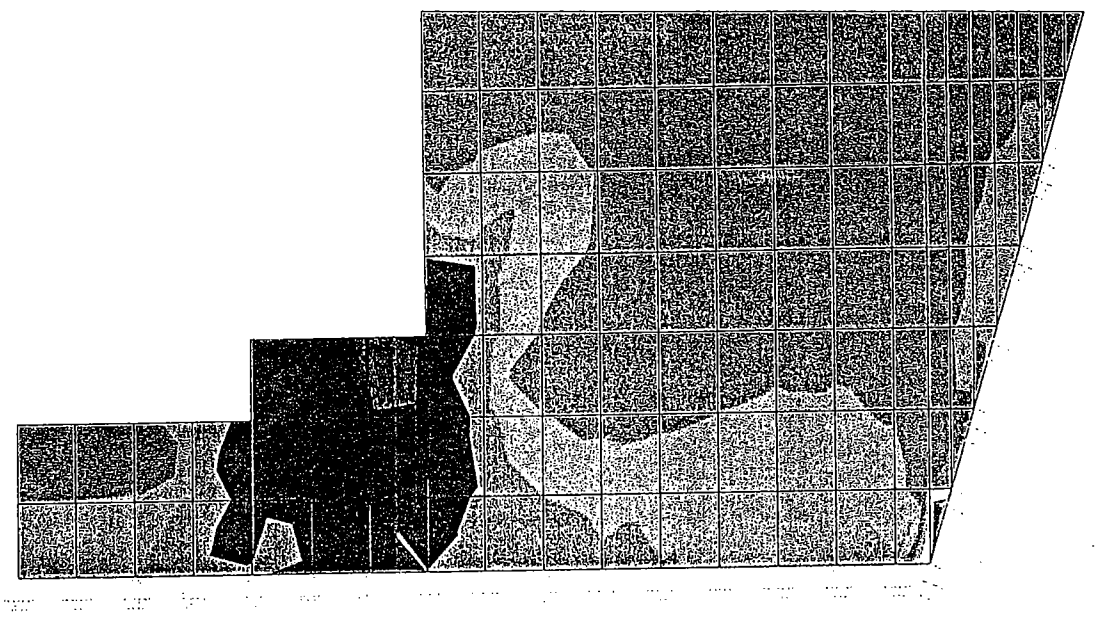


S T A A D P O S T - P L O T (REV: 22.3) DATE: JUL 17, 2002
TITLE: 'ESTRIBO 2 EJECUCI N'

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NL = 1
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ZMAX= 9.2

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-41.39
-36.25
-31.11
-25.97
-20.83
-15.7
25.42
30.56

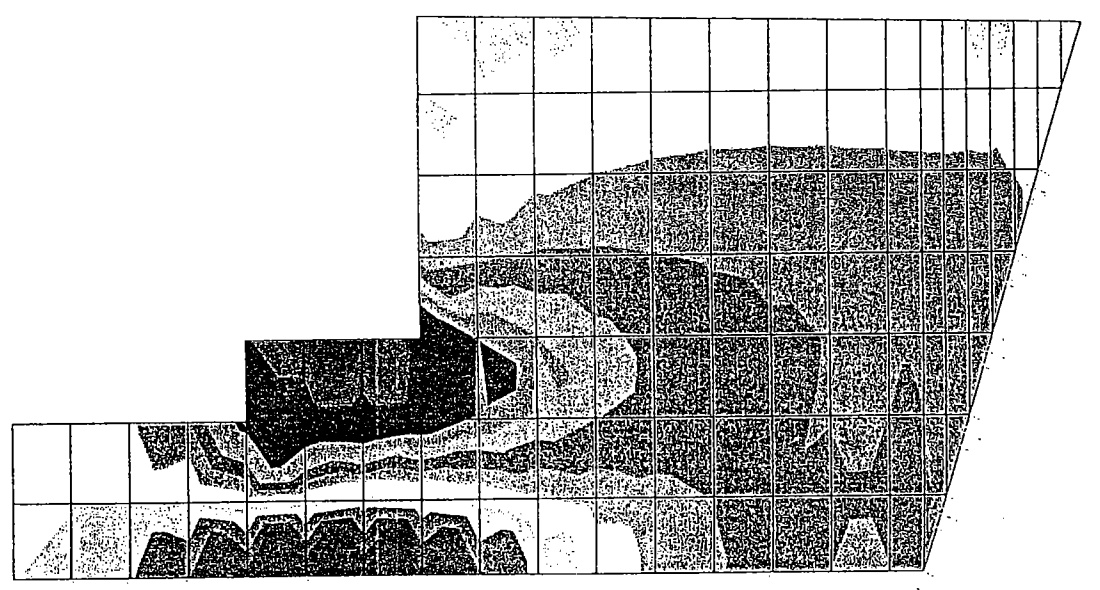


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TITLE: 'ESTRIBO 2 PP Y CM'

STRUCTURE DATA

TYPE = SPACE
NJ = 132
NM = 0
NE = 108
NS = 0
NRJ= 22
NL = 1
XMAX= 5.2
YMAX= .0
ZMAX= 9.2

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-73.46
-66.08
-58.7
-51.33
-43.95
-36.57
22.45
29.83



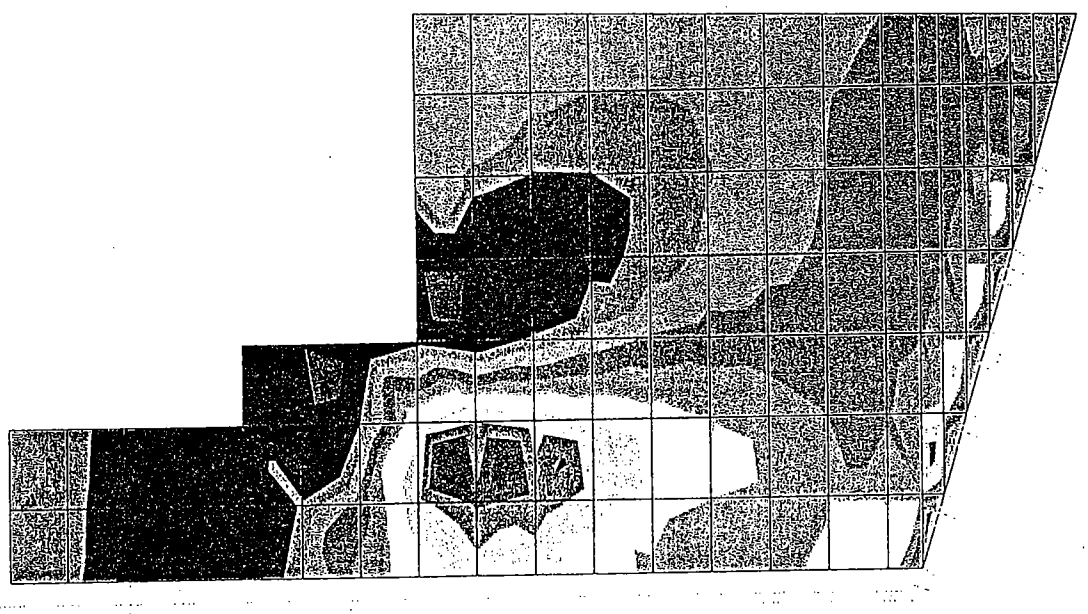
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NS = 0
NRJ= 22
NL = 1
XMAX= 5.2
YMAX= .0
ZMAX= 9.2

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-11.94
-9.83
-7.71
-5.59
-3.48

11.34
13.46
15.58



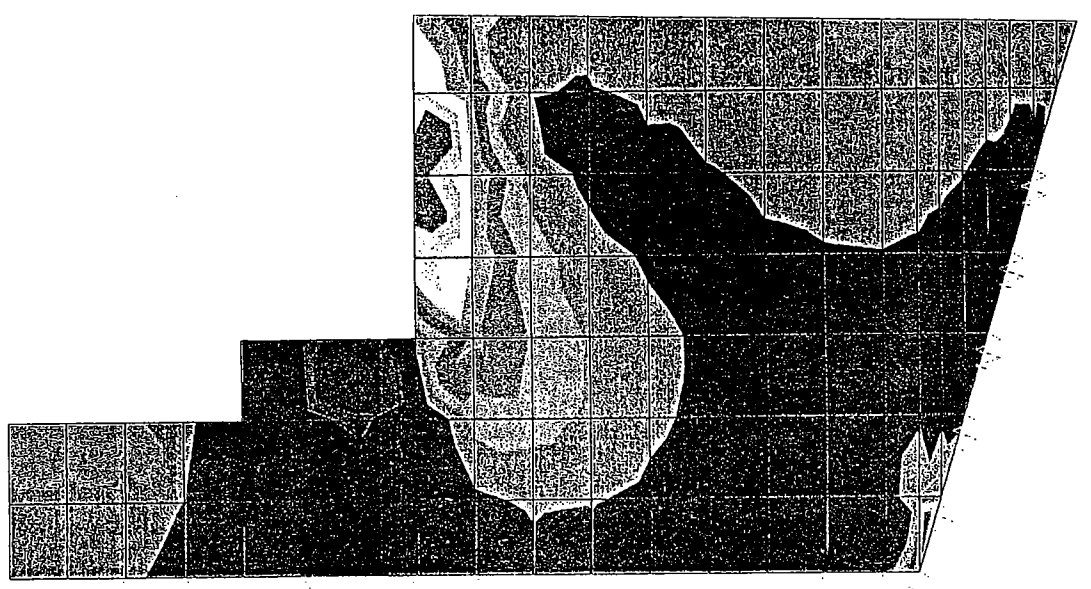
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NE = 108
NS = 0
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XMAX= 5.2
YMAX= .0
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-44.26
-37.53
-30.79
-24.05
-17.31
-10.58

36.59
43.33
50.06



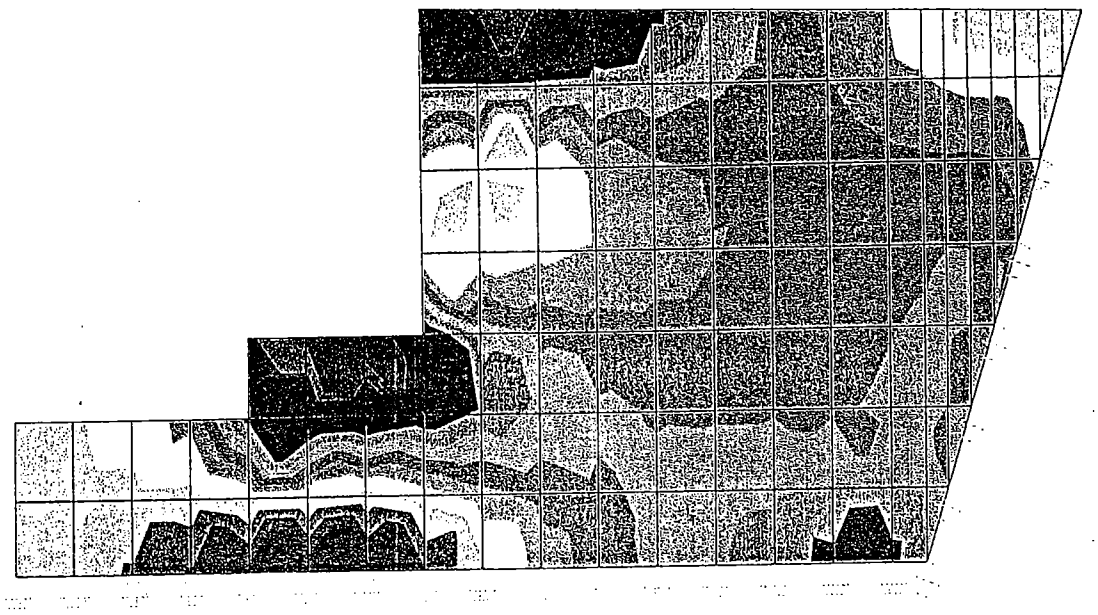
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TITLE: 'ESTRIBO 2 FRENADO 1'

STRUCTURE DATA

TYPE = SPACE
NJ = 132
NM = 0
NE = 108
NS = 0
NRJ= 22
NL = 1
XMAX= 5.2
YMAX= .0
ZMAX= 9.2

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-71.34
-64.41
-57.48
-50.56
-43.63
-36.7

18.73
25.66



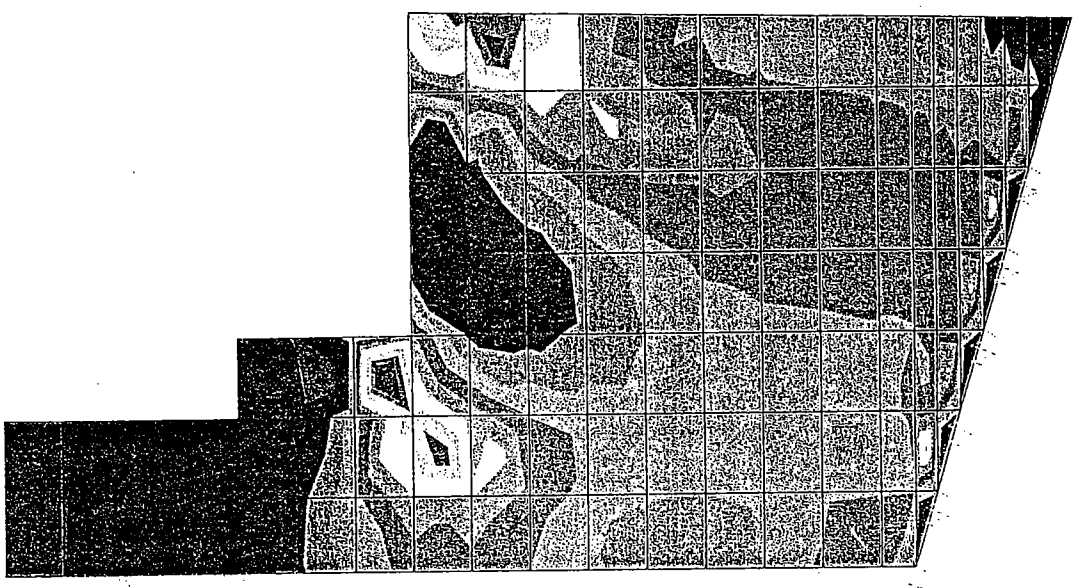
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TITLE: 'ESTRIBO 2 FRENADO 1'

STRUCTURE DATA

TYPE = SPACE
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NM = 0
NE = 108
NS = 0
NRJ= 22
NL = 1
XMAX= 5.2
YMAX= .0
ZMAX= 9.2

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-16.19
-12.71
-9.23
-5.74
-2.26
1.22

29.09
32.57

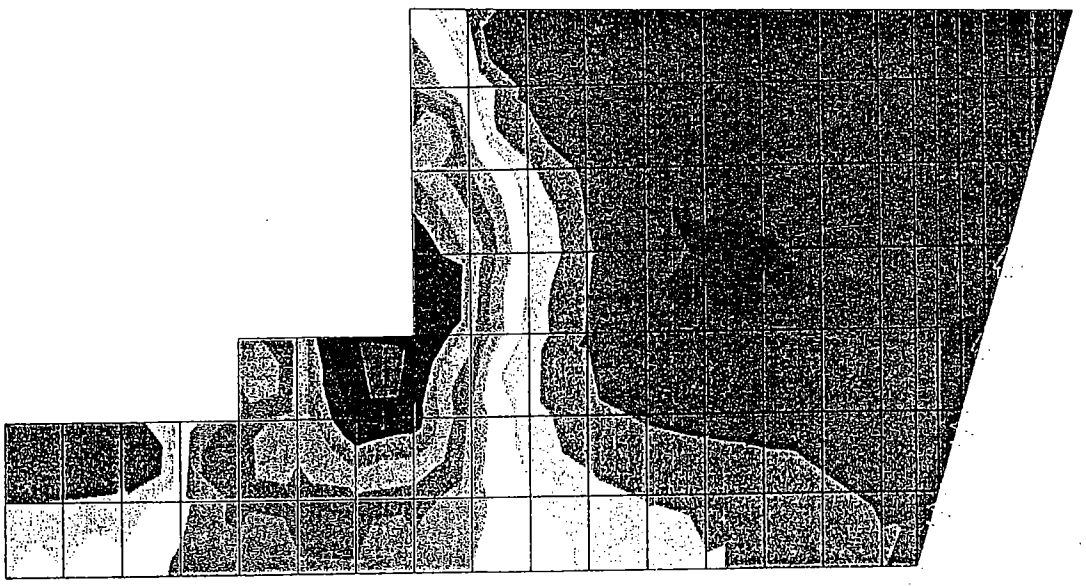


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TITLE: 'ESTRIBO 2 FRENADO 1'

STRUCTURE DATA

TYPE = SPACE
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NM = 0
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NS = 0
NRJ= 21
NL = 1
XMAX= 5.2
YMAX= .0
ZMAX= 9.2

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-83.7
-76.46
-69.22
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3.10
10.42



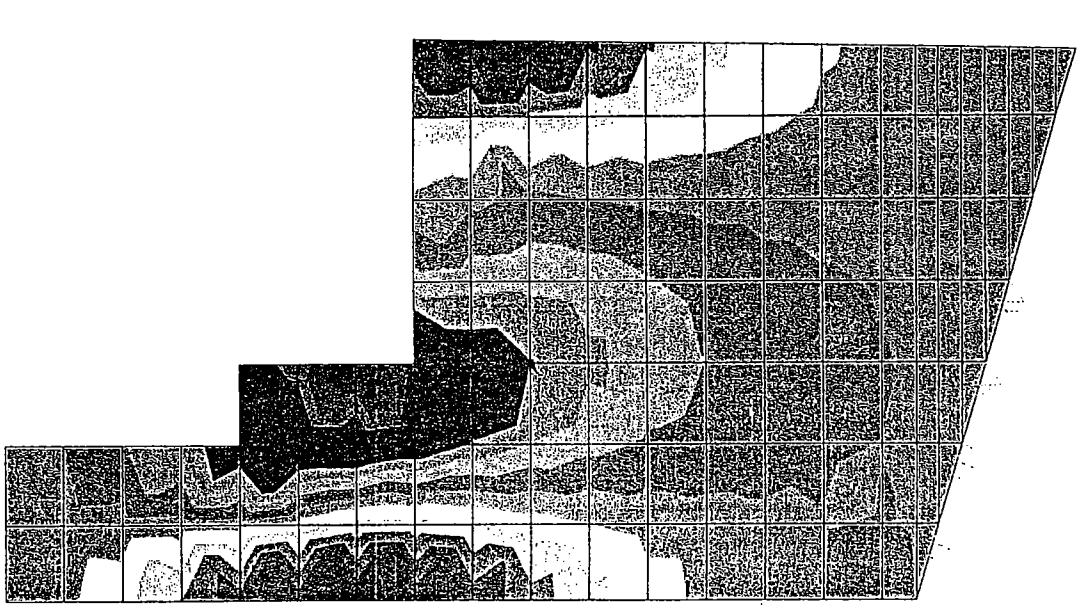
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TITLE: ESTRIBO 2

DATE: JUL 17, 2002

STRUCTURE DATA

TYPE = SPACE
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NM = 0
NE = 108
NS = 0
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XMAX= 5.2
YMAX= .0
ZMAX= 9.2

-123.48
-110.25
-97.02
-83.79
-70.56
-57.32
-44.09
40.52
61.76
74.99



S T A A D P O S T - P L O T (REV: 22.3)
TITLE: ESTRIBO 2

DATE: JUL 17, 2002

STRUCTURE DATA

TYPE = SPACE
NJ = 132
NM = 0
NE = 108
NS = 0
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NL = 1
XMAX= 5.2
YMAX= .0
ZMAX= 9.2

-41.23
-36.81
-32.38
-27.96
-23.54
-19.12
-14.7
20.68
25.1



S T A A D P O S T - P L O T (REV: 22.3)

DATE: JUL 17, 2002

TITLE: ESTRIBO 2

TENSIONES EN EL TERRENO

	Hipotesis 2:	Peso Propio + Cargas Muertas			
Nodo	V (t/m)	H (t/m)	R (t/m)	(m)	(t/m²)
1	2,63	0,00	2,63	0,25	10,52
2	5,91	0,00	5,91	0,50	11,82
3	6,53	0,00	6,53	0,50	13,06
4	7,14	0,00	7,14	0,50	14,28
5	7,64	0,00	7,64	0,50	15,28
6	7,96	0,00	7,96	0,50	15,92
7	8,05	0,00	8,05	0,50	16,10
8	7,91	0,00	7,91	0,50	15,82
9	7,61	0,00	7,61	0,50	15,22
10	7,18	0,00	7,18	0,50	14,36
11	6,69	0,00	6,69	0,50	13,38
12	6,16	0,00	6,16	0,50	12,32
13	5,62	0,00	5,62	0,50	11,24
14	5,08	0,00	5,08	0,50	10,16
15	4,55	0,00	4,55	0,50	9,10
16	3,23	0,00	3,23	0,40	8,08
17	2,7	-13,39	13,66	0,36	38,19
35	5,14	-10,51	11,70	0,75	15,68
54	5,03	-10,63	11,76	0,78	15,14
70	4,72	-10,31	11,34	0,78	14,60
84	4,45	-10,00	10,95	0,78	14,10
99	2,73	-6,32	6,88	0,50	13,74


```
'ESTRIBO 2 EJECUCI'N'
    44.  39    1.5000    0.0000    1.5000
    45.  40    1.5000    0.0000    2.0000
    46.  41    1.5000    0.0000    2.5000
    47.  42    1.5000    0.0000    3.0000
    48.  43    1.5000    0.0000    3.5000
    49.  44    1.5000    0.0000    4.0000
    50.  45    1.5000    0.0000    4.5000
    51.  46    1.5000    0.0000    5.0000
    52.  47    1.5000    0.0000    5.5000
    53.  48    1.5000    0.0000    6.0000
    54.  49    1.5000    0.0000    6.5000
    55.  50    1.5000    0.0000    7.0000
    56.  51    1.5000    0.0000    7.5000
    57.  52    1.5000    0.0000    7.8000
    58.  53    1.5000    0.0000    7.9854
    59.  54    1.5000    0.0000    8.1866
    61.  55    2.2500    0.0000    2.0000
    62.  56    2.2500    0.0000    2.5000
    63.  57    2.2500    0.0000    3.0000
    64.  58    2.2500    0.0000    3.5000
    65.  59    2.2500    0.0000    4.0000
    66.  60    2.2500    0.0000    4.5000
    67.  61    2.2500    0.0000    5.0000
    68.  62    2.2500    0.0000    5.5000
    69.  63    2.2500    0.0000    6.0000
    70.  64    2.2500    0.0000    6.5000
    71.  65    2.2500    0.0000    7.0000
    72.  66    2.2500    0.0000    7.5000
    73.  67    2.2500    0.0000    7.8000
    74.  68    2.2500    0.0000    7.9854
    75.  69    2.2500    0.0000    8.1866
    76.  70    2.2500    0.0000    8.3878
    78.  71    3.0000    0.0000    3.5000
    79.  72    3.0000    0.0000    4.0000
    80.  73    3.0000    0.0000    4.5000
    81.  74    3.0000    0.0000    5.0000
    82.  75    3.0000    0.0000    5.5000
    83.  76    3.0000    0.0000    6.0000
    84.  77    3.0000    0.0000    6.5000
    85.  78    3.0000    0.0000    7.0000
    86.  79    3.0000    0.0000    7.5000
    87.  80    3.0000    0.0000    7.8000
    88.  81    3.0000    0.0000    7.9854
    89.  82    3.0000    0.0000    8.1866
    90.  83    3.0000    0.0000    8.3878
    91.  84    3.0000    0.0000    8.5890
    93.  85    3.7500    0.0000    3.5000
    94.  86    3.7500    0.0000    4.0000
    95.  87    3.7500    0.0000    4.5000
    96.  88    3.7500    0.0000    5.0000
    97.  89    3.7500    0.0000    5.5000
    98.  90    3.7500    0.0000    6.0000
    99.  91    3.7500    0.0000    6.5000
   100.  92    3.7500    0.0000    7.0000
   101.  93    3.7500    0.0000    7.5000
   102.  94    3.7500    0.0000    7.8000
```



```
 ****************************************
 *                                      *
 *                                      *
 *        S T A A D - III               *
 *        Revision 22.3                 *
 *        Proprietary Program of        *
 *        Research Engineers, Inc.      *
 *        Date=    JUL 17, 2002         *
 *        Time=    10:32:44             *
 *                                      *
 *                                      *
 ****************************************

 1. STAAD SPACE 'ESTRIBO 2 EJECUCI'N'
 2. UNIT METER MTON
 3. JOINT COORDINATES
    4.   1    0.0591    0.0000    0.0000
    5.   2    0.0591    0.0000    0.5000
    6.   3    0.0591    0.0000    1.0000
    7.   4    0.0591    0.0000    1.5000
    8.   5    0.0591    0.0000    2.0000
    9.   6    0.0591    0.0000    2.5000
   10.   7    0.0591    0.0000    3.0000
   11.   8    0.0591    0.0000    3.5000
   12.   9    0.0591    0.0000    4.0000
   13.  10    0.0591    0.0000    4.5000
   14.  11    0.0591    0.0000    5.0000
   15.  12    0.0591    0.0000    5.5000
   16.  13    0.0591    0.0000    6.0000
   17.  14    0.0591    0.0000    6.5000
   18.  15    0.0591    0.0000    7.0000
   19.  16    0.0591    0.0000    7.5000
   20.  17    0.0591    0.0000    7.8000
   21.  18    0.7500    0.0000    0.0000
   22.  19    0.7500    0.0000    0.5000
   23.  20    0.7500    0.0000    1.0000
   24.  21    0.7500    0.0000    1.5000
   25.  22    0.7500    0.0000    2.0000
   26.  23    0.7500    0.0000    2.5000
   27.  24    0.7500    0.0000    3.0000
   28.  25    0.7500    0.0000    3.5000
   29.  26    0.7500    0.0000    4.0000
   30.  27    0.7500    0.0000    4.5000
   31.  28    0.7500    0.0000    5.0000
   32.  29    0.7500    0.0000    5.5000
   33.  30    0.7500    0.0000    6.0000
   34.  31    0.7500    0.0000    6.5000
   35.  32    0.7500    0.0000    7.0000
   36.  33    0.7500    0.0000    7.5000
   37.  34    0.7500    0.0000    7.8000
   38.  35    0.7500    0.0000    7.9854
   39.  36    1.5000    0.0000    0.0000
   40.  37    1.5000    0.0000    0.5000
   41.  38    1.5000    0.0000    1.0000
```

```
103.  95      3.7500      0.0000      7.9854
104.  96      3.7500      0.0000      8.1866
105.  97      3.7500      0.0000      8.3878
106.  98      3.7500      0.0000      8.5890
107.  99      3.7500      0.0000      8.7903
109. 100      4.5000      0.0000      3.5000
110. 101      4.5000      0.0000      4.0000
111. 102      4.5000      0.0000      4.5000
112. 103      4.5000      0.0000      5.0000
113. 104      4.5000      0.0000      5.5000
114. 105      4.5000      0.0000      6.0000
115. 106      4.5000      0.0000      6.5000
116. 107      4.5000      0.0000      7.0000
117. 108      4.5000      0.0000      7.5000
118. 109      4.5000      0.0000      7.8000
119. 110      4.5000      0.0000      7.9854
120. 111      4.5000      0.0000      8.1866
121. 112      4.5000      0.0000      8.3878
122. 113      4.5000      0.0000      8.5890
123. 114      4.5000      0.0000      8.7903
124. 115      4.5000      0.0000      8.9915
126. 116      5.2380      0.0000      3.5000
127. 117      5.2280      0.0000      4.0000
128. 118      5.2180      0.0000      4.5000
129. 119      5.2080      0.0000      5.0000
130. 120      5.1980      0.0000      5.5000
131. 121      5.1880      0.0000      6.0000
132. 122      5.1780      0.0000      6.5000
133. 123      5.1680      0.0000      7.0000
134. 124      5.1580      0.0000      7.5000
135. 125      5.1520      0.0000      7.8000
136. 126      5.1483      0.0000      7.9854
137. 127      5.1443      0.0000      8.1866
138. 128      5.1402      0.0000      8.3878
139. 129      5.1362      0.0000      8.5890
140. 130      5.1322      0.0000      8.7903
141. 131      5.1282      0.0000      8.9915
142. 132      5.1248      0.0000      9.1591
144. ELEMENT INCIDENCES
145. 1      1      18      19      2
146. 2      2      19      20      3
147. 3      3      20      21      4
148. 4      4      21      22      5
149. 5      5      22      23      6
150. 6      6      23      24      7
151. 7      7      24      25      8
152. 8      8      25      26      9
153. 9      9      26      27      10
154. 10      10      27      28      11
155. 11      11      28      29      12
156. 12      12      29      30      13
157. 13      13      30      31      14
158. 14      14      31      32      15
159. 15      15      32      33      16
160. 16      16      33      34      17
161. 17      17      34      35
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163. 18      18      36      37      19
164. 19      19      37      38      20
165. 20      20      38      39      21
166. 21      21      39      40      22
167  22      22      40      41      23
168. 23      23      41      42      24
169. 24      24      42      43      25
170. 25      25      43      44      26
171. 26      26      44      45      27
172. 27      27      45      46      28
173. 28      28      46      47      29
174. 29      29      47      48      30
175. 30      30      48      49      31
176. 31      31      49      50      32
177. 32      32      50      51      33
178. 33      33      51      52      34
179. 34      34      52      53      35
180. 35      35      53      54
182. 36      40      55      56      41
183. 37      41      56      57      42
184. 38      42      57      58      43
185. 39      43      58      59      44
186. 40      44      59      60      45
187. 41      45      60      61      46
188. 42      46      61      62      47
189. 43      47      62      63      48
190. 44      48      63      64      49
191. 45      49      64      65      50
192. 46      50      65      66      51
193. 47      51      66      67      52
194. 48      52      67      68      53
195. 49      53      68      69      54
196. 50      54      69      70
198. 51      58      71      72      59
199. 52      59      72      73      60
200. 53      60      73      74      61
201. 54      61      74      75      62
202. 55      62      75      76      63
203. 56      63      76      77      64
204. 57      64      77      78      65
205. 58      65      78      79      66
206. 59      66      79      80      67
207. 60      67      80      81      68
208. 61      68      81      82      69
209. 62      69      82      83      70
210. 63      70      83      84
212. 64      71      85      86      72
213. 65      72      86      87      73
214. 66      73      87      88      74
215. 67      74      88      89      75
216. 68      75      89      90      76
217. 69      76      90      91      77
218. 70      77      91      92      78
219. 71      78      92      93      79
220. 72      79      93      94      80
221. 73      80      94      95      81
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222. 74      81      95      96      82
223. 75      82      96      97      83
224. 76      83      97      98      84
225. 77      84      98      99
227. 78      85      100      101      86
228. 79      86      101      102      87
229. 80      87      102      103      88
230. 81      88      103      104      89
231. 82      89      104      105      90
232. 83      90      105      106      91
233. 84      91      106      107      92
234. 85      92      107      108      93
235. 86      93      108      109      94
236. 87      94      109      110      95
237. 88      95      110      111      96
238. 89      96      111      112      97
239. 90      97      112      113      98
240. 91      98      113      114      99
241. 92      99      114      115
243. 93      100      116      117      101
244. 94      101      117      118      102
245. 95      102      118      119      103
246. 96      103      119      120      104
247. 97      104      120      121      105
248. 98      105      121      122      106
249. 99      106      122      123      107
250. 100      107      123      124      108
251. 101      108      124      125      109
252. 102      109      125      126      110
253. 103      110      126      127      111
254. 104      111      127      128      112
255. 105      112      128      129      113
256. 106      113      129      130      114
257. 107      114      130      131      115
258. 108      115      131      132
260. ELEMENT PROPERTY
261. 1 TO 108 THICKNESS 1.00
262. CONSTANT
263. E CONCRETE ALL
264. DENSITY 2.50 ALL
265. POISSON CONCRETE ALL
267. SUPPORT
268. 1          FIXED BUT FZ MY KFX 10000
269. 2 TO 15    FIXED BUT FZ MY KFX 20000
270. 16         FIXED BUT FZ MY KFX 16000
271. 17         FIXED BUT    MY KFX 13800 KFZ  9700
272. 35         FIXED BUT    MY KFX 28800 KFZ  7700
273. 54 70 84   FIXED BUT    MY KFX 30000 KFZ  8000
274. 99         FIXED BUT    MY KFX 19400 KFZ  5200
276. LOAD 1
277. *PESO PROPIO DEL ESTRIBO
278. SELFWEIGHT X -1.00
279. *SOBRECARGA DE 1 T/M^2
280. JOINT LOAD
281. 116          FX -0.250
282. 117 TO 123   FX -0.500
```



```
283. 124          FX -0.200
284. 125          FX -0.121
285. 126          FX -0.097
286. 127 TO 130   FX -0.101
287. 131          FX -0.092
288. 132          FX -0.042
289. *ANCLAJES
290. 40 55 FX -5.40  FZ 30.58
291. PERFORM ANALYSIS PRINT STATIC CHECK

        P R O B L E M   S T A T I S T I C S
        -----------------------------------

NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS =   132/  108/   22
ORIGINAL/FINAL BAND-WIDTH =    19/    9
TOTAL PRIMARY LOAD CASES  =     1, TOTAL DEGREES OF FREEDOM =   792
SIZE OF STIFFNESS MATRIX  =   47520 DOUBLE PREC. WORDS
REQRD/AVAIL. DISK SPACE   =  12.82/ 2047.7 MB,  EXMEM = 1951.7 MB
```

***TOTAL APPLIED LOAD (MTON METE) SUMMARY (LOADING 1)
SUMMATION FORCE-X = -94.79
SUMMATION FORCE-Y = .00
SUMMATION FORCE-Z = 61.16

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= .00 MY= -577.08 MZ= .00

++ Processing Element Stiffness Matrix. 10:32:44
++ Processing Global Stiffness Matrix. 10:32:44
++ Processing Triangular Factorization. 10:32:44

***WARNING - IMPROPER LOAD WILL CAUSE INSTABILITY AT JOINT 36
DIRECTION = MY PROBABLE CAUSE MODELING PROBLEM -.130E-07
++ Calculating Joint Displacements. 10:32:44
++ Calculating Member Forces. 10:32:44

***TOTAL REACTION (MTON METE) SUMMARY

LOADING 1

SUM-X= 94.79 SUM-Y= .00 SUM-Z= -61.16

SUMMATION OF MOMENTS AROUND ORIGIN-

MX= .00 MY= 577.08 MZ= .00

********** END OF DATA FROM INTERNAL STORAGE **********

292. PRINT SUPPORT REACTION

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
1	1	1.49	.00	.00	.00	.00	.00
2	1	3.48	.00	.00	.00	.00	.00
3	1	3.98	.00	.00	.00	.00	.00
4	1	4.48	.00	.00	.00	.00	.00
5	1	4.91	.00	.00	.00	.00	.00
6	1	5.24	.00	.00	.00	.00	.00
7	1	5.43	.00	.00	.00	.00	.00
8	1	5.45	.00	.00	.00	.00	.00
9	1	5.37	.00	.00	.00	.00	.00
10	1	5.20	.00	.00	.00	.00	.00
11	1	4.97	.00	.00	.00	.00	.00
12	1	4.71	.00	.00	.00	.00	.00
13	1	4.44	.00	.00	.00	.00	.00
14	1	4.16	.00	.00	.00	.00	.00
15	1	3.88	.00	.00	.00	.00	.00
16	1	2.90	.00	.00	.00	.00	.00
17	1	2.52	.00	-12.98	.00	.00	.00
35	1	4.89	.00	-10.32	.00	.00	.00
54	1	4.92	.00	-10.58	.00	.00	.00
70	1	4.76	.00	-10.42	.00	.00	.00
84	1	4.64	.00	-10.26	.00	.00	.00
99	1	2.96	.00	-6.59	.00	.00	.00

********** END OF LATEST ANALYSIS RESULT **********

293. FINISH

********** END OF STAAD-III **********

**** DATE= JUL 17,2002 TIME= 10:32:45 ****

S T A A D - III
Revision 22.3
Proprietary Program of
Research Engineers, Inc.
Date= JUL 17, 2002
Time= 10:32:52

1. STAAD SPACE 'ESTRIBO 2 PP Y CM'
2. UNIT METER MTON
3. JOINT COORDINATES

4.	1	0.0591	0.0000	0.0000
5.	2	0.0591	0.0000	0.5000
6.	3	0.0591	0.0000	1.0000
7.	4	0.0591	0.0000	1.5000
8.	5	0.0591	0.0000	2.0000
9.	6	0.0591	0.0000	2.5000
10.	7	0.0591	0.0000	3.0000
11.	8	0.0591	0.0000	3.5000
12.	9	0.0591	0.0000	4.0000
13.	10	0.0591	0.0000	4.5000
14.	11	0.0591	0.0000	5.0000
15.	12	0.0591	0.0000	5.5000
16.	13	0.0591	0.0000	6.0000
17.	14	0.0591	0.0000	6.5000
18.	15	0.0591	0.0000	7.0000
19.	16	0.0591	0.0000	7.5000
20.	17	0.0591	0.0000	7.8000
22.	18	0.7500	0.0000	0.0000
23.	19	0.7500	0.0000	0.5000
24.	20	0.7500	0.0000	1.0000
25.	21	0.7500	0.0000	1.5000
26.	22	0.7500	0.0000	2.0000
27.	23	0.7500	0.0000	2.5000
28.	24	0.7500	0.0000	3.0000
29.	25	0.7500	0.0000	3.5000
30.	26	0.7500	0.0000	4.0000
31.	27	0.7500	0.0000	4.5000
32.	28	0.7500	0.0000	5.0000
33.	29	0.7500	0.0000	5.5000
34.	30	0.7500	0.0000	6.0000
35.	31	0.7500	0.0000	6.5000
36.	32	0.7500	0.0000	7.0000
37.	33	0.7500	0.0000	7.5000
38.	34	0.7500	0.0000	7.8000
39.	35	0.7500	0.0000	7.9854
41.	36	1.5000	0.0000	0.0000
42.	37	1.5000	0.0000	0.5000
43.	38	1.5000	0.0000	1.0000

44.	39	1.5000	0.0000	1.5000
45.	40	1.5000	0.0000	2.0000
46.	41	1.5000	0.0000	2.5000
47.	42	1.5000	0.0000	3.0000
48.	43	1.5000	0.0000	3.5000
49.	44	1.5000	0.0000	4.0000
50.	45	1.5000	0.0000	4.5000
51.	46	1.5000	0.0000	5.0000
52.	47	1.5000	0.0000	5.5000
53.	48	1.5000	0.0000	6.0000
54.	49	1.5000	0.0000	6.5000
55.	50	1.5000	0.0000	7.0000
56.	51	1.5000	0.0000	7.5000
57.	52	1.5000	0.0000	7.8000
58.	53	1.5000	0.0000	7.9854
59.	54	1.5000	0.0000	8.1866
61.	55	2.2500	0.0000	2.0000
62.	56	2.2500	0.0000	2.5000
63.	57	2.2500	0.0000	3.0000
64.	58	2.2500	0.0000	3.5000
65.	59	2.2500	0.0000	4.0000
66.	60	2.2500	0.0000	4.5000
67.	61	2.2500	0.0000	5.0000
68.	62	2.2500	0.0000	5.5000
69.	63	2.2500	0.0000	6.0000
70.	64	2.2500	0.0000	6.5000
71.	65	2.2500	0.0000	7.0000
72.	66	2.2500	0.0000	7.5000
73.	67	2.2500	0.0000	7.8000
74.	68	2.2500	0.0000	7.9854
75.	69	2.2500	0.0000	8.1866
76.	70	2.2500	0.0000	8.3878
78.	71	3.0000	0.0000	3.5000
79.	72	3.0000	0.0000	4.0000
80.	73	3.0000	0.0000	4.5000
81.	74	3.0000	0.0000	5.0000
82.	75	3.0000	0.0000	5.5000
83.	76	3.0000	0.0000	6.0000
84.	77	3.0000	0.0000	6.5000
85.	78	3.0000	0.0000	7.0000
86.	79	3.0000	0.0000	7.5000
87.	80	3.0000	0.0000	7.8000
88.	81	3.0000	0.0000	7.9854
89.	82	3.0000	0.0000	8.1866
90.	83	3.0000	0.0000	8.3878
91.	84	3.0000	0.0000	8.5890
93.	85	3.7500	0.0000	3.5000
94.	86	3.7500	0.0000	4.0000
95.	87	3.7500	0.0000	4.5000
96.	88	3.7500	0.0000	5.0000
97.	89	3.7500	0.0000	5.5000
98.	90	3.7500	0.0000	6.0000
99.	91	3.7500	0.0000	6.5000
100.	92	3.7500	0.0000	7.0000
101.	93	3.7500	0.0000	7.5000
102.	94	3.7500	0.0000	7.8000

```
103.  95      3.7500      0.0000      7.9854
104.  96      3.7500      0.0000      8.1866
105.  97      3.7500      0.0000      8.3878
106.  98      3.7500      0.0000      8.5890
107.  99      3.7500      0.0000      8.7903
109. 100      4.5000      0.0000      3.5000
110. 101      4.5000      0.0000      4.0000
111. 102      4.5000      0.0000      4.5000
112. 103      4.5000      0.0000      5.0000
113. 104      4.5000      0.0000      5.5000
114. 105      4.5000      0.0000      6.0000
115. 106      4.5000      0.0000      6.5000
116. 107      4.5000      0.0000      7.0000
117. 108      4.5000      0.0000      7.5000
118. 109      4.5000      0.0000      7.8000
119. 110      4.5000      0.0000      7.9854
120. 111      4.5000      0.0000      8.1866
121. 112      4.5000      0.0000      8.3878
122. 113      4.5000      0.0000      8.5890
123. 114      4.5000      0.0000      8.7903
124. 115      4.5000      0.0000      8.9915
126. 116      5.2380      0.0000      3.5000
127. 117      5.2280      0.0000      4.0000
128. 118      5.2180      0.0000      4.5000
129. 119      5.2080      0.0000      5.0000
130. 120      5.1980      0.0000      5.5000
131. 121      5.1880      0.0000      6.0000
132. 122      5.1780      0.0000      6.5000
133. 123      5.1680      0.0000      7.0000
134. 124      5.1580      0.0000      7.5000
135. 125      5.1520      0.0000      7.8000
136. 126      5.1483      0.0000      7.9854
137. 127      5.1443      0.0000      8.1866
138. 128      5.1402      0.0000      8.3878
139. 129      5.1362      0.0000      8.5890
140. 130      5.1322      0.0000      8.7903
141. 131      5.1282      0.0000      8.9915
142. 132      5.1248      0.0000      9.1591
144. ELEMENT INCIDENCES
145. 1      1      18      19      2
146. 2      2      19      20      3
147. 3      3      20      21      4
148. 4      4      21      22      5
149. 5      5      22      23      6
150. 6      6      23      24      7
151. 7      7      24      25      8
152. 8      8      25      26      9
153. 9      9      26      27      10
154. 10      10      27      28      11
155. 11      11      28      29      12
156. 12      12      29      30      13
157. 13      13      30      31      14
158. 14      14      31      32      15
159. 15      15      32      33      16
160. 16      16      33      34      17
161. 17      17      34      35
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163. 18      18      36      37      19
164. 19      19      37      38      20
165. 20      20      38      39      21
166. 21      21      39      40      22
167. 22      22      40      41      23
168. 23      23      41      42      24
169. 24      24      42      43      25
170. 25      25      43      44      26
171. 26      26      44      45      27
172. 27      27      45      46      28
173. 28      28      46      47      29
174. 29      29      47      48      30
175. 30      30      48      49      31
176. 31      31      49      50      32
177. 32      32      50      51      33
178. 33      33      51      52      34
179. 34      34      52      53      35
180. 35      35      53      54
182. 36      40      55      56      41
183. 37      41      56      57      42
184. 38      42      57      58      43
185. 39      43      58      59      44
186. 40      44      59      60      45
187. 41      45      60      61      46
188. 42      46      61      62      47
189. 43      47      62      63      48
190. 44      48      63      64      49
191. 45      49      64      65      50
192. 46      50      65      66      51
193. 47      51      66      67      52
194. 48      52      67      68      53
195. 49      53      68      69      54
196. 50      54      69      70
198. 51      58      71      72      59
199. 52      59      72      73      60
200. 53      60      73      74      61
201. 54      61      74      75      62
202. 55      62      75      76      63
203. 56      63      76      77      64
204. 57      64      77      78      65
205. 58      65      78      79      66
206. 59      66      79      80      67
207. 60      67      80      81      68
208. 61      68      81      82      69
209. 62      69      82      83      70
210. 63      70      83      84
212. 64      71      85      86      72
213. 65      72      86      87      73
214. 66      73      87      88      74
215. 67      74      88      89      75
216. 68      75      89      90      76
217. 69      76      90      91      77
218. 70      77      91      92      78
219. 71      78      92      93      79
220. 72      79      93      94      80
221. 73      80      94      95      81
```



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222. 74      81      95      96      82
223. 75      82      96      97      83
224. 76      83      97      98      84
225. 77      84      98      99
227. 78      85      100      101      86
228. 79      86      101      102      87
229. 80      87      102      103      88
230. 81      88      103      104      89
231. 82      89      104      105      90
232. 83      90      105      106      91
233. 84      91      106      107      92
234. 85      92      107      108      93
235. 86      93      108      109      94
236. 87      94      109      110      95
237. 88      95      110      111      96
238. 89      96      111      112      97
239. 90      97      112      113      98
240. 91      98      113      114      99
241. 92      99      114      115
243. 93      100      116      117      101
244. 94      101      117      118      102
245. 95      102      118      119      103
246. 96      103      119      120      104
247. 97      104      120      121      105
248. 98      105      121      122      106
249. 99      106      122      123      107
250. 100      107      123      124      108
251. 101      108      124      125      109
252. 102      109      125      126      110
253. 103      110      126      127      111
254. 104      111      127      128      112
255. 105      112      128      129      113
256. 106      113      129      130      114
257. 107      114      130      131      115
258. 108      115      131      132
260. ELEMENT PROPERTY
261. 1 TO 108 THICKNESS 1.00
262. CONSTANT
263. E CONCRETE ALL
264. DENSITY 2.50 ALL
265. POISSON CONCRETE ALL
267. SUPPORT
268. 1            FIXED BUT FZ MY KFX 10000
269. 2 TO 15      FIXED BUT FZ MY KFX 20000
270. 16           FIXED BUT FZ MY KFX 16000
271. 17           FIXED BUT    MY KFX 13800 KFZ  9700
272. 35           FIXED BUT    MY KFX 28800 KFZ  7700
273. 54 70 84     FIXED BUT    MY KFX 30000 KFZ  8000
274. 99           FIXED BUT    MY KFX 19400 KFZ  5200
276. LOAD 1
277. *PESO PROPIO DEL ESTRIBO
278. SELFWEIGHT X -1.00
279. *SOBRECARGA DE 1 T/M^2
280. JOINT LOAD
281. 116          FX -0.250
282. 117 TO 123   FX -0.500
```



```
283. 124          FX -0.200
284. 125          FX -0.121
285. 126          FX -0.097
286. 127 TO 130   FX -0.101
287. 131          FX -0.092
288. 132          FX -0.042
289. *ANCLAJES
290. 40 55 FX -5.40  FZ 30.58
291. *PESO PROPIO DEL TABLERO Y CARGAS MUERTAS
292. 57 FX -29.87
293. PERFORM ANALYSIS PRINT STATIC CHECK
```

P R O B L E M S T A T I S T I C S

```
NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS =   132/  108/   22
ORIGINAL/FINAL BAND-WIDTH =    19/    9
TOTAL PRIMARY LOAD CASES  =     1, TOTAL DEGREES OF FREEDOM =   792
SIZE OF STIFFNESS MATRIX  =    47520 DOUBLE PREC. WORDS
REQRD/AVAIL. DISK SPACE   =  12.82/ 2047.7 MB,  EXMEM = 1951.7 MB
```

***TOTAL APPLIED LOAD (MTON METE) SUMMARY (LOADING 1)
SUMMATION FORCE-X = -124.66
SUMMATION FORCE-Y = .00
SUMMATION FORCE-Z = 61.16

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= .00 MY= -666.69 MZ= .00

++ Processing Element Stiffness Matrix. 10:32:52
++ Processing Global Stiffness Matrix. 10:32:52
++ Processing Triangular Factorization. 10:32:52

***WARNING - IMPROPER LOAD WILL CAUSE INSTABILITY AT JOINT 36
DIRECTION = MY PROBABLE CAUSE MODELING PROBLEM -.130E-07
++ Calculating Joint Displacements. 10:32:52
++ Calculating Member Forces. 10:32:52

***TOTAL REACTION (MTON METE) SUMMARY

LOADING 1

SUM-X= 124.66 SUM-Y= .00 SUM-Z= -61.16

SUMMATION OF MOMENTS AROUND ORIGIN-

MX= .00 MY= 666.69 MZ= .00

********** END OF DATA FROM INTERNAL STORAGE **********

294. PRINT SUPPORT REACTION

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
1	1	2.63	.00	.00	.00	.00	.00
2	1	5.91	.00	.00	.00	.00	.00
3	1	6.53	.00	.00	.00	.00	.00
4	1	7.14	.00	.00	.00	.00	.00
5	1	7.64	.00	.00	.00	.00	.00
6	1	7.96	.00	.00	.00	.00	.00
7	1	8.05	.00	.00	.00	.00	.00
8	1	7.91	.00	.00	.00	.00	.00
9	1	7.61	.00	.00	.00	.00	.00
10	1	7.18	.00	.00	.00	.00	.00
11	1	6.69	.00	.00	.00	.00	.00
12	1	6.16	.00	.00	.00	.00	.00
13	1	5.62	.00	.00	.00	.00	.00
14	1	5.08	.00	.00	.00	.00	.00
15	1	4.55	.00	.00	.00	.00	.00
16	1	3.23	.00	.00	.00	.00	.00
17	1	2.70	.00	-13.39	.00	.00	.00
35	1	5.14	.00	-10.51	.00	.00	.00
54	1	5.03	.00	-10.63	.00	.00	.00
70	1	4.72	.00	-10.31	.00	.00	.00
84	1	4.45	.00	-10.00	.00	.00	.00
99	1	2.73	.00	-6.32	.00	.00	.00

********** END OF LATEST ANALYSIS RESULT **********

295. FINISH

********** END OF STAAD-III **********

**** DATE= JUL 17,2002 TIME= 10:32:52 ****

STAAD - III
Revision 22.3
Proprietary Program of
Research Engineers, Inc.
Date= JUL 17, 2002
Time= 10:32:57

1. STAAD SPACE 'ESTRIBO 2 FRENADO 1'
2. UNIT METER MTON
3. JOINT COORDINATES

4.	1	0.0591	0.0000	0.0000
5.	2	0.0591	0.0000	0.5000
6.	3	0.0591	0.0000	1.0000
7.	4	0.0591	0.0000	1.5000
8.	5	0.0591	0.0000	2.0000
9.	6	0.0591	0.0000	2.5000
10.	7	0.0591	0.0000	3.0000
11.	8	0.0591	0.0000	3.5000
12.	9	0.0591	0.0000	4.0000
13.	10	0.0591	0.0000	4.5000
14.	11	0.0591	0.0000	5.0000
15.	12	0.0591	0.0000	5.5000
16.	13	0.0591	0.0000	6.0000
17.	14	0.0591	0.0000	6.5000
18.	15	0.0591	0.0000	7.0000
19.	16	0.0591	0.0000	7.5000
20.	17	0.0591	0.0000	7.8000
22.	18	0.7500	0.0000	0.0000
23.	19	0.7500	0.0000	0.5000
24.	20	0.7500	0.0000	1.0000
25.	21	0.7500	0.0000	1.5000
26.	22	0.7500	0.0000	2.0000
27.	23	0.7500	0.0000	2.5000
28.	24	0.7500	0.0000	3.0000
29.	25	0.7500	0.0000	3.5000
30.	26	0.7500	0.0000	4.0000
31.	27	0.7500	0.0000	4.5000
32.	28	0.7500	0.0000	5.0000
33.	29	0.7500	0.0000	5.5000
34.	30	0.7500	0.0000	6.0000
35.	31	0.7500	0.0000	6.5000
36.	32	0.7500	0.0000	7.0000
37.	33	0.7500	0.0000	7.5000
38.	34	0.7500	0.0000	7.8000
39.	35	0.7500	0.0000	7.9854
41.	36	1.5000	0.0000	0.0000
42.	37	1.5000	0.0000	0.5000
43.	38	1.5000	0.0000	1.0000

44.	39	1.5000	0.0000	1.5000
45.	40	1.5000	0.0000	2.0000
46.	41	1.5000	0.0000	2.5000
47.	42	1.5000	0.0000	3.0000
48.	43	1.5000	0.0000	3.5000
49.	44	1.5000	0.0000	4.0000
50.	45	1.5000	0.0000	4.5000
51.	46	1.5000	0.0000	5.0000
52.	47	1.5000	0.0000	5.5000
53.	48	1.5000	0.0000	6.0000
54.	49	1.5000	0.0000	6.5000
55.	50	1.5000	0.0000	7.0000
56.	51	1.5000	0.0000	7.5000
57.	52	1.5000	0.0000	7.8000
58.	53	1.5000	0.0000	7.9854
59.	54	1.5000	0.0000	8.1866
61.	55	2.2500	0.0000	2.0000
62.	56	2.2500	0.0000	2.5000
63.	57	2.2500	0.0000	3.0000
64.	58	2.2500	0.0000	3.5000
65.	59	2.2500	0.0000	4.0000
66.	60	2.2500	0.0000	4.5000
67.	61	2.2500	0.0000	5.0000
68.	62	2.2500	0.0000	5.5000
69.	63	2.2500	0.0000	6.0000
70.	64	2.2500	0.0000	6.5000
71.	65	2.2500	0.0000	7.0000
72.	66	2.2500	0.0000	7.5000
73.	67	2.2500	0.0000	7.8000
74.	68	2.2500	0.0000	7.9854
75.	69	2.2500	0.0000	8.1866
76.	70	2.2500	0.0000	8.3878
78.	71	3.0000	0.0000	3.5000
79.	72	3.0000	0.0000	4.0000
80.	73	3.0000	0.0000	4.5000
81.	74	3.0000	0.0000	5.0000
82.	75	3.0000	0.0000	5.5000
83.	76	3.0000	0.0000	6.0000
84.	77	3.0000	0.0000	6.5000
85.	78	3.0000	0.0000	7.0000
86.	79	3.0000	0.0000	7.5000
87.	80	3.0000	0.0000	7.8000
88.	81	3.0000	0.0000	7.9854
89.	82	3.0000	0.0000	8.1866
90.	83	3.0000	0.0000	8.3878
91.	84	3.0000	0.0000	8.5890
93.	85	3.7500	0.0000	3.5000
94.	86	3.7500	0.0000	4.0000
95.	87	3.7500	0.0000	4.5000
96.	88	3.7500	0.0000	5.0000
97.	89	3.7500	0.0000	5.5000
98.	90	3.7500	0.0000	6.0000
99.	91	3.7500	0.0000	6.5000
100.	92	3.7500	0.0000	7.0000
101.	93	3.7500	0.0000	7.5000
102.	94	3.7500	0.0000	7.8000

```
103.  95      3.7500      0.0000      7.9854
104.  96      3.7500      0.0000      8.1866
105.  97      3.7500      0.0000      8.3878
106.  98      3.7500      0.0000      8.5890
107.  99      3.7500      0.0000      8.7903
109. 100      4.5000      0.0000      3.5000
110. 101      4.5000      0.0000      4.0000
111. 102      4.5000      0.0000      4.5000
112. 103      4.5000      0.0000      5.0000
113. 104      4.5000      0.0000      5.5000
114. 105      4.5000      0.0000      6.0000
115. 106      4.5000      0.0000      6.5000
116. 107      4.5000      0.0000      7.0000
117. 108      4.5000      0.0000      7.5000
118. 109      4.5000      0.0000      7.8000
119. 110      4.5000      0.0000      7.9854
120. 111      4.5000      0.0000      8.1866
121. 112      4.5000      0.0000      8.3878
122. 113      4.5000      0.0000      8.5890
123. 114      4.5000      0.0000      8.7903
124. 115      4.5000      0.0000      8.9915
126. 116      5.2380      0.0000      3.5000
127. 117      5.2280      0.0000      4.0000
128. 118      5.2180      0.0000      4.5000
129. 119      5.2080      0.0000      5.0000
130. 120      5.1980      0.0000      5.5000
131. 121      5.1880      0.0000      6.0000
132. 122      5.1780      0.0000      6.5000
133. 123      5.1680      0.0000      7.0000
134. 124      5.1580      0.0000      7.5000
135. 125      5.1520      0.0000      7.8000
136. 126      5.1483      0.0000      7.9854
137. 127      5.1443      0.0000      8.1866
138. 128      5.1402      0.0000      8.3878
139. 129      5.1362      0.0000      8.5890
140. 130      5.1322      0.0000      8.7903
141. 131      5.1282      0.0000      8.9915
142. 132      5.1248      0.0000      9.1591
144. ELEMENT INCIDENCES
145. 1      1      18      19      2
146. 2      2      19      20      3
147. 3      3      20      21      4
148. 4      4      21      22      5
149. 5      5      22      23      6
150. 6      6      23      24      7
151. 7      7      24      25      8
152. 8      8      25      26      9
153. 9      9      26      27      10
154. 10      10      27      28      11
155. 11      11      28      29      12
156. 12      12      29      30      13
157. 13      13      30      31      14
158. 14      14      31      32      15
159. 15      15      32      33      16
160. 16      16      33      34      17
161. 17      17      34      35
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163. 18      18      36      37      19
164. 19      19      37      38      20
165. 20      20      38      39      21
166. 21      21      39      40      22
167. 22      22      40      41      23
168. 23      23      41      42      24
169. 24      24      42      43      25
170. 25      25      43      44      26
171. 26      26      44      45      27
172. 27      27      45      46      28
173. 28      28      46      47      29
174. 29      29      47      48      30
175. 30      30      48      49      31
176. 31      31      49      50      32
177. 32      32      50      51      33
178. 33      33      51      52      34
179. 34      34      52      53      35
180. 35      35      53      54
182. 36      40      55      56      41
183. 37      41      56      57      42
184. 38      42      57      58      43
185. 39      43      58      59      44
186. 40      44      59      60      45
187. 41      45      60      61      46
188. 42      46      61      62      47
189. 43      47      62      63      48
190. 44      48      63      64      49
191. 45      49      64      65      50
192. 46      50      65      66      51
193. 47      51      66      67      52
194. 48      52      67      68      53
195. 49      53      68      69      54
196. 50      54      69      70
198. 51      58      71      72      59
199. 52      59      72      73      60
200. 53      60      73      74      61
201. 54      61      74      75      62
202. 55      62      75      76      63
203. 56      63      76      77      64
204. 57      64      77      78      65
205. 58      65      78      79      66
206. 59      66      79      80      67
207. 60      67      80      81      68
208. 61      68      81      82      69
209. 62      69      82      83      70
210. 63      70      83      84
212. 64      71      85      86      72
213. 65      72      86      87      73
214. 66      73      87      88      74
215. 67      74      88      89      75
216. 68      75      89      90      76
217. 69      76      90      91      77
218. 70      77      91      92      78
219. 71      78      92      93      79
220. 72      79      93      94      80
221. 73      80      94      95      81
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222. 74      81      95      96      82
223. 75      82      96      97      83
224. 76      83      97      98      84
225. 77      84      98      99
227. 78      85      100      101      86
228. 79      86      101      102      87
229. 80      87      102      103      88
230. 81      88      103      104      89
231. 82      89      104      105      90
232. 83      90      105      106      91
233. 84      91      106      107      92
234. 85      92      107      108      93
235. 86      93      108      109      94
236. 87      94      109      110      95
237. 88      95      110      111      96
238. 89      96      111      112      97
239. 90      97      112      113      98
240. 91      98      113      114      99
241. 92      99      114      115
243. 93      100      116      117      101
244. 94      101      117      118      102
245. 95      102      118      119      103
246. 96      103      119      120      104
247. 97      104      120      121      105
248. 98      105      121      122      106
249. 99      106      122      123      107
250. 100      107      123      124      108
251. 101      108      124      125      109
252. 102      109      125      126      110
253. 103      110      126      127      111
254. 104      111      127      128      112
255. 105      112      128      129      113
256. 106      113      129      130      114
257. 107      114      130      131      115
258. 108      115      131      132
260. ELEMENT PROPERTY
261. 1 TO 108 THICKNESS 1.00
262. CONSTANT
263. E CONCRETE ALL
264. DENSITY 2.50 ALL
265. POISSON CONCRETE ALL
267. SUPPORT
268. 1            FIXED BUT FZ MY KFX 10000
269. 2 TO 15      FIXED BUT FZ MY KFX 20000
270. 16           FIXED BUT FZ MY KFX 16000
271. 17           FIXED BUT    MY KFX 13800 KFZ  9700
272. 35           FIXED BUT    MY KFX 28800 KFZ  7700
273. 54 70 84     FIXED BUT    MY KFX 30000 KFZ  8000
274. 99           FIXED BUT    MY KFX 19400 KFZ  5200
276. LOAD 1
277. *PESO PROPIO DEL ESTRIBO
278. SELFWEIGHT X -1.00
279. *SOBRECARGA DE 3 T/M^2
280. JOINT LOAD
281. 116          FX -0.750
282. 117 TO 123   FX -1.500
```



```
283. 124          FX -0.600
284. 125          FX -0.364
285. 126          FX -0.290
286. 127 TO 130   FX -0.302
287. 131          FX -0.277
288. 132          FX -0.126
289. *ANCLAJES
290. 40 55 FX -5.40  FZ 30.58
291. *PESO PROPIO DEL TABLERO Y CARGAS MUERTAS
292. 57 FX -29.87
293. *SOBRECARGA
294. 57 FX -30.86
295. *FRENADO
296. 116 FZ 50.74
297. PERFORM ANALYSIS PRINT STATIC CHECK
```

P R O B L E M S T A T I S T I C S

```
NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS =   132/  108/   22
ORIGINAL/FINAL BAND-WIDTH =   19/    9
TOTAL PRIMARY LOAD CASES  =    1, TOTAL DEGREES OF FREEDOM =   792
SIZE OF STIFFNESS MATRIX  =   47520 DOUBLE PREC. WORDS
REQRD/AVAIL. DISK SPACE   =  12.82/ 2047.7 MB,  EXMEM = 1951.7 MB
```

***TOTAL APPLIED LOAD (MTON METE) SUMMARY (LOADING 1)
SUMMATION FORCE-X = -164.93
SUMMATION FORCE-Y = .00
SUMMATION FORCE-Z = 111.90

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= .00 MY= -1080.99 MZ= .00

++ Processing Element Stiffness Matrix. 10:32:57
++ Processing Global Stiffness Matrix. 10:32:57
++ Processing Triangular Factorization. 10:32:57

***WARNING - IMPROPER LOAD WILL CAUSE INSTABILITY AT JOINT 36
DIRECTION = MY PROBABLE CAUSE MODELING PROBLEM -.130E-07
++ Calculating Joint Displacements. 10:32:57
++ Calculating Member Forces. 10:32:57

***TOTAL REACTION (MTON METE) SUMMARY

LOADING 1

SUM-X= 164.93 SUM-Y= .00 SUM-Z= -111.90

SUMMATION OF MOMENTS AROUND ORIGIN-

MX= .00 MY= 1080.99 MZ= .00

************ END OF DATA FROM INTERNAL STORAGE ************

298. PRINT SUPPORT REACTION

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
1	1	2.24	.00	.00	.00	.00	.00
2	1	5.25	.00	.00	.00	.00	.00
3	1	6.01	.00	.00	.00	.00	.00
4	1	6.76	.00	.00	.00	.00	.00
5	1	7.40	.00	.00	.00	.00	.00
6	1	7.87	.00	.00	.00	.00	.00
7	1	8.14	.00	.00	.00	.00	.00
8	1	8.18	.00	.00	.00	.00	.00
9	1	8.11	.00	.00	.00	.00	.00
10	1	7.95	.00	.00	.00	.00	.00
11	1	7.77	.00	.00	.00	.00	.00
12	1	7.61	.00	.00	.00	.00	.00
13	1	7.46	.00	.00	.00	.00	.00
14	1	7.32	.00	.00	.00	.00	.00
15	1	7.18	.00	.00	.00	.00	.00
16	1	5.67	.00	.00	.00	.00	.00
17	1	5.06	.00	-23.13	.00	.00	.00
35	1	10.14	.00	-18.58	.00	.00	.00
54	1	10.55	.00	-19.27	.00	.00	.00
70	1	10.58	.00	-19.23	.00	.00	.00
84	1	10.66	.00	-19.20	.00	.00	.00
99	1	6.99	.00	-12.50	.00	.00	.00

************** END OF LATEST ANALYSIS RESULT **************

299. FINISH

********** END OF STAAD-III **********

**** DATE= JUL 17,2002 TIME= 10:32:57 ****

S T A A D - III
Revision 22.3
Proprietary Program of
Research Engineers, Inc.
Date= JUL 17, 2002
Time= 10:33: 3

1. STAAD SPACE ESTRIBO 2
2. UNIT METER MTON
3. JOINT COORDINATES

4.	1	0.0591	0.0000	0.0000
5.	2	0.0591	0.0000	0.5000
6.	3	0.0591	0.0000	1.0000
7.	4	0.0591	0.0000	1.5000
8.	5	0.0591	0.0000	2.0000
9.	6	0.0591	0.0000	2.5000
10.	7	0.0591	0.0000	3.0000
11.	8	0.0591	0.0000	3.5000
12.	9	0.0591	0.0000	4.0000
13.	10	0.0591	0.0000	4.5000
14.	11	0.0591	0.0000	5.0000
15.	12	0.0591	0.0000	5.5000
16.	13	0.0591	0.0000	6.0000
17.	14	0.0591	0.0000	6.5000
18.	15	0.0591	0.0000	7.0000
19.	16	0.0591	0.0000	7.5000
20.	17	0.0591	0.0000	7.8000
22.	18	0.7500	0.0000	0.0000
23.	19	0.7500	0.0000	0.5000
24.	20	0.7500	0.0000	1.0000
25.	21	0.7500	0.0000	1.5000
26.	22	0.7500	0.0000	2.0000
27.	23	0.7500	0.0000	2.5000
28.	24	0.7500	0.0000	3.0000
29.	25	0.7500	0.0000	3.5000
30.	26	0.7500	0.0000	4.0000
31.	27	0.7500	0.0000	4.5000
32.	28	0.7500	0.0000	5.0000
33.	29	0.7500	0.0000	5.5000
34.	30	0.7500	0.0000	6.0000
35.	31	0.7500	0.0000	6.5000
36.	32	0.7500	0.0000	7.0000
37.	33	0.7500	0.0000	7.5000
38.	34	0.7500	0.0000	7.8000
39.	35	0.7500	0.0000	7.9854
41.	36	1.5000	0.0000	0.0000
42.	37	1.5000	0.0000	0.5000
43.	38	1.5000	0.0000	1.0000

41.	39	1.5000	0.0000	1.5000
45.	40	1.5000	0.0000	2.0000
46.	41	1.5000	0.0000	2.5000
47.	42	1.5000	0.0000	3.0000
48.	43	1.5000	0.0000	3.5000
49.	44	1.5000	0.0000	4.0000
50.	45	1.5000	0.0000	4.5000
51.	46	1.5000	0.0000	5.0000
52.	47	1.5000	0.0000	5.5000
53.	48	1.5000	0.0000	6.0000
54.	49	1.5000	0.0000	6.5000
55.	50	1.5000	0.0000	7.0000
56.	51	1.5000	0.0000	7.5000
57.	52	1.5000	0.0000	7.8000
58.	53	1.5000	0.0000	7.9854
59.	54	1.5000	0.0000	8.1866
61.	55	2.2500	0.0000	2.0000
62.	56	2.2500	0.0000	2.5000
63.	57	2.2500	0.0000	3.0000
64.	58	2.2500	0.0000	3.5000
65.	59	2.2500	0.0000	4.0000
66.	60	2.2500	0.0000	4.5000
67.	61	2.2500	0.0000	5.0000
68.	62	2.2500	0.0000	5.5000
69.	63	2.2500	0.0000	6.0000
70.	64	2.2500	0.0000	6.5000
71.	65	2.2500	0.0000	7.0000
72.	66	2.2500	0.0000	7.5000
73.	67	2.2500	0.0000	7.8000
74.	68	2.2500	0.0000	7.9854
75.	69	2.2500	0.0000	8.1866
76.	70	2.2500	0.0000	8.3878
78.	71	3.0000	0.0000	3.5000
79.	72	3.0000	0.0000	4.0000
80.	73	3.0000	0.0000	4.5000
81.	74	3.0000	0.0000	5.0000
82.	75	3.0000	0.0000	5.5000
83.	76	3.0000	0.0000	6.0000
84.	77	3.0000	0.0000	6.5000
85.	78	3.0000	0.0000	7.0000
86.	79	3.0000	0.0000	7.5000
87.	80	3.0000	0.0000	7.8000
88.	81	3.0000	0.0000	7.9854
89.	82	3.0000	0.0000	8.1866
90.	83	3.0000	0.0000	8.3878
91.	84	3.0000	0.0000	8.5890
93.	85	3.7500	0.0000	3.5000
94.	86	3.7500	0.0000	4.0000
95.	87	3.7500	0.0000	4.5000
96.	88	3.7500	0.0000	5.0000
97.	89	3.7500	0.0000	5.5000
98.	90	3.7500	0.0000	6.0000
99.	91	3.7500	0.0000	6.5000
100.	92	3.7500	0.0000	7.0000
101.	93	3.7500	0.0000	7.5000
102.	94	3.7500	0.0000	7.8000

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103.  95      3.7500      0.0000      7.9854
104.  96      3.7500      0.0000      8.1866
105.  97      3.7500      0.0000      8.3878
106.  98      3.7500      0.0000      8.5890
107.  99      3.7500      0.0000      8.7903
109. 100      4.5000      0.0000      3.5000
110. 101      4.5000      0.0000      4.0000
111. 102      4.5000      0.0000      4.5000
112. 103      4.5000      0.0000      5.0000
113. 104      4.5000      0.0000      5.5000
114. 105      4.5000      0.0000      6.0000
115. 106      4.5000      0.0000      6.5000
116. 107      4.5000      0.0000      7.0000
117. 108      4.5000      0.0000      7.5000
118. 109      4.5000      0.0000      7.8000
119. 110      4.5000      0.0000      7.9854
120. 111      4.5000      0.0000      8.1866
121. 112      4.5000      0.0000      8.3878
122. 113      4.5000      0.0000      8.5890
123. 114      4.5000      0.0000      8.7903
124. 115      4.5000      0.0000      8.9915
126. 116      5.2380      0.0000      3.5000
127. 117      5.2280      0.0000      4.0000
128. 118      5.2180      0.0000      4.5000
129. 119      5.2080      0.0000      5.0000
130. 120      5.1980      0.0000      5.5000
131. 121      5.1880      0.0000      6.0000
132. 122      5.1780      0.0000      6.5000
133. 123      5.1680      0.0000      7.0000
134. 124      5.1580      0.0000      7.5000
135. 125      5.1520      0.0000      7.8000
136. 126      5.1483      0.0000      7.9854
137. 127      5.1443      0.0000      8.1866
138. 128      5.1402      0.0000      8.3878
139. 129      5.1362      0.0000      8.5890
140. 130      5.1322      0.0000      8.7903
141. 131      5.1282      0.0000      8.9915
142. 132      5.1248      0.0000      9.1591
144. ELEMENT INCIDENCES
145. 1      1      18      19      2
146. 2      2      19      20      3
147. 3      3      20      21      4
148. 4      4      21      22      5
149. 5      5      22      23      6
150. 6      6      23      24      7
151. 7      7      24      25      8
152. 8      8      25      26      9
153. 9      9      26      27      10
154. 10      10      27      28      11
155. 11      11      28      29      12
156. 12      12      29      30      13
157. 13      13      30      31      14
158. 14      14      31      32      15
159. 15      15      32      33      16
160. 16      16      33      34      17
161. 17      17      34      35
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163. 18      18      36      37      19
164. 19      19      37      38      20
165. 20      20      38      39      21
166. 21      21      39      40      22
167. 22      22      40      41      23
168. 23      23      41      42      24
169. 24      24      42      43      25
170. 25      25      43      44      26
171. 26      26      44      45      27
172. 27      27      45      46      28
173. 28      28      46      47      29
174. 29      29      47      48      30
175. 30      30      48      49      31
176. 31      31      49      50      32
177. 32      32      50      51      33
178. 33      33      51      52      34
179. 34      34      52      53      35
180. 35      35      53      54
182. 36      40      55      56      41
183. 37      41      56      57      42
184. 38      42      57      58      43
185. 39      43      58      59      44
186. 40      44      59      60      45
187. 41      45      60      61      46
188. 42      46      61      62      47
189. 43      47      62      63      48
190. 44      48      63      64      49
191. 45      49      64      65      50
192. 46      50      65      66      51
193. 47      51      66      67      52
194. 48      52      67      68      53
195. 49      53      68      69      54
196. 50      54      69      70
198. 51      58      71      72      59
199. 52      59      72      73      60
200. 53      60      73      74      61
201. 54      61      74      75      62
202. 55      62      75      76      63
203. 56      63      76      77      64
204. 57      64      77      78      65
205. 58      65      78      79      66
206. 59      66      79      80      67
207. 60      67      80      81      68
208. 61      68      81      82      69
209. 62      69      82      83      70
210. 63      70      83      84
212. 64      71      85      86      72
213. 65      72      86      87      73
214. 66      73      87      88      74
215. 67      74      88      89      75
216. 68      75      89      90      76
217. 69      76      90      91      77
218. 70      77      91      92      78
219. 71      78      92      93      79
220. 72      79      93      94      80
221. 73      80      94      95      81
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222. 74      81      95      96      82
223. 75      82      96      97      83
224. 76      83      97      98      84
225. 77      84      98      99
227. 78      85      100      101      86
228. 79      86      101      102      87
229. 80      87      102      103      88
230. 81      88      103      104      89
231. 82      89      104      105      90
232. 83      90      105      106      91
233. 84      91      106      107      92
234. 85      92      107      108      93
235. 86      93      108      109      94
236. 87      94      109      110      95
237. 88      95      110      111      96
238. 89      96      111      112      97
239. 90      97      112      113      98
240. 91      98      113      114      99
241. 92      99      114      115
243. 93      100      116      117      101
244. 94      101      117      118      102
245. 95      102      118      119      103
246. 96      103      119      120      104
247. 97      104      120      121      105
248. 98      105      121      122      106
249. 99      106      122      123      107
250. 100      107      123      124      108
251. 101      108      124      125      109
252. 102      109      125      126      110
253. 103      110      126      127      111
254. 104      111      127      128      112
255. 105      112      128      129      113
256. 106      113      129      130      114
257. 107      114      130      131      115
258. 108      115      131      132
260. ELEMENT PROPERTY
261. 1 TO 108 THICKNESS 1.00
262. CONSTANT
263. E CONCRETE ALL
264. DENSITY 2.50 ALL
265. POISSON CONCRETE ALL
267. SUPPORT
268. 1          FIXED BUT FZ MY KFX 10000
269. 2 TO 15    FIXED BUT FZ MY KFX 20000
270. 16         FIXED BUT FZ MY KFX 16000
271. 17         FIXED BUT    MY KFX 13800 KFZ  9700
272. 35         FIXED BUT    MY KFX 28800 KFZ  7700
273. 54         FIXED BUT    MY KFX 30000 KFZ  8000
274.    70 84   FIXED BUT FX MY          KFZ  8000
275. *99         FIXED BUT    MY KFX 19400 KFZ  5200
277. LOAD 1
278. *PESO PROPIO DEL ESTRIBO
279. SELFWEIGHT X -1.00
280. *SOBRECARGA DE 3 T/M^2
281. JOINT LOAD
282. 116          FX -0.750
```



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283. 117 TO 123   FX -1.500
284. 124          FX -0.600
285. 125          FX -0.364
286. 126          FX -0.290
287. 127 TO 130   FX -0.302
288. 131          FX -0.277
289. 132          FX -0.126
290. *ANCLAJES
291. 40 55 FX -5.40  FZ 30.58
292. *PESO PROPIO DEL TABLERO Y CARGAS MUERTAS
293. 57 FX -29.87
294. *SOBRECARGA
295. 57 FX -30.86
296. *FRENADO
297. 116 FZ -50.74
298. PERFORM ANALYSIS PRINT STATIC CHECK
```

P R O B L E M S T A T I S T I C S

```
NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS =   132/  108/   21
ORIGINAL/FINAL BAND-WIDTH =   19/    9
TOTAL PRIMARY LOAD CASES  =    1, TOTAL DEGREES OF FREEDOM =   792
SIZE OF STIFFNESS MATRIX =   47520 DOUBLE PREC. WORDS
REQRD/AVAIL. DISK SPACE =  12.82/ 2047.7 MB,  EXMEM = 1951.7 MB
```

***TOTAL APPLIED LOAD (MTON METE) SUMMARY (LOADING 1)
SUMMATION FORCE-X = -164.93
SUMMATION FORCE-Y = .00
SUMMATION FORCE-Z = 10.42

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= .00 MY= -549.44 MZ= .00

++ Processing Element Stiffness Matrix. 10:33: 3
++ Processing Global Stiffness Matrix. 10:33: 3
++ Processing Triangular Factorization. 10:33: 3

***WARNING - IMPROPER LOAD WILL CAUSE INSTABILITY AT JOINT 36
DIRECTION = MY PROBABLE CAUSE MODELING PROBLEM -.221E-07
++ Calculating Joint Displacements. 10:33: 3
++ Calculating Member Forces. 10:33: 3

***TOTAL REACTION (MTON METE) SUMMARY

LOADING 1

SUM-X= 164.93 SUM-Y= .00 SUM-Z= -10.42

SUMMATION OF MOMENTS AROUND ORIGIN-

MX= .00 MY= 549.44 MZ= .00

********** END OF DATA FROM INTERNAL STORAGE **********

299. PRINT SUPPORT REACTION

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
1	1	5.57	.00	.00	.00	.00	.00
2	1	12.01	.00	.00	.00	.00	.00
3	1	12.85	.00	.00	.00	.00	.00
4	1	13.63	.00	.00	.00	.00	.00
5	1	14.18	.00	.00	.00	.00	.00
6	1	14.39	.00	.00	.00	.00	.00
7	1	14.18	.00	.00	.00	.00	.00
8	1	13.55	.00	.00	.00	.00	.00
9	1	12.59	.00	.00	.00	.00	.00
10	1	11.37	.00	.00	.00	.00	.00
11	1	9.99	.00	.00	.00	.00	.00
12	1	8.53	.00	.00	.00	.00	.00
13	1	7.03	.00	.00	.00	.00	.00
14	1	5.53	.00	.00	.00	.00	.00
15	1	4.03	.00	.00	.00	.00	.00
16	1	2.03	.00	.00	.00	.00	.00
17	1	1.18	.00	-4.42	.00	.00	.00
35	1	1.59	.00	-2.78	.00	.00	.00
54	1	.71	.00	-1.99	.00	.00	.00
70	1	.00	.00	-1.08	.00	.00	.00
84	1	.00	.00	-.15	.00	.00	.00

********** END OF LATEST ANALYSIS RESULT **********

300. FINISH

********** END OF STAAD-III **********

**** DATE= JUL 17,2002 TIME= 10:33: 3 ****

TENSIONES EN EL TERRENO

Hipotesis 1:	Ejecución				
Nodo	V (t/m)	H (t/m)	R (t/m)	(m)	(t/m²)
1	1,49	0,00	1,49	0,25	5,96
2	3,48	0,00	3,48	0,50	6,96
3	3,98	0,00	3,98	0,50	7,96
4	4,48	0,00	4,48	0,50	8,96
5	4,91	0,00	4,91	0,50	9,82
6	5,24	0,00	5,24	0,50	10,48
7	5,43	0,00	5,43	0,50	10,86
8	5,45	0,00	5,45	0,50	10,90
9	5,37	0,00	5,37	0,50	10,74
10	5,2	0,00	5,20	0,50	10,40
11	4,97	0,00	4,97	0,50	9,94
12	4,71	0,00	4,71	0,50	9,42
13	4,44	0,00	4,44	0,50	8,88
14	4,16	0,00	4,16	0,50	8,32
15	3,88	0,00	3,88	0,50	7,76
16	2,9	0,00	2,90	0,40	7,25
17	2,52	-12,98	13,22	0,36	36,96
35	4,89	-10,32	11,42	0,75	15,31
54	4,92	-10,58	11,67	0,78	15,03
70	4,76	-10,42	11,46	0,78	14,75
84	4,64	-10,26	11,26	0,78	14,50
99	2,96	-6,59	7,22	0,50	14,42

TENSIONES EN EL TERRENO

	Hipotesis 3:	Frenado 1			
Nodo	V (t/m)	H (t/m)	R (t/m)	(m)	(t/m²)
1	2,24	0,00	2,24	0,25	8,96
2	5,25	0,00	5,25	0,50	10,50
3	6,01	0,00	6,01	0,50	12,02
4	6,76	0,00	6,76	0,50	13,52
5	7,4	0,00	7,40	0,50	14,80
6	7,87	0,00	7,87	0,50	15,74
7	8,14	0,00	8,14	0,50	16,28
8	8,18	0,00	8,18	0,50	16,36
9	8,11	0,00	8,11	0,50	16,22
10	7,95	0,00	7,95	0,50	15,90
11	7,77	0,00	7,77	0,50	15,54
12	7,61	0,00	7,61	0,50	15,22
13	7,46	0,00	7,46	0,50	14,92
14	7,32	0,00	7,32	0,50	14,64
15	7,18	0,00	7,18	0,50	14,36
16	5,67	0,00	5,67	0,40	14,18
17	5,06	-23,13	23,68	0,36	66,19
35	10,14	-18,58	21,17	0,75	28,38
54	10,55	-19,27	21,97	0,78	28,29
70	10,58	-19,23	21,95	0,78	28,27
84	10,66	-19,20	21,96	0,78	28,28
99	6,99	-12,50	14,32	0,50	28,58

TENSIONES EN EL TERRENO

	Hipotesis 4:	Frenado 2			
Nodo	V (t/m)	H (t/m)	R (t/m)	(m)	(t/m²)
1	5,57	0,00	5,57	0,25	22,28
2	12,01	0,00	12,01	0,50	24,02
3	12,85	0,00	12,85	0,50	25,70
4	13,63	0,00	13,63	0,50	27,26
5	14,18	0,00	14,18	0,50	28,36
6	14,39	0,00	14,39	0,50	28,78
7	14,18	0,00	14,18	0,50	28,36
8	13,55	0,00	13,55	0,50	27,10
9	12,59	0,00	12,59	0,50	25,18
10	11,37	0,00	11,37	0,50	22,74
11	9,99	0,00	9,99	0,50	19,98
12	8,53	0,00	8,53	0,50	17,06
13	7,03	0,00	7,03	0,50	14,06
14	5,53	0,00	5,53	0,50	11,06
15	4,03	0,00	4,03	0,50	8,06
16	2,03	0,00	2,03	0,40	5,08
17	1,18	-4,42	4,57	0,36	12,79
35	1,59	-2,78	3,20	0,75	4,29
54	0,71	-1,99	2,11	0,78	2,72
70	0	-1,08	1,08	0,78	1,39
84	0	-0,15	0,15	0,78	0,19
99			0,00	0,50	0,00

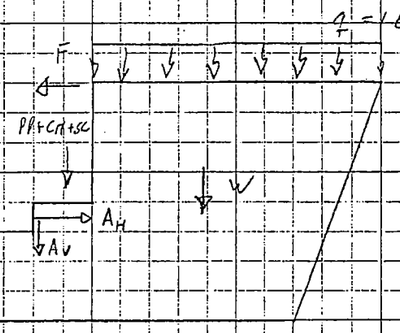
intecsa-inarsa

Proyecto: FRANCOLÍ Hoja de

Ejecutante: ESTRIBO 2 Fecha

ANÁLISIS DE VUELCO Y DESLIZAMIENTO

* Análisis de vuelco:



$W = 3'71 \cdot 2'3 = 72'93$ t/m — $d_W = 5'21$ m

$SC = 1 \cdot 5'66 = 5'66$ t/m — $d_{SC} = 6'33$ m

$PP+CM+SC = 60'73$ t/m — $d_{PP+CM+SC} = 2'90$ m

$A_H = 61'16$ t/m — $d_{AH} = 1'82$ m

$A_V = 10'80$ t/m — $d_{AV} = 2'00$ m

$F = 50'74$ t/m — $d_F = 5'18$ m

$\Sigma M_V = 50'74 \cdot 5'18 = 263$ m·t/m

$\Sigma M_{est} = 72'93 \cdot 5'21 + 5'66 \cdot 6'33 + 60'73 \cdot 2'90 +$
$+ 61'16 \cdot 1'82 + 10'80 \cdot 2'00 = 725$ m·t/m

$C_V = \frac{725}{263} = 2'75$

* Análisis de deslizamiento:

Al estar anclada y al tener la resultante de la suma de fuerzas horizontales la dirección hacia el trasdós del estribo, no puede deslizar.

intecsa-inarsa

Proyecto: FRANCOLI Hoja 1 de 3

Ejecutante: ESTRIBO 2 Fecha

ARMADURA DE ZAPATA

$R_1 = 5'57$ t/m ⇒ $R_{1d} = 8'36$ t/m

$R_2 = 12'01$ t/m ⇒ $R_{2d} = 18'02$ t/m

$R_3 = 12'85$ t/m ⇒ $R_{3d} = 19'28$ t/m

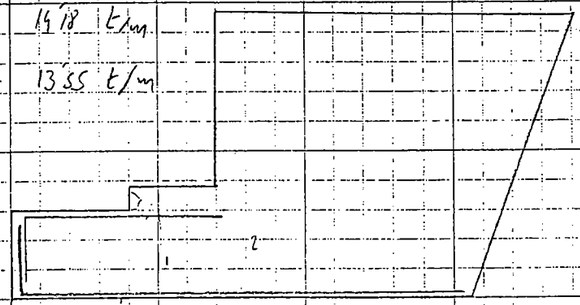
$R_4 = 13'63$ t/m ⇒ $R_{4d} = 20'45$ t/m

$R_5 = 14'18$ t/m ⇒ $R_{5d} = 21'27$ t/m

$R_6 = 14'39$ t/m ⇒ $R_{6d} = 21'59$ t/m

$R_7 = 14'18$ t/m ⇒ $R_{7d} = 21'27$ t/m

$R_8 = 13'55$ t/m ⇒ $R_{8d} = 20'33$ t/m



* $M_{1d} = 8'36 \cdot 2'50 + 18'02 \cdot 2 + 19'28 \cdot 1'5 + 20'45 \cdot 1 + 21'27 \cdot 0'5 =$

$= 117$ m·t/m

$= 1170$ m·kN/m — sección de 1'44 m de h

cuantía mínima: $25'9$ cm² ⇒ ø25/15

$M_{d_2} = 8'36 \cdot 4'00 + 18'02 \cdot 3'5 + 19'28 \cdot 3'0 + 20'45 \cdot 2'5 + 21'27 \cdot 2 +$
$+ 21'59 \cdot 1'5 + 21'27 \cdot 1'0 + 20'33 \cdot 0'5 = 312$ m·t/m =

$= 3120$ m·kN/m

sección de 2'19 ⇒ cuantía mínima 39'4 cm²/m

⇒ ø25/10

A 2.

* Vd

$\sigma_{max} = 29\ t/m^2$

$\sigma'_{max} = 43'5\ t/m^2$

$T_d = \frac{43'5 \cdot 3'5}{0'25 \cdot 1'35} (1) = 132\ t/m$

$A_s = 33\ cm^2/m \Rightarrow \phi 25/10$

$R = 43'5 \cdot 3'5 = 152'3\ t/m$

$tg\theta = \frac{0'35 \cdot 1'35}{1} = 1'15 \Rightarrow \theta = 49°$

$C_d = \frac{R}{sen\theta} = 202\ t/m$

$T_{2d} = 0'3 \cdot C_d = 61\ t/m$

$T_{2d} = A_s \cdot f_{yd} \cdot cos\theta \Rightarrow A_s = \frac{61}{4 \cdot cos\theta} = 23'05\ cm^2/m$ en 1'75 m

$A_s = 13'17\ cm^2/m \Rightarrow$

0'40

cercos $\phi 10/40/25$

A. 2.

* Vd

$T_d = \frac{43'5 \cdot 5}{0'85 \cdot 2'10} (1'50) = 183\ t/m$

$A_s = 45'7\ cm^2 \Rightarrow \phi 25/10$

$R = 43'5 \cdot 5 = 217'5\ t/m$

$tg\theta = \frac{0'85 \cdot 2'10}{1'50} \Rightarrow \theta = 50°$

$C_d = 285\ t/m$

$T_{2d} = 85\ t/m \Rightarrow A_s = \frac{85}{4 \cdot cos\theta} = 33\ cm^2/m$ en 2'30m

$A_s = 3'24\ cm^2/m$

intecsa-inarsa

Proyecto: FRANCOLI Hoja de

Ejecutante: ESTRIBO 2 Fecha

ARMADURAS ANCLAJES

* $Nd \leq A_{c1} \cdot f_{3cd}$

$f_{cd} = \sqrt{\frac{A_c}{A_{c1}}}\, f_{cd} \geq 3{,}3\, f_{cd}$

$270 \leq A_{c1} \cdot \sqrt{\frac{0{,}60\ 2{,}75}{A_{c1}}} \cdot \frac{2500}{1{,}5}$

$72900 \leq 1{,}65\, A_{c1} \cdot 1667^2 \quad A_{c1} \geq 159\ cm^2$

$\sqrt{\frac{60\ 275}{159}} = 10{,}2 > 3{,}3 \Rightarrow$

$\Rightarrow \quad 270 \leq A_{c1} \cdot 3{,}3 \cdot \frac{2500}{1{,}5} \Rightarrow A_{c1} \geq 490\ cm^2 \Rightarrow$

$\Rightarrow \quad A_{c1} = \frac{2{,}75\, a^2}{0{,}75} \Rightarrow a = 12\ cm$

$x = 45\ cm$

Placa ℓ_x $0{,}70 \times 0{,}20 \times 0{,}12$

* T_{sd}:

$T_{sd} = 0{,}25 \cdot 270 \left(\frac{2{,}75 - 0{,}70}{2{,}75} \right) = 50{,}3\ t$

$A_s = \frac{50{,}3}{4} = 12{,}6\ cm^2$

VIADUCTO RÍO FRANCOLÍ

PILA P-4 Y ESTRIBO E-2

DEFINICIÓN DE ANCLAJES Y ARMADURAS DE MUROS

Mayo 2002

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ANEJOS

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1.- INTRODUCCIÓN

A partir del "Informe preliminar de recomendaciones para la cimentación del viaducto del Río Francolí" de febrero de 2002, se especifican en este informe las características concretas de las actuaciones de estabilización en la Pila 4 y Estribo E-2 en lo concerniente a:

- Carga, longitud, disposición, número y sección de los anclajes.*
- Extensión y armadura del muro de apoyo de los anclajes.
- Secuencia constructiva recomendada.
- Medidas anticorrosión
- Prueba de anclaje

2.- DIMENSIONAMIENTO DE ANCLAJES

En el anejo nº 1 y en el plano nº 1 se justifican y especifican las dimensiones de carga, longitud y distribución de anclajes y la sección de anclajes que se resumen en los cuadros nº 1 y nº 2.

*Está pendiente la realización de una topografía detallada en la ladera de la Pila 4 para fijar la longitud final de los anclajes

CUADRO 1.- RESUMEN Y CARACTERÍSTICAS DE LOS ANCLAJES. PILA 4

Zona	Carga m/l	Carga de servicio	Superficie a anclar	N° de anclajes	Disposición	Longitud		Acero		N° de cables de 0,6"
						Bulbo	Total	Tipo	Sección	
Central	190	120 T	10 m longitud 5 m altura	18 (3 filas de 6 anclajes)	1,9 m Horizontal 2 m Vertical	7,5 m	F.1 = 27 m F.2 = 28 m F.3 = 27 m	1860 N/mm²	16,487 cm²	9
Extremos	80	80	5,5 m longitud 5 m altura (x 2)	12 3 filas de 4 anclajes	3 m Horizontal 2 m Vertical	5 m	F.1 = 24,5 m F.2 = 25,5 m F.3 = 24,5 m	1860 N/mm²	10,991 cm²	6

CUADRO 2.- RESUMEN Y CARACTERÍSTICAS DE LOS ANCLAJES. ESTRIBO E-2

Zona	Carga útil	Carga de servicio	Superficie a anclar	N° de anclajes	Disposición	Longitud		Acero		N° de cables de 0,6"
						Bulbo	Total	Tipo	Sección	
Central	196	100 t	16 m longitud 5 m altura	27 (3 filas de 9 anclajes)	2 m Horizontal 2 m Vertical	6,5 m	21 m	1860 N/mm²	13,038 cm²	7
Extremos	110	100 t	5,8 m longitud 5 m altura (x 2)	3 filas de 4 anclajes	3,30 m Horizontal 2 m Vertical	6,5 m	21 m	1860 N/mm²	13,038 cm²	7

3.- GEOMETRÍA Y ARMADURA DEL MURO DE APOYO A LOS ANCLAJES

PILA P-4

Los anclajes se dispondrán sobre un muro de apoyo de hormigón armado.

El muro, de 21 m de longitud y 5 m de altura, cubrirá la anchura de la zapata con una zona de resguardo de 3 m a cada lado de la misma.

El muro tendrá una anchura de 0,5 m.

En el Anejo nº 2 y plano nº 2 se justifican y especifica la situación, armadura y característica de los materiales del muro.

ESTRIBO E-2

Los anclajes se dispondrán sobre un muro de apoyo de hormigón armado.

El muro, de 27,6 m de longitud y 5 m de altura, cubrirá la anchura de la zapata del estribo con una anchura de resguardo de unos 5 m a cada lado de la misma.

En el anejo nº 2 y en el plano nº 2 se justifican, especifica la situación, armadura y características de los materiales del muro.

4.- SECUENCIA CONSTRUCTIVA RECOMENDADA

Para la construcción de los muros anclados y colocación de los anclajes se recomienda la siguiente secuencia:

1) Excavación del talud en el estribo 2.

2) Construcción del muro bajo el estribo 2.

3) Excavación del talud de la pila 4.

4) Ejecución de drenes californianos bajo estribo 2 y sostenimiento del talud de pila 4.

5) Construcción del muro bajo la pila 4.

6) Prueba de idoneidad en cada uno de los tipos de anclajes proyectados (80 t.,100 t., y 120 t.).

7) Replanteo de los ejes de anclajes proyectados indicando su inclinación.

8) Perforación de los taladros según diámetro indicado.

9) Colocación de los cables, de forma continua y a velocidad controlada, antes de que transcurran 8 horas desde la perforación dejando una longitud de 1,5 m de cables fuera de la cabeza del anclaje, para tesado.

10) Inyección, lo antes posible, de la lechada en la zona de bulbo, siempre de abajo-arriba y hasta alcanzar una presión de 20 kp/cm^2, controlando las posibles pérdidas.

    En caso de pérdidas de lechada (superior a tres veces el volumen teórico a baja presión) será necesario efectuar una reinyección de relleno de grietas, por lo que los anclajes estarán provisto de los dispositivos necesarios para realizar la reinyección

11) Colocación de la cabeza de anclaje.

12) Realización de la prueba de tesado completa en el 25% de los anclajes colocados, hasta una carga de 125% de la carga de servicio.

13) Prueba de tesado simple en todos los anclajes y tesado final de los anclajes a 125% de la carga de servicio y descarga posterior a la carga de servicio.

14) Realización de los drenes californianos bajo pila 4, así como los que atraviesan el muro bajo el estribo 2.

5.- RECOMENDACIONES DE PROTECCIÓN ANTICORROSIÓN

Tratándose de anclajes permanentes en obras que exijan un elevado coeficiente de seguridad a largo plazo es necesario una protección doble contra la erosión según la tabla adjunta:

Protección anticorrosión en anclajes permanentes

<table>
<tr><td rowspan="4">Zona de bulbo</td><td rowspan="4">Uno de:</td><td>Un tubo corrugado de plástico conteniendo el tirante, con vaina estanca entre la lechada de cemento que protege el tirante y la inyección del bulbo. El espesor mínimo de lechada entre tirante y tubo será de 5 mm.</td></tr>
<tr><td>Un tubo corrugado de plástico conteniendo el tirante, preinyectado con lechada de cemento. El espesor mínimo de lechada entre tirante y tubo será de 5 mm.</td></tr>
<tr><td>Dos tubos concéntricos corrugados conteniendo el tirante, preinyectados, la zona central y el espacio anular, con un producto viscoso de protección o con lechada de cemento. El espesor mínimo de recubrimiento será de 5 mm.</td></tr>
<tr><td></td></tr>
<tr><td rowspan="5">Zona libre</td><td rowspan="5">Uno de:</td><td>Una vaina de plástico por tendón, rellena de un producto viscoso de protección. Más A, B o C.</td></tr>
<tr><td>Una vaina de plástico por tendón, rellena de lechada de cemento. Más A o B.</td></tr>
<tr><td>Una vaina de plástico común al tirante, rellena de lechada de cemento. Más B.</td></tr>
<tr><td>A) Un tubo de plástico común al tirante, relleno de producto viscoso anticorrosión.
B) B) Un tubo de plástico común al tirante, con los extremos soldados y estancos a la humedad.
C) Un tubo de plástico común al tirante, relleno de lechada de cemento.</td></tr>
<tr><td></td></tr>
<tr><td>Enlace cabeza y zona libre</td><td colspan="2">Un tubo metálico, o de plástico, estanco y solidario a la placa del anclaje. SE unirá de forma estanca, o se emplearán juntas teóricas, al tubo de plástico exterior de la zona libre. Se rellenará de lechada de cemento o un producto viscoso de protección.</td></tr>
<tr><td>Cabeza</td><td colspan="2">Caperuza metálica revestida o galvanizada, de 3 mm mínimo de pared, o caperuza rígida de plástico, de 5 mm de pared, fijada a la placa de apoyo. Se rellenará de un producto viscoso contra la corrosión y junta de estanqueidad.</td></tr>
</table>

6.- PRUEBAS DE LOS ANCLAJES

En el Anejo nº 3 se incluyen las pruebas a que deberán someterse los anclajes y que se resumen en tres tipos de pruebas:

6.1.- PRUEBA DE IDONEIDAD

Se realiza para garantizar, con anterioridad a la utilización del anclaje, que tanto el anclaje completo como cada uno de sus componentes hayan superado los criterios de idoneidad correspondientes.

En esta prueba de idoneidad especificada en el Anejo nº 3, se realizará al menos una prueba por cada tipo de anclaje y dimensión de bulbo previsto, para una carga de 125% de la carga de servicio. En este caso deberán realizarse 3 pruebas para anclajes de 80, 100 y 120 t y bulbos de 5, 6,5 y 7,5 m respectivamente.

6.2.- PRUEBA COMPLETA DE TESADO

Esta prueba especificada en el Anejo nº 3 se realizará al menos en uno de cada cuatro anclajes colocados.

6.3.- PRUEBA SIMPLE DE TESADO

Esta prueba sirve para comprobar el correcto funcionamiento de todos los anclajes y se realizará por tanto en todos los anclajes colocados.

ANEJO Nº 1

CÁLCULO DE ANCLAJES

2.- ANEJO Nº 1.- CÁLCULO DE CARGA, LONGITUD DE ANCLAJES Y SECCIÓN Y CARACTERÍSTICAS DEL ACERO

El cálculo de carga necesaria de anclajes se ha realizado por dos vías:

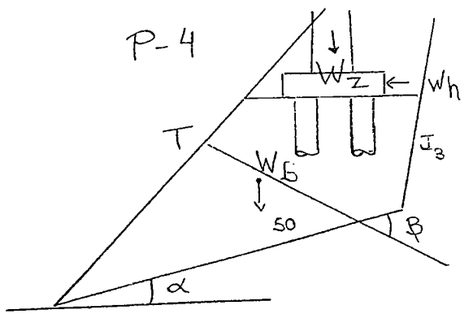
- Gráficamente aplicando el método de equilibrio límite de bloques
- Mediante el programa SLIDE, que también utiliza el equilibrio límite de bloques

Se ha tomado el valor más alto del empuje en cada uno de los métodos utilizados y se han considerado los anclajes tesados, para un coeficiente de seguridad de 1,5.

2.1.- PILA 4

2.1.1.- Cálculo de anclajes de la Pila 4

DATOS DE PARTIDA



- J_3 = 85° ϕ = 35° c = 0
- S_o = 14° ϕ = 14° c = 0
- W_B = 573 t/ml
- W_Z = 288 t/ml
- W_H = 64 t/ml
- β = 40°
- α = 14°

Del análisis gráfico de fuerza y del programa Slide se deduce un empuje de 190 t/ml por lo que serían necesarios **3 ANCLAJES DE 120 T CADA 1,9** por ml de zapata.

Para la estabilización de la Pila 4 se ha considerado una anchura de la zapata de 8 m por lo que en total, a efecto de estimación, son necesarias 3 filas de 6 anclajes separadas 2 m en vertical y 1,9 en horizontal con un total de **18 ANCLAJES DE 120 T.**

Se considera también necesario asegurar, con un coeficiente similar al calculado para la estabilidad de la zapata, la estabilidad de un tramo del bloque a ambos lados de la zapata de unos 3 m de anchura a cada lado.

Del análisis de estabilidad se ha obtenido que son necesarias 80 t de carga de anclaje por ml de talud, para lo que se colocarán 12 anclajes de 80 toneladas, 2 filas de 3 anclajes a cada lado de la zapata separadas 3 m. **TOTAL: 12 ANCLAJES DE 80 T.**

LONGITUD DE BULBO

Anclajes de zapata

$$L_B = \frac{T \cdot 3}{\pi \cdot d \cdot \tau} \sim 6\,m = 7{,}5\,m$$

T = 120
d = 0,15
τ = 100 t/m²

Anclaje talud

L_B = 5 m
T = 80 t
d = 0,15 m
τ = 100 t/m²

LONGITUD DE ANCLAJES

Área de la zapata

12 de 27 m
6 de 28 m

Área del talud

8 de 24,5 m
4 de 25,5 m

LONGITUD DE EMPOTRAMIENTO MINIMA

La longitud de empotramiento de los anclajes, en el terreno, cumple conservadoramente la longitud de empotramiento debida al efecto grupo

2.1.2.- Sección de acero del anclaje

Para carga de 120 t

La sección del acero del anclaje viene dada por la expresión

$$A_{acero} = \frac{Q \cdot \gamma_I \cdot \gamma_y}{0{,}9 \cdot \zeta_{ys}}$$

Q = carga del anclaje 120 t

γ_I = mayoración de la carga $\simeq 2$

γ_y = coeficiente de minoración de resistencia del acero = 1,15

ζ_{ys} = límite elástico del acero 1860 N/mm²

$$A_{acero} = \frac{120.000 \cdot 1{,}15 \cdot 2}{18600 \cdot 0{,}9} = \frac{276.000}{16740} = 16{,}487\ cm^2$$

Para cables de 0,6" $\simeq$ 1,767 cm² $\simeq$ 9 cables

Para cargas de 80 t

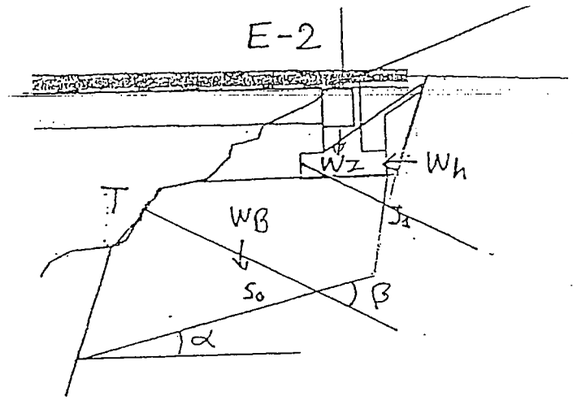
$$A_{acero} = \frac{80.000 \cdot 1{,}15 \cdot 2}{18600 \cdot 0{,}9} = \frac{184.000}{16740} = 10{,}991\ cm^2$$

Para cables de 0,6" $\simeq$ 6 cables

2.2.- ESTRIBO E-2

2.2.1.- Cálculo de anclajes para la estabilización del Estribo 2

DATOS DE PARTIDA



- J_3 = 85° ϕ = 35° c = 0
- S_o = 14° ϕ = 14° c = 0
- W_B = 660 t/ml
- W_Z = 175 t/ml
- W_H = 43 t/ml
- β = 40°
- α = 14°

Se ha considerado en primer lugar el anclaje necesario para estabilizar el bloque sin tener en cuenta el anclaje que se colocará para la estabilidad de la zapata del estribo, obteniéndose tanto gráficamente como por el programa Slide **180 t/ml.**

Al colocar los anclajes para la estabilización del estribo, debido a su situación fuera del centro de gravedad del bloque se produce un incremento en la fuerza de anclaje necesaria, para conseguir el mismo coeficiente de seguridad, hasta 196 toneladas por ml. De esta fuerza, 51 toneladas corresponden al anclaje del estribo y 145 al anclaje del bloque **3 ANCLAJES DE 100 TONELADAS CADA 2 M DE TALUD.**

Para la estabilización del Estribo 2 se ha considerado una anchura de 14 m de zapata, por lo que en total son necesarios **27 ANCLAJES DE 100 T.**

Para contar con la fuerza de los anclajes de la zapata en la estabilización del bloque será necesario aumentar la longitud de éstos hasta 21 m.

Para la estabilidad del bloque a ambos lados de la zapata, se ha considerado anclar un tramo de unos 5 m a cada lado, obteniéndose un empuje de 110 toneladas por m.l.

En total se colocarán **12 anclajes de 100 t** distribuidos en 2 filas de 3 anclajes separados 3,3 m.

LONGITUD DE BULBO

$$L_B = \frac{3 \times T}{\pi \times \phi \times \tau} = 6{,}5\ m$$

T = 100 t

ϕ = 0,15 m

τ = 100 t/m^2

LONGITUD DE ANCLAJES

Area de la zapata

- 27 anclajes de 21 m

Area del talud

- 12 anclajes de 21 m

LONGITUD DE EMPOTRAMIENTO MINIMA

Se cumple, como en el caso de la Pila, 4 la longitud de empotramiento mínima debida al efecto grupo.

2.3.- SECCIÓN DEL ACERO DEL ANCLAJE

$$A_{acero} = \frac{Q \cdot \gamma_1 \cdot \gamma_y}{0{,}9 \cdot \zeta_{ys}} = \frac{230.000}{16740} = 13{,}038\ cm^2$$

Q = 100 t

γ_1 = mayoración de la carga $\simeq$ 2

γ_y = coeficiente de minoración de resistencia del acero = 1,15

ζ_{ys} = límite elástico del acero 1860 N/mm^2

Para cables de 0,6" serían necesarios 7 cables.

ANEJO Nº 2

CÁLCULO DE ARMADURAS

ARMADURA BASICA

Presión en el muro ejercida por los anclajes:

Se supone un area tributaria por anclaje de 1,9 x 2,0 m.

$$P = 120/1,9 \times 2,0 = 32 \text{ t/m}^2.$$

Considerando una luz máxima de 2,0 m.

$$M_d = 1,5 \times 32.x.2,0^2/8 = 24 \text{ m.t}$$

Se otorga este momento a una sección de 1,0 por 0,5 m..

$$24 = 0,9 \times 0,45 \times T ; \quad T = 59,26 \text{ t/m.}$$

$$A_s = 59,26/4,43 = 13,36 \text{ cm}^2/\text{m.}$$

ARMADURA DE REFUERZO

Se hace trabajar a la misma a una tensión de 2000 Kp/cm^2, para un esfuerzo de 120 t.

Armadura por dirección:

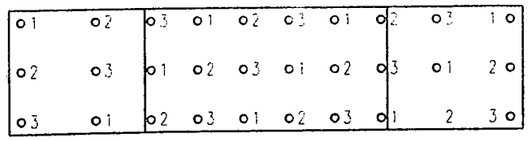
$$1,5 \times 120/4 \times 2,0 \times ½ = 11,25 \text{ cm}^2.$$

De los cálculos anteriores resulta:

Armadura básica : Φ 20 cada 20 cm. en ambas caras.

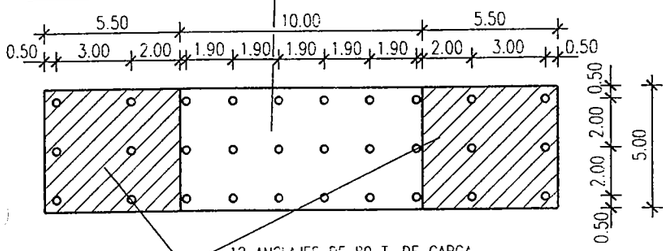
Armadura de refuerzo 4 Φ 20 en cada anclaje separados 30 cm., en ambas caras

P.K. 500+982



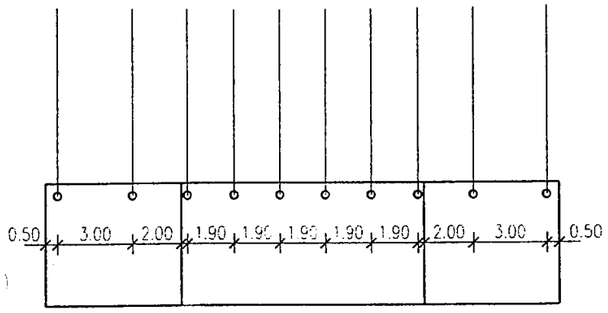
VALOR DE ANGULO α	
1	α = 5°
2	α = 10°
3	α = 18°

18 ANCLAJES DE 120 T. DE CARGA
LONGITUD DE BULBO 7,5m
ø DE PERFORACIÓN 0,15m
TIPO DE ACERO f_{γ_S} = 1860 N/mm²

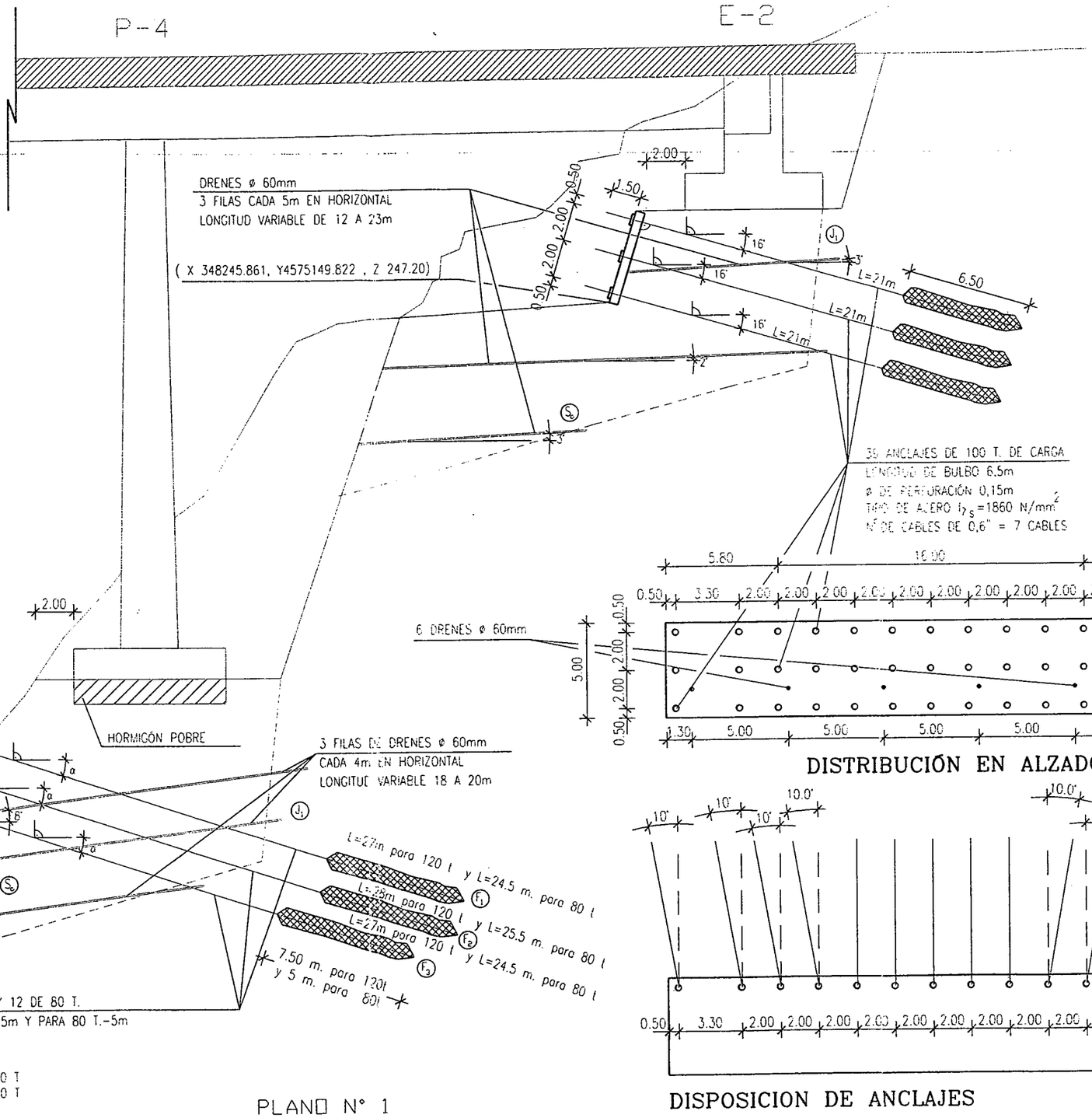


12 ANCLAJES DE 80 T. DE CARGA
LONGITUD DE BULBO 5m
ø DE PERFORACIÓN 0,15m
TIPO DE ACERO f_{γ_S} = 1860 N/mm²

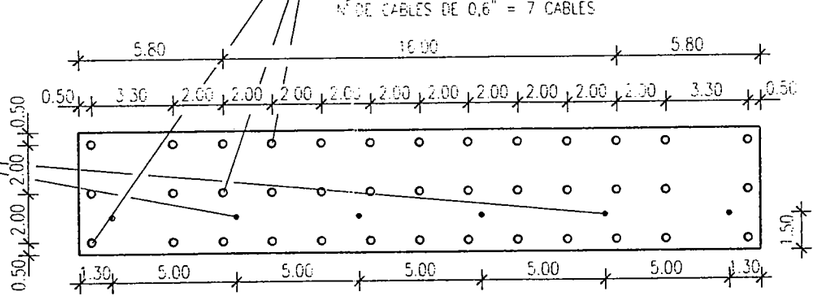
DISTRIBUCIÓN EN ALZADO



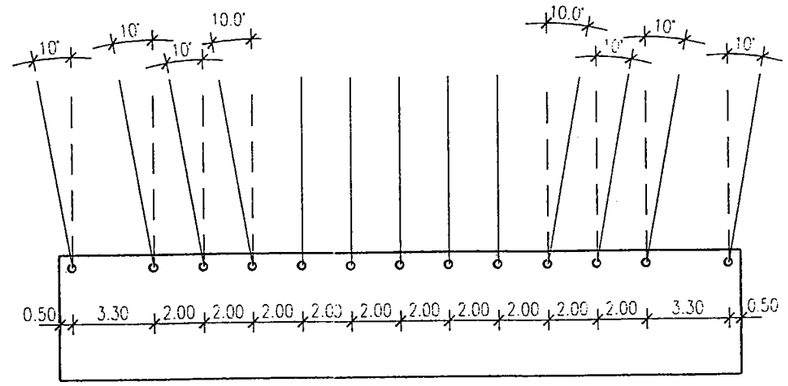
DISPOSICION DE ANCLAJES EN SECCION HORIZONTAL (PILA 4)



35 ANCLAJES DE 100 T. DE CARGA
LONGITUD DE BULBO 6.5m
ø DE PERFORACIÓN 0,15m
TIPO DE ACERO f_{γ_S}=1860 N/mm²
Nº DE CABLES DE 0,6" = 7 CABLES



DISTRIBUCIÓN EN ALZADO



DISPOSICION DE ANCLAJES EN SECCION HORIZONTAL (ESTRIBO 2)

LONGITUD ANCLAJES *

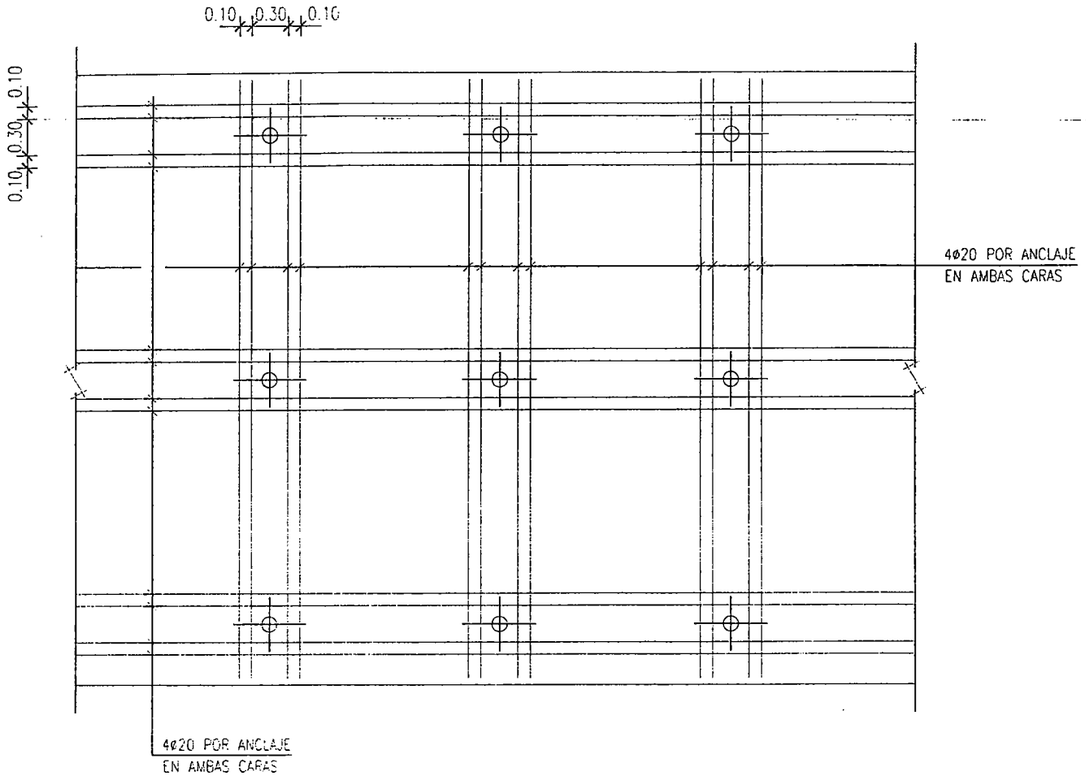
120 T	F_1	≃27m
	F_2	≃28m
	F_3	≃27m
80 T	F_1	≃24,5m
	F_2	≃25,5m
	F_3	≃24,5m

* La longitud final de los anclajes en la pila 4 depende de la topografía real de la ladera, que está pendiente de realizar.

PLANO Nº 1

DETALLE DE ANCLAJES DE LA PILA 4 Y ESTRIBO 2

2,5 0 5 10m.



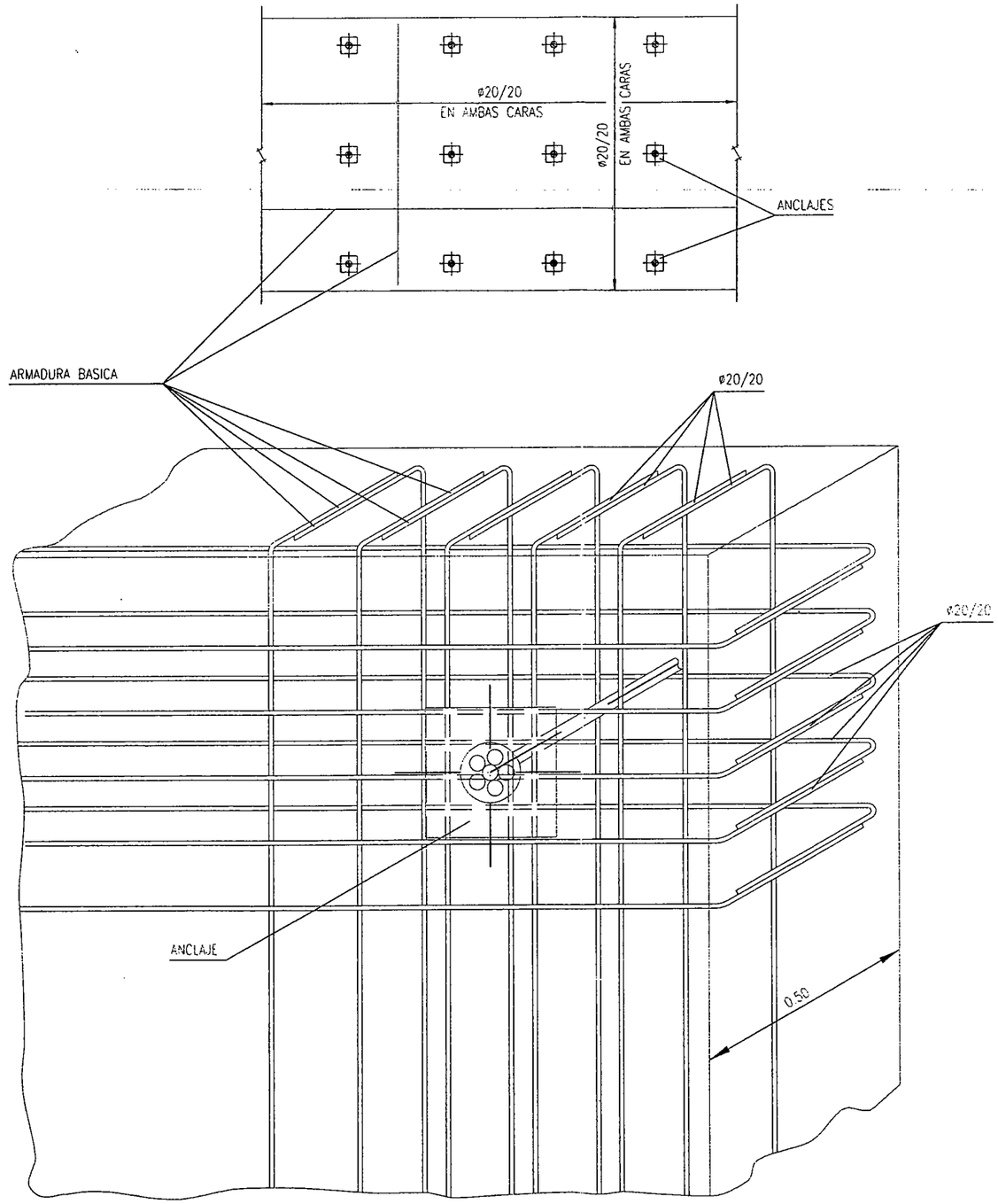
ARMADURA DE REFUERZO

NOTA:

——— SE DISPONDRA LA MISMA ARMADURA EN TODOS LOS MUROS.

MATERIALES:

HORMIGON:	HA-30
ACERO:	B 500 S
RECUBRIMIENTO DE ACERO:	5 cm



ARMADURA BASICA

PLANO N° 2
ARMADURA DEL MURO ANCLADO
EN PILA 4 Y ESTRIBO 2
VIADUCTO DEL RIO FRANCOLI

3129IP - DGN

ANEJO Nº 3

PRUEBA DE LOS ANCLAJES

5
PRUEBAS DE LOS ANCLAJES

5.1.–GENERALIDADES

El objeto de la realización de distintos tipos de pruebas a los anclajes construidos es la comprobación de la adecuación de las hipótesis de diseño y cálculo a la realidad específica de cada situación (terreno, geometría, materiales, procesos constructivos, etc.).

Se definen tres tipos de pruebas de anclaje:

a) Pruebas de idoneidad: Pueden estar referidas a los procedimientos de fabricación, instalación, inyección y/o tesado, a las características de los distintos componentes del anclaje o al comportamiento real del anclaje totalmente instalado.

La realización de los distintos tipos de pruebas de idoneidad es obligatoria en cualquier obra en la que se dispongan anclajes, con independencia de la categoría en la que éstos queden clasificados.

Con las pruebas de idoneidad se pretende comprobar el comportamiento individual de los distintos componentes, la adecuación de los distintos procedimientos operativos planificados y la comprobación, mediante las pruebas de idoneidad de carga, de que el anclaje sustenta correctamente las cargas maximas de diseño consideradas.

b) Pruebas completas de tesado : Pretenden obtener un conocimiento completo del comportamiento real del anclaje durante el tesado.

Las pruebas completas de tesado se realizarán sobre algunos de los anclajes contemplados en el proyecto y los resultados se analizarán estadísticamente. Dichos resultados servirán, como referencia comparativa, al estudiar los resultados de las pruebas simples de tesado que se definen a continuación

La realización de pruebas completas de tesado es obligatoria en cualquier obra de anclajes con independencia de la categoría en la que se clasifiquen los mismos.

c) Pruebas simples de tesado : Pretenden comprobar el correcto funcionamiento de todos y cada uno de los anclajes de un proyecto que no hayan sido sometidos a pruebas completas de tesado.

Son obligatorias en cualquier obra de anclajes con independencia de la categoría en la que se clasifiquen los mismos.

Respecto a la operación de abroche o bloqueo de cuñas, se tendrá en cuenta lo especificado en el apartado 4.7.2 referente al equipo de tesado.

5.2.– PRECISIÓN DE LAS MEDICIONES

Los alargamientos del tendón en los distintos escalones de carga de las pruebas, así como los movimientos de la placa de anclaje, se medirán siempre con respecto a un punto fijo. Esta mediciones se realizarán con una precisión mejor que el 1% del valor del alargamiento de calculo previsto para el tendón (ΔL_{lt}), bajo la carga de prueba (T_p).

Para la medición de las variaciones de alargamiento a carga mantenida, resulta conveniente emplear instrumentos de mayor precisión, siendo ésta, como minimo el 0.1% (uno por mil) del valor del diámetro nominal de la perforación (D_p).

Las mediciones de movimientos deberán tener en cuenta la posible influencia de la temperatura, sobre todo si se produce insolación directa en la cabeza del anclaje durante la prueba.

Las cargas aplicadas realmente al tendón, se medirán con aparatos de clase 0,6 (según DIN 16.070 y DIN 16.123).

Todos los aparatos de medida de alargamientos tendrán una resolución real que permita lecturas mejores que el 0.1% (uno por mil) del diámetro nominal D_p. Los aparatos de medida de cargas tendrán una resolución mejor del 1% (uno por ciento) de la carga de prueba T_p.

El contratista deberá aportar a la Dirección de Obra, y con la suficiente antelación, certificados de calibración de todos los instrumentos de medida que vaya a utilizar, emitidos por un organismo oficial competente y con fecha no anterior a 60 dias a contar desde la fecha de su utilización en la obra.

Los instrumentos de medida utilizados corrientemente durante el transcurso de la obra, deberán ser objeto de recalibraciones periodicas, estableciéndose un periodo máximo de 90 dias entre calibraciones. No obstante, la recalibración deberá realizarse prematuramente en caso de justificada sospecha de errores de calibración por parte de la D.O.

5.3.– PRUEBAS DE IDONEIDAD

5.3.1.– Generalidades.

Con anterioridad a la utilización en obra de cualquier tipo específico de anclaje al terreno, se requiere que, tanto el anclaje completo, como cada uno de sus componentes, hayan superado los criterios de idoneidad correspondientes.

Los ensayos de idoneidad de los componentes se realizarán en laboratorio y consistirán, básicamente, en una comprobación de sus características resistentes y geométricas.

Los procedimientos previstos para prefabricación, instalación, inyección y tesado deberán realizarse durante el ensayo de idoneidad de tesado, con objeto de comprobar su aplicabilidad.

Los anclajes de las pruebas de idoneidad serán similares a los previstos en el proyecto y su inclinación no podrá diferir en mas de ±5º respecto a la de los anclajes de obra.

Los anclajes que se destinen a pruebas de idoneidad, podrán ser algunos de los previstos para la obra, sin embargo, suele ser aconsejable construir unos anclajes especificamente destinados a dichas pruebas de idoneidad en una zona auxiliar y con suficiente antelación al comienzo de la obra, de manera que la realización de los ensayos no pueda ocasionar retrasos una vez comenzada la obra.

Los anclajes que se hubieran utilizado para las pruebas de idoneidad, si corresponden a alguno de los de proyecto, pueden ser descargados y, sujetos a superar con éxito una nueva prueba simple de tesado, podrán ser aprobados como anclajes ordinarios. Esta decisión será libremente tomada por la D.O. si así lo estima pertinente. Sin embargo, los anclajes utilizados en las pruebas de idoneidad podrán estar sujetos a su excavación y extracción para inspección visual, en toda su longitud, si así lo estima conveniente la D.O.

No se autorizará el inicio de las perforaciones ni tampoco el inicio de la producción de los anclajes que se vayan a disponer en tanto no se hayan realizado estas pruebas de idoneidad y haya quedado aprobado el diseño definitivo por parte de la D.O.

Las cargas de prueba , T_p, de estos anclajes, su longitud adherente y su sección total de acero, serán establecidos por la D.O. en función de las condiciones de proyecto. En todo caso, las cargas de prueba deberán respetar, de manera simultánea, las limitaciones siguientes:

$$T_p \geq \gamma_l \cdot T_d$$

$$T_p < \gamma_t \cdot T_{ad\ prevista}$$

$$T_p < 0.9 \cdot T_y / \gamma_y$$

siendo γ_y el factor minorador de la resistencia del acero del tendón, γ_l el factor de seguridad de mayoración de cargas. La sección real de acero deberá modificarse si no se pudieran cumplir estas tres condiciones de manera simultánea.

La lechada empleada en la inyección de estos anclajes se controlará exhaustivamente para fijar las características de dosificación y resistencia mínima a exigir durante la obra.

5.3.2.– Procedimiento operativo.

a) Se elige una carga de partida, $T_A = 0.1 \cdot T_p$. Se divide el recorrido de carga entre T_A y T_p en seis o más escalones iguales de valor ΔT.

b) Se establece una referencia fija e inmóvil como origen para la medición de movimientos $\Delta L = \Delta L_e + \Delta L_{pl}$. La operación de tesado no debe influir en la posición del origen fijo.

c) Se procede a realizar seis ciclos de carga y descarga, aumentando la carga final de cada ciclo. En el primer ciclo, la carga varía desde T_A hasta $T_A + \Delta T$, en el segundo desde T_A hasta $T_A + (2 \cdot \Delta T)$, y así sucesivamente hasta el sexto ciclo, en el que la carga varía desde T_A hasta $T_A + (6 \cdot \Delta T)$.

Cuando se haya completado este último escalón de carga el D.O. podrá ampliar el programa de forma libre, incluso hasta conseguir la rotura del anclaje por arrancamiento del bulbo si la sección de acero lo permite.

Durante cada escalón de carga, se tomarán medidas de alargamiento para los valores de carga correspondientes a los escalones anteriores, tanto en las fases de descarga del escalón como en la fase de recarga correspondiente hasta el escalón siguiente.

Además, y una vez alcanzada la carga correspondiente a cada escalón corriente, se tomarán medidas de alargamiento inmediato y de variación de alargamiento a carga constante.

Para comprobar la variación de alargamiento a carga constante, se tomarán medidas cuando el tiempo transcurrido desde el momento de alcanzarse la carga del escalón, sea: $(1 \cdot \Delta t)$, $(3 \cdot \Delta t)$, $(10 \cdot \Delta t)$ y $(40 \cdot \Delta t)$. Las medidas se interrumpirán cuando las variaciones de movimiento medidas en uno de estos períodos de observación sean inferiores a los valores máximos que aparecen en la Tabla 5.1.

En general se tomará $\Delta t = 15$ minutos, salvo que el bulbo del anclaje se encuentre en un suelo de consistencia blanda o media ($c_u < 100$ KN/m^2 en suelo cohesivo, ó $D_r < 60\%$ en suelo granular), en cuyo caso Δt será igual, como mínimo, a 60 minutos. En terrenos determinados o en proyectos especiales puede ser preciso realizar pruebas a más largo plazo, con valores de Δt de incluso varias horas. La D.O., a la vista de las circunstancias propias de la obra, especificará el valor de Δt en cada caso.

Tras las mediciones efectuadas en cada ciclo, se bajará la carga hasta T_A y se anotará el valor ΔL_{pl} residual del ciclo.

Condición	Período de observación	Valor límite en el período de observación. Máximo incremento de movimiento.
a)	$0 - \Delta t$	1% de D_p
b)	$\Delta t - 3\,\Delta t$	1% de D_p
c)	$3\,\Delta t - 10\,\Delta t$	1% de D_p
d)	$10\,\Delta t - 40\,\Delta t$	1% de D_p

Si la condición a) no se satisface, el período de observación se aumenta hasta $(3 \cdot \Delta t)$ y se comprueba la condición b). Si b) no se satisface, el período de observación se aumenta a $(10 \cdot \Delta t)$ y se comprueba la condición c). Si esta última no se cumpliera, se aumentará el período de observación hasta $(40 \cdot \Delta t)$ y se comprueba la condición d)

Tabla 5.1. Condiciones límite de deformación.

5.3.3.– Presentación de resultados.

Para cada prueba de idoneidad, el contratista presentará los resultados numéricos y gráficos correspondientes a todas las lecturas realizadas en un plazo breve (en general no superior a siete dias), a contar desde la finalización de la prueba. Los formatos de presentación de los resultados serán similares a los de las figuras 2 y 3 que se muestran en el Anejo 3.

5.3.4.– Evaluación de resultados.

A partir de los resultados de las pruebas de idoneidad, deberán determinarse los siguientes datos del anclaje:

- Carga límite última útil del anclaje de prueba (esta carga puede no llegar a alcanzarse en determinados tipos de terreno si no se ha previsto suficiente sección de acero).
- Longitud libre efectiva (real) bajo la carga de prueba.
- Carga residual inicial.
- Componentes plásticas (no recuperables) de los alargamientos del anclaje.

Una vez determinados los anteriores datos, se compararán con los valores admisibles especificados por la D.O.

La idoneidad de un anclaje quedará establecida cuando todos los parámetros determinados por el ensayo de idoneidad cumplen, como mínimo, las limitaciones siguientes:

A)– Determinación de la carga límite última para el anclaje de prueba :

La carga limite última del anclaje de prueba se define como la mayor que satisface simultáneamente las dos condiciones siguientes:

– La variación de alargamiento a carga constante, para el escalón de carga corriente, cumple con una de las condiciones de estabilización especificadas en el apartado 5.3.2.

– Las pendientes de las ramas de descarga y posterior recarga, en las curvas Carga/Alargamiento, son muy semejantes, debiéndose cumplir que

$$tg\,(\alpha_2) / tg(\alpha_1) \geq 0.90$$

donde α_1 es el ángulo de inclinación de la rama de descarga, para el escalón de carga en cuestión, y α_2 es el ángulo de inclinación de la rama de recarga desde T_A hasta recuperar el alargamiento elástico, ΔL_e, del escalón en cuestión cuando se procede a aplicar el escalón siguiente.

B) – Determinación de la longitud libre efectiva real:

La longitud libre efectiva real deberá estar comprendida entre:

$$0.9 \cdot L_{lt} < L_{le} < L_{lt} + (0.4 \cdot L_b)$$

donde

$$L_{le} = \frac{\Delta le\,(x) \cdot A_S \cdot E_t}{T(x) - T_A - R} \times 10^{-6}$$

en la que (x) representa cualquier punto de la curva de carga, y R la fracción de la carga aplicada que se pierde en rozamientos (ver Figuras 2 y 3 del Anejo 3). Esta fuerza, R, se tomará igual a la carga correspondiente a la intersección del eje de cargas con la recta que resulte de la interpolación lineal de los últimos cuatro puntos de la curva carga-deformación elástica

C)– Determinación de la carga residual:

Tras el tesado y bloqueo de cuñas se comprobará la carga residual, T_{ro}. Dicha carga residual inicial deberá cumplir la siguiente condición:

$$1.1 \cdot T_d \geq T_{ro} \geq T_d$$

Esta misma condición se deberá cumplir para la carga residual que se deberá medir transcurridas cuarenta y ocho horas tras la operación de bloqueo.

D)– Determinación de la componente plástica del alargamiento, ΔL_{pl}.

Las deformaciones permanentes, ΔL_{pl}, se obtendrán de acuerdo con la Figura 3 del Anejo 3. Los valores admisibles para estas deformaciones permanentes serán fijados por la D.O. y servirán de guía para la evaluación de las pruebas completas y simples de tesado. En ningún caso se admitirán alargamientos residuales plásticos mayores del 25% del diámetro nominal de la perforación del anclaje, D_p. Si no se cumplieran esta limitaciones el anclaje será no idóneo para la carga nominal prevista (aunque podría serlo para cargas menores).

5.3.5.– Número de pruebas de idoneidad.

Para los anclajes de carácter temporal, se realizará un número de pruebas de idoneidad no inferior a dos sea cual sea el número de anclajes a disponer en obra. Para los anclajes definitivos se realizará una prueba de idoneidad por cada tipo de anclaje, de acuerdo con las dimensiones de bulbo previstas, y no menos de dos pruebas por cada tipo de terreno existente en zona de bulbos si éstos terrenos difieren notablemente en sus características geotécnicas.

Respecto al número de pruebas de idoneidad, en lo que respecta a ensayos de carga en anclajes temporales de tipo C1 o C2, la D.O. podrá autorizar la reducción o en su caso la eliminación de las pruebas de idoneidad si existe una experiencia extensa, adecuada y debidamente documentada del uso del tipo específico de anclajes considerado en el proyecto así como de sus características geométricas.

La localización, geometría y demás parámetros de las pruebas de idoneidad serán decididos libremente por la D.O.

Si del resultado de estas pruebas se desprendiesen cargas límites sensiblemente diferentes a las previstas en los cálculos, y los problemas no son imputables al proceso constructivo (lo cual se podrá apreciar si se descubren los anclajes de prueba), la D.O. dictará las órdenes oportunas encaminadas a adecuar las dimensiones previstas de los anclajes de proyecto a las resistencias obtenidas en estas pruebas. Si éste fuera el caso, se deberá proceder a realizar dos nuevas pruebas de idoneidad en las condiciones que dicte la D.O.

5.4.– PRUEBAS COMPLETAS DE TESADO

5.4.1.– Generalidades

Todos y cada uno de los anclajes se someterán a una prueba de tesado, ya sea simple o bien completa, según indique la D.O. Esta evaluará los resultados de las pruebas en un plazo breve (no superior a siete dias) tras la recepción de resultados (que a su vez deberá producirse antes de los siete dias siguientes al tesado) y comunicará lo que proceda al contratista.

Las cargas de prueba, T_p, se fijarán en cada caso, de acuerdo con la condición siguiente:

$$T_p = \gamma_l \cdot T_d$$

$$T_p < T_{ad\ comprobada}$$

$$T_p < 0.9 \cdot T_y / \gamma_y$$

siendo γ_y el coeficiente de seguridad de minoración de la resistencia del tendón, y γ_l el factor de seguridad de mayoración de cargas.

5.4.2.– Procedimiento operativo.

a) Se elige una carga inicial $(0.1 \cdot T_p) < T_A < (0.2 \cdot T_p)$. El recorrido entre T_A y T_p se divide en tres intervalos iguales de magnitud ΔT.

b) Se establece un origen fijo e inmóvil para las medidas de alargamiento y movimientos: $\Delta L = \Delta L_e + \Delta L_{pl}$. La operación de tesado no debe influir en la posición del origen fijo.

c) Se establece un programa de tres ciclos de carga–descarga, llegando en cada uno de ellos hasta $(T_A+\Delta T)$, $(T_A + (2 \cdot \Delta T))$ y $(T_A+(3 \cdot \Delta T))$ respectivamente.

Cuando se llega a la carga correspondiente a los ciclos anteriores, se medirá el alargamiento correspondiente. Al alcanzar la máxima carga de cada ciclo, se medirá el alargamiento inmediato y la variación de alargamiento a carga constante, durante unos intervalos de tiempo análogos a los definidos para las pruebas de idoneidad. Cuando la carga iguale a la de los escalones anteriores, tanto en carga como en descarga, se medirán los incrementos de alargamientos con un período de observación mínimo de un minuto.

Tras haber realizado las medidas y comprobaciones, se baja la carga, en cada escalón, hasta T_A y se registra el alargamiento residual para ese escalón.

d) Tras la realización del tercer ciclo de carga (después de haber alcanzado T_p), la carga se llevará hasta (T_o + pérdidas del sistema de tesado y clavado de cuñas) y, seguidamente, se procederá al clavado de cuñas, bloqueando el anclaje.

Tras la operación de bloqueo, se determinará la carga residual inicial, T_{ro}, mediante el procedimiento previamente aprobado por la D.O.

e) De igual manera se determinará, también, la carga residual a las 48 horas tras haberse producido el bloqueo.

f) Si la pérdida de carga residual, ΔT_r, excede de los valores dados en 5.3.4 c, entonces deberá procederse a un retesado del anclaje, debiendo procederse a comprobar la carga residual 48 horas después del retesado, por los métodos indicados anteriormente.

Si por segunda vez volviera a fallar la condición de carga residual, se repetirá el proceso una vez más. En caso de persistir el fallo, el anclaje será considerado como no válido, y se procederá según criterio de la D.O.

5.4.3.– Presentación de resultados

Las cargas y movimientos medidos en cada ciclo de prueba, se anotarán y representarán gráficamente. Los resultados se presentarán a la D.O. en plazos que no serán superiores a siete dias, utilizando gráficos tipo como los que se adjuntan (Figuras 4 y 5 del Anejo 3).

5.4.4.– Evaluación de resultados

Los datos a determinar el las pruebas completas de carga, así como las limitaciones impuestas, son semejantes a los que se determinan con los ensayos de idoneidad:

– *Carga límite última del anclaje:* Se determina como en los ensayos de idoneidad. El resultado debe estar, pues, en consonancia con el obtenido en aquellas (ver punto 5.3.4 A).

– *Longitud libre efectiva:* Se determina de manera análoga a la seguida en los ensayos de idoneidad. Debe haber concordancia de resultados entre los dos tipos de ensayos. La fuerza de rozamiento, R, a considerar en las fórmulas será la mayor de las siguientes: a) la que se haya obtenido en las pruebas de idoneidad, y b) la que corresponda a intersección con el eje de cargas de la recta que una los dos últimos puntos de la curva carga-deformación elástica.

– *Deformación remanente:* La extensión plástica, ΔL_{pl}, no podrá ser en ningún caso mayor que la obtenida en pruebas de idoneidad para el mismo tipo de anclaje y nivel de carga aplicada y haya sido admitida por la D.O.

– *Carga residual:* Tras el clavado de cuñas, deberá cumplirse:

$$T_d < T_{ro} < 1.1 \cdot T_d$$

– *Pérdida de carga residual:* La variación de carga residual (ΔT_r) en el periodo de 48 horas siguientes al clavado de cuñas, no será mayor del ±2% del valor de T_{ro}, obtenido en este anclaje.

De no cumplirse alguna de las limitaciones impuestas el anclaje será considerado como no válido. La D.O., en este caso, podrá autorizar que el anclaje sea utilizado para trabajar a una carga nominal inferior a la inicialmente prevista, pero, en este caso, se deberá repetir completamente la prueba completa para nueva esta nueva carga.

5.4.5.– Número de pruebas de tesado completas

Para obras con anclajes tipos C2, C3, C4, C5 y C6 se realizarán pruebas de tesado completas sobre

un número de anclajes no inferior al 25% (veinticinco por ciento) de los realmente dispuestos en obra, con un mínimo de 5 (cinco) en cualquier caso. El emplazamiento será decidido por la D.O. y comunicado al contratista tras haber finalizado las operaciones de inyección. Unicamente en obras con anclajes tipo C1 el porcentaje se podrá rebajar, como máximo, hasta el 5% a juicio de la D.O. Sin perjuicio de lo anterior, en casos especiales el proyecto deberá especificar el número de pruebas completas a realizar.

Con objeto de poder valorar adecuadamente los resultados de las pruebas simples de tesado que se concretan a continuación, además del porcentaje antes mencionado (25%) se realizarán pruebas completas de tensado en los tres primeros anclajes que se tesen. En estos tres anclajes (que no computarán a los efectos del porcentaje especificado) se determinará el valor de la fuerza de rozamiento mínima que se utilizará en las determinaciones de los alargamientos elásticos de las pruebas simples. Al ir incorporando resultados del resto de las pruebas completas, el valor de la fuerza de rozamiento a utilizar en las fórmulas, en las pruebas simples, podrá ser revisada en consonancia por la D.O.

5.4.6.– Control de cargas durante la obra.

La D.O. podrá exigir al contratista el control de la carga residual transcurridos 15 dias desde el blocaje de cada anclaje. En el caso de que la carga medida difiera de la residual a 48 horas en más de un 2% de ésta, se estará a lo que indique la D.O.

5.5.– PRUEBAS SIMPLES DE TESADO.

5.5.1.– Generalidades.

Estas pruebas sirven para comprobar el correcto funcionamiento de todos los anclajes en los que se realiza.

Como en los tipos de prueba anteriores, la carga de prueba se especificará con las siguientes limitaciones:

$$T_p = \gamma_l \cdot T_d$$

$$T_p < T_{ad\ comprobada}$$

$$T_p < 0.9 \cdot T_y / \gamma_y$$

siendo γ_y el factor de seguridad de minoración de la resistencia del tendón y γ_l el factor de seguridad de mayoración de cargas.

5.5.2.– Procedimiento operativo.

a) Se elige una carga, T_A, que verifique $(0.1 \cdot T_p) < T_A < (0.2 \cdot T_p)$ y se establece un origen fijo e inmóvil para la medida de alargamientos.

b) Se carga el anclaje hasta la carga T_p, tomando lectura de alargamientos para los valores intermedios $(0.5 \cdot T_d)$ y T_d. Se registra, también, el alargamiento al llegar a T_p y, manteniendo constante la carga T_p, se registra la variación del alargamiento durante un intervalo de tiempo $(n \cdot \Delta t)$, donde n y Δt adoptan los valores definidos para las pruebas de

descritas anteriormente. Se reduce después la carga hasta T_A y se registra el valor de ΔL_{pl} residual, anotando las lecturas correspondientes a 0,5 • T_d y T_d al cabo de un período de observación de un minuto cada lectura.

c) Tras la realización del ciclo de carga, ésta se llevará hasta (T_o + pérdidas previstas), se bloqueará el anclaje y se medirá el alargamiento final resultante tras la operación.

Tras el bloqueo, se medirá la carga residual, T_{ro}, por el procedimiento que haya aprobado la D.O.

Eventualmente, realizada la prueba, el anclaje puede destesarse completamente antes de procederse al tesado final de bloqueo, si así lo requiere el contratista, previa aprobación expresa de la D.O.

d) Se determinará, asímismo, la carga residual transcurridas 48 horas desde la operación de bloqueo.

5.5.3.– Presentación de resultados.

Los resultados de las pruebas simples de tesado se presentarán a la D.O. en un plazo breve (en general antes de 7 dias) tras la finalización de las pruebas y seguirán los modelos de gráficos y fichas que se adjuntan (Figura 6 del Anejo 3).

5.5.4.– Evaluación de resultados.

Si un anclaje no cumple las especificaciones que se indican a continuación, no será aceptado. Sin embargo, la D.O. podrá aceptar este anclaje para trabajar a una carga nominal menor siempre que se repita la prueba y se cumplan, para esta nueva carga, las limitaciones de aceptación.

Los requisitos de aceptación son los siguientes:

a) Incremento de deformación:

La variación de deformación a carga constante, T_p, no excederá de los limites indicados en el apartado 5.3.4. A) y 5.3.4 B)

b) Longitud libre efectiva:

Se deben verificar las limitaciones indicadas en el apartado 5.3.4.B). En los cálculos se considerará la misma fuerza de rozamiento, R, que la determinada en el apartado 5.4.4.

c) Carga residual:

La carga residual inicial medida tras el bloqueo, T_{ro}, cumplirá

$$T_d < T_{ro} < 1.1 \cdot T_d$$

1.4.– NOTACIÓN

A_s = Area de la sección metálica del tendón del anclaje (mm^2).
D_p = Diámetro nominal de la perforación (mm)
E_t = Módulo de elasticidad del tendón (MPa).
L_b = Longitud fija teórica (bulbo) (m).
L_{le} = Longitud libre efectiva (m).
L_{lt} = Longitud libre teórica (m).
R = Fuerza de fricción en la longitud libre (KN).
T = Designa una fuerza (genérica) en el anclaje (KN).
T_A = Fuerza inicial elegida para la prueba de tensado del anclaje (KN).
T_{ad} = Carga admisible del anclaje determinada por consideraciones geotécnicas.(KN) (= T_u / γ_t)
T_d = Carga de trabajo nominal especificada en proyecto (KN).
T_o = Carga de bloqueo (KN).
T_p = Carga máxima de prueba de anclaje (KN) (>= $T_d \cdot \gamma_l$)
T_r = Fuerza residual que se mide en cualquier instante de la vida del anclaje tras su bloqueo (KN).
T_{ro} = Fuerza residual medida tras el bloqueo (t=o) (KN).
T_s = Fuerza de rotura del acero del anclaje (KN): (= $A_s \cdot \sigma_{sn} \cdot 10^{-3}$).
T_u = Carga última de arrancamiento del anclaje (kN) (= $\Omega \cdot \tau_{tu}$).
T_y = Fuerza correspondiente al límite elástico del acero del anclaje (KN): (= $A_s \cdot \sigma_{yn} \cdot 10^{-3}$).
ΔL = Desplazamiento de la cabeza del tendón medido *respecto a un punto fijo* (mm) para una carga dada.
ΔL_k = Recorrido del pistón del gato de pretensado en el escalón de carga k (mm).
ΔL_e = Componente elástica teórica de ΔL en cada escalón de carga (mm).

$$\Delta L_e = \frac{L_{lt} (T - T_A - R)}{A_s \cdot E_t} \times 10^6$$

ΔL_{pl} = Componente plástica (no recuperable) de ΔL en cada escalón de carga (mm).
ΔL_{lt} = Alargamiento elástico teórico del acero calculado bajo la carga de prueba, T_p, a partir de la carga inicial T_A (mm)

$$\Delta L_{lt} = \frac{L_{lt} (T_P - T_A - R)}{A_s \cdot E_t} \times 10^6$$

Δs = Movimiento de la placa de anclaje, medida en la dirección del eje del anclaje, *respecto a un punto fijo* (mm).
γ_l = Factor de seguridad de mayoración de las acciones (T_p / T_d).
γ_y = Factor de seguridad frente a fluencia del acero del tendón (T_y / T_p) (normalmente > 1.15).
γ_t = Factor de seguridad de la tensión media última de transferencia en el contacto bulbo–terreno. (τ_{tu} / τ_{ta}).

Ω = Area lateral del bulbo del anclaje (m^2).
σ_{sn} = Resistencia característica a tracción del acero de A.L.E. (MPa).
σ_{yn} = Límite elástico característico del acero (al 0,2% def. permanente) (MPa).
τ_{tu} = Tensión de transferencia media última en el contacto bulbo-terreno (kPa) .
τ_{ta} = Tensión de transferencia media admisible en el contacto bulbo-terreno (kPa) .

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Ingeniería de Instrumentación y Control, S.A. C.I.F. A 28/765881 • Inscrita en el Registro Mercantil de la Provincia de Madrid • Tomo 6515 • General 5522 • Sección 3ª • Folio 35 • Hoja nº 55174 • Inscripción 2ª

CLIENTE: UTE ALT CAMP

OBRA: L.A.V. MADRID – BARCELONA – FRONTERA – FRANCESA
TRAMO LLEIDA – MARTORELL. SUBTRAMO V

PROYECTO DE PRUEBA DE CARGA

PUENTE SOBRE EL RÍO FRANCOLÍ
L.A.V. MADRID – BARCELONA – FRONTERA FRANCESA
TRAMO LLEIDA – MARTORELL. SUBTRAMO V

JULIO 2003

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1. INTRODUCCIÓN

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De acuerdo con la "*IAP: Instrucción sobre las acciones a considerar en el Proyecto de Puentes de Carretera*" del 12 de Febrero de 1.998, se deben realizar las correspondientes pruebas de carga en los puentes de carretera que se proyectan y construyen, previamente a la puesta en servicio de los mismos. De esta forma se verifica si los parámetros de comportamiento son correctos y ajustados a los previstos según el modelo teórico de cálculo empleado en el Proyecto de la estructura.

Este documento se refiere a la estructura del **"Puente sobre el río Francolí"** de la Línea de Alta Velocidad Madrid – Barcelona – Frontera Francesa, Tramo Lleida - Martorell, Subtramo V. Con el fin de comprobar el comportamiento de esta estructura, **UTE ALT CAMP** encargó a **INGENIERÍA DE INSTRUMENTACIÓN Y CONTROL, S.A.** la realización del correspondiente proyecto de prueba de carga en el que se considerase la aplicación de sobrecargas que, aún siendo muy lejanas a las solicitaciones habituales de la estructura, permitiesen una comprobación previa y provisional de la misma.

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2. DESCRIPCIÓN DE LA OBRA

2. DESCRIPCIÓN DE LA OBRA

A continuación se describen las principales características de la estructura del "Puente sobre el río Francolí" de la L.A.V. Madrid – Barcelona – Frontera Francesa, Tramo Lleida - Martorell, Subtramo V, de acuerdo con la documentación facilitada a IIC por UTE ALT CAMP.

La estructura es una solución hiperestática de cinco vanos, con distribución de luces 32 + 3*40 + 32 m y longitud total de tablero de 184 m. La planta de la misma es recta. La estructura define el paso de la línea de alta velocidad sobre el cauce del río Francolí.

El tablero está formado a partir de una doble viga artesa de hormigón pretensado (HP-60/B/17/IIa), de 2,40 m de canto, sobre las que se ejecuta in situ una losa de hormigón pretensado (HP-30/B/20/IIa) de canto variable entre los 0,31 m de canto en el eje longitudinal del tablero y los 0,20 m en su extremo.

Los aparatos de apoyo son de tipo POT. La distancia entre ejes de apoyo es de 3,20 m.

La estructura está preparada para el paso de una doble vía de Alta Velocidad (ancho internacional 1,435 m), con separación entre ejes de 4,70 m.

Estructura	Tipo de Estructura	Nº de vanos	Luz (m)	Longitud (m)	Tipo de apoyo
Puente sobre el río Francolí	Viaducto	5	32+3*40+32	184	POT

En el Anejo nº 2 se recogen los planos de la estructura, facilitados a IIC, S.A.

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3. JUSTIFICACIÓN DE LA SOBRECARGA DE PRUEBA

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La realización de la prueba de carga ligera mediante camiones tiene por objeto el realizar una comprobación previa y provisional de las estructuras ensayadas, con anterioridad a la ejecución de la vía.

Con este tipo de prueba no resulta posible obtener porcentajes de solicitación, con respecto a los momentos por sobrecarga, según los criterios que marcan las "*Recomendaciones para la realización de pruebas de carga de recepción en puentes de carretera*" de 1998 (del orden del 60 – 70 %), que no se considera necesario alcanzar, dado el carácter de la prueba, cuya finalidad es la de servir para la recepción provisional de la estructura.

Para la ejecución del ensayo será necesario que UTE ALT CAMP proporcione **OCHO (8)** camiones para la reproducción de los estados de carga previstos en el Proyecto de Prueba de Carga. El camión-tipo debe tener un peso total de 38.000 kg repartido en cuatro ejes: 10.000 kg en cada uno de los ejes del tandem trasero, 11.000 kg en el eje intermedio y 7.000 kg en el eje delantero.

En el Anejo nº 2 se ha incluido un croquis en el que se definen las características geométricas y la distribución de pesos del camión-tipo descrito, así como un esquema referente al posicionamiento de los camiones sobre la estructura durante la realización de la prueba.

Para los estados de carga definidos se ha calculado el momento flector positivo en la sección central de cada vano, así como el momento flector negativo en la sección intermedia de apoyo en pila, comparándolos con los momentos de sobrecarga de uso indicados en la memoria del anejo de cálculo del proyecto de la estructura.

Con las disposiciones de carga recogidas en el Anejo nº 2 se ha realizado el cálculo de la estructura (ver Anejo nº 1), obteniendo a partir del mismo los valores esperados para las medidas que se realizarán durante el ensayo.

Del cálculo de la estructura sometida a los estados de carga definidos para la prueba, se obtiene que la zona más solicitada a momento flector positivo se encuentra en el centro de cada vano y a momento flector negativo en el apoyo en pila. Considerando solamente los momentos de solicitación producidos por las sobrecargas de uso, se obtiene:

Sección	Momento de sobrecarga en Proyecto (kN m)	Momento de sobrecarga en Prueba (kN m)	% alcanzado en prueba
Central vano lateral (32 m)	24.059,0	6.867,9	**28,5**
Central vano intermedio (40 m)	34.589,0	7.179,8	**20,8**
Apoyo en pila extrema	-40.177,0	-8.103,3	**20,2**
Apoyo en pila central	-42.814,0	-8.488,8	**19,8**

Si se consideran, además, los momentos flectores producidos por las cargas permanentes, se obtendrán:

Sección	Mom. CP en Proyecto (kN m)	Mom. SC en Proyecto (kN m)	Mom. Total en Proyecto (kN m)	Mom. SC en Prueba (kN m)	Mom. Total en prueba (kN m)	% alcanzado en prueba
Central vano lateral (32 m)	14.038,0	24.059,0	38.097,0	6.867,9	20.905,9	54,8
Central vano intermedio (40 m)	15.449,0	34.589,0	50.038,0	7.179,8	22.628,8	45,2
Apoyo en pila extrema	-25.010,0	-40.177,0	-65.187,0	-8.103,3	-33.113,3	50,8
Apoyo en pila central	-24.622,0	-42.814,0	-67.436,0	-8.488,8	-33.110,8	49,1

4. MEDIDAS A REALIZAR

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4. MEDIDAS A REALIZAR

Los puntos de la estructura que se instrumentarán durante la prueba, y en los que se efectuarán medidas, quedan reflejados en el croquis que se incluye en el Anejo nº 2 del presente documento.

4.1. CONTROL DE FLECHAS

Se tiene previsto el control de desplazamientos en los siguientes puntos:

Flecha en L/2
1 punto / vano

Debido a las características de la estructura (altura de pilas) y a las condiciones de acceso a la parte inferior del tablero de la misma, sólo es posible el control de flechas en un único punto de la sección central de cada vano. Para la medida de flechas se dispondrán dispositivos ópticos láser.

Mediante estos dispositivos se realizan mediciones tanto durante las pruebas estáticas como en las dinámicas.

4.2. CONTROL DE VIBRACIONES

Con la finalidad de determinar la frecuencia propia de vibración de la estructura se instalará un sismómetro en la sección central de los vanos de la estructura, para la medida de velocidades de vibración durante la prueba dinámica con tablón Rilem.

4.3. OTROS CONTROLES

Durante la realización de los ensayos de prueba de carga sobre la estructura, y para cada prueba y estado de carga, se procederá al registro de la humedad relativa y temperatura ambiente, al principio y al final de cada estado.

5. PLAN DE CARGA Y PROGRAMACIÓN DEL ENSAYO

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5. PLAN DE CARGA Y PROGRAMACIÓN DEL ENSAYO

5.1. PRUEBAS ESTÁTICAS

En las pruebas estáticas que se efectuarán se realizarán medidas de acuerdo con las siguientes fases:

I. Toma de valores iniciales de las medidas.
II. Situación de uno de los camiones dentro del vano a probar, con la posición indicada en el Croquis de Carga incluido en el Anejo nº 2 de este documento.
III. Estabilización de las medidas. Se realizarán medidas continuas hasta comprobar que se ha alcanzado la estabilización de las lecturas.
IV. Situación de los camiones restantes, repitiendo para cada uno de ellos las fases II y III.
V. Estabilización de las medidas. Cuando se encuentren posicionados los camiones previstos, se realizarán medidas continuas hasta comprobar que se alcanza la estabilización de las lecturas. El tiempo de mantenimiento de las cargas no será inferior a 10 minutos.
VI. Descarga de cada uno de los camiones, en orden inverso al de su entrada en la estructura.
VII. Medidas de recuperación. Se realizarán medidas continuas con el puente descargado hasta alcanzar la estabilización de las lecturas, y una recuperación mínima del 85 % en un intervalo de tiempo no superior al de mantenimiento de la carga dentro del vano en la fase V.

En la estructura del "Puente sobre el río Francolí" de la L.A.V. Madrid – Barcelona – Frontera Francesa, Tramo Lleida - Martorell, Subtramo V, se realizarán **SIETE (7)** pruebas estáticas para alcanzar la solicitación de momento flector positivo en sección a L/2 de cada uno de los vanos y de momento flector negativo en las secciones intermedias de apoyo en pila.

5.2. PRUEBAS DINÁMICAS

Se realizarán **TRES (3) TIPOS** de pruebas dinámicas sobre los vanos a ensayar de la estructura. Consistirán en los siguientes ensayos:

- Ensayo dinámico nº 1: Paso de uno de los camiones sobre la estructura a una velocidad constante en torno a 5 Km/h (*ensayo cuasiestático*).

- Ensayo dinámico nº 2: Paso de uno de los camiones sobre la estructura circulando a la máxima velocidad constante que sea posible alcanzar, teniendo en cuenta las exigencias de seguridad de la obra (*ensayo a máxima velocidad*).

- Ensayo dinámico nº 3: Paso de un camión sobre tablón RILEM situado en la sección central de cada uno de los vanos a ensayar, circulando a la máxima velocidad posible, teniendo en cuenta las exigencias de seguridad de la obra (ensayo de vibración).

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6. PREVISIÓN DE RESULTADOS

6. PREVISIÓN DE RESULTADOS

En el Anejo nº 1 se incluyen los cálculos justificativos realizados para evaluar las flechas y frecuencias propias de vibración previstas durante la realización de la prueba de carga. Para el cálculo de la estructura se ha empleado un programa de estructuras basado en el método de los elementos finitos.

En el proceso de cálculo existen tres fases operativas: la introducción de datos (inputs) al programa, la resolución mediante un sistema de ecuaciones y la salida (outputs) y análisis de resultados.

La operación de cálculo comienza con la discretización geométrica de la estructura. Ello lleva consigo la definición de cada uno de los elementos estructurales en cuanto a dimensiones y características mecánicas. Al mismo tiempo, se requiere la localización de cada punto o nodo de la estructura discretizada en el espacio, eligiendo para ello unos ejes de coordenadas locales para cada uno de los elementos finitos definidos, con la finalidad de conocer las direcciones y sentidos de actuación de los esfuerzos sobre cada uno de ellos.

Una vez introducida en el programa la geometría de la estructura, se definen las cargas actuantes y condiciones de contorno, de modo que mediante la resolución de un sistema de ecuaciones de la forma de Carga = Rigidez x Desplazamiento, se obtienen los movimientos en cada uno de los nodos discretizados de la estructura, y por retrosustitución se calculan los esfuerzos actuantes en los elementos definidos.

Estas operaciones son realizadas de forma automática por el programa de cálculo de estructuras por elementos finitos SAP90 (CSI, Inc., Berkeley). Es un programa desarrollado en FORTRAN y diseñado para ser usado en entorno operativo MS-DOS. Todas las operaciones numéricas son desarrolladas con la precisión de 64 bits y permite llevar a cabo un análisis de comportamiento no solo estático, sino también dinámico.

En nuestro caso, para el cálculo de flechas, frecuencias propias de vibración y la obtención de esfuerzos de solicitación, se ha optado por el desarrollo de un modelo unidimensional (*modelo viga*), formado por elementos barra unidimensionales. En los cálculos se ha empleado un módulo instantáneo de deformación de 40.817 N/mm^2. El módulo de deformación se ha calculado de acuerdo a la información del Anejo de Cálculo del Proyecto de la estructura y a las consideraciones referidas en el Artículo 39.6 de la EHE–98 "Instrucción de Hormigón Estructural", tomando como valor de resistencia media para la fecha de realización del ensayo ($f_{cm,j}$) el

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resultante de considerar la resistencia característica del hormigón (f_{ck}) y sumarle 8 N/mm^2. En el modelo se han considerado secciones resistentes no fisuradas.

En la salida impresa del cálculo mecanizado figuran las características geométricas y elásticas de la estructura discretizada, así como las acciones actuantes sobre los distintos nodos. El cálculo realizado presenta una primera parte de carácter estático para la obtención de los valores previstos en los estados de solicitación a reproducir, y una segunda parte dinámica para la obtención de las frecuencias propias de vibración de la estructura.

6.1. CÁLCULO DE FLECHAS

Los valores de flechas esperados para los puntos de medida establecidos en el Croquis de Instrumentación (ver Anejo nº 2), son los recogidos en la siguiente tabla (flechas negativas indican descenso):

Ensayo estático nº 1 – Momento flector positivo en vanos 1 y 3	
Punto de medida	**Flecha (mm)**
M1	-2,34
M2	1,99
M3	-3,30
M4	1,13
M5	-0,28

Ensayo estático nº 2 – Momento flector positivo en vanos 2 y 4	
Punto de medida	**Flecha (mm)**
M1	1,05
M2	-3,30
M3	2,13
M4	-3,30
M5	1,05

Ensayo estático nº 3 – Momento flector positivo en vanos 3 y 5	
Punto de medida	**Flecha (mm)**
M1	-0,28
M2	1,13
M3	-3,30
M4	1,99
M5	-2,34

Ensayo estático nº 4 – Momento flector negativo en sección de apoyo en pila 1	
Punto de medida	**Flecha (mm)**
M1	-1,10
M2	-2,09
M3	0,82
M4	-0,22
M5	0,05

Ensayo estático nº 5 – Momento flector negativo en sección de apoyo en pila 2	
Punto de medida	**Flecha (mm)**
M1	0,72
M2	-1,95
M3	-1,99
M4	0,78
M5	-0,19

Ensayo estático nº 6 – Momento flector negativo en sección de apoyo en pila 3	
Punto de medida	**Flecha (mm)**
M1	-0,19
M2	0,78
M3	-1,99
M4	-1,95
M5	0,72

Ensayo estático nº 7 – Momento flector negativo en sección de apoyo en pila 4	
Punto de medida	**Flecha (mm)**
M1	0,05
M2	-0,22
M3	0,82
M4	-2,09
M5	-1,10

6.2. CÁLCULO DE FRECUENCIAS

El cálculo de las frecuencias de los tres primeros modos de vibración libre de la estructura, presenta los siguientes valores previstos:

Primer modo	Segundo modo	Tercer modo
4,00 Hz	5,00 Hz	6,39 Hz

El presente documento consta de **VEINTE (20)** páginas numeradas y de **DOS (2)** Anejos sin paginar.

Madrid, Julio de 2003

Vº Bº Oficina Técnica, Área de Construcción y Civil

Fdo.: Juan Manuel García Guerra
Ingeniero de Caminos

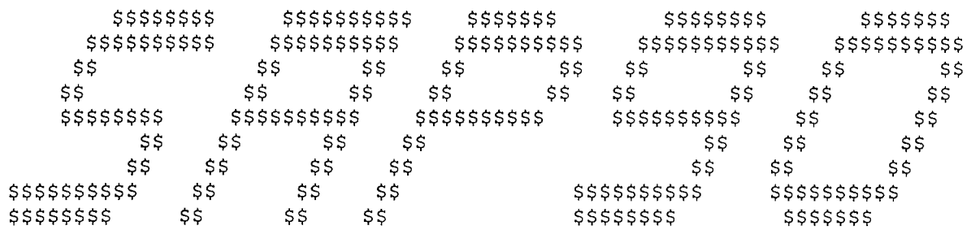
Fdo.: Pablo Fernández Bea
Ingeniero de Caminos

7. ANEJOS

7.1. ANEJO Nº 1: CÁLCULOS JUSTIFICATIVOS

AUSCULTACIÓN DE ESTRUCTURAS
Obra: L.A.V. Madrid – Barcelona – Frontera Francesa
Tramo Lleida - Martorell
Cliente: UTE ALT CAMP
Fecha: Julio 2003

MODELO UNIDIMENSIONAL PARA EL CÁLCULO DE FLECHAS, FRECUENCIAS PROPIAS DE VIBRACIÓN Y ESFUERZOS DE SOLICITACIÓN



STRUCTURAL ANALYSIS PROGRAMS

VERSION 5.30

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V FRANCOLI. LAV MADRID-BARCELONA-F.FRANCESA. LLEIDA-MARTORELL. UD: N-m

S Y S T E M D A T A

EXECUTION CODE	0
NUMBER OF LOAD CONDITIONS	4
STEADY STATE LOAD FREQUENCY	.0000E+00
NUMBER OF EIGENVALUES	3
EIGEN CONVERGENCE TOLERANCE	.1000E-03
EIGEN CUTOFF TIME PERIOD	.0000E+00

G E N E R A T E D J O I N T C O O R D I N A T E S

JOINT	X	Y	Z
1	.000	.000	.000
2	3.200	.000	.000
3	6.400	.000	.000
4	9.600	.000	.000
5	12.800	.000	.000
6	16.000	.000	.000
7	19.200	.000	.000
8	22.400	.000	.000
9	25.600	.000	.000
10	28.800	.000	.000
11	32.000	.000	.000
12	36.000	.000	.000
13	40.000	.000	.000
14	44.000	.000	.000
15	48.000	.000	.000
16	52.000	.000	.000
17	56.000	.000	.000
18	60.000	.000	.000
19	64.000	.000	.000
20	68.000	.000	.000
21	72.000	.000	.000
22	76.000	.000	.000
23	80.000	.000	.000
24	84.000	.000	.000
25	88.000	.000	.000
26	92.000	.000	.000
27	96.000	.000	.000
28	100.000	.000	.000
29	104.000	.000	.000
30	108.000	.000	.000
31	112.000	.000	.000
32	116.000	.000	.000
33	120.000	.000	.000
34	124.000	.000	.000
35	128.000	.000	.000
36	132.000	.000	.000
37	136.000	.000	.000
38	140.000	.000	.000
39	144.000	.000	.000
40	148.000	.000	.000
41	152.000	.000	.000
42	155.200	.000	.000
43	158.400	.000	.000
44	161.600	.000	.000
45	164.800	.000	.000
46	168.000	.000	.000
47	171.200	.000	.000
48	174.400	.000	.000
49	177.600	.000	.000
50	180.800	.000	.000
51	184.000	.000	.000

R E S T R A I N T D A T A

JOINT	RX	RY	RZ	RXX	RYY	RZZ
1	1	1	1	0	0	0
11	1	1	1	0	0	0
21	1	1	1	0	0	0
31	1	1	1	0	0	0
41	1	1	1	0	0	0
51	1	1	1	0	0	0

F R A M E C O N T R O L D A T A

NUMBER OF MEMBER SECTION PROPERTIES 1
NUMBER OF SPAN LOADING PATTERNS 0

LOAD	GRAVITATIONAL MULTIPLIERS			TEMPERATURE	PRESTRESS
COND	X	Y	Z	MULTIPLIERS	MULTIPLIERS
1	.000	.000	.000	.000	.000
2	.000	.000	.000	.000	.000
3	.000	.000	.000	.000	.000
4	.000	.000	.000	.000	.000

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

PROP	AREA	TORSIONAL	MOMENTS OF INERTIA		SHEAR AREAS	
ID		INERTIA	I33	I22	A2	A3
1	.759E+01	.00000E+00	.70910E+01	.10000E+03	.000E+00	.000E+00

M A T E R I A L P R O P E R T Y D A T A

PROP ID	MODULUS OF ELASTICITY	SHEAR MODULUS	WEIGHT PER UNIT LEN	MASS PER UNIT LEN	THERMAL EXPANSION
1	.4082E+11	.1570E+11	.2087E+06	.2127E+05	.0000E+00

F R A M E E L E M E N T D A T A

ELT ID	JOINT END-I	JOINT END-J	LOCAL-AXIS N1	LOCAL-AXIS N2	PROPERTY-ID END-I	PROPERTY-ID END-J	VAR	REL CODES	REF TEMP	ELEMENT LENGTH
1	1	2	-2	0	1	1	0	000000	.00	3.20
2	2	3	-2	0	1	1	0	000000	.00	3.20
3	3	4	-2	0	1	1	0	000000	.00	3.20
4	4	5	-2	0	1	1	0	000000	.00	3.20
5	5	6	-2	0	1	1	0	000000	.00	3.20
6	6	7	-2	0	1	1	0	000000	.00	3.20
7	7	8	-2	0	1	1	0	000000	.00	3.20
8	8	9	-2	0	1	1	0	000000	.00	3.20
9	9	10	-2	0	1	1	0	000000	.00	3.20
10	10	11	-2	0	1	1	0	000000	.00	3.20
11	11	12	-2	0	1	1	0	000000	.00	4.00
12	12	13	-2	0	1	1	0	000000	.00	4.00
13	13	14	-2	0	1	1	0	000000	.00	4.00
14	14	15	-2	0	1	1	0	000000	.00	4.00
15	15	16	-2	0	1	1	0	000000	.00	4.00
16	16	17	-2	0	1	1	0	000000	.00	4.00
17	17	18	-2	0	1	1	0	000000	.00	4.00
18	18	19	-2	0	1	1	0	000000	.00	4.00
19	19	20	-2	0	1	1	0	000000	.00	4.00
20	20	21	-2	0	1	1	0	000000	.00	4.00
21	21	22	-2	0	1	1	0	000000	.00	4.00
22	22	23	-2	0	1	1	0	000000	.00	4.00
23	23	24	-2	0	1	1	0	000000	.00	4.00
24	24	25	-2	0	1	1	0	000000	.00	4.00
25	25	26	-2	0	1	1	0	000000	.00	4.00
26	26	27	-2	0	1	1	0	000000	.00	4.00
27	27	28	-2	0	1	1	0	000000	.00	4.00
28	28	29	-2	0	1	1	0	000000	.00	4.00
29	29	30	-2	0	1	1	0	000000	.00	4.00
30	30	31	-2	0	1	1	0	000000	.00	4.00
31	31	32	-2	0	1	1	0	000000	.00	4.00
32	32	33	-2	0	1	1	0	000000	.00	4.00
33	33	34	-2	0	1	1	0	000000	.00	4.00
34	34	35	-2	0	1	1	0	000000	.00	4.00
35	35	36	-2	0	1	1	0	000000	.00	4.00
36	36	37	-2	0	1	1	0	000000	.00	4.00
37	37	38	-2	0	1	1	0	000000	.00	4.00
38	38	39	-2	0	1	1	0	000000	.00	4.00
39	39	40	-2	0	1	1	0	000000	.00	4.00
40	40	41	-2	0	1	1	0	000000	.00	4.00
41	41	42	-2	0	1	1	0	000000	.00	3.20
42	42	43	-2	0	1	1	0	000000	.00	3.20
43	43	44	-2	0	1	1	0	000000	.00	3.20
44	44	45	-2	0	1	1	0	000000	.00	3.20
45	45	46	-2	0	1	1	0	000000	.00	3.20
46	46	47	-2	0	1	1	0	000000	.00	3.20
47	47	48	-2	0	1	1	0	000000	.00	3.20
48	48	49	-2	0	1	1	0	000000	.00	3.20
49	49	50	-2	0	1	1	0	000000	.00	3.20
50	50	51	-2	0	1	1	0	000000	.00	3.20

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

PROP	WEIGHT	MASS
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TOTAL	38397672.0000	3914232.0000

J O I N T L O A D S

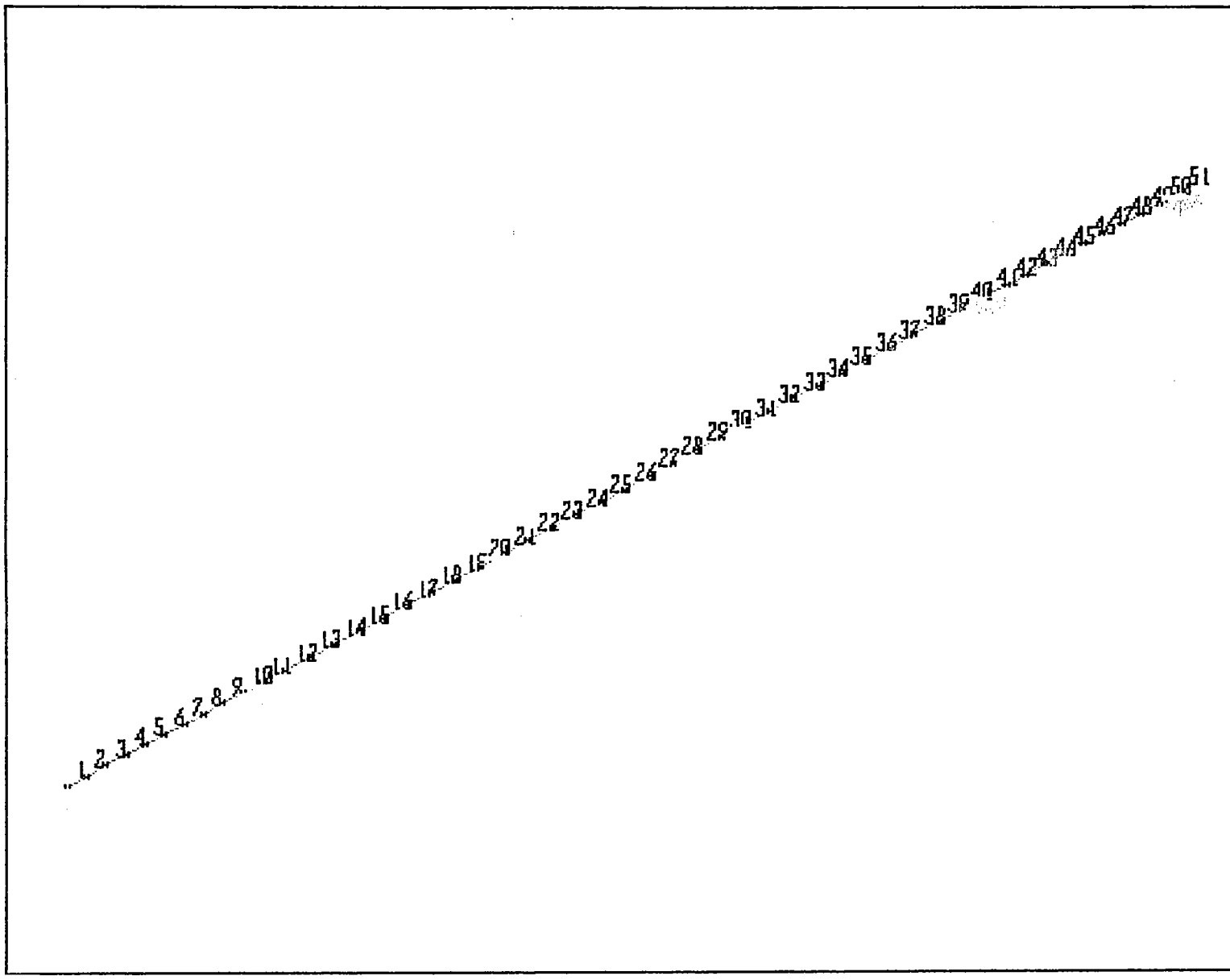
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10	1	.000E+00	.000E+00	-.323E+05	.000E+00	.000E+00	.000E+00
3	1	.000E+00	.000E+00	-.123E+06	.000E+00	.000E+00	.000E+00
9	1	.000E+00	.000E+00	-.123E+06	.000E+00	.000E+00	.000E+00
4	1	.000E+00	.000E+00	-.199E+06	.000E+00	.000E+00	.000E+00
8	1	.000E+00	.000E+00	-.199E+06	.000E+00	.000E+00	.000E+00
5	1	.000E+00	.000E+00	-.300E+06	.000E+00	.000E+00	.000E+00
7	1	.000E+00	.000E+00	-.300E+06	.000E+00	.000E+00	.000E+00
6	1	.000E+00	.000E+00	-.184E+06	.000E+00	.000E+00	.000E+00
13	2	.000E+00	.000E+00	-.811E+05	.000E+00	.000E+00	.000E+00
19	2	.000E+00	.000E+00	-.811E+05	.000E+00	.000E+00	.000E+00
14	2	.000E+00	.000E+00	-.200E+06	.000E+00	.000E+00	.000E+00
18	2	.000E+00	.000E+00	-.200E+06	.000E+00	.000E+00	.000E+00
15	2	.000E+00	.000E+00	-.313E+06	.000E+00	.000E+00	.000E+00
17	2	.000E+00	.000E+00	-.313E+06	.000E+00	.000E+00	.000E+00
16	2	.000E+00	.000E+00	-.304E+06	.000E+00	.000E+00	.000E+00
23	3	.000E+00	.000E+00	-.811E+05	.000E+00	.000E+00	.000E+00
29	3	.000E+00	.000E+00	-.811E+05	.000E+00	.000E+00	.000E+00
24	3	.000E+00	.000E+00	-.200E+06	.000E+00	.000E+00	.000E+00
28	3	.000E+00	.000E+00	-.200E+06	.000E+00	.000E+00	.000E+00
25	3	.000E+00	.000E+00	-.313E+06	.000E+00	.000E+00	.000E+00
27	3	.000E+00	.000E+00	-.313E+06	.000E+00	.000E+00	.000E+00
26	3	.000E+00	.000E+00	-.304E+06	.000E+00	.000E+00	.000E+00
33	4	.000E+00	.000E+00	-.811E+05	.000E+00	.000E+00	.000E+00
39	4	.000E+00	.000E+00	-.811E+05	.000E+00	.000E+00	.000E+00
34	4	.000E+00	.000E+00	-.200E+06	.000E+00	.000E+00	.000E+00
38	4	.000E+00	.000E+00	-.200E+06	.000E+00	.000E+00	.000E+00
35	4	.000E+00	.000E+00	-.313E+06	.000E+00	.000E+00	.000E+00
37	4	.000E+00	.000E+00	-.313E+06	.000E+00	.000E+00	.000E+00
36	4	.000E+00	.000E+00	-.304E+06	.000E+00	.000E+00	.000E+00

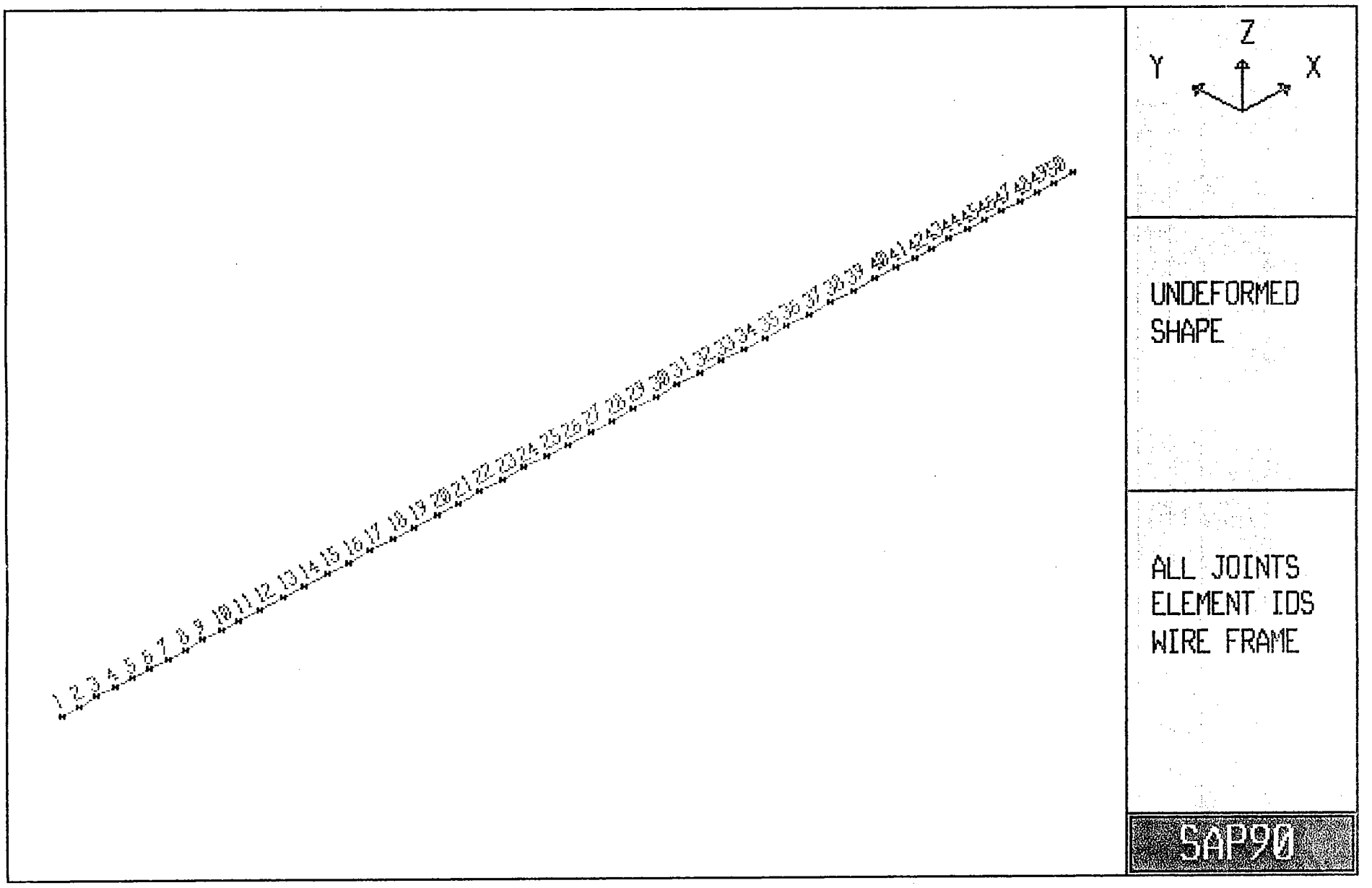
L O A D C O N D I T I O N C O M B I N A T I O N M U L T I P L I E R S

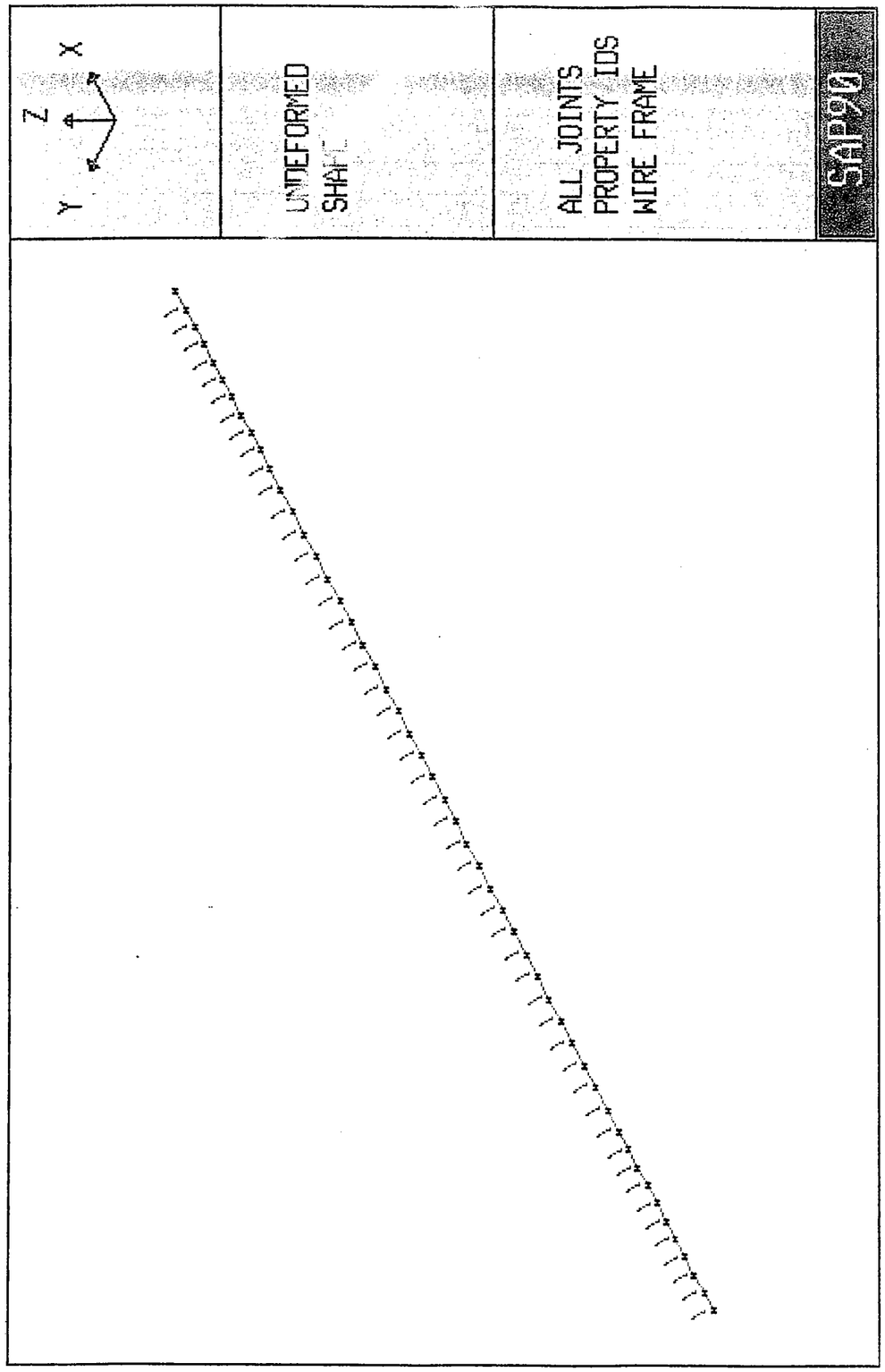
COMBINATION	CONDITION	FACTOR
1		
	1	1.000
	3	1.000
2		
	2	1.000
	4	1.000
3		
	1	1.000
	2	1.000
4		
	2	1.000
	3	1.000

O U T P U T F I L E S C R E A T E D B Y P R O G R A M

INPUT DATA ECHO	FRANCOLI.SAP
SOLUTION ERRORS AND WARNINGS	FRANCOLI.ERR
EQUATION NUMBERING	FRANCOLI.EQN
FREQUENCIES	FRANCOLI.EIG
DISPLACEMENTS AND REACTIONS	FRANCOLI.SOL
FRAME ELEMENT FORCES	FRANCOLI.F3F


Z
Y
X
UNDEFORMED
SHAPE
JOINT IDS
ALL JOINTS
RESTRAINTS
WIRE FRAME
SAP90


Z
Y
X
UNDEFORMED
SHAPE
ALL JOINTS
ELEMENT IDS
WIRE FRAME
SAP90




```
      $$$$$$$$     $$$$$$$$$$    $$$$$$$         $$$$$$$$        $$$$$$$
     $$$$$$$$$$    $$$$$$$$$$    $$$$$$$$$$    $$$$$$$$$$$     $$$$$$$$$$
    $$             $$      $$    $$        $$   $$         $$   $$        $$
    $$             $$      $$    $$        $$   $$         $$   $$        $$
    $$$$$$$$       $$$$$$$$$$    $$$$$$$$$$     $$$$$$$$$$$     $$        $$
           $$      $$      $$    $$                        $$    $$        $$
           $$      $$      $$    $$                        $$    $$        $$
    $$$$$$$$$$     $$      $$    $$              $$$$$$$$$$      $$$$$$$$$$
     $$$$$$$$      $$      $$    $$               $$$$$$$$        $$$$$$$
```

STRUCTURAL ANALYSIS PROGRAMS

VERSION 5.30

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F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
1								
	1	.00			.00			
		.00	668310.59	.00				
		3.20	668310.59	2138593.90				
		3.20			.00			
	2	.00			.00			
		.00	-148299.04	.00				
		3.20	-148299.04	-474556.94				
		3.20			.00			
	3	.00			.00			
		.00	492772.95	.00				
		3.20	492772.95	1576873.44				
		3.20			.00			
	4	.00			.00			
		.00	-101388.12	.00				
		3.20	-101388.12	-324441.99				
		3.20			.00			
2								
	1	.00			.00			
		.00	635966.59	2138593.90				
		3.20	635966.59	4173686.99				
		3.20			.00			
	2	.00			.00			
		.00	-148299.04	-474556.94				
		3.20	-148299.04	-949113.88				
		3.20			.00			
	3	.00			.00			
		.00	460428.95	1576873.44				
		3.20	460428.95	3050246.07				
		3.20			.00			
	4	.00			.00			
		.00	-101388.12	-324441.99				
		3.20	-101388.12	-648883.98				
		3.20			.00			
3								
	1	.00			.00			
		.00	513435.59	4173686.99				
		3.20	513435.59	5816680.89				
		3.20			.00			
	2	.00			.00			
		.00	-148299.04	-949113.88				

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
		3.20	-148299.04	-1423670.82				
		3.20			.00			
	3	.00			.00			
		.00	337897.95	3050246.07				
		3.20	337897.95	4131519.51				
		3.20			.00			
	4	.00			.00			
		.00	-101388.12	-648883.98				
		3.20	-101388.12	-973325.97				
		3.20			.00			
4								
	1	.00			.00			
		.00	314310.59	5816680.89				
		3.20	314310.59	6822474.79				
		3.20			.00			
	2	.00			.00			
		.00	-148299.04	-1423670.82				
		3.20	-148299.04	-1898227.76				
		3.20			.00			
	3	.00			.00			
		.00	138772.95	4131519.51				
		3.20	138772.95	4575592.95				
		3.20			.00			
	4	.00			.00			
		.00	-101388.12	-973325.97				
		3.20	-101388.12	-1297767.96				
		3.20			.00			
5								
	1	.00			.00			
		.00	14185.59	6822474.79				
		3.20	14185.59	6867868.69				
		3.20			.00			
	2	.00			.00			
		.00	-148299.04	-1898227.76				
		3.20	-148299.04	-2372784.71				
		3.20			.00			
	3	.00			.00			
		.00	-161352.05	4575592.95				
		3.20	-161352.05	4059266.38				
		3.20			.00			
	4	.00			.00			

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
		.00	-101388.12	-1297767.96				
		3.20	-101388.12	-1622209.95				
		3.20			.00			
6								
1		.00			.00			
		.00	-169564.41	6867868.69				
		3.20	-169564.41	6325262.58				
		3.20			.00			
2		.00			.00			
		.00	-148299.04	-2372784.71				
		3.20	-148299.04	-2847341.65				
		3.20			.00			
3		.00			.00			
		.00	-345102.05	4059266.38				
		3.20	-345102.05	2954939.82				
		3.20			.00			
4		.00			.00			
		.00	-101388.12	-1622209.95				
		3.20	-101388.12	-1946651.94				
		3.20			.00			
7								
1		.00			.00			
		.00	-469689.41	6325262.58				
		3.20	-469689.41	4822256.48				
		3.20			.00			
2		.00			.00			
		.00	-148299.04	-2847341.65				
		3.20	-148299.04	-3321898.59				
		3.20			.00			
3		.00			.00			
		.00	-645227.05	2954939.82				
		3.20	-645227.05	890213.26				
		3.20			.00			
4		.00			.00			
		.00	-101388.12	-1946651.94				
		3.20	-101388.12	-2271093.93				
		3.20			.00			
8								
1		.00			.00			
		.00	-668814.41	4822256.48				
		3.20	-668814.41	2682050.38				
		3.20			.00			

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
	2	.00			.00			
		.00	-148299.04	-3321898.59				
		3.20	-148299.04	-3796455.53				
		3.20			.00			
	3	.00			.00			
		.00	-844352.05	890213.26				
		3.20	-844352.05	-1811713.31				
		3.20			.00			
	4	.00			.00			
		.00	-101388.12	-2271093.93				
		3.20	-101388.12	-2595535.92				
		3.20			.00			
9								
1		.00			.00			
		.00	-791345.41	2682050.38				
		3.20	-791345.41	149745.08				
		3.20			.00			
2		.00			.00			
		.00	-148299.04	-3796455.53				
		3.20	-148299.04	-4271012.47				
		3.20			.00			
3		.00			.00			
		.00	-966883.05	-1811713.31				
		3.20	-966883.05	-4905739.07				
		3.20			.00			
4		.00			.00			
		.00	-101388.12	-2595535.92				
		3.20	-101388.12	-2919977.91				
		3.20			.00			
10								
1		.00			.00			
		.00	-823689.41	149745.08				
		3.20	-823689.41	-2486061.03				
		3.20			.00			
2		.00			.00			
		.00	-148299.04	-4271012.47				
		3.20	-148299.04	-4745569.41				
		3.20			.00			
3		.00			.00			
		.00	-999227.05	-4905739.07				
		3.20	-999227.05	-8103265.64				

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
		3.20			.00			
	4	.00			.00			
		.00	-101388.12	-2919977.91				
		3.20	-101388.12	-3244419.90				
		3.20			.00			
11		----------						
	1	.00			.00			
		.00	-20018.35	-2486061.03				
		4.00	-20018.35	-2566134.42				
		4.00			.00			
	2	.00			.00			
		.00	787523.73	-4745569.41				
		4.00	787523.73	-1595474.48				
		4.00			.00			
	3	.00			.00			
		.00	867743.43	-8103265.64				
		4.00	867743.43	-4632291.91				
		4.00			.00			
	4	.00			.00			
		.00	614891.54	-3244419.90				
		4.00	614891.54	-784853.75				
		4.00			.00			
12		----------						
	1	.00			.00			
		.00	-20018.35	-2566134.42				
		4.00	-20018.35	-2646207.81				
		4.00			.00			
	2	.00			.00			
		.00	787523.73	-1595474.48				
		4.00	787523.73	1554620.45				
		4.00			.00			
	3	.00			.00			
		.00	867743.43	-4632291.91				
		4.00	867743.43	-1161318.18				
		4.00			.00			
	4	.00			.00			
		.00	614891.54	-784853.75				
		4.00	614891.54	1674712.41				
		4.00			.00			
13		----------						
	1	.00			.00			

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
		.00	-20018.35	-2646207.81				
		4.00	-20018.35	-2726281.21				
		4.00			.00			
	2	.00			.00			
		.00	706448.73	1554620.45				
		4.00	706448.73	4380415.38				
		4.00			.00			
	3	.00			.00			
		.00	786668.43	-1161318.18				
		4.00	786668.43	1985355.54				
		4.00			.00			
	4	.00			.00			
		.00	533816.54	1674712.41				
		4.00	533816.54	3809978.56				
		4.00			.00			
14		----------						
	1	.00			.00			
		.00	-20018.35	-2726281.21				
		4.00	-20018.35	-2806354.60				
		4.00			.00			
	2	.00			.00			
		.00	506423.73	4380415.38				
		4.00	506423.73	6406110.31				
		4.00			.00			
	3	.00			.00			
		.00	586643.43	1985355.54				
		4.00	586643.43	4331929.27				
		4.00			.00			
	4	.00			.00			
		.00	333791.54	3809978.56				
		4.00	333791.54	5145144.72				
		4.00			.00			
15		----------						
	1	.00			.00			
		.00	-20018.35	-2806354.60				
		4.00	-20018.35	-2886428.00				
		4.00			.00			
	2	.00			.00			
		.00	193423.73	6406110.31				
		4.00	193423.73	7179805.24				
		4.00			.00			

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
	3	.00			.00			
		.00	273643.43	4331929.27				
		4.00	273643.43	5426503.00				
		4.00			.00			
	4	.00			.00			
		.00	20791.54	5145144.72				
		4.00	20791.54	5228310.88				
		4.00			.00			
16								
	1	.00			.00			
		.00	-20018.35	-2886428.00				
		4.00	-20018.35	-2966501.39				
		4.00			.00			
	2	.00			.00			
		.00	-110376.27	7179805.24				
		4.00	-110376.27	6738300.16				
		4.00			.00			
	3	.00			.00			
		.00	-30156.57	5426503.00				
		4.00	-30156.57	5305876.72				
		4.00			.00			
	4	.00			.00			
		.00	-283008.46	5228310.88				
		4.00	-283008.46	4096277.03				
		4.00			.00			
17								
	1	.00			.00			
		.00	-20018.35	-2966501.39				
		4.00	-20018.35	-3046574.78				
		4.00			.00			
	2	.00			.00			
		.00	-423376.27	6738300.16				
		4.00	-423376.27	5044795.09				
		4.00			.00			
	3	.00			.00			
		.00	-343156.57	5305876.72				
		4.00	-343156.57	3933250.45				
		4.00			.00			
	4	.00			.00			
		.00	-596008.46	4096277.03				
		4.00	-596008.46	1712243.19				

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
		4.00			.00			
18								
	1	.00			.00			
		.00	-20018.35	-3046574.78				
		4.00	-20018.35	-3126648.18				
		4.00			.00			
	2	.00			.00			
		.00	-623401.27	5044795.09				
		4.00	-623401.27	2551190.02				
		4.00			.00			
	3	.00			.00			
		.00	-543181.57	3933250.45				
		4.00	-543181.57	1760524.18				
		4.00			.00			
	4	.00			.00			
		.00	-796033.46	1712243.19				
		4.00	-796033.46	-1471890.66				
		4.00			.00			
19								
	1	.00			.00			
		.00	-20018.35	-3126648.18				
		4.00	-20018.35	-3206721.57				
		4.00			.00			
	2	.00			.00			
		.00	-704476.27	2551190.02				
		4.00	-704476.27	-266715.05				
		4.00			.00			
	3	.00			.00			
		.00	-624256.57	1760524.18				
		4.00	-624256.57	-736502.10				
		4.00			.00			
	4	.00			.00			
		.00	-877108.46	-1471890.66				
		4.00	-877108.46	-4980324.50				
		4.00			.00			
20								
	1	.00			.00			
		.00	-20018.35	-3206721.57				
		4.00	-20018.35	-3286794.97				
		4.00			.00			
	2	.00			.00			

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
		.00	-704476.27	-266715.05				
		4.00	-704476.27	-3084620.12				
		4.00			.00			
	3	.00			.00			
		.00	-624256.57	-736502.10				
		4.00	-624256.57	-3233528.37				
		4.00			.00			
	4	.00			.00			
		.00	-877108.46	-4980324.50				
		4.00	-877108.46	-8488758.35				
		4.00			.00			
21	----------							
	1	.00			.00			
		.00	714784.15	-3286794.97				
		4.00	714784.15	-427658.38				
		4.00			.00			
	2	.00			.00			
		.00	.00	-3084620.12				
		4.00	.00	-3084620.12				
		4.00			.00			
	3	.00			.00			
		.00	102555.94	-3233528.37				
		4.00	102555.94	-2823304.62				
		4.00			.00			
	4	.00			.00			
		.00	879771.79	-8488758.35				
		4.00	879771.79	-4969671.18				
		4.00			.00			
22	----------							
	1	.00			.00			
		.00	714784.15	-427658.38				
		4.00	714784.15	2431478.21				
		4.00			.00			
	2	.00			.00			
		.00	.00	-3084620.12				
		4.00	.00	-3084620.12				
		4.00			.00			
	3	.00			.00			
		.00	102555.94	-2823304.62				
		4.00	102555.94	-2413080.87				
		4.00			.00			

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
	4	.00			.00			
		.00	879771.79	-4969671.18				
		4.00	879771.79	-1450584.02				
		4.00			.00			
23	----------							
	1	.00			.00			
		.00	633709.15	2431478.21				
		4.00	633709.15	4966314.79				
		4.00			.00			
	2	.00			.00			
		.00	.00	-3084620.12				
		4.00	.00	-3084620.12				
		4.00			.00			
	3	.00			.00			
		.00	102555.94	-2413080.87				
		4.00	102555.94	-2002857.12				
		4.00			.00			
	4	.00			.00			
		.00	798696.79	-1450584.02				
		4.00	798696.79	1744203.14				
		4.00			.00			
24	----------							
	1	.00			.00			
		.00	433684.15	4966314.79				
		4.00	433684.15	6701051.38				
		4.00			.00			
	2	.00			.00			
		.00	.00	-3084620.12				
		4.00	.00	-3084620.12				
		4.00			.00			
	3	.00			.00			
		.00	102555.94	-2002857.12				
		4.00	102555.94	-1592633.38				
		4.00			.00			
	4	.00			.00			
		.00	598671.79	1744203.14				
		4.00	598671.79	4138890.31				
		4.00			.00			
25	----------							
	1	.00			.00			
		.00	120684.15	6701051.38				

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
		4.00	120684.15	7183787.96				
		4.00			.00			
	2	.00			.00			
		.00	.00	-3084620.12				
		4.00	.00	-3084620.12				
		4.00			.00			
	3	.00			.00			
		.00	102555.94	-1592633.38				
		4.00	102555.94	-1182409.63				
		4.00			.00			
	4	.00			.00			
		.00	285671.79	4138890.31				
		4.00	285671.79	5281577.47				
		4.00			.00			
26								
	1	.00			.00			
		.00	-183115.85	7183787.96				
		4.00	-183115.85	6451324.55				
		4.00			.00			
	2	.00			.00			
		.00	.00	-3084620.12				
		4.00	.00	-3084620.12				
		4.00			.00			
	3	.00			.00			
		.00	102555.94	-1182409.63				
		4.00	102555.94	-772185.88				
		4.00			.00			
	4	.00			.00			
		.00	-18128.21	5281577.47				
		4.00	-18128.21	5209064.63				
		4.00			.00			
27								
	1	.00			.00			
		.00	-496115.85	6451324.55				
		4.00	-496115.85	4466861.13				
		4.00			.00			
	2	.00			.00			
		.00	.00	-3084620.12				
		4.00	.00	-3084620.12				
		4.00			.00			
	3	.00			.00			

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
		.00	102555.94	-772185.88				
		4.00	102555.94	-361962.13				
		4.00			.00			
	4	.00			.00			
		.00	-331128.21	5209064.63				
		4.00	-331128.21	3884551.80				
		4.00			.00			
28								
	1	.00			.00			
		.00	-696140.85	4466861.13				
		4.00	-696140.85	1682297.72				
		4.00			.00			
	2	.00			.00			
		.00	.00	-3084620.12				
		4.00	.00	-3084620.12				
		4.00			.00			
	3	.00			.00			
		.00	102555.94	-361962.13				
		4.00	102555.94	48261.62				
		4.00			.00			
	4	.00			.00			
		.00	-531153.21	3884551.80				
		4.00	-531153.21	1759938.96				
		4.00			.00			
29								
	1	.00			.00			
		.00	-777215.85	1682297.72				
		4.00	-777215.85	-1426565.70				
		4.00			.00			
	2	.00			.00			
		.00	.00	-3084620.12				
		4.00	.00	-3084620.12				
		4.00			.00			
	3	.00			.00			
		.00	102555.94	48261.62				
		4.00	102555.94	458485.37				
		4.00			.00			
	4	.00			.00			
		.00	-612228.21	1759938.96				
		4.00	-612228.21	-688973.88				
		4.00			.00			

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
30								
	1	.00			.00			
		.00	-777215.85	-1426565.70				
		4.00	-777215.85	-4535429.11				
		4.00			.00			
	2	.00			.00			
		.00	.00	-3084620.12				
		4.00	.00	-3084620.12				
		4.00			.00			
	3	.00			.00			
		.00	102555.94	458485.37				
		4.00	102555.94	868709.11				
		4.00			.00			
	4	.00			.00			
		.00	-612228.21	-688973.88				
		4.00	-612228.21	-3137886.71				
		4.00			.00			
31								
	1	.00			.00			
		.00	144881.76	-4535429.11				
		4.00	144881.76	-3955902.06				
		4.00			.00			
	2	.00			.00			
		.00	704476.27	-3084620.12				
		4.00	704476.27	-266715.05				
		4.00			.00			
	3	.00			.00			
		.00	-27750.43	868709.11				
		4.00	-27750.43	757707.39				
		4.00			.00			
	4	.00			.00			
		.00	100238.05	-3137886.71				
		4.00	100238.05	-2736934.52				
		4.00			.00			
32								
	1	.00			.00			
		.00	144881.76	-3955902.06				
		4.00	144881.76	-3376375.01				
		4.00			.00			
	2	.00			.00			
		.00	704476.27	-266715.05				

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
		4.00	704476.27	2551190.02				
		4.00			.00			
	3	.00			.00			
		.00	-27750.43	757707.39				
		4.00	-27750.43	646705.67				
		4.00			.00			
	4	.00			.00			
		.00	100238.05	-2736934.52				
		4.00	100238.05	-2335982.33				
		4.00			.00			
33								
	1	.00			.00			
		.00	144881.76	-3376375.01				
		4.00	144881.76	-2796847.95				
		4.00			.00			
	2	.00			.00			
		.00	623401.27	2551190.02				
		4.00	623401.27	5044795.09				
		4.00			.00			
	3	.00			.00			
		.00	-27750.43	646705.67				
		4.00	-27750.43	535703.95				
		4.00			.00			
	4	.00			.00			
		.00	100238.05	-2335982.33				
		4.00	100238.05	-1935030.14				
		4.00			.00			
34								
	1	.00			.00			
		.00	144881.76	-2796847.95				
		4.00	144881.76	-2217320.90				
		4.00			.00			
	2	.00			.00			
		.00	423376.27	5044795.09				
		4.00	423376.27	6738300.16				
		4.00			.00			
	3	.00			.00			
		.00	-27750.43	535703.95				
		4.00	-27750.43	424702.23				
		4.00			.00			
	4	.00			.00			

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
		.00	100238.05	-1935030.14				
		4.00	100238.05	-1534077.95				
		4.00			.00			
35								
	1	.00			.00			
		.00	144881.76	-2217320.90				
		4.00	144881.76	-1637793.85				
		4.00			.00			
	2	.00			.00			
		.00	110376.27	6738300.16				
		4.00	110376.27	7179805.24				
		4.00			.00			
	3	.00			.00			
		.00	-27750.43	424702.23				
		4.00	-27750.43	313700.51				
		4.00			.00			
	4	.00			.00			
		.00	100238.05	-1534077.95				
		4.00	100238.05	-1133125.76				
		4.00			.00			
36								
	1	.00			.00			
		.00	144881.76	-1637793.85				
		4.00	144881.76	-1058266.79				
		4.00			.00			
	2	.00			.00			
		.00	-193423.73	7179805.24				
		4.00	-193423.73	6406110.31				
		4.00			.00			
	3	.00			.00			
		.00	-27750.43	313700.51				
		4.00	-27750.43	202698.79				
		4.00			.00			
	4	.00			.00			
		.00	100238.05	-1133125.76				
		4.00	100238.05	-732173.57				
		4.00			.00			
37								
	1	.00			.00			
		.00	144881.76	-1058266.79				
		4.00	144881.76	-478739.74				
		4.00			.00			

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
	2	.00			.00			
		.00	-506423.73	6406110.31				
		4.00	-506423.73	4380415.38				
		4.00			.00			
	3	.00			.00			
		.00	-27750.43	202698.79				
		4.00	-27750.43	91697.07				
		4.00			.00			
	4	.00			.00			
		.00	100238.05	-732173.57				
		4.00	100238.05	-331221.38				
		4.00			.00			
38								
	1	.00			.00			
		.00	144881.76	-478739.74				
		4.00	144881.76	100787.31				
		4.00			.00			
	2	.00			.00			
		.00	-706448.73	4380415.38				
		4.00	-706448.73	1554620.45				
		4.00			.00			
	3	.00			.00			
		.00	-27750.43	91697.07				
		4.00	-27750.43	-19304.65				
		4.00			.00			
	4	.00			.00			
		.00	100238.05	-331221.38				
		4.00	100238.05	69730.82				
		4.00			.00			
39								
	1	.00			.00			
		.00	144881.76	100787.31				
		4.00	144881.76	680314.37				
		4.00			.00			
	2	.00			.00			
		.00	-787523.73	1554620.45				
		4.00	-787523.73	-1595474.48				
		4.00			.00			
	3	.00			.00			
		.00	-27750.43	-19304.65				
		4.00	-27750.43	-130306.37				

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
		4.00			.00			
	4	.00			.00			
		.00	100238.05	69730.82				
		4.00	100238.05	470683.01				
		4.00			.00			
40	----------							
	1	.00			.00			
		.00	144881.76	680314.37				
		4.00	144881.76	1259841.42				
		4.00			.00			
	2	.00			.00			
		.00	-787523.73	-1595474.48				
		4.00	-787523.73	-4745569.41				
		4.00			.00			
	3	.00			.00			
		.00	-27750.43	-130306.37				
		4.00	-27750.43	-241308.09				
		4.00			.00			
	4	.00			.00			
		.00	100238.05	470683.01				
		4.00	100238.05	871635.20				
		4.00			.00			
41	----------							
	1	.00			.00			
		.00	-39370.04	1259841.42				
		3.20	-39370.04	1133857.28				
		3.20			.00			
	2	.00			.00			
		.00	148299.04	-4745569.41				
		3.20	148299.04	-4271012.47				
		3.20			.00			
	3	.00			.00			
		.00	7540.88	-241308.09				
		3.20	7540.88	-217177.28				
		3.20			.00			
	4	.00			.00			
		.00	-27238.60	871635.20				
		3.20	-27238.60	784471.68				
		3.20			.00			
42	----------							
	1	.00			.00			

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
		.00	-39370.04	1133857.28				
		3.20	-39370.04	1007873.14				
		3.20			.00			
	2	.00			.00			
		.00	148299.04	-4271012.47				
		3.20	148299.04	-3796455.53				
		3.20			.00			
	3	.00			.00			
		.00	7540.88	-217177.28				
		3.20	7540.88	-193046.47				
		3.20			.00			
	4	.00			.00			
		.00	-27238.60	784471.68				
		3.20	-27238.60	697308.16				
		3.20			.00			
43	----------							
	1	.00			.00			
		.00	-39370.04	1007873.14				
		3.20	-39370.04	881888.99				
		3.20			.00			
	2	.00			.00			
		.00	148299.04	-3796455.53				
		3.20	148299.04	-3321898.59				
		3.20			.00			
	3	.00			.00			
		.00	7540.88	-193046.47				
		3.20	7540.88	-168915.66				
		3.20			.00			
	4	.00			.00			
		.00	-27238.60	697308.16				
		3.20	-27238.60	610144.64				
		3.20			.00			
44	----------							
	1	.00			.00			
		.00	-39370.04	881888.99				
		3.20	-39370.04	755904.85				
		3.20			.00			
	2	.00			.00			
		.00	148299.04	-3321898.59				
		3.20	148299.04	-2847341.65				
		3.20			.00			

F R A M E E L E M E N T F O R C E S

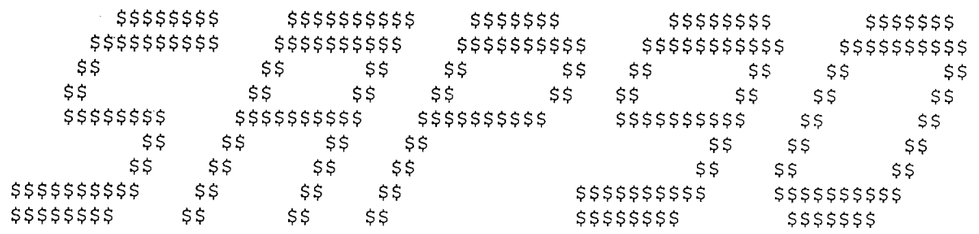
ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
	3	.00			.00			
		.00	7540.88	-168915.66				
		3.20	7540.88	-144784.85				
		3.20			.00			
	4	.00			.00			
		.00	-27238.60	610144.64				
		3.20	-27238.60	522981.12				
		3.20			.00			
45								
	1	.00			.00			
		.00	-39370.04	755904.85				
		3.20	-39370.04	629920.71				
		3.20			.00			
	2	.00			.00			
		.00	148299.04	-2847341.65				
		3.20	148299.04	-2372784.71				
		3.20			.00			
	3	.00			.00			
		.00	7540.88	-144784.85				
		3.20	7540.88	-120654.04				
		3.20			.00			
	4	.00			.00			
		.00	-27238.60	522981.12				
		3.20	-27238.60	435817.60				
		3.20			.00			
46								
	1	.00			.00			
		.00	-39370.04	629920.71				
		3.20	-39370.04	503936.57				
		3.20			.00			
	2	.00			.00			
		.00	148299.04	-2372784.71				
		3.20	148299.04	-1898227.76				
		3.20			.00			
	3	.00			.00			
		.00	7540.88	-120654.04				
		3.20	7540.88	-96523.23				
		3.20			.00			
	4	.00			.00			
		.00	-27238.60	435817.60				
		3.20	-27238.60	348654.08				

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
		3.20			.00			
47								
	1	.00			.00			
		.00	-39370.04	503936.57				
		3.20	-39370.04	377952.43				
		3.20			.00			
	2	.00			.00			
		.00	148299.04	-1898227.76				
		3.20	148299.04	-1423670.82				
		3.20			.00			
	3	.00			.00			
		.00	7540.88	-96523.23				
		3.20	7540.88	-72392.43				
		3.20			.00			
	4	.00			.00			
		.00	-27238.60	348654.08				
		3.20	-27238.60	261490.56				
		3.20			.00			
48								
	1	.00			.00			
		.00	-39370.04	377952.43				
		3.20	-39370.04	251968.28				
		3.20			.00			
	2	.00			.00			
		.00	148299.04	-1423670.82				
		3.20	148299.04	-949113.88				
		3.20			.00			
	3	.00			.00			
		.00	7540.88	-72392.43				
		3.20	7540.88	-48261.62				
		3.20			.00			
	4	.00			.00			
		.00	-27238.60	261490.56				
		3.20	-27238.60	174327.04				
		3.20			.00			
49								
	1	.00			.00			
		.00	-39370.04	251968.28				
		3.20	-39370.04	125984.14				
		3.20			.00			
	2	.00			.00			

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
		.00	148299.04	-949113.88				
		3.20	148299.04	-474556.94				
		3.20			.00			
	3	.00			.00			
		.00	7540.88	-48261.62				
		3.20	7540.88	-24130.81				
		3.20			.00			
	4	.00			.00			
		.00	-27238.60	174327.04				
		3.20	-27238.60	87163.52				
		3.20			.00			
50	----------							
	1	.00			.00			
		.00	-39370.04	125984.14				
		3.20	-39370.04	.00				
		3.20			.00			
	2	.00			.00			
		.00	148299.04	-474556.94				
		3.20	148299.04	.00				
		3.20			.00			
	3	.00			.00			
		.00	7540.88	-24130.81				
		3.20	7540.88	.00				
		3.20			.00			
	4	.00			.00			
		.00	-27238.60	87163.52				
		3.20	-27238.60	.00				
		3.20			.00			



STRUCTURAL ANALYSIS PROGRAMS

VERSION 5.30

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V FRANCOLI. LAV MADRID-BARCELONA-F.FRANCESA. LLEIDA-MARTORELL. UD: N-m

M O D E S H A P E S

MODE SHAPE NUMBER 1 PERIOD = .250296 SECONDS

DISPLACEMENTS "U" AND ROTATIONS "R"

JOINT	U(X)	U(Y)	U(Z)	R(X)	R(Y)	R(Z)
1	.0000E+00	.0000E+00	.0000E+00	.0000E+00	-.3119E-04	.6452E-09
2	.0000E+00	.2037E-08	.9847E-04	.0000E+00	-.2994E-04	.6194E-09
3	.0000E+00	.3911E-08	.1891E-03	.0000E+00	-.2630E-04	.5437E-09
4	.0000E+00	.5468E-08	.2644E-03	.0000E+00	-.2046E-04	.4225E-09
5	.0000E+00	.6574E-08	.3180E-03	.0000E+00	-.1277E-04	.2632E-09
6	.0000E+00	.7122E-08	.3447E-03	.0000E+00	-.3680E-05	.7498E-10
7	.0000E+00	.7035E-08	.3406E-03	.0000E+00	.6310E-05	-.1316E-09
8	.0000E+00	.6272E-08	.3039E-03	.0000E+00	.1668E-04	-.3456E-09
9	.0000E+00	.4825E-08	.2340E-03	.0000E+00	.2694E-04	-.5569E-09
10	.0000E+00	.2719E-08	.1320E-03	.0000E+00	.3669E-04	-.7568E-09
11	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.4564E-04	-.9396E-09
12	.0000E+00	-.4074E-08	-.1981E-03	.0000E+00	.5201E-04	-.1068E-08
13	-.1252E-11	-.8320E-08	-.4051E-03	.0000E+00	.5012E-04	-.1027E-08
14	-.1740E-11	-.1209E-07	-.5893E-03	.0000E+00	.4088E-04	-.8352E-09
15	-.2072E-11	-.1484E-07	-.7243E-03	.0000E+00	.2577E-04	-.5230E-09
16	-.2208E-11	-.1617E-07	-.7902E-03	.0000E+00	.6713E-05	-.1310E-09
17	-.2129E-11	-.1585E-07	-.7757E-03	.0000E+00	-.1403E-04	.2940E-09
18	-.1833E-11	-.1384E-07	-.6788E-03	.0000E+00	-.3414E-04	.7038E-09
19	-.1345E-11	-.1030E-07	-.5063E-03	.0000E+00	-.5146E-04	.1054E-08
20	.0000E+00	-.5537E-08	-.2732E-03	.0000E+00	-.6424E-04	.1307E-08
21	.0000E+00	.0000E+00	.0000E+00	.0000E+00	-.7132E-04	.1440E-08
22	.0000E+00	.5780E-08	.2874E-03	.0000E+00	-.7088E-04	.1420E-08
23	-.1191E-11	.1114E-07	.5557E-03	.0000E+00	-.6194E-04	.1232E-08
24	-.1621E-11	.1545E-07	.7732E-03	.0000E+00	-.4575E-04	.9018E-09
25	-.1877E-11	.1822E-07	.9146E-03	.0000E+00	-.2427E-04	.4685E-09
26	-.1940E-11	.1913E-07	.9636E-03	.0000E+00	-.1113E-08	-.1670E-10
27	-.1814E-11	.1809E-07	.9146E-03	.0000E+00	.2426E-04	-.4976E-09
28	-.1518E-11	.1523E-07	.7732E-03	.0000E+00	.4575E-04	-.9182E-09
29	-.1089E-11	.1089E-07	.5557E-03	.0000E+00	.6194E-04	-.1229E-08
30	.0000E+00	.5596E-08	.2874E-03	.0000E+00	.7088E-04	-.1390E-08
31	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.7132E-04	-.1378E-08
32	.0000E+00	-.5232E-08	-.2732E-03	.0000E+00	.6424E-04	-.1220E-08
33	.0000E+00	-.9630E-08	-.5063E-03	.0000E+00	.5146E-04	-.9632E-09
34	.0000E+00	-.1283E-07	-.6788E-03	.0000E+00	.3414E-04	-.6277E-09
35	.0000E+00	-.1459E-07	-.7757E-03	.0000E+00	.1403E-04	-.2462E-09
36	.0000E+00	-.1479E-07	-.7902E-03	.0000E+00	-.6710E-05	.1416E-09
37	.0000E+00	-.1351E-07	-.7243E-03	.0000E+00	-.2576E-04	.4936E-09
38	.0000E+00	-.1095E-07	-.5893E-03	.0000E+00	-.4088E-04	.7696E-09
39	.0000E+00	-.7497E-08	-.4051E-03	.0000E+00	-.5012E-04	.9346E-09
40	.0000E+00	-.3653E-08	-.1982E-03	.0000E+00	-.5201E-04	.9626E-09
41	.0000E+00	.0000E+00	.0000E+00	.0000E+00	-.4565E-04	.8376E-09
42	.0000E+00	.2412E-08	.1320E-03	.0000E+00	-.3669E-04	.6678E-09
43	.0000E+00	.4261E-08	.2340E-03	.0000E+00	-.2694E-04	.4862E-09
44	.0000E+00	.5517E-08	.3039E-03	.0000E+00	-.1668E-04	.2978E-09
45	.0000E+00	.6167E-08	.3406E-03	.0000E+00	-.6309E-05	.1094E-09
46	.0000E+00	.6226E-08	.3447E-03	.0000E+00	.3681E-05	-.7053E-10
47	.0000E+00	.5734E-08	.3180E-03	.0000E+00	.1277E-04	-.2332E-09
48	.0000E+00	.4761E-08	.2644E-03	.0000E+00	.2046E-04	-.3701E-09

V FRANCOLI. LAV MADRID-BARCELONA-F.FRANCESA. LLEIDA-MARTORELL. UD: N-m

M O D E S H A P E S

MODE SHAPE NUMBER 1 PERIOD = .250296 SECONDS

DISPLACEMENTS "U" AND ROTATIONS "R"

JOINT	U(X)	U(Y)	U(Z)	R(X)	R(Y)	R(Z)
49	.0000E+00	.3401E-08	.1891E-03	.0000E+00	.2629E-04	-.4738E-09
50	.0000E+00	.1770E-08	.9847E-04	.0000E+00	.2994E-04	-.5385E-09
51	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.3119E-04	-.5605E-09

V FRANCOLI. LAV MADRID-BARCELONA-F.FRANCESA. LLEIDA-MARTORELL. UD: N-m

M O D E S H A P E S

MODE SHAPE NUMBER 2 PERIOD = .200192 SECONDS

DISPLACEMENTS "U" AND ROTATIONS "R"

JOINT	U(X)	U(Y)	U(Z)	R(X)	R(Y)	R(Z)
1	.0000E+00	.0000E+00	.0000E+00	.0000E+00	-.5896E-04	.1369E-08
2	.0000E+00	.4313E-08	.1859E-03	.0000E+00	-.5631E-04	.1306E-08
3	.0000E+00	.8234E-08	.3550E-03	.0000E+00	-.4857E-04	.1125E-08
4	.1362E-11	.1140E-07	.4919E-03	.0000E+00	-.3638E-04	.8403E-09
5	.1600E-11	.1353E-07	.5841E-03	.0000E+00	-.2076E-04	.4756E-09
6	.1682E-11	.1440E-07	.6225E-03	.0000E+00	-.2964E-05	.6151E-10
7	.1600E-11	.1390E-07	.6023E-03	.0000E+00	.1556E-04	-.3678E-09
8	.1360E-11	.1206E-07	.5237E-03	.0000E+00	.3337E-04	-.7779E-09
9	.0000E+00	.8981E-08	.3910E-03	.0000E+00	.4912E-04	-.1137E-08
10	.0000E+00	.4869E-08	.2126E-03	.0000E+00	.6173E-04	-.1419E-08
11	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.7049E-04	-.1607E-08
12	-.4188E-11	-.6592E-08	-.2906E-03	.0000E+00	.7279E-04	-.1643E-08
13	-.7965E-11	-.1280E-07	-.5670E-03	.0000E+00	.6362E-04	-.1420E-08
14	-.1096E-10	-.1767E-07	-.7870E-03	.0000E+00	.4497E-04	-.9844E-09
15	-.1288E-10	-.2049E-07	-.9183E-03	.0000E+00	.1997E-04	-.4103E-09
16	-.1353E-10	-.2089E-07	-.9435E-03	.0000E+00	-.7425E-05	.2101E-09
17	-.1286E-10	-.1888E-07	-.8615E-03	.0000E+00	-.3291E-04	.7765E-09
18	-.1094E-10	-.1488E-07	-.6884E-03	.0000E+00	-.5229E-04	.1192E-08
19	-.7943E-11	-.9655E-08	-.4561E-03	.0000E+00	-.6198E-04	.1374E-08
20	-.4174E-11	-.4278E-08	-.2090E-03	.0000E+00	-.5933E-04	.1262E-08
21	.0000E+00	.0000E+00	.0000E+00	.0000E+00	-.4280E-04	.8208E-09
22	.0000E+00	.2140E-08	.1261E-03	.0000E+00	-.2081E-04	.2689E-09
23	.0000E+00	.2316E-08	.1714E-03	.0000E+00	-.2541E-05	-.1595E-09
24	.0000E+00	.1047E-08	.1523E-03	.0000E+00	.1131E-04	-.4512E-09
25	.0000E+00	-.1095E-08	.8786E-04	.0000E+00	.1999E-04	-.5940E-09
26	.0000E+00	-.3500E-08	-.3142E-08	.0000E+00	.2295E-04	-.5823E-09
27	.0000E+00	-.5553E-08	-.8786E-04	.0000E+00	.1999E-04	-.4203E-09
28	.0000E+00	-.6681E-08	-.1523E-03	.0000E+00	.1131E-04	-.1226E-09
29	.0000E+00	-.6383E-08	-.1714E-03	.0000E+00	-.2542E-05	.2884E-09
30	.0000E+00	-.4257E-08	-.1261E-03	.0000E+00	-.2081E-04	.7869E-09
31	.0000E+00	.0000E+00	.0000E+00	.0000E+00	-.4280E-04	.1351E-08
32	.4608E-11	.6330E-08	.2090E-03	.0000E+00	-.5933E-04	.1749E-08
33	.8773E-11	.1349E-07	.4561E-03	.0000E+00	-.6198E-04	.1771E-08
34	.1209E-10	.2006E-07	.6884E-03	.0000E+00	-.5229E-04	.1462E-08
35	.1425E-10	.2484E-07	.8615E-03	.0000E+00	-.3291E-04	.8936E-09
36	.1501E-10	.2700E-07	.9435E-03	.0000E+00	-.7428E-05	.1670E-09
37	.1431E-10	.2612E-07	.9184E-03	.0000E+00	.1997E-04	-.6030E-09
38	.1219E-10	.2227E-07	.7870E-03	.0000E+00	.4497E-04	-.1298E-08
39	.8871E-11	.1598E-07	.5671E-03	.0000E+00	.6363E-04	-.1809E-08
40	.4668E-11	.8158E-08	.2906E-03	.0000E+00	.7279E-04	-.2051E-08
41	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.7049E-04	-.1970E-08
42	.0000E+00	-.5925E-08	-.2126E-03	.0000E+00	.6173E-04	-.1715E-08
43	.0000E+00	-.1086E-07	-.3910E-03	.0000E+00	.4912E-04	-.1357E-08
44	.0000E+00	-.1452E-07	-.5237E-03	.0000E+00	.3337E-04	-.9161E-09
45	.0000E+00	-.1667E-07	-.6023E-03	.0000E+00	.1556E-04	-.4223E-09
46	.0000E+00	-.1720E-07	-.6225E-03	.0000E+00	-.2965E-05	.8881E-10
47	.0000E+00	-.1613E-07	-.5841E-03	.0000E+00	-.2076E-04	.5780E-09
48	.0000E+00	-.1357E-07	-.4919E-03	.0000E+00	-.3638E-04	.1007E-08

V FRANCOLI. LAV MADRID-BARCELONA-F.FRANCESA. LLEIDA-MARTORELL. UD: N-m

M O D E S H A P E S

MODE SHAPE NUMBER 2 PERIOD = .200192 SECONDS

DISPLACEMENTS "U" AND ROTATIONS "R"

JOINT	U(X)	U(Y)	U(Z)	R(X)	R(Y)	R(Z)
49	.0000E+00	-.9785E-08	-.3549E-03	.0000E+00	-.4857E-04	.1340E-08
50	.0000E+00	-.5121E-08	-.1858E-03	.0000E+00	-.5631E-04	.1552E-08
51	.0000E+00	.0000E+00	.0000E+00	.0000E+00	-.5896E-04	.1625E-08

V FRANCOLI. LAV MADRID-BARCELONA-F.FRANCESA. LLEIDA-MARTORELL. UD: N-m

M O D E S H A P E S

MODE SHAPE NUMBER 3 PERIOD = .156559 SECONDS

DISPLACEMENTS "U" AND ROTATIONS "R"

JOINT	U(X)	U(Y)	U(Z)	R(X)	R(Y)	R(Z)
1	.0000E+00	.0000E+00	.0000E+00	.0000E+00	-.8345E-04	.3881E-08
2	.4942E-11	.1221E-07	.2623E-03	.0000E+00	-.7897E-04	.3690E-08
3	.9396E-11	.2323E-07	.4964E-03	.0000E+00	-.6605E-04	.3136E-08
4	.1292E-10	.3196E-07	.6775E-03	.0000E+00	-.4614E-04	.2275E-08
5	.1518E-10	.3755E-07	.7867E-03	.0000E+00	-.2154E-04	.1191E-08
6	.1594E-10	.3945E-07	.8134E-03	.0000E+00	.4928E-05	-.8862E-11
7	.1514E-10	.3749E-07	.7565E-03	.0000E+00	.3015E-04	-.1205E-08
8	.1287E-10	.3187E-07	.6250E-03	.0000E+00	.5108E-04	-.2282E-08
9	.9340E-11	.2313E-07	.4370E-03	.0000E+00	.6505E-04	-.3132E-08
10	.4908E-11	.1215E-07	.2183E-03	.0000E+00	.7000E-04	-.3674E-08
11	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.6464E-04	-.3856E-08
12	-.2209E-10	-.1506E-07	-.2285E-03	.0000E+00	.4876E-04	-.3586E-08
13	-.4198E-10	-.2805E-07	-.3846E-03	.0000E+00	.2876E-04	-.2839E-08
14	-.5770E-10	-.3729E-07	-.4562E-03	.0000E+00	.6977E-05	-.1732E-08
15	-.6771E-10	-.4166E-07	-.4423E-03	.0000E+00	-.1342E-04	-.4385E-09
16	-.7106E-10	-.4082E-07	-.3552E-03	.0000E+00	-.2902E-04	.8360E-09
17	-.6747E-10	-.3527E-07	-.2206E-03	.0000E+00	-.3679E-04	.1885E-08
18	-.5731E-10	-.2628E-07	-.7423E-04	.0000E+00	-.3457E-04	.2527E-08
19	-.4159E-10	-.1578E-07	.4118E-04	.0000E+00	-.2123E-04	.2621E-08
20	-.2185E-10	-.6152E-08	.8064E-04	.0000E+00	.3351E-05	.2085E-08
21	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.3871E-04	.8786E-09
22	-.3801E-10	.8083E-09	-.2207E-03	.0000E+00	.6778E-04	-.3789E-09
23	-.7231E-10	-.2281E-08	-.5126E-03	.0000E+00	.7461E-04	-.1074E-08
24	-.9953E-10	-.7090E-08	-.7917E-03	.0000E+00	.6200E-04	-.1250E-08
25	-.1170E-09	-.1171E-07	-.9892E-03	.0000E+00	.3487E-04	-.9990E-09
26	.000000	.000000	-.001060	.000000	.000000	.000000
27	-.1170E-09	-.1523E-07	-.9892E-03	.0000E+00	-.3489E-04	.1983E-09
28	-.9956E-10	-.1319E-07	-.7915E-03	.0000E+00	-.6200E-04	.7973E-09
29	-.7234E-10	-.9144E-08	-.5125E-03	.0000E+00	-.7461E-04	.1176E-08
30	-.3803E-10	-.4237E-08	-.2206E-03	.0000E+00	-.6776E-04	.1212E-08
31	.0000E+00	.0000E+00	.0000E+00	.0000E+00	-.3870E-04	.8332E-09
32	-.1205E-10	.2204E-08	.8058E-04	.0000E+00	-.3341E-05	.2854E-09
33	-.2294E-10	.2432E-08	.4111E-04	.0000E+00	.2123E-04	-.1505E-09
34	-.3161E-10	.1184E-08	-.7429E-04	.0000E+00	.3456E-04	-.4486E-09
35	-.3721E-10	-.9428E-09	-.2206E-03	.0000E+00	.3678E-04	-.5866E-09
36	-.3920E-10	-.3286E-08	-.3552E-03	.0000E+00	.2900E-04	-.5574E-09
37	-.3736E-10	-.5197E-08	-.4422E-03	.0000E+00	.1341E-04	-.3745E-09
38	-.3184E-10	-.6121E-08	-.4561E-03	.0000E+00	-.6976E-05	-.7088E-10
39	-.2318E-10	-.5665E-08	-.3845E-03	.0000E+00	-.2876E-04	.3071E-09
40	-.1220E-10	-.3630E-08	-.2284E-03	.0000E+00	-.4875E-04	.7104E-09
41	.0000E+00	.0000E+00	.0000E+00	.0000E+00	-.6464E-04	.1100E-08
42	.3180E-11	.3877E-08	.2183E-03	.0000E+00	-.6999E-04	.1285E-08
43	.6055E-11	.7987E-08	.4370E-03	.0000E+00	-.6505E-04	.1248E-08
44	.8349E-11	.1165E-07	.6250E-03	.0000E+00	-.5109E-04	.1014E-08
45	.9836E-11	.1431E-07	.7565E-03	.0000E+00	-.3015E-04	.6262E-09
46	.1037E-10	.1556E-07	.8134E-03	.0000E+00	-.4930E-05	.1391E-09
47	.9882E-11	.1517E-07	.7867E-03	.0000E+00	.2154E-04	-.3832E-09
48	.8423E-11	.1314E-07	.6776E-03	.0000E+00	.4614E-04	-.8752E-09

V FRANCOLI. LAV MADRID-BARCELONA-F.FRANCESA. LLEIDA-MARTORELL. UD: N-m

M O D E S H A P E S

MODE SHAPE NUMBER 3 PERIOD = .156559 SECONDS

DISPLACEMENTS "U" AND ROTATIONS "R"

JOINT	U(X)	U(Y)	U(Z)	R(X)	R(Y)	R(Z)
49	.6130E-11	.9662E-08	.4964E-03	.0000E+00	.6605E-04	-.1276E-08
50	.3226E-11	.5116E-08	.2623E-03	.0000E+00	.7898E-04	-.1538E-08
51	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.8346E-04	-.1629E-08

J O I N T D I S P L A C E M E N T S

LOAD COMBINATION 1 - DISPLACEMENTS "U" AND ROTATIONS "R"

JOINT	U(X)	U(Y)	U(Z)	R(X)	R(Y)	R(Z)
1	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.2360E-03	.0000E+00
2	.0000E+00	.0000E+00	-.7427E-03	.0000E+00	.2242E-03	.0000E+00
3	.000000	.000000	-.001410	.000000	.000189	.000000
4	.000000	.000000	-.001933	.000000	.000134	.000000
5	.000000	.000000	-.002253	.000000	.000064	.000000
6	.000000	.000000	-.002337	.000000	-.000011	.000000
7	.000000	.000000	-.002182	.000000	-.000084	.000000
8	.000000	.000000	-.001809	.000000	-.000146	.000000
9	.000000	.000000	-.001270	.000000	-.000187	.000000
10	.0000E+00	.0000E+00	-.6371E-03	.0000E+00	-.2031E-03	.0000E+00
11	.0000E+00	.0000E+00	.0000E+00	.0000E+00	-.1902E-03	.0000E+00
12	.0000E+00	.0000E+00	.6914E-03	.0000E+00	-.1553E-03	.0000E+00
13	.000000	.000000	.001241	.000000	-.000119	.000000
14	.000000	.000000	.001644	.000000	-.000082	.000000
15	.000000	.000000	.001897	.000000	-.000044	.000000
16	.000000	.000000	.001994	.000000	-.000005	.000000
17	.000000	.000000	.001932	.000000	.000036	.000000
18	.000000	.000000	.001706	.000000	.000077	.000000
19	.000000	.000000	.001312	.000000	.000120	.000000
20	.0000E+00	.0000E+00	.7445E-03	.0000E+00	.1638E-03	.0000E+00
21	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.2087E-03	.0000E+00
22	.0000E+00	.0000E+00	-.8991E-03	.0000E+00	.2343E-03	.0000E+00
23	.000000	.000000	-.001822	.000000	.000220	.000000
24	.000000	.000000	-.002613	.000000	.000169	.000000
25	.000000	.000000	-.003138	.000000	.000089	.000000
26	.000000	.000000	-.003303	.000000	-.000007	.000000
27	.000000	.000000	-.003082	.000000	-.000101	.000000
28	.000000	.000000	-.002517	.000000	-.000177	.000000
29	.000000	.000000	-.001711	.000000	-.000219	.000000
30	.0000E+00	.0000E+00	-.8163E-03	.0000E+00	-.2211E-03	.0000E+00
31	.0000E+00	.0000E+00	.0000E+00	.0000E+00	-.1799E-03	.0000E+00
32	.0000E+00	.0000E+00	.5996E-03	.0000E+00	-.1212E-03	.0000E+00
33	.0000E+00	.0000E+00	.9805E-03	.0000E+00	-.7057E-04	.0000E+00
34	.000000	.000000	.001175	.000000	-.000028	.000000
35	.000000	.000000	.001215	.000000	.000007	.000000
36	.000000	.000000	.001132	.000000	.000033	.000000
37	.0000E+00	.0000E+00	.9582E-03	.0000E+00	.5200E-04	.0000E+00
38	.0000E+00	.0000E+00	.7263E-03	.0000E+00	.6262E-04	.0000E+00
39	.0000E+00	.0000E+00	.4680E-03	.0000E+00	.6523E-04	.0000E+00
40	.0000E+00	.0000E+00	.2152E-03	.0000E+00	.5983E-04	.0000E+00
41	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.4643E-04	.0000E+00
42	.0000E+00	.0000E+00	-.1270E-03	.0000E+00	.3319E-04	.0000E+00
43	.0000E+00	.0000E+00	-.2139E-03	.0000E+00	.2136E-04	.0000E+00
44	.0000E+00	.0000E+00	-.2652E-03	.0000E+00	.1091E-04	.0000E+00
45	.0000E+00	.0000E+00	-.2852E-03	.0000E+00	.1857E-05	.0000E+00
46	.0000E+00	.0000E+00	-.2786E-03	.0000E+00	-.5803E-05	.0000E+00
47	.0000E+00	.0000E+00	-.2496E-03	.0000E+00	-.1207E-04	.0000E+00
48	.0000E+00	.0000E+00	-.2028E-03	.0000E+00	-.1695E-04	.0000E+00
49	.0000E+00	.0000E+00	-.1426E-03	.0000E+00	-.2043E-04	.0000E+00
50	.0000E+00	.0000E+00	-.7354E-04	.0000E+00	-.2252E-04	.0000E+00

J O I N T D I S P L A C E M E N T S

LOAD COMBINATION 1 - DISPLACEMENTS "U" AND ROTATIONS "R"

JOINT	U(X)	U(Y)	U(Z)	R(X)	R(Y)	R(Z)
51	.0000E+00	.0000E+00	.0000E+00	.0000E+00	-.2321E-04	.0000E+00

J O I N T D I S P L A C E M E N T S

LOAD COMBINATION 2 - DISPLACEMENTS "U" AND ROTATIONS "R"

JOINT	U(X)	U(Y)	U(Z)	R(X)	R(Y)	R(Z)
1	.0000E+00	.0000E+00	.0000E+00	.0000E+00	-.8744E-04	.0000E+00
2	.0000E+00	.0000E+00	.2770E-03	.0000E+00	-.8482E-04	.0000E+00
3	.0000E+00	.0000E+00	.5372E-03	.0000E+00	-.7695E-04	.0000E+00
4	.0000E+00	.0000E+00	.7639E-03	.0000E+00	-.6383E-04	.0000E+00
5	.0000E+00	.0000E+00	.9401E-03	.0000E+00	-.4547E-04	.0000E+00
6	.000000	.000000	.001049	.000000	-.000022	.000000
7	.000000	.000000	.001074	.000000	.000007	.000000
8	.0000E+00	.0000E+00	.9989E-03	.0000E+00	.4110E-04	.0000E+00
9	.0000E+00	.0000E+00	.8058E-03	.0000E+00	.8044E-04	.0000E+00
10	.0000E+00	.0000E+00	.4785E-03	.0000E+00	.1250E-03	.0000E+00
11	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.1749E-03	.0000E+00
12	.0000E+00	.0000E+00	-.8017E-03	.0000E+00	.2187E-03	.0000E+00
13	.000000	.000000	-.001691	.000000	.000219	.000000
14	.000000	.000000	-.002498	.000000	.000178	.000000
15	.000000	.000000	-.003071	.000000	.000103	.000000
16	.000000	.000000	-.003300	.000000	.000010	.000000
17	.000000	.000000	-.003144	.000000	-.000087	.000000
18	.000000	.000000	-.002627	.000000	-.000168	.000000
19	.000000	.000000	-.001838	.000000	-.000221	.000000
20	.0000E+00	.0000E+00	-.9118E-03	.0000E+00	-.2363E-03	.0000E+00
21	.0000E+00	.0000E+00	.0000E+00	.0000E+00	-.2131E-03	.0000E+00
22	.0000E+00	.0000E+00	.7673E-03	.0000E+00	-.1705E-03	.0000E+00
23	.000000	.000000	.001364	.000000	-.000128	.000000
24	.000000	.000000	.001790	.000000	-.000085	.000000
25	.000000	.000000	.002046	.000000	-.000043	.000000
26	.000000	.000000	.002131	.000000	.000000	.000000
27	.000000	.000000	.002046	.000000	.000043	.000000
28	.000000	.000000	.001790	.000000	.000085	.000000
29	.000000	.000000	.001364	.000000	.000128	.000000
30	.0000E+00	.0000E+00	.7673E-03	.0000E+00	.1705E-03	.0000E+00
31	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.2131E-03	.0000E+00
32	.0000E+00	.0000E+00	-.9118E-03	.0000E+00	.2363E-03	.0000E+00
33	.000000	.000000	-.001838	.000000	.000221	.000000
34	.000000	.000000	-.002627	.000000	.000168	.000000
35	.000000	.000000	-.003144	.000000	.000087	.000000
36	.000000	.000000	-.003300	.000000	-.000010	.000000
37	.000000	.000000	-.003071	.000000	-.000103	.000000
38	.000000	.000000	-.002498	.000000	-.000178	.000000
39	.000000	.000000	-.001691	.000000	-.000219	.000000
40	.0000E+00	.0000E+00	-.8017E-03	.0000E+00	-.2187E-03	.0000E+00
41	.0000E+00	.0000E+00	.0000E+00	.0000E+00	-.1749E-03	.0000E+00
42	.0000E+00	.0000E+00	.4785E-03	.0000E+00	-.1250E-03	.0000E+00
43	.0000E+00	.0000E+00	.8058E-03	.0000E+00	-.8044E-04	.0000E+00
44	.0000E+00	.0000E+00	.9989E-03	.0000E+00	-.4110E-04	.0000E+00
45	.000000	.000000	.001074	.000000	-.000007	.000000
46	.000000	.000000	.001049	.000000	.000022	.000000
47	.0000E+00	.0000E+00	.9401E-03	.0000E+00	.4547E-04	.0000E+00
48	.0000E+00	.0000E+00	.7639E-03	.0000E+00	.6383E-04	.0000E+00
49	.0000E+00	.0000E+00	.5372E-03	.0000E+00	.7695E-04	.0000E+00
50	.0000E+00	.0000E+00	.2770E-03	.0000E+00	.8482E-04	.0000E+00

J O I N T D I S P L A C E M E N T S

LOAD COMBINATION 2 - DISPLACEMENTS "U" AND ROTATIONS "R"

JOINT	U(X)	U(Y)	U(Z)	R(X)	R(Y)	R(Z)
51	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.8744E-04	.0000E+00

V FRANCOLI. LAV MADRID-BARCELONA-F.FRANCESA. LLEIDA-MARTORELL. UD: N-m

J O I N T D I S P L A C E M E N T S

LOAD COMBINATION 3 - DISPLACEMENTS "U" AND ROTATIONS "R"

JOINT	U(X)	U(Y)	U(Z)	R(X)	R(Y)	R(Z)
1	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.1325E-03	.0000E+00
2	.0000E+00	.0000E+00	-.4148E-03	.0000E+00	.1238E-03	.0000E+00
3	.0000E+00	.0000E+00	-.7744E-03	.0000E+00	.9823E-04	.0000E+00
4	.000000	.000000	-.001028	.000000	.000059	.000000
5	.000000	.000000	-.001140	.000000	.000010	.000000
6	.000000	.000000	-.001095	.000000	-.000037	.000000
7	.0000E+00	.0000E+00	-.9107E-03	.0000E+00	-.7610E-04	.0000E+00
8	.0000E+00	.0000E+00	-.6271E-03	.0000E+00	-.9735E-04	.0000E+00
9	.0000E+00	.0000E+00	-.3157E-03	.0000E+00	-.9226E-04	.0000E+00
10	.0000E+00	.0000E+00	-.7078E-04	.0000E+00	-.5513E-04	.0000E+00
11	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.1678E-04	.0000E+00
12	.0000E+00	.0000E+00	-.2591E-03	.0000E+00	.1048E-03	.0000E+00
13	.0000E+00	.0000E+00	-.7743E-03	.0000E+00	.1448E-03	.0000E+00
14	.000000	.000000	-.001357	.000000	.000139	.000000
15	.000000	.000000	-.001837	.000000	.000095	.000000
16	.000000	.000000	-.002089	.000000	.000028	.000000
17	.000000	.000000	-.002052	.000000	-.000046	.000000
18	.000000	.000000	-.001733	.000000	-.000110	.000000
19	.000000	.000000	-.001205	.000000	-.000149	.000000
20	.0000E+00	.0000E+00	-.5821E-03	.0000E+00	-.1564E-03	.0000E+00
21	.0000E+00	.0000E+00	.0000E+00	.0000E+00	-.1289E-03	.0000E+00
22	.0000E+00	.0000E+00	.4302E-03	.0000E+00	-.8709E-04	.0000E+00
23	.0000E+00	.0000E+00	.7043E-03	.0000E+00	-.5091E-04	.0000E+00
24	.0000E+00	.0000E+00	.8450E-03	.0000E+00	-.2040E-04	.0000E+00
25	.0000E+00	.0000E+00	.8750E-03	.0000E+00	.4446E-05	.0000E+00
26	.0000E+00	.0000E+00	.8170E-03	.0000E+00	.2362E-04	.0000E+00
27	.0000E+00	.0000E+00	.6936E-03	.0000E+00	.3713E-04	.0000E+00
28	.0000E+00	.0000E+00	.5275E-03	.0000E+00	.4496E-04	.0000E+00
29	.0000E+00	.0000E+00	.3415E-03	.0000E+00	.4713E-04	.0000E+00
30	.0000E+00	.0000E+00	.1581E-03	.0000E+00	.4363E-04	.0000E+00
31	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.3446E-04	.0000E+00
32	.0000E+00	.0000E+00	-.1148E-03	.0000E+00	.2322E-04	.0000E+00
33	.0000E+00	.0000E+00	-.1878E-03	.0000E+00	.1352E-04	.0000E+00
34	.0000E+00	.0000E+00	-.2250E-03	.0000E+00	.5347E-05	.0000E+00
35	.0000E+00	.0000E+00	-.2326E-03	.0000E+00	-.1289E-05	.0000E+00
36	.0000E+00	.0000E+00	-.2168E-03	.0000E+00	-.6391E-05	.0000E+00
37	.0000E+00	.0000E+00	-.1835E-03	.0000E+00	-.9960E-05	.0000E+00
38	.0000E+00	.0000E+00	-.1391E-03	.0000E+00	-.1199E-04	.0000E+00
39	.0000E+00	.0000E+00	-.8964E-04	.0000E+00	-.1249E-04	.0000E+00
40	.0000E+00	.0000E+00	-.4122E-04	.0000E+00	-.1146E-04	.0000E+00
41	.0000E+00	.0000E+00	.0000E+00	.0000E+00	-.8892E-05	.0000E+00
42	.0000E+00	.0000E+00	.2433E-04	.0000E+00	-.6358E-05	.0000E+00
43	.0000E+00	.0000E+00	.4098E-04	.0000E+00	-.4091E-05	.0000E+00
44	.0000E+00	.0000E+00	.5079E-04	.0000E+00	-.2090E-05	.0000E+00
45	.0000E+00	.0000E+00	.5464E-04	.0000E+00	-.3557E-06	.0000E+00
46	.0000E+00	.0000E+00	.5335E-04	.0000E+00	.1112E-05	.0000E+00
47	.0000E+00	.0000E+00	.4781E-04	.0000E+00	.2312E-05	.0000E+00
48	.0000E+00	.0000E+00	.3884E-04	.0000E+00	.3246E-05	.0000E+00
49	.0000E+00	.0000E+00	.2732E-04	.0000E+00	.3913E-05	.0000E+00
50	.0000E+00	.0000E+00	.1409E-04	.0000E+00	.4313E-05	.0000E+00

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J O I N T D I S P L A C E M E N T S

LOAD COMBINATION 3 - DISPLACEMENTS "U" AND ROTATIONS "R"

JOINT	U(X)	U(Y)	U(Z)	R(X)	R(Y)	R(Z)
51	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.4446E-05	.0000E+00

J O I N T D I S P L A C E M E N T S

LOAD COMBINATION 4 - DISPLACEMENTS "U" AND ROTATIONS "R"

JOINT	U(X)	U(Y)	U(Z)	R(X)	R(Y)	R(Z)
1	.0000E+00	.0000E+00	.0000E+00	.0000E+00	-.5978E-04	.0000E+00
2	.0000E+00	.0000E+00	.1894E-03	.0000E+00	-.5799E-04	.0000E+00
3	.0000E+00	.0000E+00	.3673E-03	.0000E+00	-.5261E-04	.0000E+00
4	.0000E+00	.0000E+00	.5222E-03	.0000E+00	-.4364E-04	.0000E+00
5	.0000E+00	.0000E+00	.6428E-03	.0000E+00	-.3109E-04	.0000E+00
6	.0000E+00	.0000E+00	.7174E-03	.0000E+00	-.1494E-04	.0000E+00
7	.0000E+00	.0000E+00	.7346E-03	.0000E+00	.4782E-05	.0000E+00
8	.0000E+00	.0000E+00	.6829E-03	.0000E+00	.2810E-04	.0000E+00
9	.0000E+00	.0000E+00	.5509E-03	.0000E+00	.5500E-04	.0000E+00
10	.0000E+00	.0000E+00	.3271E-03	.0000E+00	.8549E-04	.0000E+00
11	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.1196E-03	.0000E+00
12	.0000E+00	.0000E+00	-.5452E-03	.0000E+00	.1474E-03	.0000E+00
13	.000000	.000000	-.001134	.000000	.000141	.000000
14	.000000	.000000	-.001633	.000000	.000103	.000000
15	.000000	.000000	-.001929	.000000	.000041	.000000
16	.000000	.000000	-.001952	.000000	-.000030	.000000
17	.000000	.000000	-.001697	.000000	-.000095	.000000
18	.000000	.000000	-.001227	.000000	-.000135	.000000
19	.0000E+00	.0000E+00	-.6701E-03	.0000E+00	-.1364E-03	.0000E+00
20	.0000E+00	.0000E+00	-.1974E-03	.0000E+00	-.9184E-04	.0000E+00
21	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.1227E-05	.0000E+00
22	.0000E+00	.0000E+00	-.2071E-03	.0000E+00	.9422E-04	.0000E+00
23	.0000E+00	.0000E+00	-.6889E-03	.0000E+00	.1386E-03	.0000E+00
24	.000000	.000000	-.001254	.000000	.000137	.000000
25	.000000	.000000	-.001730	.000000	.000096	.000000
26	.000000	.000000	-.001989	.000000	.000031	.000000
27	.000000	.000000	-.001966	.000000	-.000042	.000000
28	.000000	.000000	-.001668	.000000	-.000105	.000000
29	.000000	.000000	-.001162	.000000	-.000144	.000000
30	.0000E+00	.0000E+00	-.5620E-03	.0000E+00	-.1509E-03	.0000E+00
31	.0000E+00	.0000E+00	.0000E+00	.0000E+00	-.1245E-03	.0000E+00
32	.0000E+00	.0000E+00	.4148E-03	.0000E+00	-.8387E-04	.0000E+00
33	.0000E+00	.0000E+00	.6784E-03	.0000E+00	-.4882E-04	.0000E+00
34	.0000E+00	.0000E+00	.8128E-03	.0000E+00	-.1931E-04	.0000E+00
35	.0000E+00	.0000E+00	.8403E-03	.0000E+00	.4657E-05	.0000E+00
36	.0000E+00	.0000E+00	.7829E-03	.0000E+00	.2309E-04	.0000E+00
37	.0000E+00	.0000E+00	.6630E-03	.0000E+00	.3598E-04	.0000E+00
38	.0000E+00	.0000E+00	.5025E-03	.0000E+00	.4332E-04	.0000E+00
39	.0000E+00	.0000E+00	.3238E-03	.0000E+00	.4513E-04	.0000E+00
40	.0000E+00	.0000E+00	.1489E-03	.0000E+00	.4140E-04	.0000E+00
41	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.3212E-04	.0000E+00
42	.0000E+00	.0000E+00	-.8788E-04	.0000E+00	.2297E-04	.0000E+00
43	.0000E+00	.0000E+00	-.1480E-03	.0000E+00	.1478E-04	.0000E+00
44	.0000E+00	.0000E+00	-.1835E-03	.0000E+00	.7548E-05	.0000E+00
45	.0000E+00	.0000E+00	-.1973E-03	.0000E+00	.1285E-05	.0000E+00
46	.0000E+00	.0000E+00	-.1927E-03	.0000E+00	-.4015E-05	.0000E+00
47	.0000E+00	.0000E+00	-.1727E-03	.0000E+00	-.8351E-05	.0000E+00
48	.0000E+00	.0000E+00	-.1403E-03	.0000E+00	-.1172E-04	.0000E+00
49	.0000E+00	.0000E+00	-.9867E-04	.0000E+00	-.1413E-04	.0000E+00
50	.0000E+00	.0000E+00	-.5088E-04	.0000E+00	-.1558E-04	.0000E+00

J O I N T D I S P L A C E M E N T S

LOAD COMBINATION 4 - DISPLACEMENTS "U" AND ROTATIONS "R"

JOINT	U(X)	U(Y)	U(Z)	R(X)	R(Y)	R(Z)
51	.0000E+00	.0000E+00	.0000E+00	.0000E+00	-.1606E-04	.0000E+00

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

LOAD COMBINATION 1 - FORCES "F" AND MOMENTS "M"

JOINT	F(Z)	M(Y)
1	.6683E+06	.1099E-07
2	-.3234E+05	-.1950E-08
3	-.1225E+06	-.1041E-06
4	-.1991E+06	.7980E-07
5	-.3001E+06	-.1397E-08
6	-.1838E+06	-.1851E-07
7	-.3001E+06	-.3038E-07
8	-.1991E+06	.1676E-07
9	-.1225E+06	.3329E-07
10	-.3234E+05	.1199E-07
11	.8037E+06	-.1164E-08
12	.6199E-08	.7451E-08
13	.3012E-08	-.8862E-08
14	.4700E-08	-.1158E-07
15	-.7378E-08	-.4657E-09
16	-.9124E-08	-.3492E-08
17	.2327E-07	.1362E-07
18	-.2600E-07	-.2270E-07
19	.1237E-07	-.6439E-08
20	.2008E-08	.4831E-08
21	.7348E+06	-.2142E-07
22	-.1372E-07	.3783E-07
23	-.8108E+05	.2049E-07
24	-.2000E+06	.1548E-07
25	-.3130E+06	.1461E-07
26	-.3038E+06	.4412E-07
27	-.3130E+06	-.9159E-07
28	-.2000E+06	-.8353E-08
29	-.8108E+05	.3464E-07
30	.2340E-07	.2189E-07
31	.9221E+06	-.1059E-07
32	-.1196E-07	.1772E-07
33	.8884E-08	.2928E-07
34	-.5719E-08	.1269E-07
35	-.1122E-07	.2100E-07
36	.4384E-09	-.2045E-07
37	-.1007E-07	-.2289E-07
38	.9270E-08	-.1448E-07
39	-.7389E-08	-.1579E-07
40	.2337E-08	-.2146E-08
41	-.1843E+06	-.3361E-08
42	-.6953E-09	.8004E-09
43	-.7926E-08	-.2445E-08
44	-.3737E-08	.9662E-08
45	.2378E-08	-.9109E-08
46	-.1778E-08	-.7407E-08
47	-.6950E-08	-.7338E-08
48	-.2971E-08	.6581E-08
49	-.2777E-08	.7172E-08
50	-.6871E-09	.3634E-08

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

LOAD COMBINATION 1 - FORCES "F" AND MOMENTS "M"

JOINT	F(Z)	M(Y)
51	.3937E+05	.6196E-10

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

LOAD COMBINATION 2 - FORCES "F" AND MOMENTS "M"

JOINT	F(Z)	M(Y)
1	-.1483E+06	-.1129E-08
2	.6239E-09	.7443E-08
3	-.1044E-07	.3080E-07
4	-.7796E-08	-.3332E-08
5	.9344E-08	.1934E-07
6	-.2619E-08	.1746E-09
7	-.2413E-07	-.7043E-08
8	.7061E-08	-.3143E-08
9	-.1170E-08	.7742E-08
10	.7174E-08	-.6054E-08
11	.9358E+06	-.7625E-08
12	-.4533E-08	-.2212E-08
13	-.8107E+05	.9313E-09
14	-.2000E+06	-.2523E-07
15	-.3130E+06	.2421E-07
16	-.3038E+06	.6694E-08
17	-.3130E+06	-.3073E-07
18	-.2000E+06	.2747E-07
19	-.8108E+05	-.3527E-07
20	-.1154E-07	-.2270E-07
21	.7045E+06	.1304E-07
22	.2939E-08	-.1723E-07
23	.2910E-08	-.5930E-08
24	-.1688E-07	-.1746E-09
25	.4016E-08	.1816E-07
26	.9604E-08	-.3562E-07
27	.1350E-07	.1537E-07
28	-.3783E-08	-.8091E-08
29	-.3085E-08	.2976E-08
30	-.4657E-09	-.1630E-08
31	.7045E+06	-.9313E-08
32	-.9262E-08	-.3085E-07
33	-.8107E+05	-.2002E-07
34	-.2000E+06	-.6240E-07
35	-.3130E+06	-.6217E-07
36	-.3038E+06	-.2165E-07
37	-.3130E+06	.2829E-07
38	-.2000E+06	-.4769E-07
39	-.8108E+05	-.1058E-07
40	-.7203E-09	-.2328E-09
41	.9358E+06	.8615E-08
42	.1578E-07	.1863E-08
43	.9622E-08	.8149E-09
44	-.5166E-09	.1892E-08
45	.2529E-07	.1054E-07
46	-.7945E-08	.4916E-07
47	.3236E-07	.3885E-08
48	-.5166E-09	.4657E-08
49	.3049E-07	.1528E-08
50	-.9903E-08	-.5679E-08

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

LOAD COMBINATION 2 - FORCES "F" AND MOMENTS "M"

JOINT	F(Z)	M(Y)
51	-.1483E+06	.1016E-08

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

LOAD COMBINATION 3 - FORCES "F" AND MOMENTS "M"

JOINT	F(Z)	M(Y)
1	.4928E+06	.9888E-08
2	-.3234E+05	.3842E-08
3	-.1225E+06	-.7078E-07
4	-.1991E+06	.7497E-07
5	-.3001E+06	.1932E-07
6	-.1838E+06	-.1537E-07
7	-.3001E+06	-.3912E-07
8	-.1991E+06	.7916E-08
9	-.1225E+06	.3842E-07
10	-.3234E+05	.8498E-08
11	.1867E+07	-.6519E-08
12	.3027E-08	.2328E-08
13	-.8107E+05	-.1397E-07
14	-.2000E+06	-.3632E-07
15	-.3130E+06	.1513E-07
16	-.3038E+06	.2095E-08
17	-.3130E+06	-.2037E-07
18	-.2000E+06	.1222E-07
19	-.8107E+05	-.4090E-07
20	-.1339E-07	-.3079E-07
21	.7268E+06	.5588E-08
22	.3711E-09	-.5704E-08
23	.1593E-08	-.3492E-08
24	-.9964E-08	.3842E-08
25	.3547E-08	.1345E-07
26	-.4842E-08	.2177E-07
27	.2173E-07	.7596E-08
28	-.1202E-07	.2183E-08
29	-.1124E-08	.6881E-08
30	-.2910E-09	.9080E-08
31	-.1303E+06	.2445E-08
32	.6094E-09	-.3813E-08
33	.4366E-09	.1746E-09
34	-.2350E-08	-.8149E-09
35	.3451E-08	.4235E-08
36	.1115E-08	.6796E-08
37	.1042E-08	.5748E-08
38	-.8004E-10	.1746E-09
39	.4402E-09	.1020E-08
40	.1037E-09	-.1673E-09
41	.3529E+05	.1310E-09
42	.1451E-09	.1019E-09
43	.3211E-09	.3492E-09
44	.1902E-08	-.2299E-08
45	.1069E-08	-.4395E-08
46	-.1669E-08	.4220E-09
47	.1106E-08	.3300E-08
48	.8199E-09	.1575E-08
49	.1151E-08	.2310E-09
50	-.1560E-09	-.9823E-09

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

LOAD COMBINATION 3 - FORCES "F" AND MOMENTS "M"

JOINT	F(Z)	M(Y)
51	-7540.8777	.0000

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

LOAD COMBINATION 4 - FORCES "F" AND MOMENTS "M"

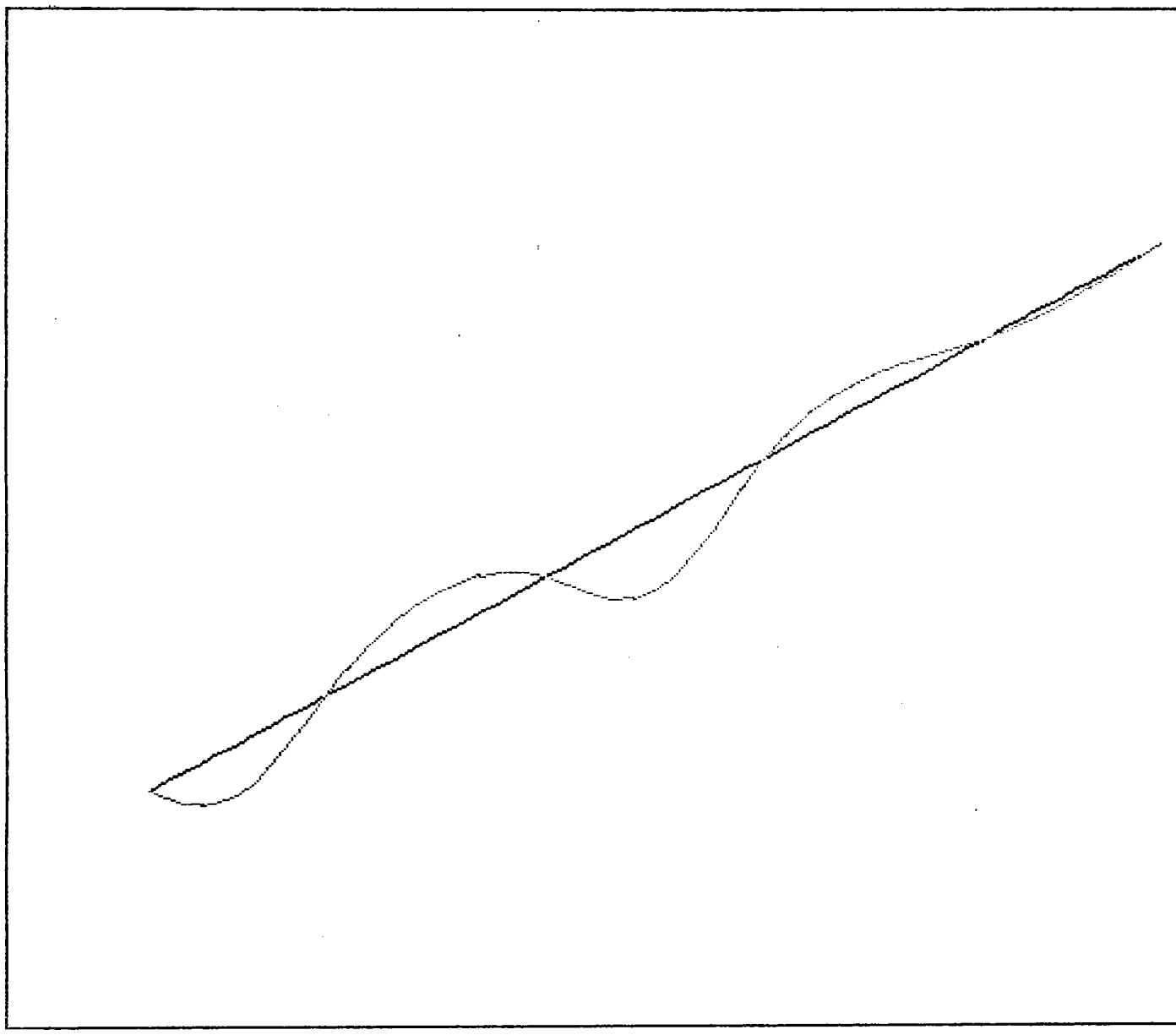
JOINT	F(Z)	M(Y)
1	-.1014E+06	-.9375E-09
2	.3420E-09	.1027E-07
3	-.6541E-08	.2439E-07
4	-.4489E-08	.1746E-09
5	.6934E-08	.1793E-07
6	-.2939E-08	-.4075E-08
7	-.1956E-07	-.6170E-08
8	.3871E-08	.4191E-08
9	.3180E-08	.6054E-08
10	.3274E-08	-.1048E-07
11	.7163E+06	-.9546E-08
12	-.4045E-08	-.4657E-09
13	-.8107E+05	.8833E-08
14	-.2000E+06	-.2555E-07
15	-.3130E+06	.2910E-07
16	-.3038E+06	.0000E+00
17	-.3130E+06	-.2375E-07
18	-.2000E+06	.9779E-08
19	-.8107E+05	-.4098E-07
20	-.9983E-08	-.1886E-07
21	.1757E+07	-.6519E-08
22	-.1059E-07	.2584E-07
23	-.8108E+05	.1001E-07
24	-.2000E+06	.2002E-07
25	-.3130E+06	.2864E-07
26	-.3038E+06	.5774E-07
27	-.3130E+06	-.7777E-07
28	-.2000E+06	-.9954E-08
29	-.8108E+05	.4023E-07
30	.2381E-07	.3004E-07
31	.7125E+06	-.9313E-08
32	-.1107E-07	.1385E-07
33	.8840E-08	.2864E-07
34	-.7865E-08	.1350E-07
35	-.7276E-08	.2841E-07
36	.4227E-08	-.9080E-08
37	-.9553E-08	-.1490E-07
38	.8928E-08	-.1317E-07
39	-.7130E-08	-.1421E-07
40	.2889E-08	-.1513E-08
41	-.1275E+06	-.3027E-08
42	-.1346E-09	.6985E-09
43	-.7396E-08	-.2095E-08
44	-.1724E-08	.7363E-08
45	.3871E-08	-.1251E-07
46	-.3485E-08	-.5442E-08
47	-.4982E-08	-.3332E-08
48	-.1797E-08	.7800E-08
49	-.8022E-09	.6505E-08
50	-.1070E-08	.2106E-08

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

LOAD COMBINATION 4 - FORCES "F" AND MOMENTS "M"

JOINT	F(Z)	M(Y)
51	.2724E+05	-.1708E-09



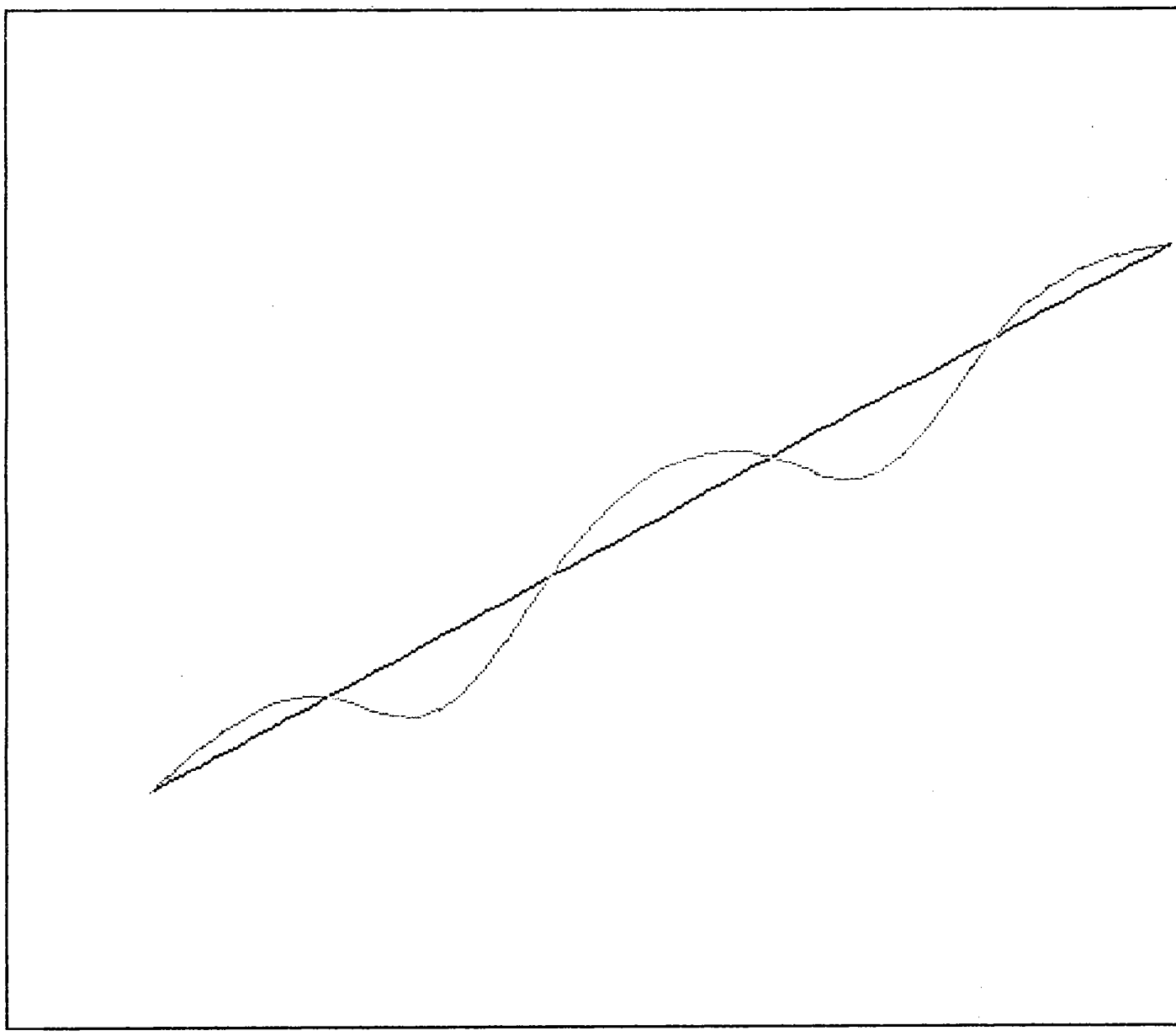
Z
Y X

DEFORMED
SHAPE
LOAD 1

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Y .0000E+00
Z -.3303E-02

X .0000E+00
Y .0000E+00
Z .1994E-02

SAP90



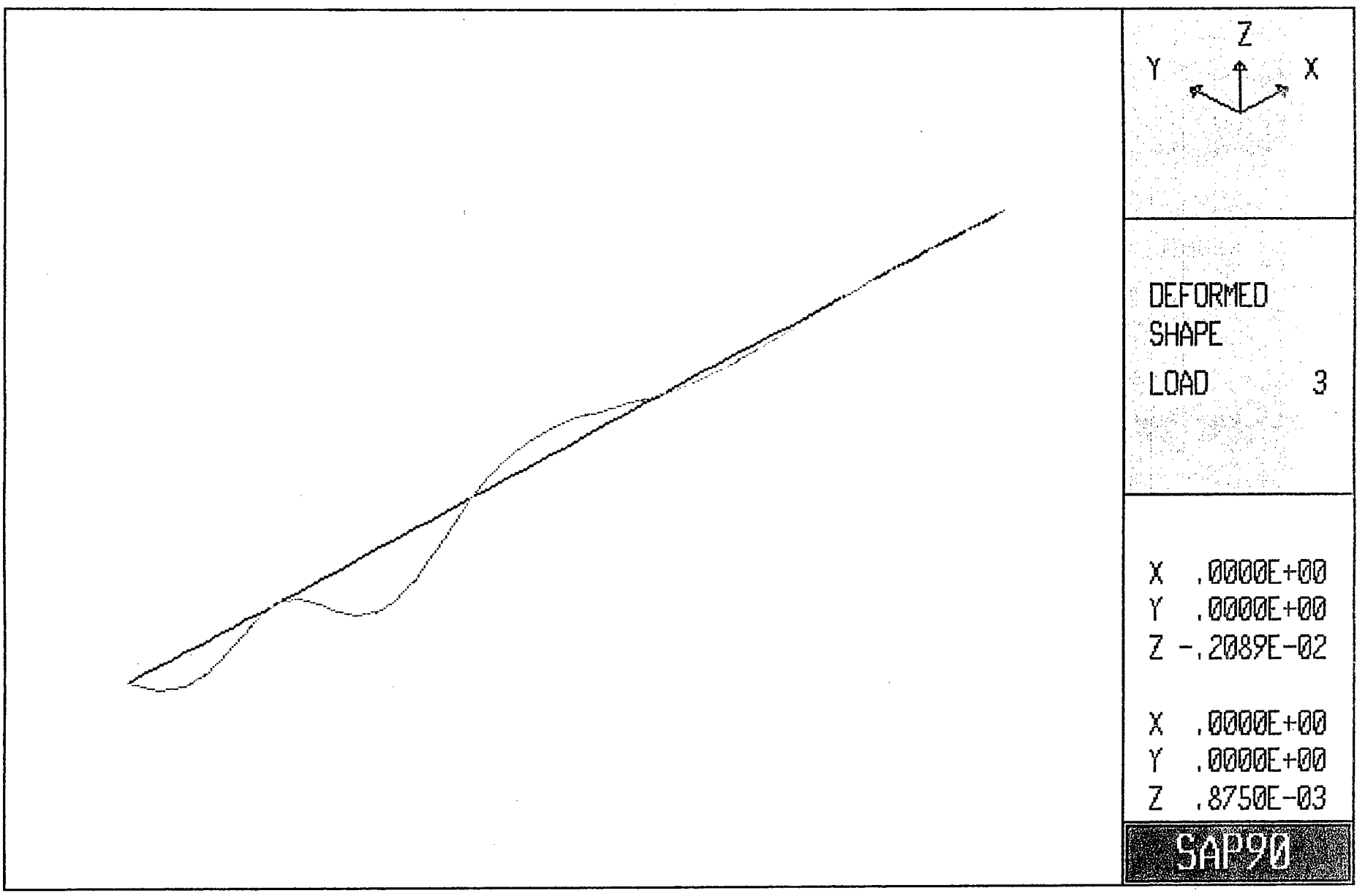
Z
Y X

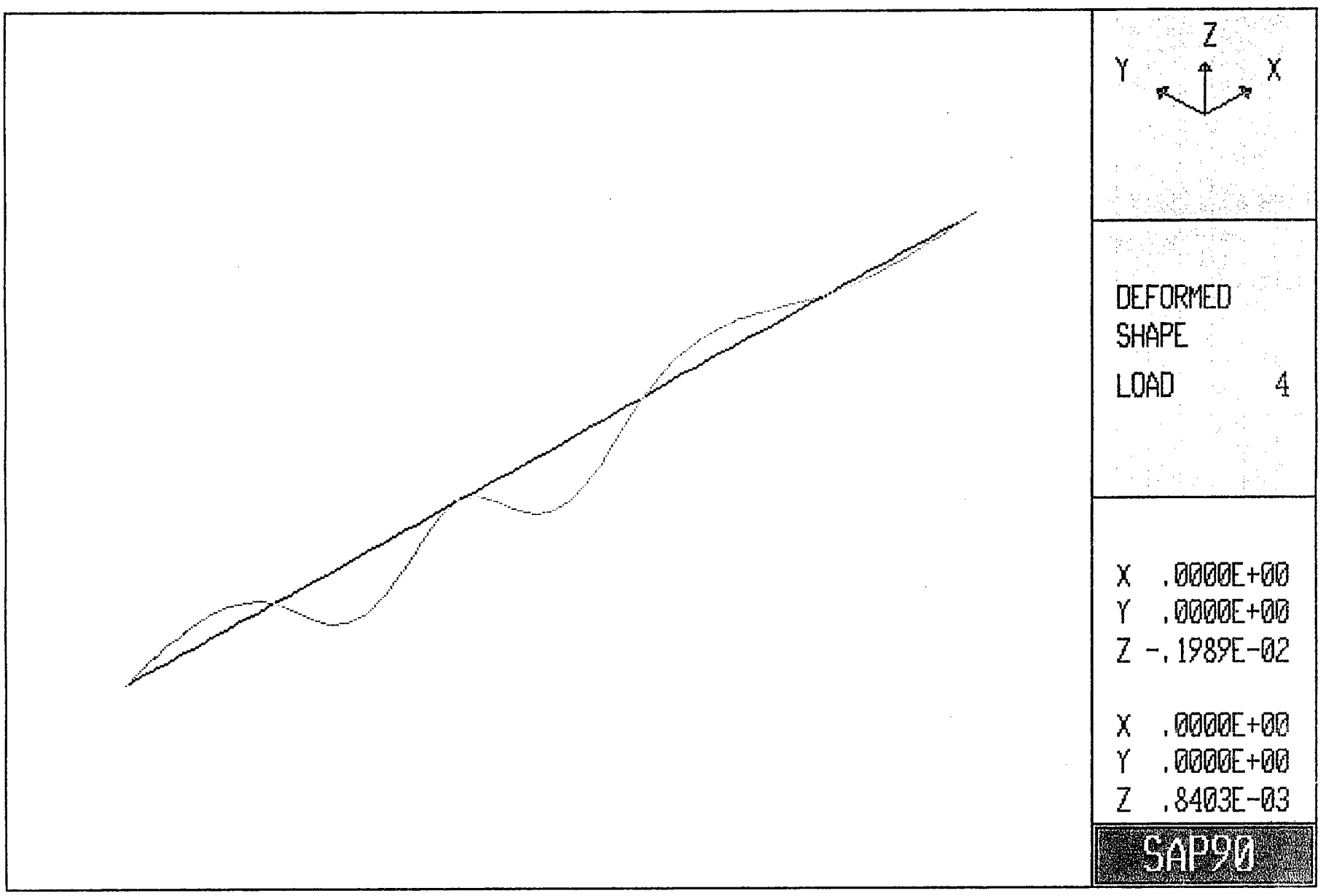
DEFORMED
SHAPE
LOAD 2

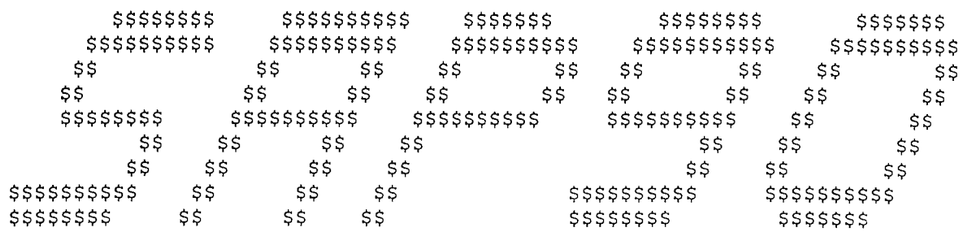
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Y .0000E+00
Z -.3300E-02

X .0000E+00
Y .0000E+00
Z .2131E-02

SAP90


Z
Y
X
DEFORMED
SHAPE
LOAD 3
X .0000E+00
Y .0000E+00
Z -.2089E-02
X .0000E+00
Y .0000E+00
Z .8750E-03
SAP90


Z
Y
X
DEFORMED
SHAPE
LOAD 4
X .0000E+00
Y .0000E+00
Z -.1989E-02
X .0000E+00
Y .0000E+00
Z .8403E-03
SAP90



STRUCTURAL ANALYSIS PROGRAMS

VERSION 5.30

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V FRANCOLI. LAV MADRID-BARCELONA-F.FRANCESA. LLEIDA-MARTORELL. UD: N-m

E I G E N S Y S T E M P A R A M E T E R S

NUMBER OF EQUATIONS	=	288
NUMBER OF MASSES	=	135
NUMBER OF VALUES TO BE EVALUATED	=	3
SIZE OF SUBSPACE	=	7

E I G E N V A L U E S A N D F R E Q U E N C I E S

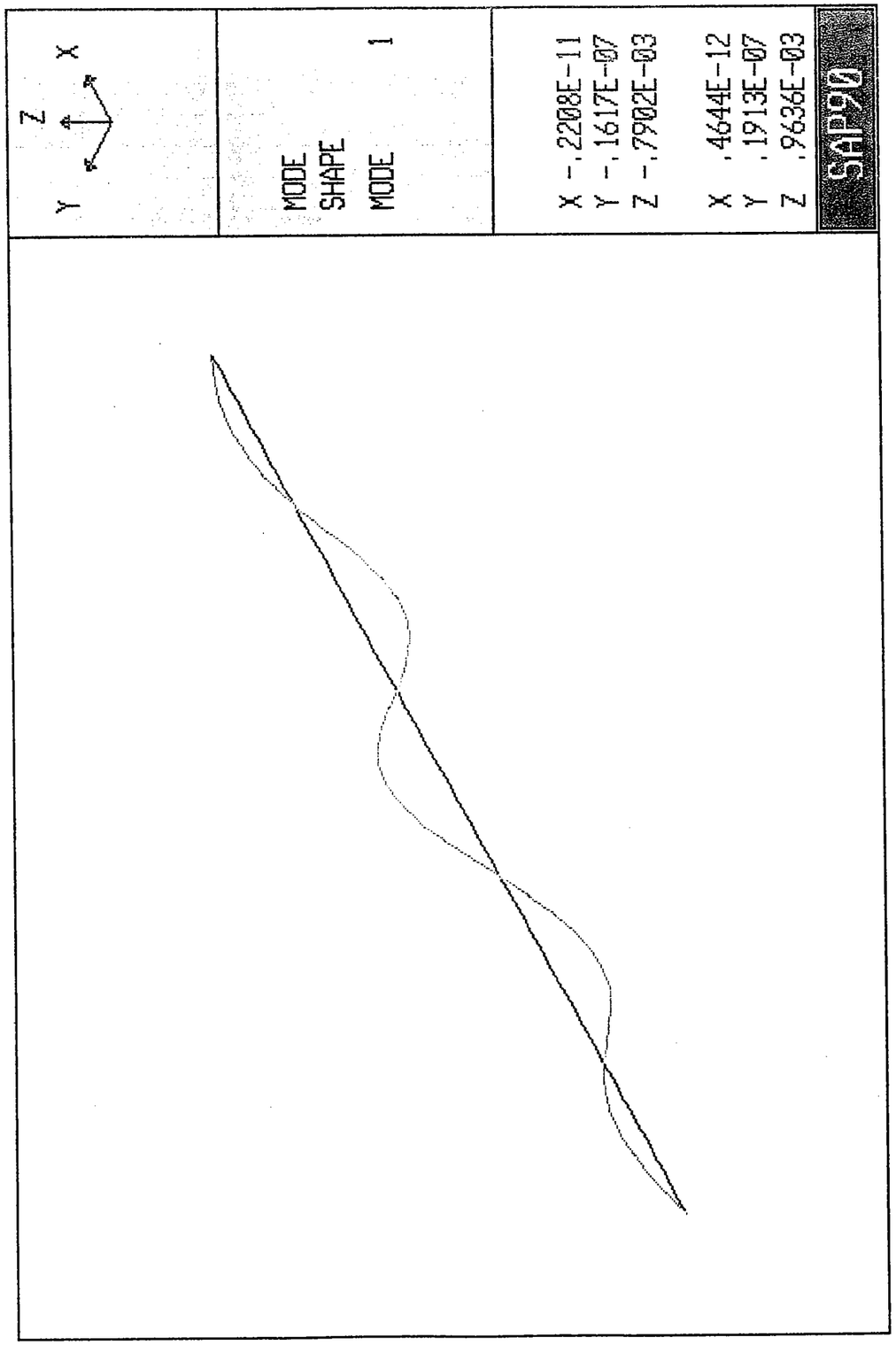
MODE NUMBER	EIGENVALUE (RAD/SEC)**2	CIRCULAR FREQ (RAD/SEC)	FREQUENCY (CYCLES/SEC)	PERIOD (SEC)
1	.630159E+03	.251030E+02	3.995262	.250296
2	.985072E+03	.313858E+02	4.995213	.200192
3	.161066E+04	.401330E+02	6.387369	.156559

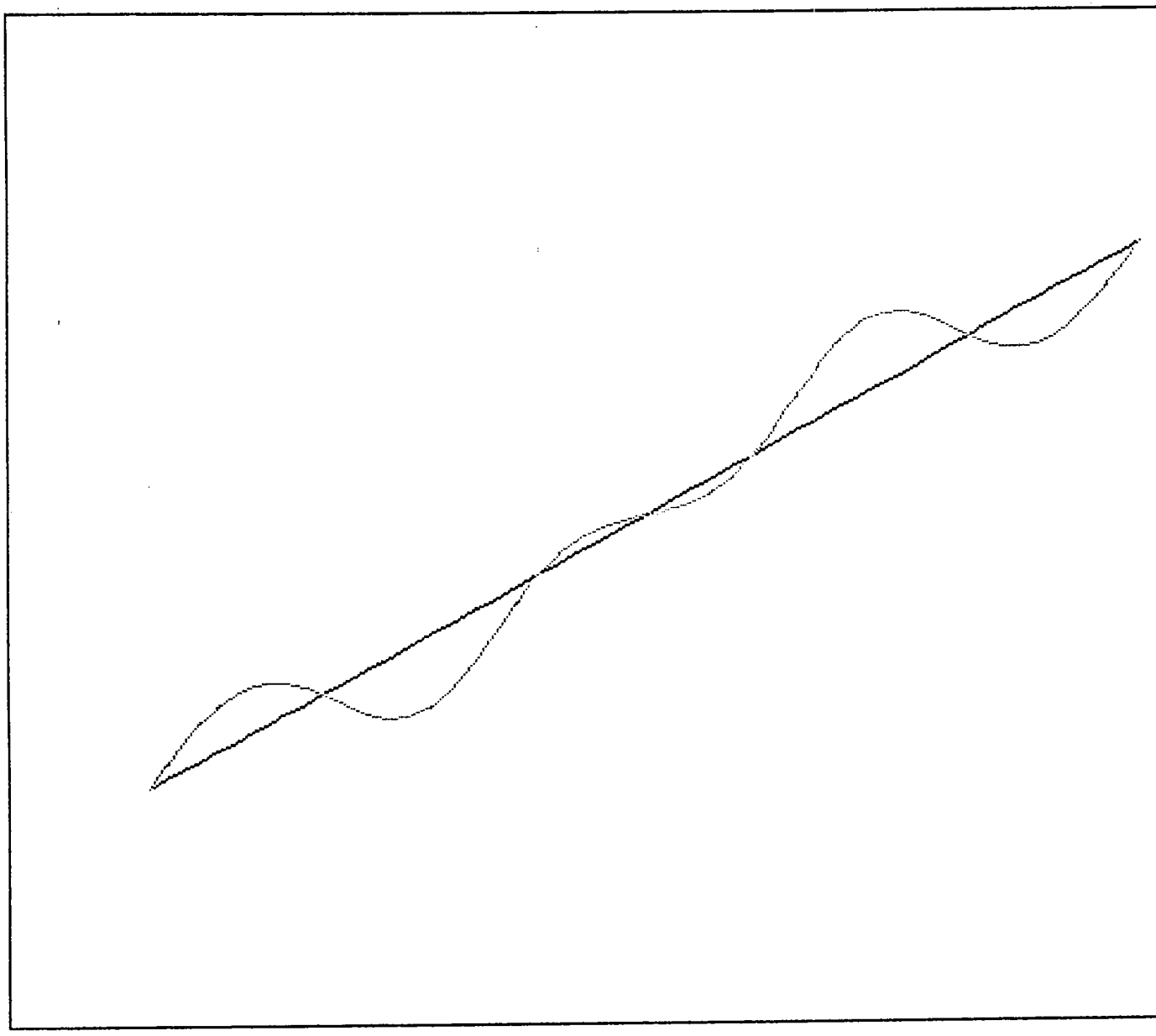
B A S E F O R C E R E A C T I O N F A C T O R S

MODE #	PERIOD (sec)	X DIRECTION	Y DIRECTION	Z DIRECTION	X MOMENT	Y MOMENT	Z MOMENT
1	.250	-.196E-05	-.443E-03	-.252E+02	.000E+00	.232E+04	-.422E-01
2	.200	.120E-05	.143E-03	.128E-03	.000E+00	.233E+04	-.462E-01
3	.157	-.114E-03	-.559E-02	-.174E+03	.000E+00	.161E+05	-.535E+00

P A R T I C I P A T I N G M A S S - (percent)

MODE	X-DIR	Y-DIR	Z-DIR	X-SUM	Y-SUM	Z-SUM
1	.000	.000	.018	.000	.000	.018
2	.000	.000	.000	.000	.000	.018
3	.000	.000	.864	.000	.000	.882





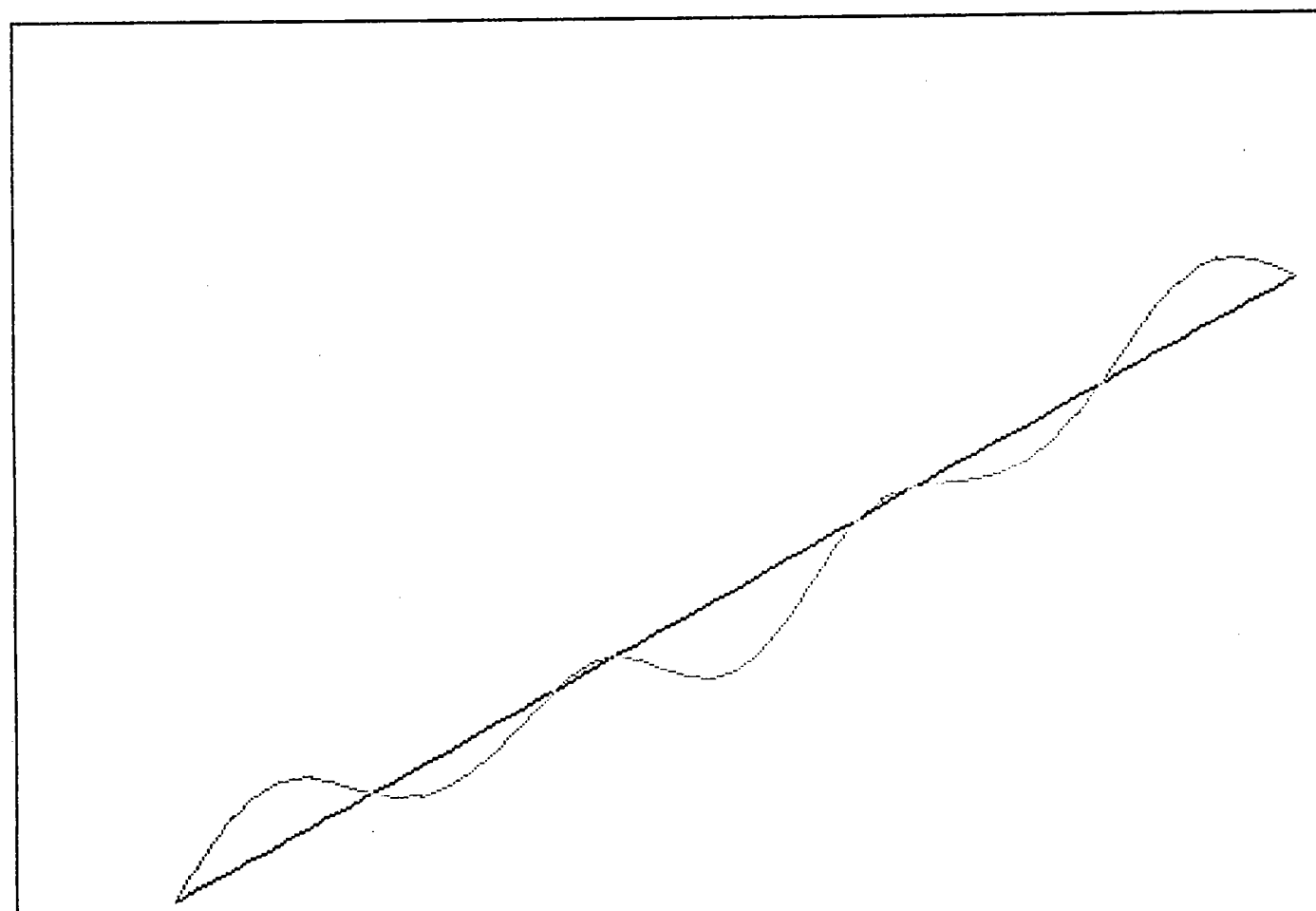
Z
Y
X

MODE
SHAPE
MODE 2

X -.1353E-10
Y -.2089E-07
Z -.9435E-03

X .1501E-10
Y .2700E-07
Z .9435E-03

SAP90



Z
Y
X

MODE
SHAPE
MODE 3

X -.1230E-09
Y -.4166E-07
Z -.1060E-02

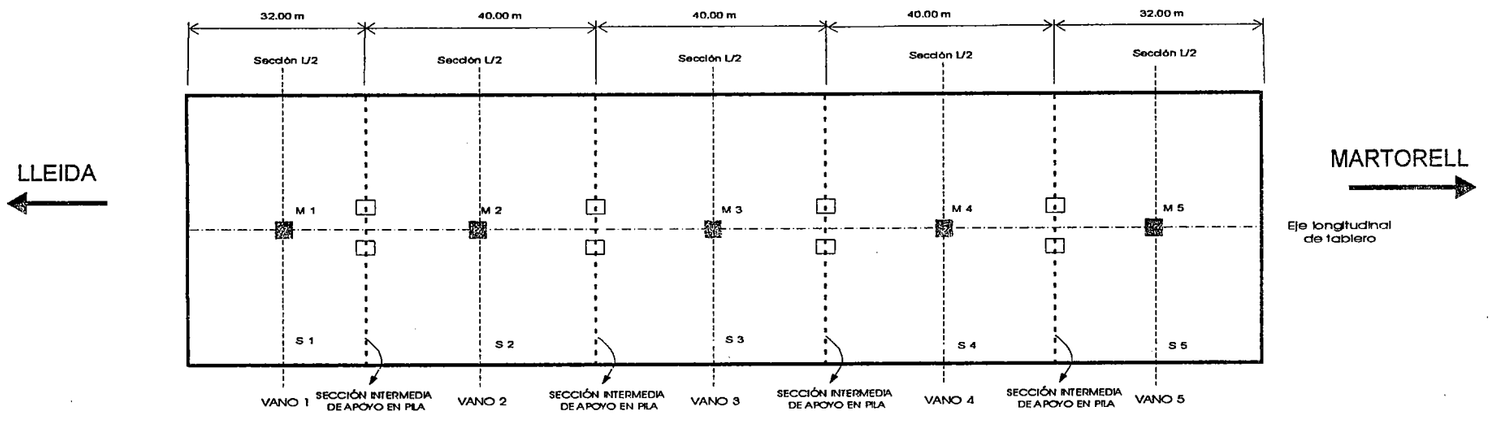
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Y .3945E-07
Z .8134E-03

SAP90

7.2. ANEJO Nº 2: CROQUIS Y PLANOS

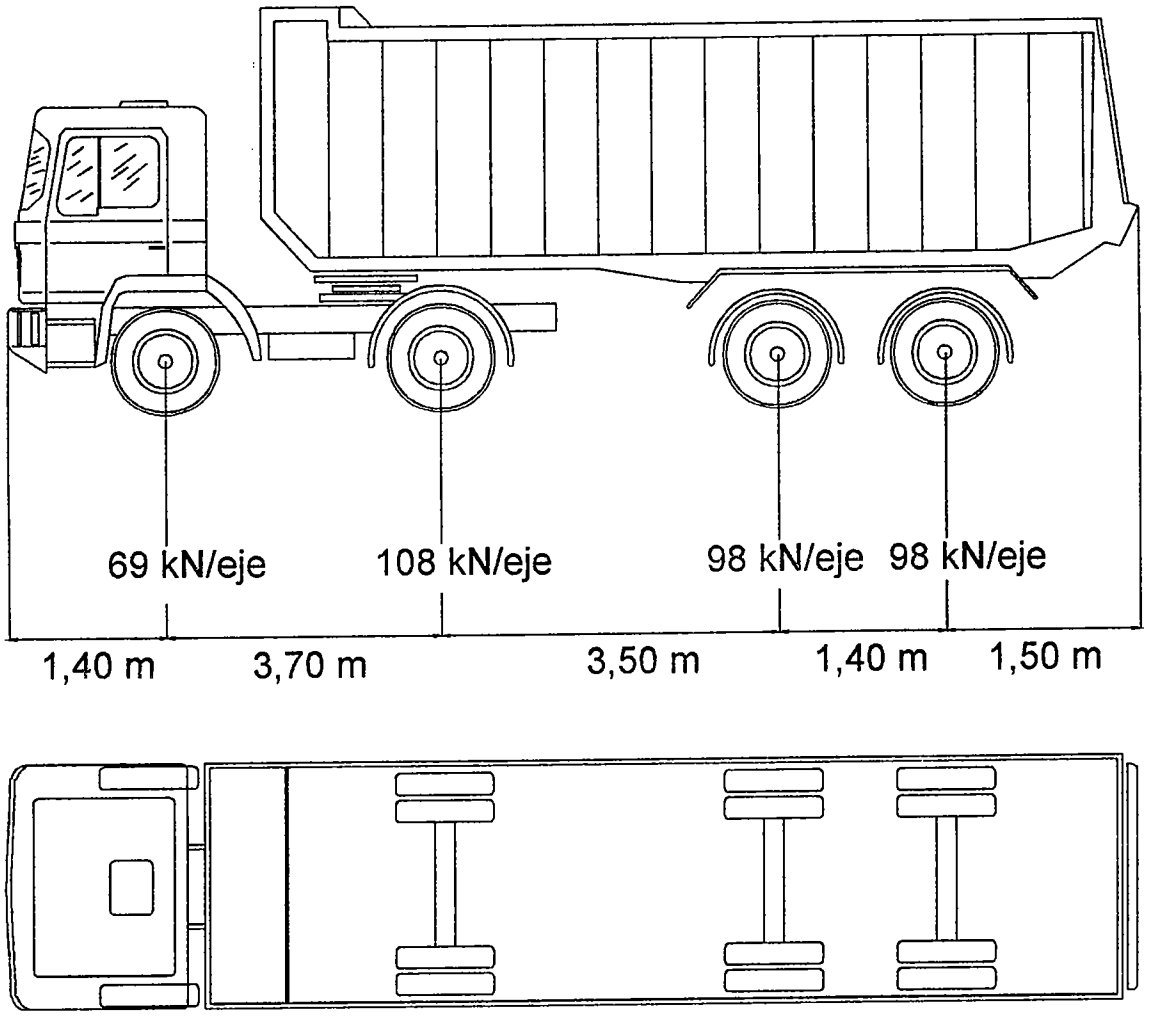
AUSCULTACIÓN DE ESTRUCTURAS
Obra: L.A.V. Madrid - Barcelona - Frontera Francesa
Tramo Lleida - Martorell. Subtramo V
Cliente: UTE ALT CAMP
Fecha: Julio 2003

CROQUIS DE INSTRUMENTACIÓN



Sensor óptico láser
Sismómetro

CARGA TIPO 373 kN

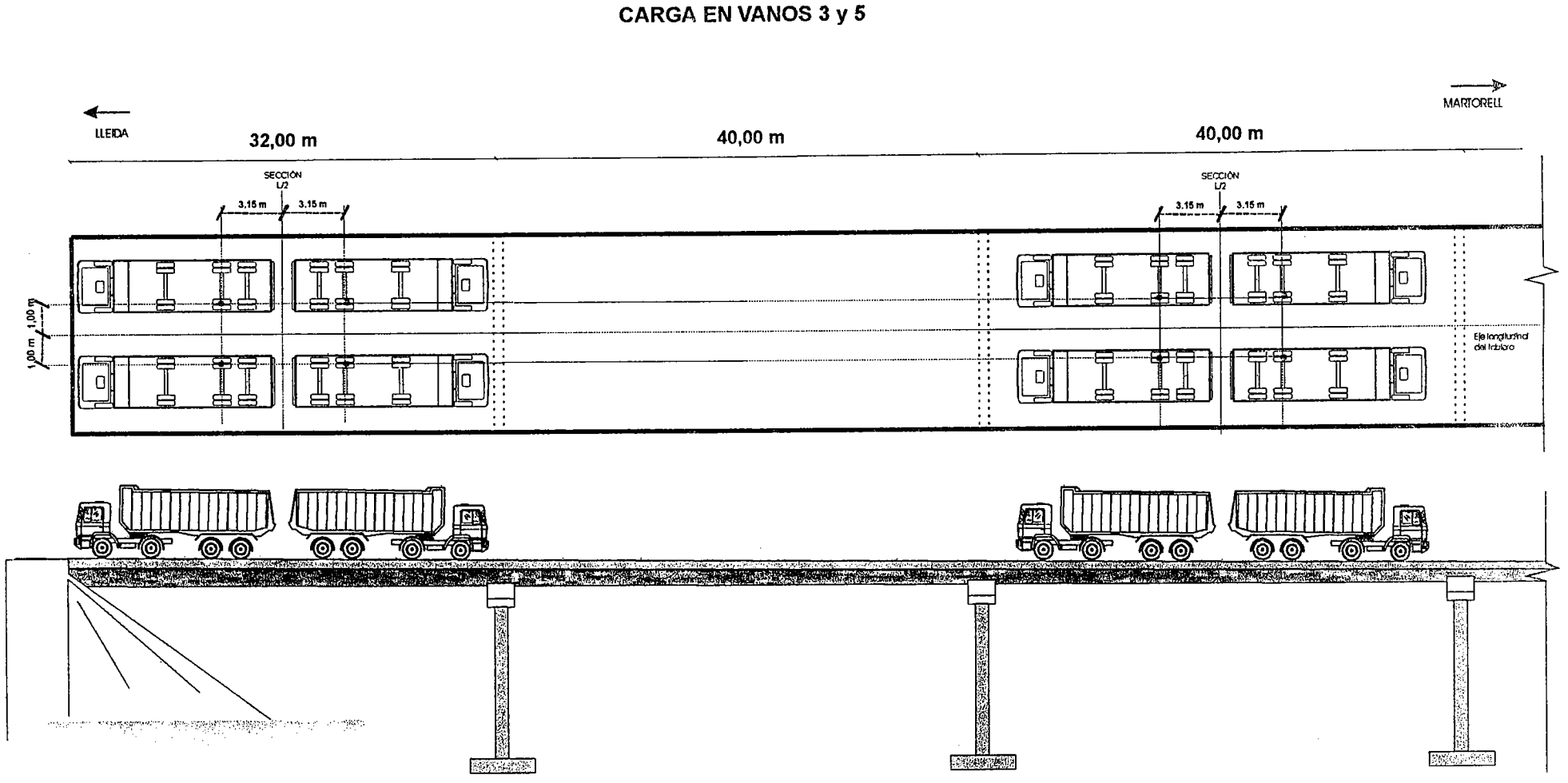


Ref: PPC.0703.Francolí. UTE ALT CAMP

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Obra: L.A.V. Madrid - Barcelona - Frontera Francesa
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Cliente: UTE ALT CAMP
Fecha: Julio 2003

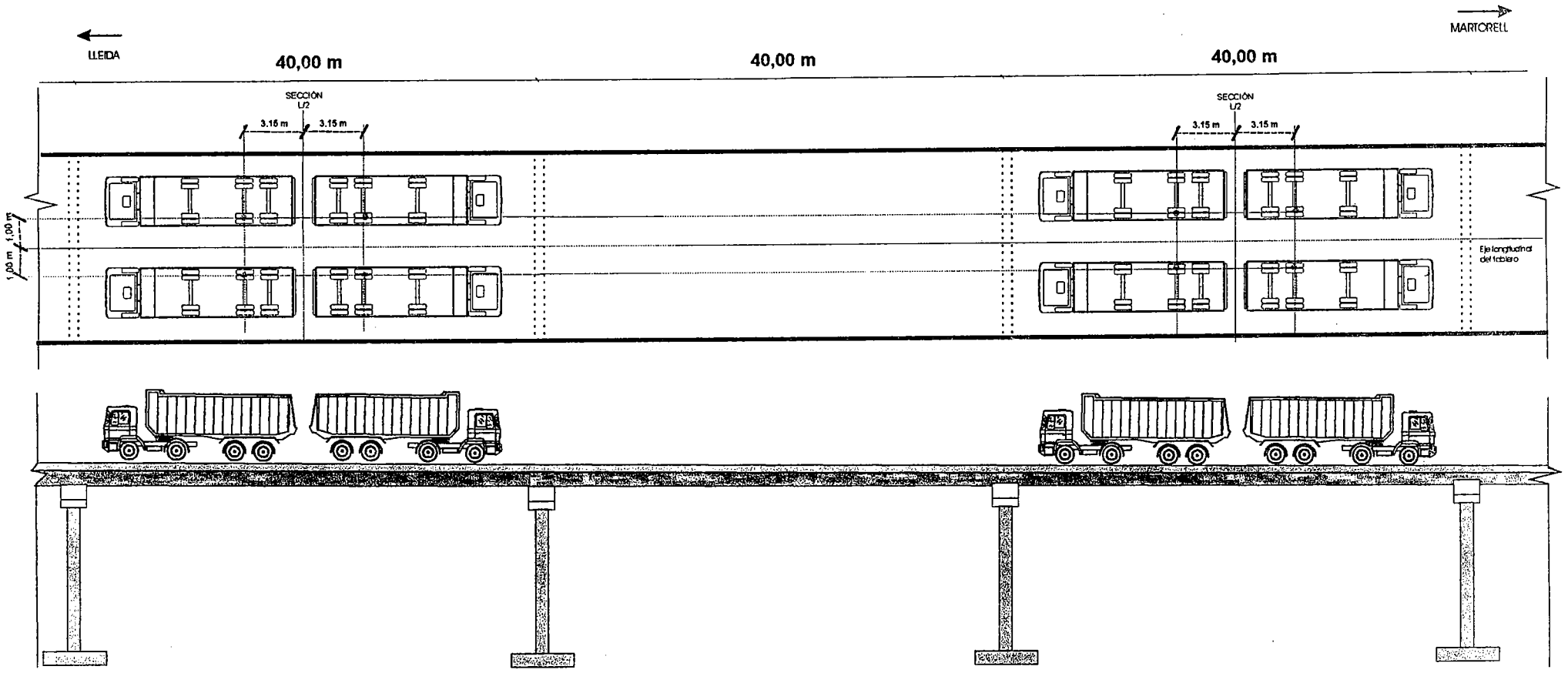
PRUEBA DE CARGA. (HIPOTESIS I)

CARGA EN VANOS 1 y 3
CARGA EN VANOS 3 y 5



Ref: PPC.0703.Francolí. UTE ALT CAMP

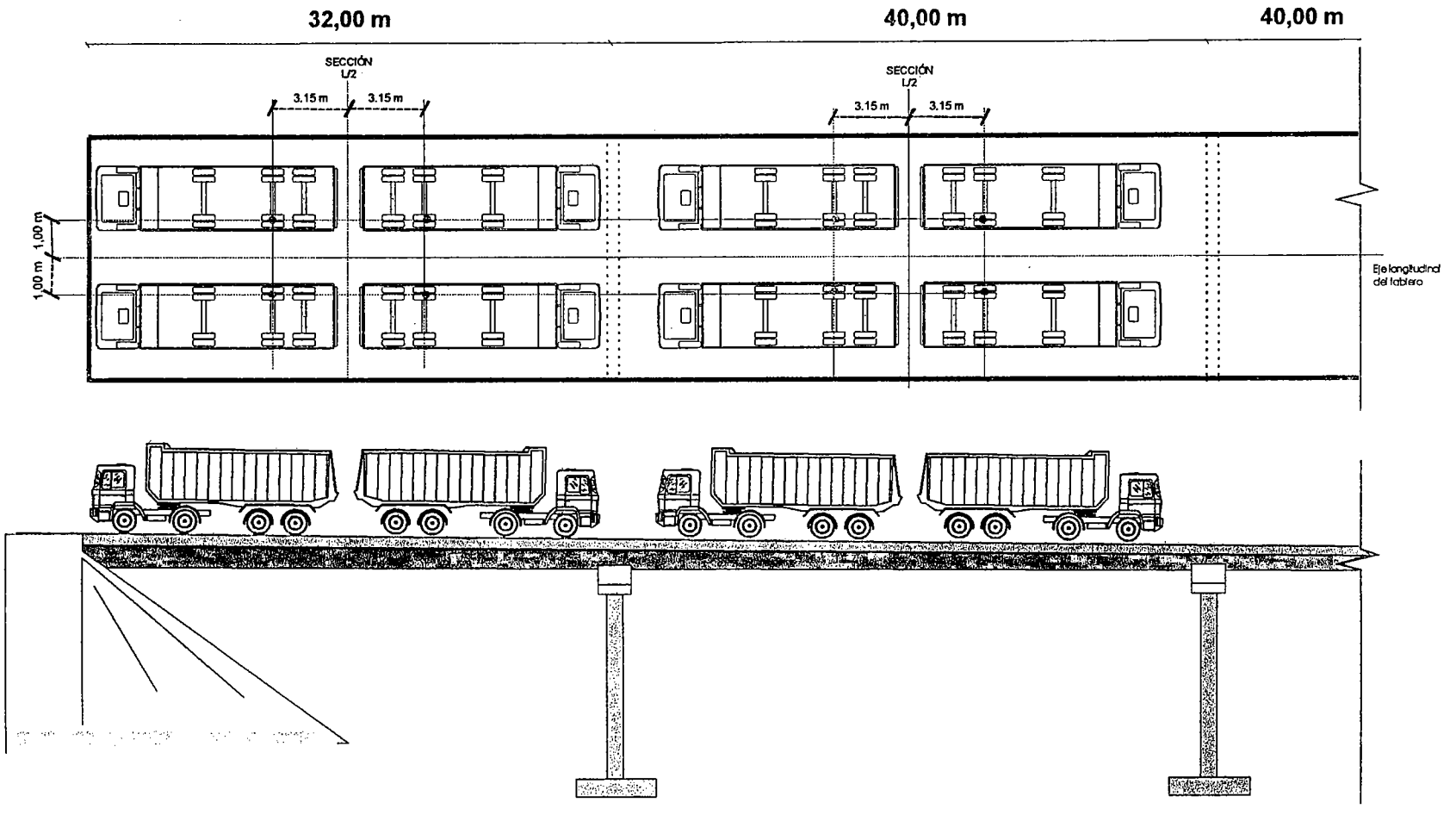
PRUEBA DE CARGA. (HIPOTESIS II)
CARGA EN VANOS 2 y 4



Ref: PPC.0703.Francolí. UTE ALT CAMP

AUSCULTACIÓN DE ESTRUCTURAS
Obra: L.A.V. Madrid - Barcelona - Frontera Francesa
Tramo Lleida - Martorell. Subtramo V
Cliente: UTE ALT CAMP
Fecha: Julio 2003

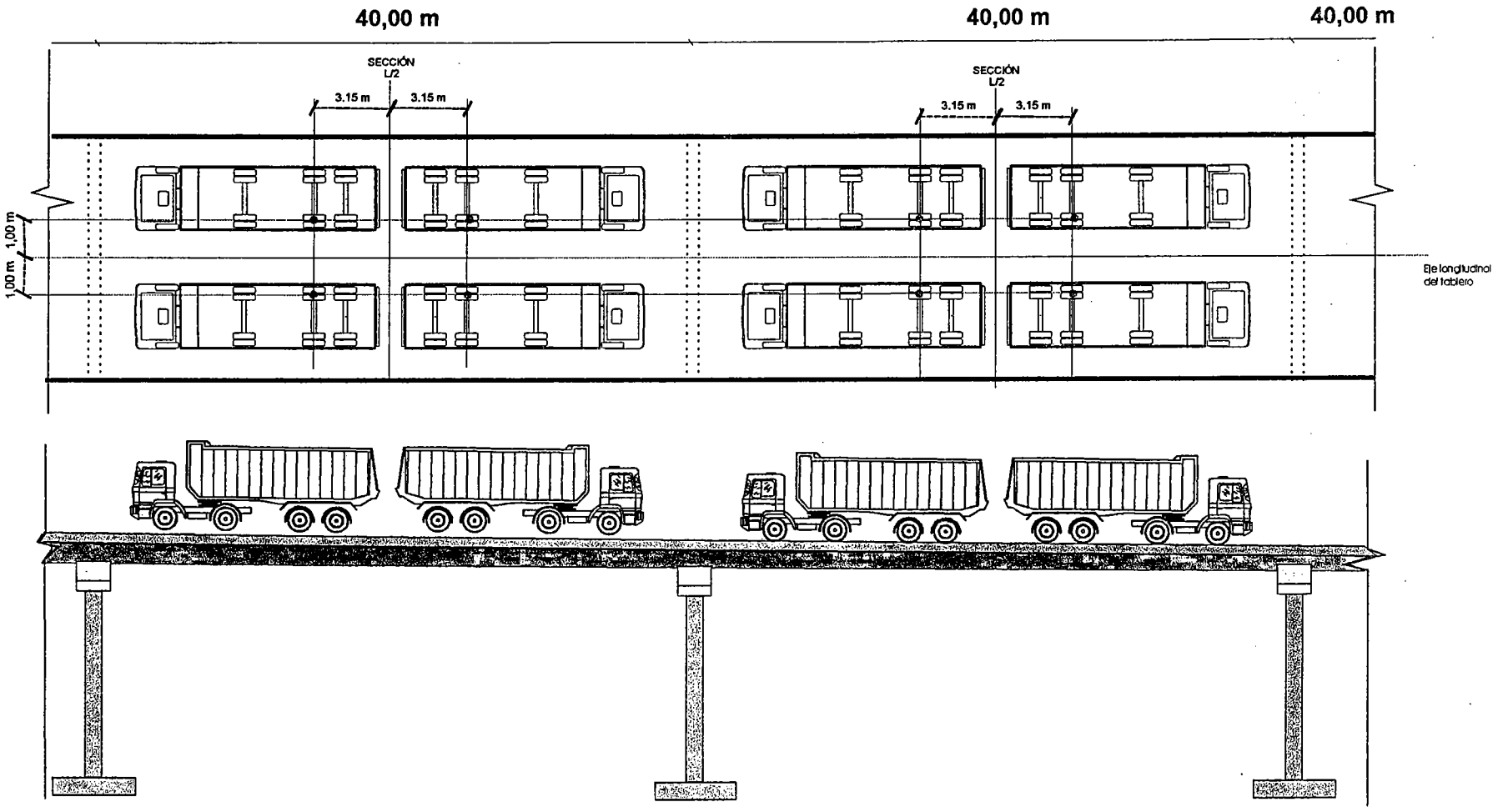
PRUEBA DE CARGA. (HIPOTESIS III)
CARGA EN VANOS 1 y 2
CARGA EN VANOS 4 y 5



Ref: PPC.0703.Francolí. UTE ALT CAMP

PRUEBA DE CARGA. (HIPOTESIS IV)

CARGA EN VANOS 2 y 3
CARGA EN VANOS 3 y 4



Ref: PPC.0703.Francolí. UTE ALT CAMP

4.2. Estructura E1

U.T.E. ALT CAMP

AVE LLEIDA – MARTORELL
SUBTRAMO V EN VALLS
VIADUCTO 1

ANEJO DE CÁLCULOS

Mayo 2001

INDICE

1.- BASES DE CÁLCULO Y DIMENSIONAMIENTO

2.- ANÁLISIS ESTRUCTURAL

2.1.- MODELO DEL TABLERO

2.2.- DIMENSIONAMIENTO DE VIGAS

2.3.- DIMENSIONAMIENTO DE LA LOSA

2.4.- REACCIONES EN APOYOS

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1.- Bases de cálculo y dimensionamiento

1.- Bases de cálculo y dimensionamiento.

Se exponen a continuación los criterios y normativas empleadas en la realización de este anejo de cálculo.

1.1.- Normativas empleadas.

- Borrador G de la Instrucción de acciones a considerar en el proyecto de puentes de ferrocarril.
- Instrucción de Hormigón Estructural (EHE).

1.2. - Cargas aplicadas.

- Peso específico del hormigón armado o pretensado: $\gamma h = 2.5$ Mp/m3.
- Peso específico del balasto: $\gamma b = 1.6$ Mp/m3.
- Peso acera, imposta, barandilla y pantallas p = 0.875 Mp/m.
- Sobrecarga puntual debida al tráfico: Tren U.I.C.
- Los efectos térmicos y reológicos que se han utilizado han sido los siguientes:

  Deformación reológica y decremento térmico uniforme: 0.625 mm/m

  Gradiente térmico: 10º C

1.3.- Características de los materiales empleados

- Hormigones:
  - Prefabricados:
    - Pretensado: HP-60/ B / 17 / II b
  - "In situ":
    - Armado: HA-30/ F / 20 / II b

- Aceros:
  - Elementos prefabricados:
    - Acero pasivo: B 500 S
    - Acero activo: Cordones Y 186057
  - Elementos "in situ":
    - Acero pasivo: B 500 S

1.4.- Coeficientes de seguridad adoptados

- Mayoración acciones (Estados Límites Últimos):

  Nivel de control intenso:

  - Permanentes: $\gamma_G = 1.35$
  - Variable: $\gamma_Q = 1.50$

- Minoración de resistencia del hormigón:
  - En prefabricados: $\gamma_c = 1.50$
  - "In situ": $\gamma_c = 1.50$

- Minoración de resistencia del acero:
  - En prefabricados: $\gamma_s = 1.15$
  - "In situ": $\gamma_s = 1.15$

1.5.- Programas informáticos utilizados

El programa de cálculo AVANSSE WIN 98 ("Structural Analysis and Design Software"), ha sido utilizado para la obtención de los esfuerzos, en los elementos del modelo, con el que se ha discretizado la estructura objeto de este anejo de cálculos.

Este es un programa de cálculo matricial, que utiliza elementos barra y/o placa para modelizar la estructura. En nuestro caso se han empleado elementos barra, creando un emparrillado plano.

Además permite la introducción de variados tipos de carga en nudos, barras o placas, y coacciones en los seis grados de libertad espaciales, ya sean totales o parciales (muelles).

EXCEL97 ha sido empleada en el tratamiento de los datos obtenidos de la resolución de los emparrillados.

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2.- Análisis estructural

2.1.- Modelo del tablero

2.1.- Tablero

La estructura ha sido modelizada mediante diversos emparrillados, en los que la estructura se discretiza por medio de elementos tipo viga, que concentran las diferentes características mecánicas. La tipología de la estructura considerada, posibilita que el estudio mediante esta técnica sea el más aconsejable, puesto que el comportamiento real se asemeja con gran exactitud al idealizado.

Se han tenido en cuenta la variación de las condiciones estático-resistentes durante el montaje de los diversos elementos y la posterior ejecución in-situ de la losa, de ahí la utilización de varios modelos con diferentes características resistentes. El comportamiento de los citados elementos ha sido considerado elástico y lineal.

En el caso particular del tablero final, hay que comentar que éste ha sido discretizado como un emparrillado de seis nervios longitudinales y barras transversales. Los nervios longitudinales se subdividen en:

- cuatro, correspondientes a cada alma de las vigas cajón
- otros dos, a los bordes de la losa

Las diferentes características mecánicas que presentan los diversos elementos, conforme se avanza en el proceso de montaje, motiva que se deban utilizar diferentes modelos. A continuación pasamos a describirlos.

a) Montaje de vigas y colocación de cargas hasta el hormigonado

En las primeras fases, se procede al montaje de las vigas, y colocación de prelosas. Ante estas cargas, la sección resistente que tenemos, es la de la viga, cuyos valores se presentan a continuación:

	Inercia (m^4)	Módulo de torsión (m^4)
Barras longitudinales (mitad de viga cajón)	0.3986	0.0097
Barras transversales (tabla inferior de la viga cajón) (Valores por metro de longitud de losa)	0.0013	0.0026

b) Hormigonado de la losa

Posteriormente, ya sobre una disposición estructural hiperestática (ejecutados los empalmes entre vigas), se hormigona la losa del tablero en su totalidad.

Como sección resistente seguimos teniendo la de la viga, aunque el esquema resistente haya dejado de ser isostático.

c) Situación final.

La losa del tablero ha sido ejecutada y ya colabora en el comportamiento resistente de la estructura. A partir de este momento las características mecánicas son las siguientes:

	Inercia (m^4)	Módulo de torsión (m^4)
Barras longitudinales de viga cajón (exteriores)	0.9703	0.3412
Barras longitudinales de viga cajón (interiores)	0.9412	0.3412
Barras longitudinales de voladizo	0.1586	0.0043
Barras transversales de viga (por metro)	0.4222	0.3412
Barras transversales de voladizo (por metro)	0.0009	0.0018

Sobre el tablero así construido, actúan las cargas permanentes, así como el tren UIC71 con el coeficiente de impacto correspondiente:

$$\Phi_2 = \frac{1.44}{\sqrt{L_\Phi} - 0.2} + 0.82 = \frac{1.44}{\sqrt{40} - 0.2} + 0.82 = 1.055$$

$$K_i = 1.21 \cdot 1.055 \approx 1.28$$

Se disponen los trenes ripados en la situación más desfavorable, es decir, ambos hacia el mismo lado.

A continuación se adjunta la entrada de datos y el gráfico del emparrillado final estudiado . Los modelos de las fases previas se han obtenido quitando elementos a este emparrillado final.

D A T O S

```
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CAMP.AVW
Proyecto     :
Unidades     : Ton-M
Fecha        : 28/05/2001
Hora         : 00:03:47
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N U D O S

Nudo	X [M]	Y [M]	Z [M]	Piso
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2	0	2.974	0	0
3	0	4.38	0	0
4	0	5.786	0	0
5	0	8.214	0	0
6	0	9.62	0	0
7	0	11.026	0	0
8	0	14	0	0
9	2.5	0	0	0
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11	2.5	5.786	0	0
12	2.5	8.214	0	0
13	2.5	11.026	0	0
14	2.5	14	0	0
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16	5	2.974	0	0
17	5	5.786	0	0
18	5	8.214	0	0
19	5	11.026	0	0
20	5	14	0	0
21	7.5	0	0	0
22	7.5	2.974	0	0
23	7.5	5.786	0	0

24	7.5	8.214	0	0
25	7.5	11.026	0	0
26	7.5	14	0	0
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37	12.5	11.026	0	0
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63	23	11.026	0	0
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75	27.8	11.026	0	0
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104	39.8	8.214	0	0
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135	52.625	5.786	0	0
136	52.625	8.214	0	0
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141	55.25	5.786	0	0
142	55.25	8.214	0	0
143	55.25	11.026	0	0
144	55.25	14	0	0
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147	57.875	5.786	0	0
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149	57.875	11.026	0	0
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173	68.375	11.026	0	0
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178	71	8.214	0	0
179	71	11.026	0	0
180	71	14	0	0
181	74	0	0	0
182	74	2.974	0	0
183	74	4.38	0	0
184	74	5.786	0	0
185	74	8.214	0	0
186	74	9.62	0	0
187	74	11.026	0	0
188	74	14	0	0
189	76.4	0	0	0
190	76.4	2.974	0	0
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205	81.2	11.026	0	0
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214	86	2.974	0	0
215	86	5.786	0	0
216	86	8.214	0	0
217	86	11.026	0	0
218	86	14	0	0
219	88.4	0	0	0
220	88.4	2.974	0	0
221	88.4	5.786	0	0
222	88.4	8.214	0	0
223	88.4	11.026	0	0
224	88.4	14	0	0
225	90.8	0	0	0
226	90.8	2.974	0	0
227	90.8	5.786	0	0
228	90.8	8.214	0	0
229	90.8	11.026	0	0
230	90.8	14	0	0
231	93.2	0	0	0
232	93.2	2.974	0	0
233	93.2	5.786	0	0
234	93.2	8.214	0	0
235	93.2	11.026	0	0
236	93.2	14	0	0
237	95.6	0	0	0
238	95.6	2.974	0	0
239	95.6	5.786	0	0
240	95.6	8.214	0	0
241	95.6	11.026	0	0
242	95.6	14	0	0
243	98	0	0	0
244	98	2.974	0	0
245	98	5.786	0	0
246	98	8.214	0	0
247	98	11.026	0	0
248	98	14	0	0
249	101	0	0	0
250	101	2.974	0	0
251	101	4.38	0	0
252	101	5.786	0	0
253	101	8.214	0	0
254	101	9.62	0	0
255	101	11.026	0	0
256	101	14	0	0
257	103.5	0	0	0
258	103.5	2.974	0	0
259	103.5	5.786	0	0
260	103.5	8.214	0	0
261	103.5	11.026	0	0
262	103.5	14	0	0
263	106	0	0	0
264	106	2.974	0	0
265	106	5.786	0	0
266	106	8.214	0	0
267	106	11.026	0	0
268	106	14	0	0
269	108.5	0	0	0
270	108.5	2.974	0	0
271	108.5	5.786	0	0
272	108.5	8.214	0	0
273	108.5	11.026	0	0
274	108.5	14	0	0
275	111	0	0	0
276	111	2.974	0	0
277	111	5.786	0	0
278	111	8.214	0	0
279	111	11.026	0	0

280	111	14	0	0
281	113.5	0	0	0
282	113.5	2.974	0	0
283	113.5	5.786	0	0
284	113.5	8.214	0	0
285	113.5	11.026	0	0
286	113.5	14	0	0
287	116	0	0	0
288	116	2.974	0	0
289	116	5.786	0	0
290	116	8.214	0	0
291	116	11.026	0	0
292	116	14	0	0
293	118.5	0	0	0
294	118.5	2.974	0	0
295	118.5	5.786	0	0
296	118.5	8.214	0	0
297	118.5	11.026	0	0
298	118.5	14	0	0
299	121	0	0	0
300	121	2.974	0	0
301	121	4.38	0	0
302	121	5.786	0	0
303	121	8.214	0	0
304	121	9.62	0	0
305	121	11.026	0	0
306	121	14	0	0

R E S T R I C C I O N E S

Nudo	TX	TY	TZ	RX	RY	RZ
3	0	0	1	0	0	0
6	0	0	1	0	0	0
53	0	0	1	0	0	0
56	0	0	1	0	0	0
121	0	0	1	0	0	0
124	0	0	1	0	0	0
183	0	0	1	0	0	0
186	0	0	1	0	0	0
251	0	0	1	0	0	0
254	0	0	1	0	0	0
301	0	0	1	0	0	0
304	0	0	1	0	0	0

V I G A S

Viga	NJ	NK	Descripcion	SecciÛn	Material
1	1	9	Long voladizo	AC B0001	EA MAT01
2	15	21	Long voladizo	AC B0003	EA MAT01
3	21	27	Long voladizo	AC B0004	EA MAT01
4	27	33	Long voladizo	AC B0005	EA MAT01
5	33	39	Long voladizo	AC B0006	EA MAT01
6	39	45	Long voladizo	AC B0007	EA MAT01
7	45	51	Long voladizo	AC B0008	EA MAT01
8	51	59	Long voladizo	AC B0009	EA MAT01
9	59	65	Long voladizo	AC B0010	EA MAT01
10	65	71	Long voladizo	AC B0011	EA MAT01
11	71	77	Long voladizo	AC B0012	EA MAT01
12	77	83	Long voladizo	AC B0013	EA MAT01
13	83	89	Long voladizo	AC B0014	EA MAT01
14	89	95	Long voladizo	AC B0015	EA MAT01
15	95	101	Long voladizo	AC B0016	EA MAT01
16	101	107	Long voladizo	AC B0017	EA MAT01
17	107	113	Long voladizo	AC B0018	EA MAT01
18	113	119	Long voladizo	AC B0019	EA MAT01
19	119	127	Long voladizo	AC B0020	EA MAT01
20	127	133	Long voladizo	AC B0021	EA MAT01
21	133	139	Long voladizo	AC B0022	EA MAT01
22	139	145	Long voladizo	AC B0023	EA MAT01
23	145	151	Long voladizo	AC B0024	EA MAT01
24	151	157	Long voladizo	AC B0025	EA MAT01
25	157	163	Long voladizo	AC B0026	EA MAT01
26	163	169	Long voladizo	AC B0027	EA MAT01
27	169	175	Long voladizo	AC B0028	EA MAT01
28	175	181	Long voladizo	AC B0029	EA MAT01
29	181	189	Long voladizo	AC B0030	EA MAT01
30	189	195	Long voladizo	AC B0031	EA MAT01
31	195	201	Long voladizo	AC B0032	EA MAT01
32	201	207	Long voladizo	AC B0033	EA MAT01
33	207	213	Long voladizo	AC B0034	EA MAT01
34	213	219	Long voladizo	AC B0035	EA MAT01
35	219	225	Long voladizo	AC B0036	EA MAT01
36	225	231	Long voladizo	AC B0037	EA MAT01
37	231	237	Long voladizo	AC B0038	EA MAT01
38	237	243	Long voladizo	AC B0039	EA MAT01
39	243	249	Long voladizo	AC B0040	EA MAT01
40	249	257	Long voladizo	AC B0041	EA MAT01
41	257	263	Long voladizo	AC B0042	EA MAT01
42	263	269	Long voladizo	AC B0043	EA MAT01
43	269	275	Long voladizo	AC B0044	EA MAT01
44	275	281	Long voladizo	AC B0045	EA MAT01
45	281	287	Long voladizo	AC B0046	EA MAT01
46	287	293	Long voladizo	AC B0047	EA MAT01
47	293	299	Long voladizo	AC B0048	EA MAT01
48	2	10	Almas	AC B0049	EA MAT01
49	10	16	Almas	AC B0050	EA MAT01
50	16	22	Almas	AC B0051	EA MAT01
51	22	28	Almas	AC B0052	EA MAT01
52	28	34	Almas	AC B0053	EA MAT01
53	34	40	Almas	AC B0054	EA MAT01
54	40	46	Almas	AC B0055	EA MAT01
55	46	52	Almas	AC B0056	EA MAT01
56	52	60	Almas	AC B0057	EA MAT01
57	60	66	Almas	AC B0058	EA MAT01
58	66	72	Almas	AC B0059	EA MAT01
59	72	78	Almas	AC B0060	EA MAT01
60	78	84	Almas	AC B0061	EA MAT01
61	84	90	Almas	AC B0062	EA MAT01
62	90	96	Almas	AC B0063	EA MAT01
63	96	102	Almas	AC B0064	EA MAT01
64	102	108	Almas	AC B0065	EA MAT01
65	108	114	Almas	AC B0066	EA MAT01
66	114	120	Almas	AC B0067	EA MAT01
67	120	128	Almas	AC B0068	EA MAT01
68	128	134	Almas	AC B0069	EA MAT01
69	134	140	Almas	AC B0070	EA MAT01
70	140	146	Almas	AC B0071	EA MAT01
71	146	152	Almas	AC B0072	EA MAT01
72	152	158	Almas	AC B0073	EA MAT01
73	158	164	Almas	AC B0074	EA MAT01
74	164	170	Almas	AC B0075	EA MAT01
75	170	176	Almas	AC B0076	EA MAT01
76	176	182	Almas	AC B0077	EA MAT01
77	182	190	Almas	AC B0078	EA MAT01

78	190	196	Almas	AC B0079	EA MAT01
79	196	202	Almas	AC B0080	EA MAT01
80	202	208	Almas	AC B0081	EA MAT01
81	208	214	Almas	AC B0082	EA MAT01
82	214	220	Almas	AC B0083	EA MAT01
83	220	226	Almas	AC B0084	EA MAT01
84	226	232	Almas	AC B0085	EA MAT01
85	232	238	Almas	AC B0086	EA MAT01
86	238	244	Almas	AC B0087	EA MAT01
87	244	250	Almas	AC B0088	EA MAT01
88	250	258	Almas	AC B0089	EA MAT01
89	258	264	Almas	AC B0090	EA MAT01
90	264	270	Almas	AC B0091	EA MAT01
91	270	276	Almas	AC B0092	EA MAT01
92	276	282	Almas	AC B0093	EA MAT01
93	282	288	Almas	AC B0094	EA MAT01
94	288	294	Almas	AC B0095	EA MAT01
95	294	300	Almas	AC B0096	EA MAT01
96	4	11	Almas	AC B0097	EA MAT01
97	11	17	Almas	AC B0098	EA MAT01
98	17	23	Almas	AC B0099	EA MAT01
99	23	29	Almas	AC B0100	EA MAT01
100	29	35	Almas	AC B0101	EA MAT01
101	35	41	Almas	AC B0102	EA MAT01
102	41	47	Almas	AC B0103	EA MAT01
103	47	54	Almas	AC B0104	EA MAT01
104	54	61	Almas	AC B0105	EA MAT01
105	61	67	Almas	AC B0106	EA MAT01
106	67	73	Almas	AC B0107	EA MAT01
107	73	79	Almas	AC B0108	EA MAT01
108	79	85	Almas	AC B0109	EA MAT01
109	85	91	Almas	AC B0110	EA MAT01
110	91	97	Almas	AC B0111	EA MAT01
111	97	103	Almas	AC B0112	EA MAT01
112	103	109	Almas	AC B0113	EA MAT01
113	109	115	Almas	AC B0114	EA MAT01
114	115	122	Almas	AC B0115	EA MAT01
115	122	129	Almas	AC B0116	EA MAT01
116	129	135	Almas	AC B0117	EA MAT01
117	135	141	Almas	AC B0118	EA MAT01
118	141	147	Almas	AC B0119	EA MAT01
119	147	153	Almas	AC B0120	EA MAT01
120	153	159	Almas	AC B0121	EA MAT01
121	159	165	Almas	AC B0122	EA MAT01
122	165	171	Almas	AC B0123	EA MAT01
123	171	177	Almas	AC B0124	EA MAT01
124	177	184	Almas	AC B0125	EA MAT01
125	184	191	Almas	AC B0126	EA MAT01
126	191	197	Almas	AC B0127	EA MAT01
127	197	203	Almas	AC B0128	EA MAT01
128	203	209	Almas	AC B0129	EA MAT01
129	209	215	Almas	AC B0130	EA MAT01
130	215	221	Almas	AC B0131	EA MAT01
131	221	227	Almas	AC B0132	EA MAT01
132	227	233	Almas	AC B0133	EA MAT01
133	233	239	Almas	AC B0134	EA MAT01
134	239	245	Almas	AC B0135	EA MAT01
135	245	252	Almas	AC B0136	EA MAT01
136	252	259	Almas	AC B0137	EA MAT01
137	259	265	Almas	AC B0138	EA MAT01
138	265	271	Almas	AC B0139	EA MAT01
139	271	277	Almas	AC B0140	EA MAT01
140	277	283	Almas	AC B0141	EA MAT01
141	283	289	Almas	AC B0142	EA MAT01

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142	289	295	Almas	AC B0143	EA MAT01
143	295	302	Almas	AC B0144	EA MAT01
144	5	12	Almas	AC B0145	EA MAT01
145	12	18	Almas	AC B0146	EA MAT01
146	18	24	Almas	AC B0147	EA MAT01
147	24	30	Almas	AC B0148	EA MAT01
148	30	36	Almas	AC B0149	EA MAT01
149	36	42	Almas	AC B0150	EA MAT01
150	42	48	Almas	AC B0151	EA MAT01
151	48	55	Almas	AC B0152	EA MAT01
152	55	62	Almas	AC B0153	EA MAT01
153	62	68	Almas	AC B0154	EA MAT01
154	68	74	Almas	AC B0155	EA MAT01
155	74	80	Almas	AC B0156	EA MAT01
156	80	86	Almas	AC B0157	EA MAT01
157	86	92	Almas	AC B0158	EA MAT01
158	92	98	Almas	AC B0159	EA MAT01
159	98	104	Almas	AC B0160	EA MAT01
160	104	110	Almas	AC B0161	EA MAT01
161	110	116	Almas	AC B0162	EA MAT01
162	116	123	Almas	AC B0163	EA MAT01
163	123	130	Almas	AC B0164	EA MAT01
164	130	136	Almas	AC B0165	EA MAT01
165	136	142	Almas	AC B0166	EA MAT01
166	142	148	Almas	AC B0167	EA MAT01
167	148	154	Almas	AC B0168	EA MAT01
168	154	160	Almas	AC B0169	EA MAT01
169	160	166	Almas	AC B0170	EA MAT01
170	166	172	Almas	AC B0171	EA MAT01
171	172	178	Almas	AC B0172	EA MAT01
172	178	185	Almas	AC B0173	EA MAT01
173	185	192	Almas	AC B0174	EA MAT01
174	192	198	Almas	AC B0175	EA MAT01
175	198	204	Almas	AC B0176	EA MAT01
176	204	210	Almas	AC B0177	EA MAT01
177	210	216	Almas	AC B0178	EA MAT01
178	216	222	Almas	AC B0179	EA MAT01
179	222	228	Almas	AC B0180	EA MAT01
180	228	234	Almas	AC B0181	EA MAT01
181	234	240	Almas	AC B0182	EA MAT01
182	240	246	Almas	AC B0183	EA MAT01
183	246	253	Almas	AC B0184	EA MAT01
184	253	260	Almas	AC B0185	EA MAT01
185	260	266	Almas	AC B0186	EA MAT01
186	266	272	Almas	AC B0187	EA MAT01
187	272	278	Almas	AC B0188	EA MAT01
188	278	284	Almas	AC B0189	EA MAT01
189	284	290	Almas	AC B0190	EA MAT01
190	290	296	Almas	AC B0191	EA MAT01
191	296	303	Almas	AC B0192	EA MAT01
192	7	13	Almas	AC B0193	EA MAT01
193	13	19	Almas	AC B0194	EA MAT01
194	19	25	Almas	AC B0195	EA MAT01
195	25	31	Almas	AC B0196	EA MAT01
196	31	37	Almas	AC B0197	EA MAT01
197	37	43	Almas	AC B0198	EA MAT01
198	43	49	Almas	AC B0199	EA MAT01
199	49	57	Almas	AC B0200	EA MAT01
200	57	63	Almas	AC B0201	EA MAT01
201	63	69	Almas	AC B0202	EA MAT01
202	69	75	Almas	AC B0203	EA MAT01
203	75	81	Almas	AC B0204	EA MAT01
204	81	87	Almas	AC B0205	EA MAT01
205	87	93	Almas	AC B0206	EA MAT01

206	93	99	Almas	AC B0207	EA MAT01
207	99	105	Almas	AC B0208	EA MAT01
208	105	111	Almas	AC B0209	EA MAT01
209	111	117	Almas	AC B0210	EA MAT01
210	117	125	Almas	AC B0211	EA MAT01
211	125	131	Almas	AC B0212	EA MAT01
212	131	137	Almas	AC B0213	EA MAT01
213	137	143	Almas	AC B0214	EA MAT01
214	143	149	Almas	AC B0215	EA MAT01
215	149	155	Almas	AC B0216	EA MAT01
216	155	161	Almas	AC B0217	EA MAT01
217	161	167	Almas	AC B0218	EA MAT01
218	167	173	Almas	AC B0219	EA MAT01
219	173	179	Almas	AC B0220	EA MAT01
220	179	187	Almas	AC B0221	EA MAT01
221	187	193	Almas	AC B0222	EA MAT01
222	193	199	Almas	AC B0223	EA MAT01
223	199	205	Almas	AC B0224	EA MAT01
224	205	211	Almas	AC B0225	EA MAT01
225	211	217	Almas	AC B0226	EA MAT01
226	217	223	Almas	AC B0227	EA MAT01
227	223	229	Almas	AC B0228	EA MAT01
228	229	235	Almas	AC B0229	EA MAT01
229	235	241	Almas	AC B0230	EA MAT01
230	241	247	Almas	AC B0231	EA MAT01
231	247	255	Almas	AC B0232	EA MAT01
232	255	261	Almas	AC B0233	EA MAT01
233	261	267	Almas	AC B0234	EA MAT01
234	267	273	Almas	AC B0235	EA MAT01
235	273	279	Almas	AC B0236	EA MAT01
236	279	285	Almas	AC B0237	EA MAT01
237	285	291	Almas	AC B0238	EA MAT01
238	291	297	Almas	AC B0239	EA MAT01
239	297	305	Almas	AC B0240	EA MAT01
240	8	14	Long voladizo	AC B0241	EA MAT01
241	14	20	Long voladizo	AC B0242	EA MAT01
242	20	26	Long voladizo	AC B0243	EA MAT01
243	26	32	Long voladizo	AC B0244	EA MAT01
244	32	38	Long voladizo	AC B0245	EA MAT01
245	38	44	Long voladizo	AC B0246	EA MAT01
246	44	50	Long voladizo	AC B0247	EA MAT01
247	50	58	Long voladizo	AC B0248	EA MAT01
248	58	64	Long voladizo	AC B0249	EA MAT01
249	64	70	Long voladizo	AC B0250	EA MAT01
250	70	76	Long voladizo	AC B0251	EA MAT01
251	76	82	Long voladizo	AC B0252	EA MAT01
252	82	88	Long voladizo	AC B0253	EA MAT01
253	88	94	Long voladizo	AC B0254	EA MAT01
254	94	100	Long voladizo	AC B0255	EA MAT01
255	100	106	Long voladizo	AC B0256	EA MAT01
256	106	112	Long voladizo	AC B0257	EA MAT01
257	112	118	Long voladizo	AC B0258	EA MAT01
258	118	126	Long voladizo	AC B0259	EA MAT01
259	126	132	Long voladizo	AC B0260	EA MAT01
260	132	138	Long voladizo	AC B0261	EA MAT01
261	138	144	Long voladizo	AC B0262	EA MAT01
262	144	150	Long voladizo	AC B0263	EA MAT01
263	150	156	Long voladizo	AC B0264	EA MAT01
264	156	162	Long voladizo	AC B0265	EA MAT01
265	162	168	Long voladizo	AC B0266	EA MAT01
266	168	174	Long voladizo	AC B0267	EA MAT01
267	174	180	Long voladizo	AC B0268	EA MAT01
268	180	188	Long voladizo	AC B0269	EA MAT01
269	188	194	Long voladizo	AC B0270	EA MAT01

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270	194	200	Long voladizo	AC B0271	EA MAT01
271	200	206	Long voladizo	AC B0272	EA MAT01
272	206	212	Long voladizo	AC B0273	EA MAT01
273	212	218	Long voladizo	AC B0274	EA MAT01
274	218	224	Long voladizo	AC B0275	EA MAT01
275	224	230	Long voladizo	AC B0276	EA MAT01
276	230	236	Long voladizo	AC B0277	EA MAT01
277	236	242	Long voladizo	AC B0278	EA MAT01
278	242	248	Long voladizo	AC B0279	EA MAT01
279	248	256	Long voladizo	AC B0280	EA MAT01
280	256	262	Long voladizo	AC B0281	EA MAT01
281	262	268	Long voladizo	AC B0282	EA MAT01
282	268	274	Long voladizo	AC B0283	EA MAT01
283	274	280	Long voladizo	AC B0284	EA MAT01
284	280	286	Long voladizo	AC B0285	EA MAT01
285	286	292	Long voladizo	AC B0286	EA MAT01
286	292	298	Long voladizo	AC B0287	EA MAT01
287	298	306	Long voladizo	AC B0288	EA MAT01
288	1	2	Trans voladizo	AC B0289	EA MAT01
289	2	3	Diafragma	AC B0290	EA MAT01
290	3	4	Diafragma	AC B0291	EA MAT01
291	4	5	Trans entre cajones	AC B0292	EA MAT01
292	5	6	Diafragma	AC B0293	EA MAT01
293	6	7	Diafragma	AC B0294	EA MAT01
294	7	8	Trans voladizo	AC B0295	EA MAT01
295	9	10	Trans voladizo	AC B0296	EA MAT01
296	10	11	Trans cajon	AC B0297	EA MAT01
297	11	12	Trans entre cajones	AC B0298	EA MAT01
298	12	13	Trans cajon	AC B0299	EA MAT01
299	13	14	Trans voladizo	AC B0300	EA MAT01
300	15	16	Trans voladizo	AC B0301	EA MAT01
301	16	17	Trans cajon	AC B0302	EA MAT01
302	17	18	Trans entre cajones	AC B0303	EA MAT01
303	18	19	Trans cajon	AC B0304	EA MAT01
304	19	20	Trans voladizo	AC B0305	EA MAT01
305	21	22	Trans voladizo	AC B0306	EA MAT01
306	22	23	Trans cajon	AC B0307	EA MAT01
307	23	24	Trans entre cajones	AC B0308	EA MAT01
308	24	25	Trans cajon	AC B0309	EA MAT01
309	25	26	Trans voladizo	AC B0310	EA MAT01
310	27	28	Trans voladizo	AC B0311	EA MAT01
311	28	29	Trans cajon	AC B0312	EA MAT01
312	29	30	Trans entre cajones	AC B0313	EA MAT01
313	30	31	Trans cajon	AC B0314	EA MAT01
314	31	32	Trans voladizo	AC B0315	EA MAT01
315	33	34	Trans voladizo	AC B0316	EA MAT01
316	34	35	Trans cajon	AC B0317	EA MAT01
317	35	36	Trans entre cajones	AC B0318	EA MAT01
318	36	37	Trans cajon	AC B0319	EA MAT01
319	37	38	Trans voladizo	AC B0320	EA MAT01
320	39	40	Trans voladizo	AC B0321	EA MAT01
321	40	41	Trans cajon	AC B0322	EA MAT01
322	41	42	Trans entre cajones	AC B0323	EA MAT01
323	42	43	Trans cajon	AC B0324	EA MAT01
324	43	44	Trans voladizo	AC B0325	EA MAT01
325	45	46	Trans voladizo	AC B0326	EA MAT01
326	46	47	Trans cajon	AC B0327	EA MAT01
327	47	48	Trans entre cajones	AC B0328	EA MAT01
328	48	49	Trans cajon	AC B0329	EA MAT01
329	49	50	Trans voladizo	AC B0330	EA MAT01
330	51	52	Trans voladizo	AC B0331	EA MAT01
331	52	53	Diafragma	AC B0332	EA MAT01
332	53	54	Diafragma	AC B0333	EA MAT01
333	54	55	Trans entre cajones	AC B0334	EA MAT01

334	55	56	Diafragma	AC B0335	EA MAT01
335	56	57	Diafragma	AC B0336	EA MAT01
336	57	58	Trans voladizo	AC B0337	EA MAT01
337	59	60	Trans voladizo	AC B0338	EA MAT01
338	60	61	Trans cajon	AC B0339	EA MAT01
339	61	62	Trans entre cajones	AC B0340	EA MAT01
340	62	63	Trans cajon	AC B0341	EA MAT01
341	63	64	Trans voladizo	AC B0342	EA MAT01
342	65	66	Trans voladizo	AC B0343	EA MAT01
343	66	67	Trans cajon	AC B0344	EA MAT01
344	67	68	Trans entre cajones	AC B0345	EA MAT01
345	68	69	Trans cajon	AC B0346	EA MAT01
346	69	70	Trans voladizo	AC B0347	EA MAT01
347	71	72	Trans voladizo	AC B0348	EA MAT01
348	72	73	Trans cajon	AC B0349	EA MAT01
349	73	74	Trans entre cajones	AC B0350	EA MAT01
350	74	75	Trans cajon	AC B0351	EA MAT01
351	75	76	Trans voladizo	AC B0352	EA MAT01
352	77	78	Trans voladizo	AC B0353	EA MAT01
353	78	79	Trans cajon	AC B0354	EA MAT01
354	79	80	Trans entre cajones	AC B0355	EA MAT01
355	80	81	Trans cajon	AC B0356	EA MAT01
356	81	82	Trans voladizo	AC B0357	EA MAT01
357	83	84	Trans voladizo	AC B0358	EA MAT01
358	84	85	Trans cajon	AC B0359	EA MAT01
359	85	86	Trans entre cajones	AC B0360	EA MAT01
360	86	87	Trans cajon	AC B0361	EA MAT01
361	87	88	Trans voladizo	AC B0362	EA MAT01
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374	103	104	Trans entre cajones	AC B0375	EA MAT01
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376	105	106	Trans voladizo	AC B0377	EA MAT01
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380	110	111	Trans cajon	AC B0381	EA MAT01
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383	114	115	Trans cajon	AC B0384	EA MAT01
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428	167	168	Trans voladizo	AC B0429	EA MAT01
429	169	170	Trans voladizo	AC B0430	EA MAT01
430	170	171	Trans cajon	AC B0431	EA MAT01
431	171	172	Trans entre cajones	AC B0432	EA MAT01
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455	199	200	Trans voladizo	AC B0456	EA MAT01
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457	202	203	Trans cajon	AC B0458	EA MAT01
458	203	204	Trans entre cajones	AC B0459	EA MAT01
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461	207	208	Trans voladizo	AC B0462	EA MAT01

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465	211	212	Trans voladizo	AC B0466	EA MAT01
466	213	214	Trans voladizo	AC B0467	EA MAT01
467	214	215	Trans cajon	AC B0468	EA MAT01
468	215	216	Trans entre cajones	AC B0469	EA MAT01
469	216	217	Trans cajon	AC B0470	EA MAT01
470	217	218	Trans voladizo	AC B0471	EA MAT01
471	219	220	Trans voladizo	AC B0472	EA MAT01
472	220	221	Trans cajon	AC B0473	EA MAT01
473	221	222	Trans entre cajones	AC B0474	EA MAT01
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478	227	228	Trans entre cajones	AC B0479	EA MAT01
479	228	229	Trans cajon	AC B0480	EA MAT01
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482	232	233	Trans cajon	AC B0483	EA MAT01
483	233	234	Trans entre cajones	AC B0484	EA MAT01
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499	252	253	Trans entre cajones	AC B0500	EA MAT01
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501	254	255	Diafragma	AC B0502	EA MAT01
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506	260	261	Trans cajon	AC B0507	EA MAT01
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508	263	264	Trans voladizo	AC B0509	EA MAT01
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520	277	278	Trans entre cajones	AC B0521	EA MAT01
521	278	279	Trans cajon	AC B0522	EA MAT01
522	279	280	Trans voladizo	AC B0523	EA MAT01
523	281	282	Trans voladizo	AC B0524	EA MAT01
524	282	283	Trans cajon	AC B0525	EA MAT01
525	283	284	Trans entre cajones	AC B0526	EA MAT01

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526	284	285	Trans cajon	AC B0527	EA MAT01
527	285	286	Trans voladizo	AC B0528	EA MAT01
528	287	288	Trans voladizo	AC B0529	EA MAT01
529	288	289	Trans cajon	AC B0530	EA MAT01
530	289	290	Trans entre cajones	AC B0531	EA MAT01
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533	293	294	Trans voladizo	AC B0534	EA MAT01
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535	295	296	Trans entre cajones	AC B0536	EA MAT01
536	296	297	Trans cajon	AC B0537	EA MAT01
537	297	298	Trans voladizo	AC B0538	EA MAT01
538	299	300	Trans voladizo	AC B0539	EA MAT01
539	300	301	Diafragma	AC B0540	EA MAT01
540	301	302	Diafragma	AC B0541	EA MAT01
541	302	303	Trans entre cajones	AC B0542	EA MAT01
542	303	304	Diafragma	AC B0543	EA MAT01
543	304	305	Diafragma	AC B0544	EA MAT01
544	305	306	Trans voladizo	AC B0545	EA MAT01
545	9	15	Long voladizo	AC B0002	EA MAT01

FUERZA DISTRIBUIDA SOBRE VIGAS

Estado	Viga	Dir.	Valor [Ton/M]
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V2	144	Z	-7.44
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	151	Z	-7.44
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V3	48	Z	-4.84
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	102	Z	-5.4
	103	Z	-5.4
	115	Z	-5.4
	116	Z	-5.4
	117	Z	-5.4

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	118	Z	-5.4
	121	Z	-5.4
	122	Z	-5.4
	123	Z	-5.4
	124	Z	-5.4
	136	Z	-5.4
	137	Z	-5.4
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	140	Z	-5.4
	141	Z	-5.4
	142	Z	-5.4
	143	Z	-5.4
	168	Z	0
V4	144	Z	-7.44
	145	Z	-7.44
	146	Z	-7.44
	147	Z	-7.44
	148	Z	-7.44
	149	Z	-7.44
	150	Z	-7.44
	151	Z	-7.44
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	165	Z	-7.44
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	239	Z	-2.8
V5	56	Z	-4.84
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	132	Z	-5.4
	133	Z	-5.4
	134	Z	-5.4
	135	Z	-5.4
V6	152	Z	-7.44
	153	Z	-7.44
	154	Z	-7.44
	155	Z	-7.44
	158	Z	-7.44
	159	Z	-7.44
	160	Z	-7.44
	161	Z	-7.44
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	206	Z	-2.8
	207	Z	-2.8

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	208	Z	-2.8
	209	Z	-2.8
	210	Z	-2.8
	221	Z	-2.8
	222	Z	-2.8
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	231	Z	-2.8
V7	48	Z	-4.84
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	111	Z	-5.4
	112	Z	-5.4
	113	Z	-5.4
	114	Z	-5.4
V8	144	Z	-7.44
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	147	Z	-7.44
	148	Z	-7.44
	149	Z	-7.44
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	162	Z	-7.44
	192	Z	-2.8
	193	Z	-2.8
	194	Z	-2.8
	195	Z	-2.8
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	203	Z	-2.8
	206	Z	-2.8
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	210	Z	-2.8
V9	56	Z	-4.84
	57	Z	-4.84
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	120	Z	-5.4
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	122	Z	-5.4
	123	Z	-5.4
	124	Z	-5.4
V0	152	Z	-7.44
	153	Z	-7.44
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	155	Z	-7.44
	158	Z	-7.44
	159	Z	-7.44
	160	Z	-7.44
	161	Z	-7.44

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	162	Z	-7.44
	163	Z	-7.44
	164	Z	-7.44
	165	Z	-7.44
	166	Z	-7.44
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	215	Z	-2.8
	216	Z	-2.8
	217	Z	-2.8
	218	Z	-2.8
	219	Z	-2.8
	220	Z	-2.8

FUERZA CONCENTRADA SOBRE VIGAS

Estado	Viga	Dir.	Valor [Ton]	Distancia [M]	%
AC	288	Z	-0.625	6.725	1
	294	Z	-0.625	2.774	0
	295	Z	-1.25	6.725	1
	299	Z	-1.25	2.774	0
	300	Z	-1.25	6.725	1
	304	Z	-1.25	2.774	0
	305	Z	-1.25	6.725	1
	309	Z	-1.25	2.774	0
	310	Z	-1.25	6.725	1
	314	Z	-1.25	2.774	0
	315	Z	-1.25	6.725	1
	319	Z	-1.25	2.774	0
	320	Z	-1.25	6.725	1
	324	Z	-1.25	2.774	0
	325	Z	-1.25	6.725	1
	329	Z	-1.25	2.774	0
	330	Z	-1.375	0.2	0
	336	Z	-1.375	2.774	0
	337	Z	-1.35	0.2	0
	341	Z	-1.35	2.774	0
	342	Z	-1.2	0.2	0
	346	Z	-1.2	2.774	0
	347	Z	-1.2	0.2	0
	351	Z	-1.2	2.774	0
	352	Z	-1.2	0.2	0
	356	Z	-1.2	2.774	0
	357	Z	-1.2	0.2	0
	361	Z	-1.2	2.774	0

362	Z	-1.2	0.2	0
366	Z	-1.2	2.774	0
367	Z	-1.2	0.2	0
371	Z	-1.2	2.774	0
372	Z	-1.2	0.2	0
376	Z	-1.2	2.774	0
377	Z	-1.2	0.2	0
381	Z	-1.2	2.774	0
382	Z	-1.2	0.2	0
386	Z	-1.2	2.774	0
387	Z	-1.35	0.2	0
393	Z	-1.35	2.774	0
394	Z	-1.4075	0.2	0
398	Z	-1.4075	2.774	0
399	Z	-1.315	0.2	0
403	Z	-1.315	2.774	0
404	Z	-1.315	0.2	0
408	Z	-1.315	2.774	0
409	Z	-1.315	0.2	0
413	Z	-1.315	2.774	0
414	Z	-1.315	0.2	0
418	Z	-1.315	2.774	0
419	Z	-1.315	0.2	0
423	Z	-1.315	2.774	0
424	Z	-1.315	0.2	0
428	Z	-1.315	2.774	0
429	Z	-1.315	0.2	0
433	Z	-1.315	2.774	0
434	Z	-1.4075	0.2	0
438	Z	-1.4075	2.774	0
439	Z	-1.35	0.2	0
445	Z	-1.35	2.774	0
446	Z	-1.2	0.2	0
450	Z	-1.2	2.774	0
451	Z	-1.2	0.2	0
455	Z	-1.2	2.774	0
456	Z	-1.2	0.2	0
460	Z	-1.2	2.774	0
461	Z	-1.2	0.2	0
465	Z	-1.2	2.774	0
466	Z	-1.2	0.2	0
470	Z	-1.2	2.774	0
471	Z	-1.2	0.2	0
475	Z	-1.2	2.774	0
476	Z	-1.2	0.2	0
480	Z	-1.2	2.774	0
481	Z	-1.2	0.2	0
485	Z	-1.2	2.774	0
486	Z	-1.2	0.2	0
490	Z	-1.2	2.774	0
491	Z	-1.35	0.2	0
495	Z	-1.35	2.774	0
496	Z	-1.375	0.2	0
502	Z	-1.375	2.774	0
503	Z	-1.25	6.725	1
507	Z	-1.25	2.774	0
508	Z	-1.25	6.725	1
512	Z	-1.25	2.774	0
513	Z	-1.25	6.725	1
517	Z	-1.25	2.774	0
518	Z	-1.25	6.725	1
522	Z	-1.25	2.774	0
523	Z	-1.25	6.725	1
527	Z	-1.25	2.774	0

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	528	Z	-1.25	6.725	1
	532	Z	-1.25	2.774	0
	533	Z	-1.25	6.725	1
	537	Z	-1.25	2.774	0
	538	Z	-0.625	6.725	1
	544	Z	-0.625	2.774	0
V1	51	Z	-15.21	0.1	0
	52	Z	-15.21	0.8	0
	99	Z	-16.79	0.1	0
	100	Z	-16.79	0.8	0
V2	147	Z	-23.23	0.1	0
	148	Z	-23.23	0.8	0
	195	Z	-8.77	0.1	0
	196	Z	-8.77	0.8	0
V3	71	Z	-15.21	0.23	0
	72	Z	-15.21	0.8	0
	119	Z	-16.79	0.23	0
	120	Z	-16.79	0.8	0
V4	167	Z	-23.23	0.23	0
	168	Z	-23.23	0.8	0
	215	Z	-8.77	0.23	0
	216	Z	-8.77	0.8	0
V5	60	Z	-15.21	0	0
	61	Z	-15.21	0.8	0
	108	Z	-16.79	0	0
	109	Z	-16.79	0.8	0
V6	156	Z	-23.23	0.23	0
	157	Z	-23.23	0.8	0
	204	Z	-8.77	0.23	0
	205	Z	-8.77	0.8	0
V7	60	Z	-15.21	0	0
	61	Z	-15.21	0.8	0
	108	Z	-16.79	0	0
	109	Z	-16.79	0.8	0
V8	156	Z	-23.23	0	0
	157	Z	-23.23	0.8	0
	204	Z	-8.77	0	0
	205	Z	-8.77	0.8	0
V9	60	Z	-15.21	0	0
	61	Z	-15.21	0.8	0
	108	Z	-16.79	0	0
	109	Z	-16.79	0.8	0
V0	156	Z	-23.23	0	0
	157	Z	-23.23	0.8	0
	204	Z	-8.77	0	0
	205	Z	-8.77	0.8	0

PRESIONES Y TEMPERATURA

Estado	Viga	PresiÛn X [Ton/M2]	PresiÛn Y [Ton/M2]	PresiÛn Z [Ton/M2]	Temp1 [C]	Temp 2 [C/M]	Temp 3 [C/M]
Ta	48	0	0	0	0	0	3
	49	0	0	0	0	0	3
	50	0	0	0	0	0	3
	51	0	0	0	0	0	3
	52	0	0	0	0	0	3
	53	0	0	0	0	0	3
	54	0	0	0	0	0	3
	55	0	0	0	0	0	3
	56	0	0	0	0	0	3
	57	0	0	0	0	0	3
	58	0	0	0	0	0	3
	59	0	0	0	0	0	3

60	0	0	0	0	0	3
61	0	0	0	0	0	3
62	0	0	0	0	0	3
63	0	0	0	0	0	3
64	0	0	0	0	0	3
65	0	0	0	0	0	3
66	0	0	0	0	0	3
67	0	0	0	0	0	3
68	0	0	0	0	0	3
69	0	0	0	0	0	3
70	0	0	0	0	0	3
71	0	0	0	0	0	3
72	0	0	0	0	0	3
73	0	0	0	0	0	3
74	0	0	0	0	0	3
75	0	0	0	0	0	3
76	0	0	0	0	0	3
77	0	0	0	0	0	3
78	0	0	0	0	0	3
79	0	0	0	0	0	3
80	0	0	0	0	0	3
81	0	0	0	0	0	3
82	0	0	0	0	0	3
83	0	0	0	0	0	3
84	0	0	0	0	0	3
85	0	0	0	0	0	3
86	0	0	0	0	0	3
87	0	0	0	0	0	3
88	0	0	0	0	0	3
89	0	0	0	0	0	3
90	0	0	0	0	0	3
91	0	0	0	0	0	3
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94	0	0	0	0	0	3
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104	0	0	0	0	0	3
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107	0	0	0	0	0	3
108	0	0	0	0	0	3
109	0	0	0	0	0	3
110	0	0	0	0	0	3
111	0	0	0	0	0	3
112	0	0	0	0	0	3
113	0	0	0	0	0	3
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115	0	0	0	0	0	3
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117	0	0	0	0	0	3
118	0	0	0	0	0	3
119	0	0	0	0	0	3
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121	0	0	0	0	0	3
122	0	0	0	0	0	3
123	0	0	0	0	0	3

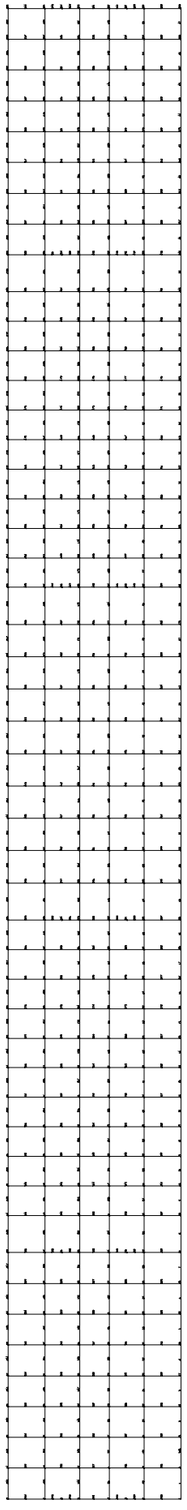
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124	0	0	0	0	0	3
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238	0	0	0	0	0	3
239	0	0	0	0	0	3

E S T A D O S D E C A R G A

Estado	DescripciÛn	Comb.	MultX	MultY	MultZ
AC	Aceras + Barandillas	0	0	0	0
BA	Balasto	0	0	0	0
V1	TREN 1 VANOS 1 + (3 y 5)	0	0	0	0
V2	TREN 2 VANOS 1 + (3 y 5)	0	0	0	0
V3	TREN 1 VANOS 3 + (1 y 5)	0	0	0	0
V4	TREN 2 VANO 3 + (1 y 5)	0	0	0	0
V5	TREN 1 VANOS 2 + (4)	0	0	0	0
V6	TREN 2 VANOS 2 + (4)	0	0	0	0
V7	TREN 1 VANOS 2 + (1)	0	0	0	0
V8	TREN 2 VANOS 2 + (1)	0	0	0	0
V9	TREN 1 VANOS 2 + (3)	0	0	0	0
V0	TREN 2 VANOS 2 + (3)	0	0	0	0
X1	V1+V2	1	0	0	0
X2	V3+V4	1	0	0	0
X3	V5+V6	1	0	0	0
X4	V7+V8	1	0	0	0
X5	V9+V0	1	0	0	0
Ta	Temperatura	0	0	0	0



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2.2.- Dimensionamiento de vigas

2.2.- Dimensionamiento de vigas

A continuación se adjunta el cálculo de las vigas cajón sometidas a los esfuerzos extraídos del análisis de los diversos emparrillados anteriormente mencionados (las abscisas se refieren a la distancia a los apoyos). Dada la simetría del viaducto en su sentido longitudinal, sólo se muestran a continuación los resultados del estudio de media estructura.

Hay que señalar que, debido a las fuertes solicitaciones existentes en las secciones en apoyo sobre estribo, se ha realizado una hoja de cálculo que comprueba el comportamiento de éstas frente a esfuerzos de cortadura y de torsión. Las mencionadas comprobaciones se adjuntan seguidamente.

2.2.1.- Análisis tensional en servicio

Se explica a continuación el criterio seguido para proceder al estudio del estado tensional en las fibras críticas a lo largo de la ejecución de la estructura (este análisis se adjunta en el presente apartado). Con los esfuerzos (momento flector) obtenidos de la resolución de los emparrillados anteriormente explicados se obtienen las tensiones correspondientes (en Mp/m^2) para cada sección considerada:

S_a: Tensión en fibra superior de viga.

S_b: Tensión en fibra inferior de viga.

S_c: Tensión en fibra superior de losa.

Se incluye igualmente el número y disposición de armadura activa en la sección analizada para, finalmente, hallar el estado tensional total (tanto inicial como final) en dicha sección.

UTE ALT CAMP. Viaducto en Valls — **Momento flector**

ESFUERZOS EN UNA VIGA

	Sección	x=	Vigas	Prelosas	Losa	Aceras Barandillas	Balasto	Reología	Gradiente	Sobrecarga Max (+)	Sobrecarga Min (-)	Negativo Md
	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
	2	2.50	67.85	24.76	49.60	17.53	64.61	7.54	27.33	297.56		
	3	5.00	111.28	40.62	78.58	27.70	102.09	15.09	54.82	518.95		
	4	7.50	130.31	47.56	86.94	30.60	112.75	22.63	82.01	670.44		
	5	10.00	124.95	45.60	74.66	26.24	96.71	30.17	109.07	696.98		
	6	12.50	95.17	34.74	41.78	14.64	53.94	37.71	135.71	602.64	-379.55	-194.05
	7	15.00	40.99	14.96	-11.74	-4.28	-15.75	45.26	162.13	384.98	-459.83	-596.01
	8	17.50	-21.58	-13.72	-85.90	-30.59	-112.74	52.80	188.44	100.97	-545.70	-1104.39
Pila 1	9	20.00	-140.56	-51.30	-180.66	-64.40	-237.29	60.34	214.78	0.00	-868.95	-2132.15
Rótula	10	23.00	0.00	0.00	-64.46	-23.08	-85.08	61.07	208.78	0.00	-316.95	-626.02
	11	25.40	87.15	31.80	7.12	2.22	8.14	61.65	204.47	225.52	-250.96	-109.03
	12	27.80	151.81	55.40	59.68	20.74	76.39	62.23	200.12	503.66	-255.32	192.46
	13	30.20	193.98	70.80	93.24	32.56	119.92	62.81	195.90	721.25		
	14	32.60	213.66	77.98	107.80	37.74	139.00	63.39	191.78	819.37		
	15	35.00	210.85	76.96	103.34	36.32	133.73	63.98	187.72	811.41		
	16	37.40	185.55	67.72	79.88	28.26	104.09	64.56	183.71	684.52		
	17	39.80	137.75	50.28	37.58	13.57	49.91	65.14	179.71	498.42	-377.50	-88.04
	18	42.20	67.47	24.62	-24.06	-7.88	-29.13	65.72	175.72	249.23	-419.33	-498.39
	19	44.60	-25.30	-9.24	-104.56	-36.17	-133.34	66.31	171.70	0.00	-523.05	-1111.69
Pila 2	20	47.00	-140.56	-51.30	-204.06	-71.39	-263.08	66.89	167.66	0.00	-973.80	-2356.42
Rótula	21	50.00	0.00	0.00	-85.26	-29.13	-107.34	66.89	167.84	0.00	-488.93	-942.43
	22	52.63	94.16	34.36	-5.66	-1.02	-3.71	66.89	167.96	319.51	-380.61	-321.14
	23	55.26	161.42	58.92	51.18	18.93	69.84	66.89	168.02	589.09	-359.78	37.02
	24	57.89	201.78	73.64	85.03	30.85	113.77	66.89	168.09	784.79		
	25	60.52	215.24	78.56	96.66	34.81	128.38	66.89	168.10	852.63		

Características mecánicas

INICIAL						FINAL					
Canto	**Va**	**Vb**	**Vc**	**Área**	**Inercia**	**Canto**	**Va**	**Vb**	**Vc**	**Área**	**Inercia**
2.0000	1.2376	0.7624	0.0000	1.6423	0.7971	2.2700	0.5827	1.4173	0.8527	3.1408	2.2826

MOMENTOS POSITIVOS

1 Seccion X= 0

	Vigas	Prelosas	Losa	Ac y Baran	Balasto	Reología	Gradiente	Sc	Total
Momentos	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.000
Sa	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Sb	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sc	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

Nº cables	0	48	Estado inicial	Sa+0.95 Pa	38.477
F. Pret.	0	874.944		Sb+0.95 Pb	794.163
Cota cables	10	40	Estado final	Sa+0.8 Pa	32.401
e	0.662365	0.362365		Sb+0.8 Pb	668.769
Pa	0.000	40.502	0.95 Pa=	38.477	0.80 Pa= 32.401
Pb	0.000	835.961	0.95 Pb=	794.163	0.80 Pb= 668.769

2 Seccion X= 2.5

	Vigas	Prelosas	Losa	Ac y Baran	Balasto	Reología	Gradiente	Sc	Total
Momentos	67.85	24.76	49.60	17.53	64.61	7.5425	27.33	297.56	556.783
Sa	105.343	38.442	77.008	4.475	16.495	1.926	6.977	75.968	
Sb	-64.889	-23.680	-47.436	-10.884	-40.116	-4.683	-16.969	-184.755	-393.413
Sc	0.000	0.000	0.000	6.549	24.138	2.818	10.210	111.165	

Nº cables	48	0	Estado inicial	Sa+0.95 Pa	-243.331
F. Pret.	874.944	0		Sb+0.95 Pb	967.752
Cota cables	10	40	Estado final	Sa+0.8 Pa	33.014
e	0.662365	0.362365		Sb+0.8 Pb	476.180
Pa	-367.025	0.000	0.95 Pa=	-348.673	0.80 Pa= -293.620
Pb	1086.991	0.000	0.95 Pb=	1032.642	0.80 Pb= 869.593

3 Seccion X= 5

	Vigas	Prelosas	Losa	Ac y Baran	Balasto	Reología	Gradiente	Sc	Total
Momentos	111.28	40.62	78.58	27.70	102.09	15.085	54.82	518.95	949.125
Sa	172.771	63.066	122.002	7.072	26.064	3.851	13.996	132.489	
Sb	-106.425	-38.848	-75.151	-17.199	-63.388	-9.366	-34.038	-322.216	-666.631
Sc	0.000	0.000	0.000	10.348	38.140	5.636	20.480	193.874	

Nº cables	48	0		Estado inicial	Sa+0.95 Pa	-175.902
F. Pret.	874.944	0			Sb+0.95 Pb	926.217
Cota cables	10	40		Estado final	Sa+0.8 Pa	247.690
e	0.662365	0.362365			Sb+0.8 Pb	202.963
Pa	-367.025	0.000	0.95 Pa=	-348.673	0.80 Pa=	-293.620
Pb	1086.991	0.000	0.95 Pb=	1032.642	0.80 Pb=	869.593

4 Seccion X= 7.5

	Vigas	Prelosas	Losa	Ac y Baran	Balasto	Reología	Gradiente	Sc	Total
Momentos	130.31	47.56	86.94	30.60	112.75	22.6275	82.01	670.44	1183.238
Sa	202.317	73.841	134.981	7.812	28.785	5.777	20.937	171.165	
Sb	-124.624	-45.485	-83.147	-19.000	-70.007	-14.049	-50.920	-416.277	-823.508
Sc	0.000	0.000	0.000	11.432	42.122	8.453	30.638	250.469	

Nº cables	48	0		Estado inicial	Sa+0.95 Pa	-146.357
F. Pret.	874.944	0			Sb+0.95 Pb	908.018
Cota cables	10	40		Estado final	Sa+0.8 Pa	351.995
e	0.662365	0.362365			Sb+0.8 Pb	46.085
Pa	-367.025	0.000	0.95 Pa=	-348.673	0.80 Pa=	-293.620
Pb	1086.991	0.000	0.95 Pb=	1032.642	0.80 Pb=	869.593

5 Seccion X= 10

	Vigas	Prelosas	Losa	Ac y Baran	Balasto	Reología	Gradiente	Sc	Total
Momentos	124.95	45.60	74.66	26.24	96.71	30.17	109.07	696.98	1204.380
Sa	193.995	70.798	115.916	6.699	24.690	7.702	27.846	177.940	
Sb	-119.498	-43.610	-71.402	-16.292	-60.047	-18.733	-67.722	-432.755	-830.060
Sc	0.000	0.000	0.000	9.803	36.130	11.271	40.747	260.384	

Nº cables	48	0		Estado inicial	Sa+0.95 Pa	-154.679
F. Pret.	874.944	0			Sb+0.95 Pb	913.144
Cota cables	10	40		Estado final	Sa+0.8 Pa	331.966
e	0.662365	0.362365			Sb+0.8 Pb	39.533
Pa	-367.025	0.000	0.95 Pa=	-348.673	0.80 Pa=	-293.620
Pb	1086.991	0.000	0.95 Pb=	1032.642	0.80 Pb=	869.593

6 Seccion X= 12.5

	Vigas	Prelosas	Losa	Ac y Baran	Balasto	Reología	Gradiente	Sc	Total
Momentos	95.17	34.74	41.78	14.64	53.94	37.7125	135.71	602.64	1016.333
Sa	147.759	53.937	64.867	3.738	13.771	9.628	34.647	153.855	
Sb	-91.017	-33.224	-39.957	-9.090	-33.491	-23.416	-84.262	-374.180	-688.638
Sc	0.000	0.000	0.000	5.469	20.151	14.089	50.700	225.140	

Nº cables	48	0	0	Estado inicial	Sa+0.95 Pa	-200.914
F. Pret.	874.944	0	0		Sb+0.95 Pb	941.624
Cota cables	10	40	190	Estado final	Sa+0.8 Pa	188.582
e	0.662365	0.362365	-1.137635		Sb+0.8 Pb	180.955
Pa	-367.025	0.000	0.000	0.95 Pa=	-348.673	0.80 Pa=	-293.620
Pb	1086.991	0.000	0.000	0.95 Pb=	1032.642	0.80 Pb=	869.593

7 Seccion X= 15

	Vigas	Prelosas	Losa	Ac y Baran	Balasto	Reología	Gradiente	Sc	Total
Momentos	40.99	14.96	-11.74	-4.28	-15.75	45.255	162.13	384.98	616.545
Sa	63.640	23.227	-18.227	-1.093	-4.021	11.554	41.392	98.286	
Sb	-39.201	-14.307	11.228	2.657	9.779	-28.099	-100.667	-239.034	-397.644
Sc	0.000	0.000	0.000	-1.599	-5.884	16.907	60.570	143.824	

Nº cables	48	0	24	Estado inicial	Sa+0.95 Pa	702.080
F. Pret.	874.944	0	437.472		Sb+0.95 Pb	794.325
Cota cables	10	40	190	Estado final	Sa+0.8 Pa	752.391
e	0.662365	0.362365	-1.137635		Sb+0.8 Pb	304.273
Pa	-367.025	0.000	1039.067	0.95 Pa=	638.440	0.80 Pa=	537.634
Pb	1086.991	0.000	-209.595	0.95 Pb=	833.527	0.80 Pb=	701.917

8 Seccion X= 17.5

	Vigas	Prelosas	Losa	Ac y Baran	Balasto	Reología	Gradiente	Sc	Total
Momentos	-21.58	-13.72	-85.90	-30.59	-112.74	52.7975	188.44	100.97	77.678
Sa	-33.505	-21.301	-133.367	-7.810	-28.783	13.479	48.109	25.778	
Sb	20.638	13.121	82.152	18.993	70.000	-32.782	-117.003	-62.692	-7.571
Sc	0.000	0.000	0.000	-11.428	-42.118	19.725	70.399	37.721	

Nº cables	24	0	24	Estado inicial	Sa+0.95 Pa	779.272
F. Pret.	437.472	0	437.472		Sb+0.95 Pb	337.844
Cota cables	10	40	190	Estado final	Sa+0.8 Pa	547.044
e	0.662365	0.362365	-1.137635		Sb+0.8 Pb	259.549
Pa	-183.512	0.000	1039.067	0.95 Pa=	812.777	0.80 Pa=	684.443
Pb	543.496	0.000	-209.595	0.95 Pb=	317.206	0.80 Pb=	267.121

9 Seccion X= 20

	Vigas	Prelosas	Losa	Ac y Baran	Balasto	Reología	Gradiente	Sc	Total
Momentos	-140.56	-51.30	-180.66	-64.40	-237.29	60.338	214.78	0.00	-399.092
Sa	-218.231	-79.647	-280.489	-16.441	-60.581	15.404	54.834	0.000	
Sb	134.427	49.062	172.777	39.986	147.333	-37.464	-133.357	0.000	372.764
Sc	0.000	0.000	0.000	-24.059	-88.649	22.542	80.239	0.000	

Nº cables	0	24	24	Estado inicial	Sa+0.95 Pa	788.121
F. Pret.	0	437.472	437.472		Sb+0.95 Pb	332.393
Cota cables	10	40	190	Estado final	Sa+0.8 Pa	262.303
e	0.662365	0.362365	-1.137635		Sb+0.8 Pb	539.473
Pa	0.000	20.251	1039.067	0.95 Pa=	1006.352	0.80 Pa=	847.454
Pb	0.000	417.981	-209.595	0.95 Pb=	197.966	0.80 Pb=	166.708

10 Seccion X= 23

	Vigas	Prelosas	Losa	Ac y Baran	Balasto	Reología	Gradiente	Sc	Total
Momentos	0.00	0.00	-64.46	-23.08	-85.08	61.06577778	208.78	0.00	97.226
Sa	0.000	0.000	-100.079	-5.892	-21.721	15.590	53.302	0.000	
Sb	0.000	0.000	61.647	14.330	52.826	-37.916	-129.632	0.000	-38.743
Sc	0.000	0.000	0.000	-8.622	-31.785	22.814	77.998	0.000	

Nº cables	0	0	24	Estado inicial	Sa+0.95 Pa	922.588
F. Pret.	0	0	437.472		Sb+0.95 Pb	-159.369
Cota cables	10	40	180	Estado final	Sa+0.8 Pa	718.116
e	0.662365	0.362365	-1.037635		Sb+0.8 Pb	-172.949
Pa	0.000	0.000	971.146	0.95 Pa=	922.588	0.80 Pa=	776.916
Pb	0.000	0.000	-167.757	0.95 Pb=	-159.369	0.80 Pb=	-134.205

10 Seccion X= 23

	Vigas	Prelosas	Losa	Ac y Baran	Balasto	Reología	Gradiente	Sc	Total
Momentos	0.00	0.00	-64.46	-23.08	-85.08	61.06577778	208.78	0.00	97.226
Sa	0.000	0.000	-100.079	-5.892	-21.721	15.590	53.302	0.000	
Sb	0.000	0.000	61.647	14.330	52.826	-37.916	-129.632	0.000	-38.743
Sc	0.000	0.000	0.000	-8.622	-31.785	22.814	77.998	0.000	

Nº cables	0	48		Estado inicial	Sa+0.95 Pa	38.477
F. Pret.	0	874.944			Sb+0.95 Pb	794.163
Cota cables	10	40		Estado final	Sa+0.8 Pa	-26.399
e	0.662365	0.362365			Sb+0.8 Pb	630.026
Pa	0.000	40.502	0.95 Pa=	38.477	0.80 Pa=	32.401
Pb	0.000	835.961	0.95 Pb=	794.163	0.80 Pb=	668.769

11 Seccion X= 25.4

	Vigas	Prelosas	Losa	Ac y Baran	Balasto	Reología	Gradiente	Sc	Total
Momentos	87.15	31.80	7.12	2.22	8.14	61.648	204.47	225.52	628.068
Sa	135.307	49.372	11.054	0.567	2.078	15.739	52.202	57.576	
Sb	-83.347	-30.412	-6.809	-1.378	-5.054	-38.277	-126.956	-140.025	-432.260
Sc	0.000	0.000	0.000	0.829	3.041	23.031	76.388	84.252	

Nº cables	48	0		Estado inicial	Sa+0.95 Pa	-213.366
F. Pret.	874.944	0			Sb+0.95 Pb	949.294
Cota cables	10	40		Estado final	Sa+0.8 Pa	30.275
e	0.662365	0.362365			Sb+0.8 Pb	437.333
Pa	-367.025	0.000	0.95 Pa=	-348.673	0.80 Pa=	-293.620
Pb	1086.991	0.000	0.95 Pb=	1032.642	0.80 Pb=	869.593

12 Seccion X= 27.8

	Vigas	Prelosas	Losa	Ac y Baran	Balasto	Reología	Gradiente	Sc	Total
Momentos	151.81	55.40	59.68	20.74	76.39	62.23022222	200.12	503.66	1130.030
Sa	235.697	86.013	92.658	5.295	19.503	15.887	51.091	128.585	
Sb	-145.186	-52.983	-57.076	-12.877	-47.431	-38.639	-124.255	-312.723	-791.169
Sc	0.000	0.000	0.000	7.748	28.538	23.249	74.763	188.162	

Nº cables	48	0		Estado inicial	Sa+0.95 Pa	-112.976
F. Pret.	874.944	0			Sb+0.95 Pb	887.456
Cota cables	10	40		Estado final	Sa+0.8 Pa	341.110
e	0.662365	0.362365			Sb+0.8 Pb	78.424
Pa	-367.025	0.000	0.95 Pa=	-348.673	0.80 Pa=	-293.620
Pb	1086.991	0.000	0.95 Pb=	1032.642	0.80 Pb=	869.593

13 Seccion X= 30.2

	Vigas	Prelosas	Losa	Ac y Baran	Balasto	Reología	Gradiente	Sc	Total
Momentos	193.98	70.80	93.24	32.56	119.92	62.81244444	195.90	721.25	1490.462
Sa	301.170	109.923	144.763	8.313	30.616	16.036	50.014	184.136	
Sb	-185.516	-67.711	-89.172	-20.217	-74.458	-39.000	-121.634	-447.825	-1045.533
Sc	0.000	0.000	0.000	12.164	44.801	23.466	73.186	269.451	

Nº cables	72	0		Estado inicial	Sa+0.95 Pa	-221.841
F. Pret.	1312.416	0			Sb+0.95 Pb	1363.447
Cota cables	10	40		Estado final	Sa+0.8 Pa	404.540
e	0.662365	0.362365			Sb+0.8 Pb	258.857
Pa	-550.537	0.000	0.95 Pa=	-523.010	0.80 Pa=	-440.430
Pb	1630.487	0.000	0.95 Pb=	1548.963	0.80 Pb=	1304.390

14 Seccion X= 32.6

	Vigas	Prelosas	Losa	Ac y Baran	Balasto	Reología	Gradiente	Sc	Total
Momentos	213.66	77.98	107.80	37.74	139.00	63.39466667	191.78	819.37	1650.725
Sa	331.724	121.070	167.368	9.635	35.487	16.185	48.962	209.187	
Sb	-204.337	-74.577	-103.096	-23.433	-86.305	-39.362	-119.076	-508.747	-1158.935
Sc	0.000	0.000	0.000	14.099	51.929	23.684	71.647	306.108	

Nº cables	72	0	Estado inicial	Sa+0.95 Pa	-191.286
F. Pret.	1312.416	0		Sb+0.95 Pb	1344.625
Cota cables	10	40	Estado final	Sa+0.8 Pa	499.188
e	0.662365	0.362365		Sb+0.8 Pb	145.455
Pa	-550.537	0.000	0.95 Pa=	-523.010	0.80 Pa= -440.430
Pb	1630.487	0.000	0.95 Pb=	1548.963	0.80 Pb= 1304.390

15 Seccion X= 35

	Vigas	Prelosas	Losa	Ac y Baran	Balasto	Reología	Gradiente	Sc	Total
Momentos	210.85	76.96	103.34	36.32	133.73	63.97688889	187.72	811.41	1624.307
Sa	327.362	119.487	160.444	9.273	34.142	16.333	47.925	207.154	
Sb	-201.650	-73.602	-98.831	-22.551	-83.033	-39.723	-116.555	-503.805	-1139.751
Sc	0.000	0.000	0.000	13.569	49.960	23.901	70.130	303.134	

Nº cables	72	0	Estado inicial	Sa+0.95 Pa	-195.649
F. Pret.	1312.416	0		Sb+0.95 Pb	1347.313
Cota cables	10	40	Estado final	Sa+0.8 Pa	481.689
e	0.662365	0.362365		Sb+0.8 Pb	164.639
Pa	-550.537	0.000	0.95 Pa=	-523.010	0.80 Pa= -440.430
Pb	1630.487	0.000	0.95 Pb=	1548.963	0.80 Pb= 1304.390

16 Seccion X= 37.4

	Vigas	Prelosas	Losa	Ac y Baran	Balasto	Reología	Gradiente	Sc	Total
Momentos	185.55	67.72	79.88	28.26	104.09	64.55911111	183.71	684.52	1398.289
Sa	288.081	105.141	124.020	7.215	26.574	16.482	46.901	174.759	
Sb	-177.454	-64.765	-76.395	-17.547	-64.630	-40.085	-114.066	-425.019	-979.959
Sc	0.000	0.000	0.000	10.558	38.887	24.119	68.632	255.729	

Nº cables	72	0	Estado inicial	Sa+0.95 Pa	-234.929
F. Pret.	1312.416	0		Sb+0.95 Pb	1371.509
Cota cables	10	40	Estado final	Sa+0.8 Pa	348.745
e	0.662365	0.362365		Sb+0.8 Pb	324.431
Pa	-550.537	0.000	0.95 Pa=	-523.010	0.80 Pa= -440.430
Pb	1630.487	0.000	0.95 Pb=	1548.963	0.80 Pb= 1304.390

17 Seccion X= 39.8

	Vigas	Prelosas	Losa	Ac y Baran	Balasto	Reología	Gradiente	Sc	Total
Momentos	137.75	50.28	37.58	13.57	49.91	65.14133333	179.71	498.42	1032.361
Sa	213.868	78.064	58.346	3.464	12.742	16.631	45.880	127.248	
Sb	-131.740	-48.086	-35.940	-8.426	-30.989	-40.446	-111.582	-309.469	-716.678
Sc	0.000	0.000	0.000	5.070	18.646	24.336	67.138	186.204	

Nº cables	72	0	24	Estado inicial	Sa+0.95 Pa 677.971
F. Pret.	1312.416	0	437.472		Sb+0.95 Pb 1218.108
Cota cables	10	40	190	Estado final	Sa+0.8 Pa 947.066
e	0.662365	0.362365	-1.137635		Sb+0.8 Pb 420.035
Pa	-550.537	0.000	1039.067	0.95 Pa=	464.103 0.80 Pa= 390.824
Pb	1630.487	0.000	-209.595	0.95 Pb=	1349.847 0.80 Pb= 1136.714

18 Seccion X= 42.2

	Vigas	Prelosas	Losa	Ac y Baran	Balasto	Reología	Gradiente	Sc	Total
Momentos	67.47	24.62	-24.06	-7.88	-29.13	65.72355556	175.72	249.23	521.694
Sa	104.753	38.225	-37.355	-2.012	-7.437	16.779	44.862	63.629	
Sb	-64.526	-23.546	23.010	4.893	18.087	-40.808	-109.105	-154.747	-346.742
Sc	0.000	0.000	0.000	-2.944	-10.883	24.554	65.647	93.110	

Nº cables	48	0	24	Estado inicial	Sa+0.95 Pa 743.192
F. Pret.	874.944	0	437.472		Sb+0.95 Pb 769.000
Cota cables	10	40	190	Estado final	Sa+0.8 Pa 759.077
e	0.662365	0.362365	-1.137635		Sb+0.8 Pb 355.175
Pa	-367.025	0.000	1039.067	0.95 Pa=	638.440 0.80 Pa= 537.634
Pb	1086.991	0.000	-209.595	0.95 Pb=	833.527 0.80 Pb= 701.917

19 Seccion X= 44.6

	Vigas	Prelosas	Losa	Ac y Baran	Balasto	Reología	Gradiente	Sc	Total
Momentos	-25.30	-9.24	-104.56	-36.17	-133.34	66.30577778	171.70	0.00	-70.604
Sa	-39.280	-14.346	-162.338	-9.234	-34.042	16.928	43.835	0.000	
Sb	24.196	8.837	99.998	22.458	82.791	-41.169	-106.609	0.000	90.502
Sc	0.000	0.000	0.000	-13.513	-49.814	24.771	64.145	0.000	

Nº cables	24	0	24	Estado inicial	Sa+0.95 Pa 773.496
F. Pret.	437.472	0	437.472		Sb+0.95 Pb 341.402
Cota cables	10	40	190	Estado final	Sa+0.8 Pa 485.967
e	0.662365	0.362365	-1.137635		Sb+0.8 Pb 357.622
Pa	-183.512	0.000	1039.067	0.95 Pa=	812.777 0.80 Pa= 684.443
Pb	543.496	0.000	-209.595	0.95 Pb=	317.206 0.80 Pb= 267.121

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20 Seccion X= 47

	Vigas	Prelosas	Losa	Ac y Baran	Balasto	Reología	Gradiente	Sc	Total
Momentos	-140.56	-51.30	-204.06	-71.39	-263.08	66.894	167.66	0.00	-495.836
Sa	-218.231	-79.647	-316.820	-18.226	-67.165	17.078	42.804	0.000	
Sb	134.427	49.062	195.156	44.326	163.347	-41.535	-104.100	0.000	440.683
Sc	0.000	0.000	0.000	-26.671	-98.284	24.991	62.636	0.000	

Nº cables	0	24	24	Estado inicial	Sa+0.95 Pa 788.121
F. Pret.	0	437.472	437.472		Sb+0.95 Pb 332.393
Cota cables	10	40	190	Estado final	Sa+0.8 Pa 207.247
e	0.662365	0.362365	-1.137635		Sb+0.8 Pb 607.391
Pa	0.000	20.251	1039.067	0.95 Pa=	1006.352 0.80 Pa= 847.454
Pb	0.000	417.981	-209.595	0.95 Pb=	197.966 0.80 Pb= 166.708

21 Seccion X= 50

	Vigas	Prelosas	Losa	Ac y Baran	Balasto	Reología	Gradiente	Sc	Total
Momentos	0.00	0.00	-85.26	-29.13	-107.34	66.89	167.84	0.00	13.000
Sa	0.000	0.000	-132.373	-7.437	-27.404	17.077	42.850	0.000	
Sb	0.000	0.000	81.540	18.087	66.647	-41.532	-104.212	0.000	20.530
Sc	0.000	0.000	0.000	-10.883	-40.101	24.989	62.703	0.000	

Nº cables	0	0	24	Estado inicial	Sa+0.95 Pa 922.588
F. Pret.	0	0	437.472		Sb+0.95 Pb -159.369
Cota cables	10	40	180	Estado final	Sa+0.8 Pa 669.629
e	0.662365	0.362365	-1.037635		Sb+0.8 Pb -113.675
Pa	0.000	0.000	971.146	0.95 Pa=	922.588 0.80 Pa= 776.916
Pb	0.000	0.000	-167.757	0.95 Pb=	-159.369 0.80 Pb= -134.205

21 Seccion X= 50

	Vigas	Prelosas	Losa	Ac y Baran	Balasto	Reología	Gradiente	Sc	Total
Momentos	0.00	0.00	-85.26	-29.13	-107.34	66.89	167.84	0.00	13.000
Sa	0.000	0.000	-132.373	-7.437	-27.404	17.077	42.850	0.000	
Sb	0.000	0.000	81.540	18.087	66.647	-41.532	-104.212	0.000	20.530
Sc	0.000	0.000	0.000	-10.883	-40.101	24.989	62.703	0.000	

Nº cables	0	48		Estado inicial	Sa+0.95 Pa 38.477
F. Pret.	0	874.944			Sb+0.95 Pb 794.163
Cota cables	10	40		Estado final	Sa+0.8 Pa -74.886
e	0.662365	0.362365			Sb+0.8 Pb 689.299
Pa	0.000	40.502	0.95 Pa=	38.477	0.80 Pa= 32.401
Pb	0.000	835.961	0.95 Pb=	794.163	0.80 Pb= 668.769

22 Seccion X= 52.63

	Vigas	Prelosas	Losa	Ac y Baran	Balasto	Reología	Gradiente	Sc	Total
Momentos	94.16	34.36	-5.66	-1.02	-3.71	66.89	167.96	319.51	672.490
Sa	146.191	53.347	-8.788	-0.260	-0.947	17.077	42.880	81.571	
Sb	-90.052	-32.861	5.413	0.633	2.304	-41.532	-104.286	-198.384	-458.765
Sc	0.000	0.000	0.000	-0.381	-1.386	24.989	62.748	119.365	

Nº cables	48	0		Estado inicial	Sa+0.95 Pa -202.482
F. Pret.	874.944	0			Sb+0.95 Pb 942.590
Cota cables	10	40		Estado final	Sa+0.8 Pa 37.452
e	0.662365	0.362365			Sb+0.8 Pb 410.828
Pa	-367.025	0.000	0.95 Pa=	-348.673	0.80 Pa= -293.620
Pb	1086.991	0.000	0.95 Pb=	1032.642	0.80 Pb= 869.593

23 Seccion X= 55.26

	Vigas	Prelosas	Losa	Ac y Baran	Balasto	Reología	Gradiente	Sc	Total
Momentos	161.42	58.92	51.18	18.93	69.84	66.89	168.02	589.09	1184.290
Sa	250.618	91.478	79.461	4.833	17.830	17.077	42.896	150.396	
Sb	-154.377	-56.349	-48.947	-11.754	-43.364	-41.532	-104.324	-365.766	-826.412
Sc	0.000	0.000	0.000	7.072	26.091	24.989	62.770	220.078	

Nº cables	48	0		Estado inicial	Sa+0.95 Pa -98.056
F. Pret.	874.944	0			Sb+0.95 Pb 878.265
Cota cables	10	40		Estado final	Sa+0.8 Pa 360.969
e	0.662365	0.362365			Sb+0.8 Pb 43.181
Pa	-367.025	0.000	0.95 Pa=	-348.673	0.80 Pa= -293.620
Pb	1086.991	0.000	0.95 Pb=	1032.642	0.80 Pb= 869.593

24 Seccion X= 57.89

	Vigas	Prelosas	Losa	Ac y Baran	Balasto	Reología	Gradiente	Sc	Total
Momentos	201.78	73.64	85.03	30.85	113.77	66.89	168.09	784.79	1524.840
Sa	313.280	114.332	132.016	7.876	29.046	17.077	42.914	200.358	
Sb	-192.976	-70.427	-81.320	-19.155	-70.640	-41.532	-104.367	-487.277	-1067.693
Sc	0.000	0.000	0.000	11.525	42.503	24.989	62.797	293.189	

Nº cables	72	0		Estado inicial	Sa+0.95 Pa -209.731
F. Pret.	1312.416	0			Sb+0.95 Pb 1355.987
Cota cables	10	40		Estado final	Sa+0.8 Pa 416.469
e	0.662365	0.362365			Sb+0.8 Pb 236.697
Pa	-550.537	0.000	0.95 Pa=	-523.010	0.80 Pa= -440.430
Pb	1630.487	0.000	0.95 Pb=	1548.963	0.80 Pb= 1304.390

25 Seccion X= 60.52

	Vigas	Prelosas	Losa	Ac y Baran	Balasto	Reología	Gradiente	Sc	Total
Momentos	215.24	78.56	96.66	34.81	128.38	66.89	168.10	852.63	1641.270
Sa	334.177	121.971	150.072	8.887	32.776	17.077	42.916	217.678	
Sb	-205.848	-75.132	-92.442	-21.614	-79.711	-41.532	-104.373	-529.398	-1150.052
Sc	0.000	0.000	0.000	13.005	47.961	24.989	62.800	318.533	

Nº cables	72	0	Estado inicial	Sa+0.95 Pa	-188.833
F. Pret.	1312.416	0		Sb+0.95 Pb	1343.114
Cota cables	10	40	Estado final	Sa+0.8 Pa	485.125
e	0.662365	0.362365		Sb+0.8 Pb	154.338
Pa	-550.537	0.000	0.95 Pa=	-523.010	0.80 Pa= -440.430
Pb	1630.487	0.000	0.95 Pb=	1548.963	0.80 Pb= 1304.390

2.2.2.- Estados Límites Últimos

Se acompañan los resultados de las comprobaciones siguientes en Estados Límites Últimos:

- E.L.U. de agotamiento frente a solicitaciones normales en sección centro-luz de viga.
- E.L.U. de agotamiento frente a cortante en sección de apoyo en estribo y en pila.

2.2.2.1.- E.L.U. de agotamiento frente a solicitaciones normales en sección centro-luz de viga

- .Solicitaciones actuantes en una viga:
  - Momento por peso propio viga: 215.24 Tn x m
  - Momento por peso propio prelosas: 78.56 Tn x m
  - Momento por peso propio de losa: 96.66 Tn x m
  - Momento por aceras y barandillas: 34.81 Tn x m
  - Momento por peso propio de balasto128.38 Tn x m
  - Momento por gradiente térmico: 168.10 Tn x m
  - Momento por reología: 66.89 Tn x m
  - Momento por sobrecarga: 852.63 Tn x m

Momento de diseño Md = 2368.82 Tn x m

Momento último resistido, suponiendo plastificada la totalidad de la losa en un ancho eficaz de 4.5 m para una viga: Mu = 4369.68 Tn x m.

Mu > Md

2.2.2.2.- E.L.U. de agotamiento frente a cortante en sección de apoyo en estribos .

TENSIONES NORMALES DEBIDAS A FLEXIÓN

UTE ALT CAMP Viaducto en Valls
x = 0

Características mecánicas de las secciones

	Inicial	Semifinal	Final
Canto (m)	2	2.27	2.27
Inercia (m^4)	0.7971	2.2826	2.2826
V_a (m)	1.2376	0.5827	0.5827
Area (m^2)	1.6423	3.1408	3.1408
V_b (m)	0.7624	1.4173	1.4173
V_c (m)	-	0.8527	0.8527

Esfuerzos y tensiones antes de pretensado

	V (t)	M (t.m)	T (t.m)	σ_a (t/m^2)	σ_b (t/m^2)	σ_c (t/m^2)	$\sigma_{fb,f}$ (t/m^2)
Peso viga	32.020	0.000	0.440	0.000	0.000	0.000	0.000
Prelosas	11.680	0.000	0.160	0.000	0.000	0.000	0.000
Losa	23.960	0.000	0.380	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ace y baran	7.080	0.000	0.040	0.000	0.000	0.000	0.000
Balasto	26.120	0.000	0.150	0.000	0.000	0.000	0.000
Sobrecarga	134.600	0.000	1.340	0.000	0.000	0.000	0.000
Temperatura	5.230	0.000	0.000	0.000	0.000	0.000	0.000
Reología	1.510	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL...	**242.200**	**0.000**	**2.510**	**0.000**	**0.000**	**0.000**	**0.000**

Tensiones introducidas mediante pretensado

Cota	Cables	P (t/cable)	M (t.m)	σ_a (t/m^2)	σ_b (t/m^2)	$\sigma_{fb,f}$ (t/m^2)
0.4	48	18.228	-317.080	40.448	836.032	272.242
0	0	18.228	0.000	0.000	0.000	0.000
0	0	0	0.000	0.000	0.000	0.000
0	0	0	0.000	0.000	0.000	0.000
0	0	0	0.000	0.000	0.000	0.000
		TOTAL...	**Instantáneas**	**38.426**	**794.230**	**258.629**
			Largo plazo	**32.359**	**668.825**	**217.793**
				Fuerza de pretensado (t):		**874.944**
				Área de cables (mm^2) :		**6720.000**

Tensiones totales

	σ_a (t/m^2)	σ_b (t/m^2)	σ_c (t/m^2)	$\sigma_{fb,f}$ (t/m^2)
Peso propio + pretensado	38.426	794.230	-	258.629
Finales	32.359	668.825	0.000	217.793

Tensión de compresión máxima en viga (Kg/cm²)	79.423	<=	500.000
mínima en viga (Kg/cm²)	3.236		
máxima en losa (Kg/cm²)	0.000		

DIMENSIONAMIENTO A ESFUERZO CORTANTE Y TORSIÓN

Características del hormigón:

F_{ck} (Kg/cm²) :	500	F_{cd} (Kg/cm²):	333.333
$F_{ct,k}$:	28.501		
$F_{ct,m}$:	40.716		

Características del acero:

F_{yk} (Kg/cm²) :	5000	F_{yd} (Kg/cm²) :	4347.826
F_{pk} (Kg/cm²) :	17100	F_{pd} (Kg/cm²) :	14869.565

Características de la sección final:

Sx (m^3) :	1.388	Momento estático respecto al c.d.g. final
b_o (m):	0.440	Ancho total del alma
d (m) :	2.200	Canto útil
c_o (m) :	0.100	Dist. armaduras longitudinales al paramento
h_o (m) :	0.300	Espesor del alma
A (m^2) :	6.200	Area del contorno exterior sección eficaz
U (m) :	10.230	Perímetro exterior
A / U (m) :	0.606	
A_e (m^2) :	5.120	Area del contorno medio sección eficaz
U_e (m) :	9.150	Perímetro del contorno medio
h_e (m) :	0.220	Espesor eficaz de sección de cálculo
Comp.:	0.220	

Solicitaciones tangentes:

V_{rd} (t) :	351.863	Esfuerzo cortante mayorado
T_d (t.m) :	3.590	Momento torsor mayorado

1.- ESFUERZO CORTANTE (Según EHE) (Tracciones positivas)

Angulo θ de inclinación de las fisuras (Art. 44.2.3.2.2):

$\sigma_{x,d}$ (kp/cm^2):	-21.779	
cotg θ :	1.239	0.5<cotg θ<2.0
θ (º):	38.909	

Esfuerzo cortante de agotamiento por compresión oblicua (Art. 44.2.3.1.):

σ'_{cd} (t/m^2):	-278.574			
K:	1.000			
V_{u1} (t) :	946.203	>	351.863	**CUMPLE**

Esfuerzo cortante de agotamiento por tracción en el alma (Art. 44.2.3.2.):

Cotg θ :	1.239	Vsu (t) :	427.223
A_α nec	35.860		
A_α (cm²/m)	43.540	(1EØ12+1EØ8) c/0.15	
ξ :	1.302		
A_s (tanteo) :	107.200		
ρ :	0.020		
β :	1.000		
V_{cu} (t) :	98.926		

V_{u2} (t) :	526.148	>	351.863	**CUMPLE**

2.- TORSIÓN

Agotamiento por compresión del hormigón (Art. 45.2.2.1.)

h_e (m) :	0.220			
α :	1.500			
T_{u1} (t.m) :	1651.555	=>	3.590	

Agotamiento por tracción de la armadura transversal (Art. 45.2.2.2.)

A_t (cm^2/m) :	0.088			
$A_{t,real}$:	3.500			
T_{u2} (t.m) :	177.611	=>	3.590	

Agotamiento por tracción de la armadura longitudinal

A_{s1} (cm^2) :	0.738			
$A_{s1,real}$:	10.000			
T_{u3} (t.m) :	48.658	=>	3.590	

3.- TORSIÓN Y CORTANTE (Art. 45.3.2.2.)

Td / Tu1 :	0.002			
Vrd / Vu1 :	0.372			
β :	1.000			
	0.374	**<=**	**1.0**	**CUMPLE**

2.2.2.3.- E.L.U. de agotamiento frente a cortante en sección de apoyo en pila

TENSIONES NORMALES DEBIDAS A FLEXIÓN

UTE ALT CAMP Viaducto en Valls
x = 47

Características mecánicas de las secciones

	Inicial	Semifinal	Final
Canto (m)	2	2.27	2.27
Inercia (m^4)	0.7971	2.2826	2.2826
V_a (m)	1.2376	0.5827	0.5827
Area (m^2)	1.6423	3.1408	3.1408
V_b (m)	0.7624	1.4173	1.4173
V_c (m)	-	0.8527	0.8527

Esfuerzos y tensiones antes de pretensado

	V (t)	M (t.m)	T (t.m)	σ_a (t/m^2)	σ_b (t/m^2)	σ_c (t/m^2)	$\sigma_{fb,f}$ (t/m^2)
Peso viga	52.720	-140.560	0.440	-218.237	134.441	0.000	-115.485
Prelosas	19.240	-51.300	0.160	-79.650	49.067	0.000	-42.148
Losa	45.420	-204.060	0.380	-316.829	195.177	0.000	-167.656
	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ace y baran	14.800	-71.390	0.040	-18.224	44.327	-26.669	0.000
Balasto	54.460	-263.080	0.150	-67.159	163.350	-98.278	0.000
Sobrecarga	203.320	-973.800	1.340	-248.591	604.647	-363.778	0.000
Temperatura	0.880	66.894	0.000	17.077	-41.535	24.989	0.000
Reología	0.360	167.660	0.000	42.800	-104.103	62.632	0.000
TOTAL...	**391.200**	**-1469.636**	**2.510**	**-888.814**	**1045.371**	**-401.103**	**-325.289**

Tensiones introducidas mediante pretensado

Cota	Cables	P (t/cable)	M (t.m)	σ_a (t/m^2)	σ_b (t/m^2)	$\sigma_{fb,f}$ (t/m^2)
0.4	24	18.228	-158.540	20.224	418.016	136.121
1.9	24	18.228	497.668	1039.071	-209.626	675.263
0	0	0	0.000	0.000	0.000	0.000
0	0	0	0.000	0.000	0.000	0.000
0	0	0	0.000	0.000	0.000	0.000
		TOTAL...	**Instantáneas**	**1006.331**	**197.971**	**770.815**
			Largo plazo	**847.436**	**166.712**	**649.107**
					Fuerza de pretensado (t):	**874.944**
					Área de cables (mm^2) :	**6720.000**

Tensiones totales

	σ_a (t/m^2)	σ_b (t/m^2)	σ_c (t/m^2)	$\sigma_{fb,f}$ (t/m^2)
Peso propio + pretensado	788.093	332.412	-	655.330
Finales	-41.377	1212.083	-401.103	323.818

Tensión de compresión máxima en viga (Kg/cm²)	121.208	<=	500.000
mínima en viga (Kg/cm²)	-4.138		
máxima en losa (Kg/cm²)	-40.110		

DIMENSIONAMIENTO A ESFUERZO CORTANTE Y TORSIÓN

Características del hormigón:

F_{ck} (Kg/cm^2) :	500	F_{cd} (Kg/cm²):	333.333
$F_{ct,k}$:	28.501		
$F_{ct,m}$:	40.716		

Características del acero:

F_{yk} (Kg/cm^2) :	5000	F_{yd} (Kg/cm^2) :	4347.826
F_{pk} (Kg/cm^2) :	17100	F_{pd} (Kg/cm^2) :	14869.565

Características de la sección final:

Sx (m^3) :	1.388	Momento estático respecto al c.d.g. final
b_o (m):	0.440	Ancho total del alma
d (m) :	2.200	Canto útil
c_o (m) :	0.100	Dist. armaduras longitudinales al paramento
h_o (m) :	0.300	Espesor del alma
A (m^2) :	6.200	Area del contorno exterior sección eficaz
U (m) :	10.230	Perímetro exterior
A / U (m) :	0.606	
A_e (m^2) :	5.120	Area del contorno medio sección eficaz
U_e (m) :	9.150	Perímetro del contorno medio
h_e (m) :	0.220	Espesor eficaz de sección de cálculo
Comp.:	0.220	

Solicitaciones tangentes:

V_{rd} (t) :	566.919	Esfuerzo cortante mayorado
T_d (t.m) :	3.590	Momento torsor mayorado

1.- ESFUERZO CORTANTE (Según EHE)

(Tracciones positivas)

Angulo θ de inclinación de las fisuras (Art. 44.2.3.2.2):

$\sigma_{x,d}$ (kp/cm^2):	-20.997	
cotg θ :	1.231	0.5<cotgθ<2.0
θ (º):	39.086	

Esfuerzo cortante de agotamiento por compresión oblicua (Art. 44.2.3.1.):

σ'_{cd} (t/m^2):	-278.574			
K:	1.000			
V_{u1} (t) :	947.444	>	566.919	**CUMPLE**

Esfuerzo cortante de agotamiento por tracción en el alma (Art. 44.2.3.2.):

Cotg θ :	1.231	Vsu (t) :	1045.650
A_α nec	58.142		
A_α (cm²/m)	107.240	(2EØ16) c/0.15	
ξ :	1.302		
A_s (tanteo) :	107.200		
ρ :	0.020		
β :	1.000		
V_{cu} (t) :	98.926		

V_{u2} (t) :	1144.575	>	566.919	**CUMPLE**

2.- TORSIÓN

Agotamiento por compresión del hormigón (Art. 45.2.2.1.)

h_e (m) :	0.220		
α :	1.500		
T_{u1} (t.m) :	1653.721	=>	3.590

Agotamiento por tracción de la armadura transversal (Art. 45.2.2.2.)

A_t (cm^2/m) :	0.088		
$A_{t,real}$:	3.500		
T_{u2} (t.m) :	176.495	=>	3.590

Agotamiento por tracción de la armadura longitudinal

A_{s1} (cm^2) :	0.738		
$A_{s1,real}$:	10.000		
T_{u3} (t.m) :	48.658	=>	3.590

3.- TORSIÓN Y CORTANTE (Art. 45.3.2.2.)

Td / Tu1 :	0.002			
Vrd / Vu1 :	0.598			
β :	1.000			
	0.601	**<=**	**1.0**	**CUMPLE**

2.3.- Dimensionamiento de la losa

MOMENTOS NEGATIVOS

ARMADURA DE LOSA (momento negativo)

Sección X= 12.5		
Momento negativo mayorado	Md =	194.050
Canto útil	d =	2.150
Espesor losa de fondo	e =	0.250
Anchura losa de fondo	b =	2.500
Momento último resistido (Dominio 3)	Mu =	4303.125
Dominio 3		
Armadura necesaria	As =	23.065

Sección X= 15		
Momento negativo mayorado	Md =	596.010
Canto útil	d =	2.150
Espesor losa de fondo	e =	0.250
Anchura losa de fondo	b =	2.500
Momento último resistido (Dominio 3)	Mu =	4303.125
Dominio 3		
Armadura necesaria	As =	70.844

Sección X= 17.5		
Momento negativo mayorado	Md =	1104.390
Canto útil	d =	2.150
Espesor losa de fondo	e =	0.250
Anchura losa de fondo	b =	2.500
Momento último resistido (Dominio 3)	Mu =	4303.125
Dominio 3		
Armadura necesaria	As =	131.271

Sección X= 20		
Momento negativo mayorado	Md =	2132.150
Canto útil	d =	2.150
Espesor losa de fondo	e =	0.250
Anchura losa de fondo	b =	2.500
Momento último resistido (Dominio 3)	Mu =	4303.125
Dominio 3		
Armadura necesaria	As =	253.434

Sección X= 23		
Momento negativo mayorado	Md =	626.020
Canto útil	d =	2.150
Espesor losa de fondo	e =	0.250
Anchura losa de fondo	b =	2.500
Momento último resistido (Dominio 3)	Mu =	4303.125
Dominio 3		
Armadura necesaria	As =	74.411

Sección X= 25.4		
Momento negativo mayorado	Md =	109.030
Canto útil	d =	2.150
Espesor losa de fondo	e =	0.250
Anchura losa de fondo	b =	2.500
Momento último resistido (Dominio 3)	Mu =	4303.125
Dominio 3		
Armadura necesaria	As =	12.960

COMPROBACIÓN A FISURACIÓN EN PILA 1

Según el artículo 49 de la Instrucción EHE, se obtiene la abertura característica de fisura :

$$W_k = \beta \cdot s_m \cdot \varepsilon_{sm}$$

β =	1.7

$$s_m = 2 \cdot c + 0.2 \cdot s + 0.4 \cdot k_1 \cdot \frac{\Phi A_{c,eficaz}}{A_c}$$

$$\varepsilon_{sm} = \frac{\sigma_s}{E_s}\left[1 - k_2\left(\frac{\sigma_{sr}}{\sigma_s}\right)^2\right] \geq 04\frac{\sigma_s}{E_s}$$

Cálculo de la separación media de fisuras (Sm) en mm:

Recubrimiento del hormigón	c =	40	mm
Diametro máximo armadura	ϕ =	25	mm
Distancia entre barras	s =	83.33	mm
Ancho en zona de barras	a =	4.5	m
Nº barras por capa		54	
En flexión simple	k1 =	0.125	
Area barras traccionadas	As =	265.07	cm2
Area de hormigón zona tracc	Ac,eficaz =	7075	cm2

Sm = 130.03 mm

Cálculo del alargamiento medio de las armaduras (εsm) en mm:

Módulo elasticidad acero	Es =	2100000	Tn/m2
Momento diseño	Md =	613.87	Tn m
Tensión en las armaduras	σs =	12156.33	Tn/m2
Tensión al fisurar la sección	σsr =	15353.26	Tn/m2

M fisuración = 775.31 Tn m

El momento de fisuración de la sección, es mayor que el momento de diseño para la combinación de carga cuasipermanente que marca la intrucción.

MOMENTOS NEGATIVOS

ARMADURA DE LOSA (momento negativo)

Sección X=	39.8		
Momento negativo mayorado		Md =	88.040
Canto útil		d =	2.150
Espesor losa de fondo		e =	0.250
Anchura losa de fondo		b =	2.500
Momento último resistido (Dominio 3)		Mu =	4303.125
Dominio 3			
Armadura necesaria		As =	10.465
Sección X=	42.2		
Momento negativo mayorado		Md =	498.390
Canto útil		d =	2.150
Espesor losa de fondo		e =	0.250
Anchura losa de fondo		b =	2.500
Momento último resistido (Dominio 3)		Mu =	4303.125
Dominio 3			
Armadura necesaria		As =	59.240
Sección X=	44.6		
Momento negativo mayorado		Md =	1111.630
Canto útil		d =	2.150
Espesor losa de fondo		e =	0.250
Anchura losa de fondo		b =	2.500
Momento último resistido (Dominio 3)		Mu =	4303.125
Dominio 3			
Armadura necesaria		As =	132.132
Sección X=	47		
Momento negativo mayorado		Md =	2356.420
Canto útil		d =	2.150
Espesor losa de fondo		e =	0.250
Anchura losa de fondo		b =	2.500
Momento último resistido (Dominio 3)		Mu =	4303.125
Dominio 3			
Armadura necesaria		As =	280.091
Sección X=	50		
Momento negativo mayorado		Md =	942.430
Canto útil		d =	2.150
Espesor losa de fondo		e =	0.250
Anchura losa de fondo		b =	2.500
Momento último resistido (Dominio 3)		Mu =	4303.125
Dominio 3			
Armadura necesaria		As =	112.020
Sección X=	52.63		
Momento negativo mayorado		Md =	321.140
Canto útil		d =	2.150
Espesor losa de fondo		e =	0.250
Anchura losa de fondo		b =	2.500
Momento último resistido (Dominio 3)		Mu =	4303.125
Dominio 3			
Armadura necesaria		As =	38.172

COMPROBACIÓN A FISURACIÓN EN PILA 2

Según el artículo 49 de la Instrucción EHE, se obtiene la abertura característica de fisura :

$$W_k = \beta \cdot s_m \cdot \varepsilon_{sm}$$

β =	1.7

$$s_m = 2 \cdot c + 0.2 \cdot s + 0.4 \cdot k_1 \cdot \frac{\Phi A_{c,eficaz}}{A_c}$$

$$\varepsilon_{sm} = \frac{\sigma_s}{E_s}\left[1 - k_2\left(\frac{\sigma_{sr}}{\sigma_s}\right)^2\right] \geq 04\frac{\sigma_s}{E_s}$$

Cálculo de la separación media de fisuras (Sm) en mm:

Recubrimiento del hormigón	c =	40	mm
Diametro máximo armadura	ϕ =	25	mm
Distancia entre barras	s =	75.00	mm
Ancho en zona de barras	a =	4.5	m
Nº barras por capa		60	
En flexión simple	k1 =	0.125	
Area barras traccionadas	As =	294.53	cm2
Area de hormigón zona traco	Ac,eficaz =	7075	cm2

Sm = 125.03 mm

Cálculo del alargamiento medio de las armaduras (εsm) en mm:

Módulo elasticidad acero	Es =	2100000	Tn/m2
Momento diseño	Md =	663.5	Tn m
Tensión en las armaduras	σs =	11960.28	Tn/m2
Tensión al fisurar la sección	σsr =	13975.75	Tn/m2

M fisuración = 775.31 Tn m

El momento de fisuración de la sección, es mayor que el momento de diseño para la combinación de carga cuasipermanente que marca la intrucción.

2.4.- Reacciones en apoyos

REACCIONES VERTICALES. Viaducto en Valls

	ESTRIBO		PILA 1		PILA 2	
	1	2	5	6	7	8
Peso Viga	32.02	32.02	98.78	98.78	105.42	105.42
Prelosas	11.69	11.69	36.05	36.05	38.48	38.48
Losa	23.97	23.97	85.72	85.72	89.97	89.97
Aceras y barand.	8.51	8.51	30.59	30.59	32.02	32.02
Balasto	31.35	31.35	112.72	112.72	117.96	117.96
Reología	1.51	1.51	-1.88	-1.88	0.37	0.37
Carga térmica	10.76	10.76	-12.52	-12.52	1.76	1.76
SC	135.15	135.15	362.22	362.22	382.84	382.84
	-32.57	-32.57	-17.64	-17.64	-29.10	-29.10
Viento	12.71	12.71	29.87	29.87	34.31	34.31
	-12.71	-12.71	-29.87	-29.87	-34.31	-34.31

Rmax	267.67	267.67	754.07	754.07	803.13	803.13
Rmin	63.77	63.77	301.95	301.95	320.81	320.81

U.T.E.
ALT CAMP

DRAGADOS - TECSA

CÁLCULO DE LAS PILAS Y ESTRIBOS DE LA ESTRUCTURA 1 DE LA VARIANTE DE ALT CAMP.

PEDELTA, S.L.
INGENIERÍA CIVIL

BARCELONA,
MARZO 2001

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ÍNDICE DEL ANEJO DE CÁLCULO

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1 ANTECEDENTES

A petición del ingeniero Sr. D. Jagoba Ruiz de Aguirre de la Unión temporal Dragados - Tecsa se redacta el presente documento donde se justifican las dimensiones y armado de los estribos y las pilas de la estructura 1 de la variante de Alt Camp.

Los cálculos de los diferentes elementos de la infraestructura del viaducto están basados en las reacciones del tablero suministrada por la empresa Research & Concret.

2 ACCIONES, MATERIALES, COEFICIENTES DE SEGURIDAD Y NORMATIVAS

2.1 ACCIONES

En el cálculo de los elementos estructurales se han considerado las siguientes acciones:

Acciones permanentes (G):

g1, PESO PROPIO.

El peso propio de los distintos elementos se ha calculado a partir de su geometría (secciones transversales) adoptando una densidad de valor $\gamma c = 2.5$ T/m^3.

g2, PESO DEL BALASTO Y CARGAS MUERTAS

Las cargas permanentes distintas del propio peso del tablero son las siguientes:

- Balasto.
- Vías y traviesas.
- Conductos de cableado y paseos.
- Soportes de catenarias.
- Impostas y barandillas.

El peso de balasto sobre el tablero se calcula a partir de la plataforma en la estructura de vía tomando como densidad $\gamma = 1.6$ t/m^3

Se obtiene $g_{2,\,balasto} = 10.75$ T/m.

De acuerdo con las bases de cálculo se adoptarán para esta carga los siguientes valores característicos superior e inferior:

valor inferior (0.70 x peso medio) g2, bal, inf = 7.53 T/m de tablero
valor superior (1.30 x peso medio) g2, bal, sup = 13.98 T/m de tablero

Se consideran dos hipótesis de desbalastado.

- 50% de una vía en toda su longitud.
- 100% de una vía sobre 15 metros.

El peso de vías y traviesas para la plataforma con doble vía es:

$g_{2,vías+traviesas} = 2 \times (0.52 + 0.12) = 2 \times 0.64 = 1.28$ T/m de tablero
(trav) + (carril)

El peso de los conductos para cableados y zona de paseos es:

$g_{2,conductos} = 0.3$ T/m (peso de 1 canaleta)

El peso de la imposta y barandilla es:

Se toma $g_{2,imposta+barandilla} = 1.4$ T/m, de acuerdo a la sección tipo de plataforma.

	g2, medio (T/m)	g2, sup (T/m)	g2, inf (T/m)
Balasto	10.75	13.98	7.53
Vías y traviesas	1.28	1.28	1.28
Conductos cableado	0.60	0.60	0.60
Imposta y barandillas	1.40	1.40	1.40
	14.03 T/m	**17.26 T/m**	**10.81 T/m**

Tabla 1. Carga permanente, g2

ACCIONES DEBIDAS AL TERRENO

Carga sobre zapatas y empuje de las tierras en alzados de estribos y aletas, con una densidad 2,0 T/m^3 y un ángulo de rozamiento interno de 30 ° (con presiones horizontales correspondientes a un empuje con coeficiente Ko= 0.33). En el trasdós de estribos se coloca una sobrecarga de uso de 3 T/m^2.

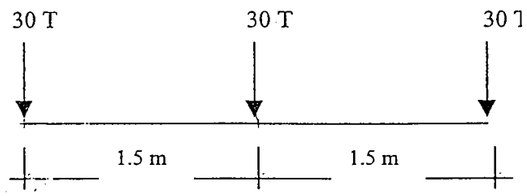
SOBRECARGAS DE USO. COMPONENTES VERTICALES.

Se utilizará la envolvente de esfuerzos debidos a los trenes de carga de IPF-75 y del Eurocódigo 1 (parte 3, acciones en puentes) EC1-3 tomando como coeficiente de impacto se adoptará en cada caso el que corresponda.

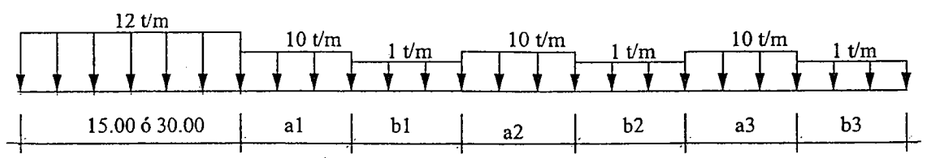
Los coeficientes de impacto no afectan al cálculo de apoyos, pilas y estribos, salvo aquellos casos en que la unión tablero-estructura sea de tipo rígido. Esto conduciría a que el coeficiente de impacto afectaría a la subestructura para las fuerzas de frenado, transmitida al estribo a través del tope rígido longitudinal, y fuerza centrífuga, transmitida a través de apoyos tipo POT guiados. No obstante, la presencia del balasto supone una liberación en la rigidez de la transmisión de las fuerzas horizontales a los apoyos y topes, por lo que no se considera el coeficiente de impacto para estas acciones.

De acuerdo con la normativa IPF-75 Existen dos trenes de carga

Tipo A Por cada vía: Q_A = 3 ejes de 30 T separados 1.50 m



Tipo B Por cada vía: Sobrecarga uniforme de 12 T/m sobre 15 ó 30 metros, más un conjunto de cuchillos de carga de 10 T/m y 1 T/m de longitud arbitraria.

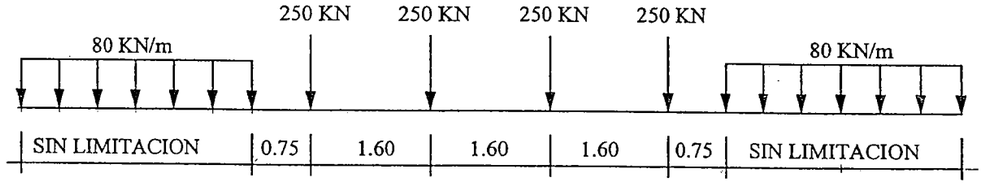


El tren tipo A suele condicionar el trabajo local de reparto de la losa y el tren tipo B condiciona el dimensionamiento general de la mayor parte de los Estados Límites Últimos o de Servicio.

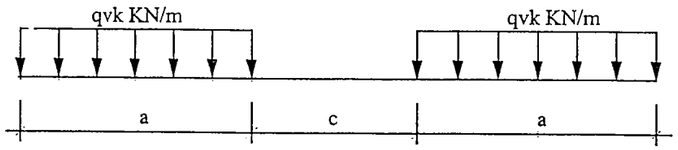
No se admite reducción de cargas por simultaneidad entre ambas vías. En cualquier caso se debe contemplar la posibilidad de un ripado de la vía respecto al eje teórico de 0.30 m.

El tren de cargas de Eurocódigo 1 (parte 3, acciones en puentes) EC1-3 se define de acuerdo con las configuraciones indicadas en las 2 figuras siguientes. En ambos casos, a efectos de cálculo se contemplará un eventual ripado de la vía de 0.30 m.

Tren tipo 71



Modelo de carga SW



Se considera adicionalmente un tren pesado equivalente al siguiente esquema de cargas (SW/0) ó (SW2) en una de las vías y el tren estandar tipo 71 en la otra vía.

	SW0	SW2
Q_{vk} (kN)	133	150
a (m)	15	25
b (m)	5,3	7

De acuerdo con la IPF-75, para algunas comprobaciones específicas asociadas a combinaciones de carga con viento transversal se considerará un tren sin carga de 12.5 KN/m.

En los paseos laterales se contemplará una sobrecarga sobrecarga de uno de 0.4 T/m^2, sólo el 50 % dicha carga es compatible con el tráfico ferroviario.

SOBRECARGAS DE USO. COMPONENTES HORIZONTALES.

- *EFECTO LAZO*

En la estructura se considerará una única fuerza transversal concomitante con la sobrecarga vertical para contemplar el efecto lazo. El valor de dicha carga (que no debe ser mayorada con el coeficiente de impacto) es el siguiente:

Según IPF-75 $H_T = 5$ T para el conjunto de ambas vías, aplicada a cota superior del carril.

Según EC1 $H_T = 10.2$ T para el conjunto de ambas vías, aplicada a cota superior del carril.

- *EFECTOS DE FRENADO Y ARRANQUE*

Se adopta la Norma EC1 ya que las acciones definidas en la IPF75 son mucho más favorables. (1/8 de la carga frente a 1/4). Esta fuerza se considerará actuando sobre la cota superior del carril y no se mayorarán por el coeficiente de impacto.

Fuerzas de arranque (por vía) LM71 y SW

$F_a = 33$ (KN/m) × L(m) ≤ 1.000 KN Se tomará Fa= 102 T/vía

Fuerzas de frenado (por vía)

$F_f = 20$ (KN/m) × L(m) ≤ 6.000 (KN) LM71 y SW0
$F_f = 35$ (KN/m) × L(m) SW2

Condiciona el frenado del tren tipo, con una fuerza total de valor: $F_f = 249$ T/vía que deberá resistir el tope longitudinal ubicado en el estribo.

En la combinación de acciones de frenado y arranque sobre el tablero se considera la reducción que permite EC1 debido a la continuidad de vías más allá del tablero (Coeficiente reductor 0.90).

En los dos tramos se supondrá frenado simultáneo en dos vías (combinación más desfavorable).

Se reducirán al 50% si se considera concominantes con la fuerza centrífuga.

- *INTERACCIÓN VÍA - ESTRUCTURA*

Se colocará un punto fijo de tablero en el estribo 1 y libertad de movimientos en el otro extremo. Se dispondrá aparato de dilatación de vía en el extremo móvil. Con ello, y según las especificaciones del Eurocódigo 1 las acciones horizontales a considerar son las siguientes:

- *ACCIONES TÉRMICAS VÍA-ESTRUCTURA*

$F_{TK} = \pm (40.8 + 0.51\ LT) = 103$ T/vía ≤ 112 T/vía ⇒ $F_{tk} = 206$ T (en 2 vías).

- *ACCIONES DE FRENADO Y ARRANQUE*

La longitud del tramo continuo aconseja considerar reducción de frenado por interacción vía estructura, tomando un coeficiente de reducción 0.70.

- *EMPUJE SOBRE BARANDILLAS.*

En el elemento superior de la barandilla se considera una fuerza horizontal de valor 1.5 kN/m actuando de modo simultáneo con la sobrecarga uniforme.

ACCIONES CLIMÁTICAS

- *VIENTO*

Al estar la estructura ubicada en la zona de costa de la provincia de Tarragona la velocidad de cálculo se puede determinar a partir de una velocidad de referencia de v_{ref}=28 m/s corregida con los siguientes parámetros multiplicadores:

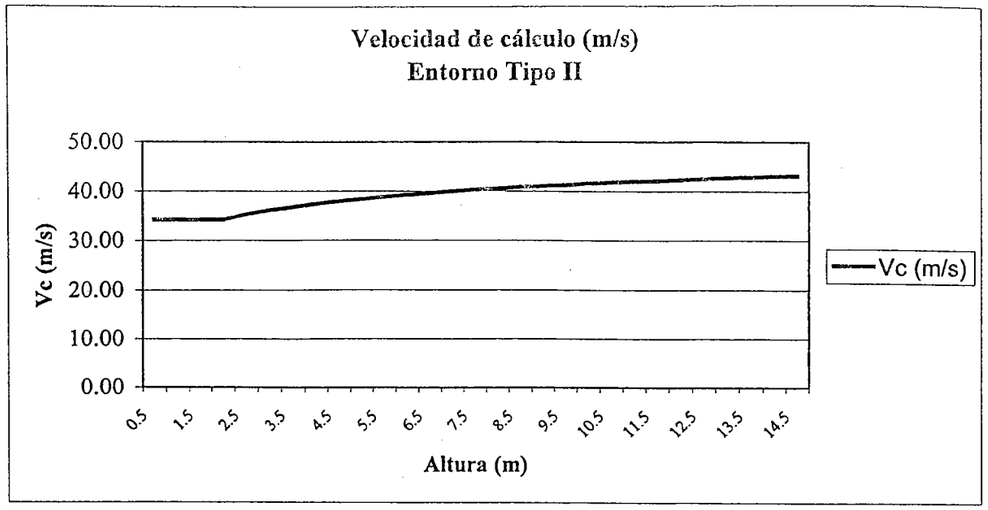
Ct = factor de topografía
Cr = factor de riesgo (se toma un periodo de retorno de 100 años)
Cz = factor de altura (se adopta un entorno Tipo II, zona rural plana con algunos obstáculos)
Cg = factor de ráfaga

$$Cz = Kz \ln(\frac{z}{zo}) \quad si \quad z \geq z_{min}$$

$$Cz = Kz \ln(\frac{z_{min}}{zo}) \quad si \quad z \leq z_{min}$$

$$Cg = \sqrt{\left(1 + \frac{7Kz}{CzCt}\right)}$$

Vref=28 m/s, Ct=1.0 y Cr=1.04



Para un entorno Tipo II

Kz= 0.19 zo = 0.05m zmin = 4 m

Para determinar el empuje de viento sobre el tablero, la velocidad de cálculo es:

$$Vc = Ct \cdot Cr \cdot Cz \cdot Cg \cdot Vref = 50.2 \text{ m/s}$$

Por lo que el empuje horizontal ejercido por el viento en el tablero es:

$$F = C_D \cdot A \cdot (1/2\ \rho\ V_c^2) = 0.45 \quad T/m$$

Cuando se combina con la sobrecarga se reduce en un 50% esta acción.

- ***NIEVE***

Según al IAP (y el borrador de la nueva IPF) se debe aplicar una carga de nieve sobre la superficie de tablero en la que no se considere sobrecarga de uso. Para el cálculo del tablero se considera la posibilidad de tener sobrecarga en toda su superficie, por lo tanto no es necesario aplicar la sobrecarga de nieve.

2.2 COEFICIENTES DE SEGURIDAD, MATERIALES, NIVELES DE CONTROL Y NORMATIVAS

HORMIGONES

- Hormigón de Limpieza..... HM-15
- Cimentaciones..... HA-25 / 20 / B / IIa
- Alzados de pilas y estribos... HA-30 / 30 / F / IIIa

Control del hormigón NORMAL

γc= 1.50 (Situación persistente o transitoria)
γc= 1.30 (Situación accidental)

ACEROS

- Acero corrugado para la armadura pasiva B500S, con $f_{yk} > 500$ MPa (5100 Kp/cm^2)

Control de los aceros NORMAL

γs= 1.15 (Situación persistente o transitoria)
γs= 1.0 (Situación accidental)

CONTROL DE EJECUCIÓN

El control de ejecución será INTENSO (γ_g= 1.35 *y* γ_{fq}= 1.50) en tablero, pilas y estribos de acuerdo con las especificaciones de la normativa EHE.

NORMATIVAS Y BASES DE CÁLCULO

Para el establecimiento de acciones y las combinaciones necesarias para la obtención de las solicitaciones de cálculo que se emplearán en la comprobación de los diferentes Estados Límite se realizarán los cálculos empleando la normativa IPF-75 y los criterios especificados en los Eurocódigos, adoptándose el más desfavorable de ambos.

Cálculo según IPF-75

Para el cálculo de las acciones se utilizarán las siguientes instrucciones.

- Instrucción relativa a las acciones a considerar en el Proyecto de Puentes de Ferrocarril", correspondiente a la O.M. 25 de Junio de 1.975 (IPF-75).

- Norma de construcción Sismorresistente: Parte general y edificación (NCSE-94)" R.D. 29 de Diciembre de 1.994.

Para el cálculo de las acciones ambientales se utilizará la siguiente instrucción.

- Instrucción relativa a las acciones a considerar en el proyecto de puentes de carretera IAP, aprobada Orden de12 de febrero de 1998.

- Instrucción para el proyecto de estructuras de hormigón estructural EHE, aprobada por el Real Decreto 2661/1998 de 11 de diciembre.

- Normativa Sismoresistente NCSE-94.

- Instrucción relativa a las acciones a considerar en el proyecto de Puentes de Carreteras I.A.P. 12 de Febrero de 1998.

Para establecer las hipótesis y combinaciones de cálculo y sus correspondientes coeficientes de ponderación se utilizarán las siguientes Instrucciones:

- Instrucción de Hormigón Estructural (EHE) R.D. 2661/1998 de 11 de Diciembre.

Cálculo según Eurocódigos y EHE

- Eurocódigo 1*: Bases de proyecto y acciones. Parte 3. Cargas de tráfico en puentes.* UNE-ENV 1991-3. Octubre 1997. (EC1.1.3.)

Para establecer las hipótesis y combinaciones de cálculo y sus correspondientes coeficientes de ponderación se utilizarán las siguientes Instrucciones:

- Eurocódigo 1: *Bases de proyecto y acciones en estructuras. Parte 1; Bases de proyecto*. UNE-ENV 1991-1, Octubre 1997 (EC1.1)

Para dimensionamiento y comprobación de secciones se actuará, en todo momento, de acuerdo con la normativa española;

- Instrucción de Hormigón Estructural EHE. R.D. 2661/1998 de 11 de Diciembre

Para el análisis de la interacción vía-estructura se empleará la siguiente norma:

- Norma U.I.C. Ficha 774.3 R. 1ª edición. Febrero 1999 (U.I.C. 774.3).

Subsidiariamente, y en lo no contemplado en las normas anterioriores se emplearán las siguientes:

- Norma UIC. Ficha 776.1. 3ª edición. 1 de Julio de 1.979. (U.I.C. 776.1)

- Norma UIC. Ficha 774-2. 1ª Edición. 1 de Julio de 1.974. (U.I.C. 774.2)

- Norma UIC. Ficha 702.0. 2ª Edición. 1 de Enero de 1.974. (U.I.C. 702.0)

2.3 AMBIENTES, RECUBRIMIENTOS, FISURACIÓN Y CUANTÍAS MÍNIMAS

De acuerdo con la normativa EHE se consideran los ambientes indicados en la tabla siguiente.

Elemento	Ambiente	Recubrimiento de Armadura pasiva (mm)	Límite de abertura de fisura Wmax (mm)	
			Hormigón armado	Hormigón postesado
Alzados de pilas y estribos	IIIa	30	0.2	-
Cimentaciones	IIa	30	0.3	-
Pilotes	IIa	75	0.3	-

Las cuantías mínimas de armadura pasiva B500S serán las expuestas en la siguiente tabla (EHE, art. 4.3.5)

Elemento	Posición	Tipo	Cuantía geométrica o/oo
Zapatas	cara superior o inferior	transversal o longitudinal	0.90
Pilotes	vertical	-	4.0
Pilas	vertical	-	4.0
Alzados de estribos y aletas (1)	horizontal	lado tierras	1.07
		lado visto	2.13
	vertical	lado tierras	0.90
		lado visto	0.30
Tablero	cara superior o inferior	transversal o longitudinal	0.90

(1) las cuantías geométricas horizontales se pueden reducir un 50 % si se colocan juntas de contracción distanciadas menos de 7,5 m.

2.4 HIPÓTESIS DE COMBINACIÓN DE ESFUERZOS

Se han considerado las combinaciones de hipótesis de las acciones recogidas en la Normativa EHE, basados en la teoría de Estados Límites, para las distintas situaciones de cálculo de la estructura.

2.4.1 ESTADOS LÍMITES ÚLTIMOS

Las hipótesis de cálculo consideradas son:

- Situaciones persistentes o transitorias

$$\underset{j\geq 1}{\Sigma}\,\gamma_{Gj}\,G_{kj} + \underset{j\geq 1}{\Sigma}\,\gamma_{Gj}\,G^{*}_{kj} + \gamma_{Q1}\,Q_{k1} + \underset{i>1}{\Sigma}\,\gamma_{Qi}\,\Psi_{0i}\,Q_{ki}$$

- Situaciones accidentales

$$\underset{j\geq 1}{\Sigma}\,\gamma_{Gaj}\,G_{kj} + \underset{j\geq 1}{\Sigma}\,\gamma_{Gj}\,G^{*}_{kj} + \gamma_{A}\,A_{k} + \Psi_{11}\,Q_{k1} + \underset{i>1}{\Sigma}\,\gamma_{Qi}\,\Psi_{2i}\,Q_{ki}$$

- Situaciones accidentales de sismo

$$\underset{j\geq 1}{\Sigma}\,G_{kj} + \underset{j\geq 1}{\Sigma}\,\gamma_{Gj}\,G^{*}_{kj} + \gamma_{i}\,A_{Ed} + \underset{i>1}{\Sigma}\,\gamma_{Qi}\,\Psi_{2i}\,Q_{ki}$$

donde:

G = Valor característico de las cargas permanentes.
G* = Valor característico de las cargas permanentes de valor no constante.
Q_{k1} = Valor característico de la carga variable dominante.
A_k = Valor característico de la acción accidental
A_{eq} = Valor característico de la acción sísmica, calculado según la Norma Sismorresistente.

Los coeficientes de seguridad y de combinación de acciones empleados se definen en la EHE.

Barcelona, 13 de Marzo del 2001

Fdo. Leonardo A. Rosillo
Ing. Civil Msc

Fdo: Juan A. Sobrino Almunia
Dr. Ingeniero de Caminos

3. CÁLCULO DE REACCIONES COMO VIGA CONTINUA

CÁLCULO DE FUERZAS HORIZONTALES

CÁLCULO DE FUERZAS HORIZONTALES

EFECTOS DE FRENADO Y ARRANQUE

Se adopta la norma EC-1 ya que las acciones definidas en la IPF75 son mucho más favorables (1/8 de la carga frente a 1/4). Esta fuerza se considerará actuando sobre la cota superior del carril y no se mayorarán por el coeficiente de impacto

- Fuerza de arranque (por vía) LM71 y SW

$F_a = 33(kN/m) \times L(m) \leq 1000\ kN$

$F_a = 33 \times 122 = 408\ T \Rightarrow F_a = 102\ T/vía$

- Fuerza de frenado (por vía)

$F_f = 20(kN/m) \times L(m)$ LM71 y SW0

$= 20 \times 122 = 249\ T/vía$

$f_f = 35(kN/m) \times L(m)$ SW2

$= 35 \times 122 = 433.5\ T/vía$

→

HIPÓTESIS 1.

Frenado + arranque (2 vías)

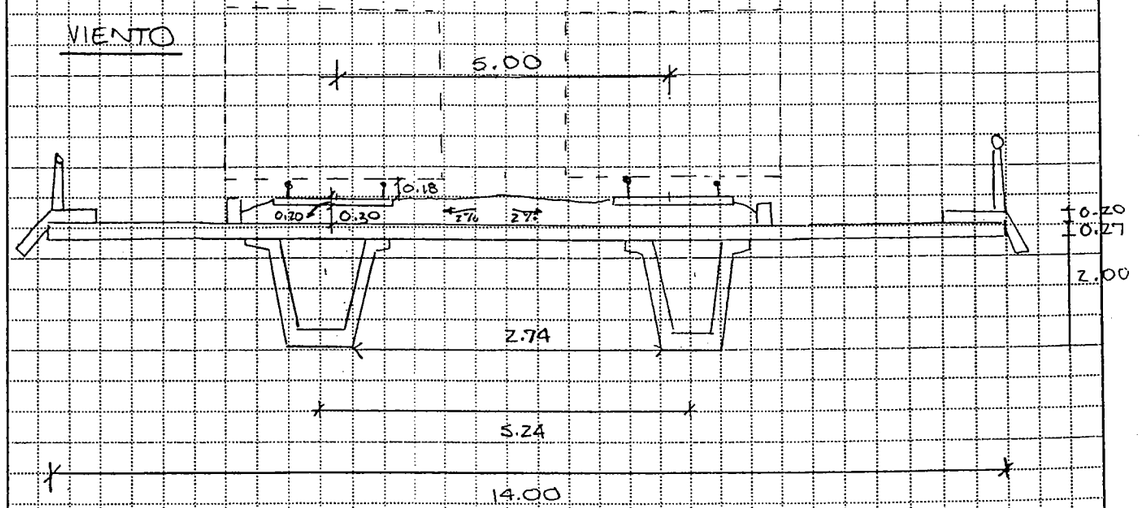
$f_{fa} = 102 + 249 = 351\ T$

HIPÓTESIS 2. (Frenado)

$f_{fz} = 2 \times 249 = 498$

La longitud del tramo continuo aconseja considerar la reducción de frenada por interacción vía estructura tomando un coeficiente de reducción de 0.75

$f_{fz} = 498 \times 0.7 = 348.60$



COEFICIENTES DE OCULTAMIENTO

- VIGAS

$$\frac{d}{h} = \frac{2.74}{2.50} = 1.09$$

RELACIÓN DE SOLIDEZ = 1.00

$$\eta = 0.10$$

- TRENES

$$\frac{d}{h} = \frac{2.00}{4.0} = 0.50$$

RELACIÓN DE SOLIDEZ = 1.00

$$\eta = 0.06$$

AREA EXPUESTA SIN FERROCARRIL

$A = 2.30 + 1 + 1 + 4 \times 0.18 + 2.00 \times 0.10 = 5.22 \ m^2/m$

AREA EXPUESTA CON FERROCARRIL

$A = 4.22 + 4(1+0.06) + 0.31 = 8.77 \ m^2/m$
L= 2 Barreras

S/ IPF 75

$W = 0.20 \times 5.22 = 1.044 \ T/m$

$W_c = 0.20 \times 8.77 = 1.754 \ T/m$

S/ IA=

$\gamma_1 =$

INTERACCIÓN VIA ESTRUCTURA

Se colocará un punto fijo de tablero en el estribo 1 y libertad de movimientos en el otro extremo. Se dispondrá de un aparato de dilatación de vía en el extremo móvil. Con ello, y según las especificaciones del EC-1 las acciones horizontales a considerar son las siguientes:

ACCIONES TÉRMICAS VÍA - ESTRUCTURA

$F_{TK} = \pm (40.8 + 0.51 L_T) =$

$\pm (40.8 + 0.51 \times 122) = 103 \ T/vía$

$F_{TK} = 206 \ T$ (en 2 vías)

TOTAL FUERZA HORIZONTAL LONG.

$F_{máx} = F_t + F_{TK} = 348.60 + 206 = 554 \ T$

CÁLCULO DE REACCIONES VERTICALES

PEDELTA, S.L.
INGENIERÍA CIVIL

Fecha:

Hoja:

CARGAS

g_1 - Peso Propio

g_2

$g_{2,balasto}^{K} = 10.75\ T/m$

$g_{2,vía+trav} = 1.28\ T/m$

$g_{2,conductos+p} = (0,5+0,30)\ T/m \times 2 = 2,05\ T/m$

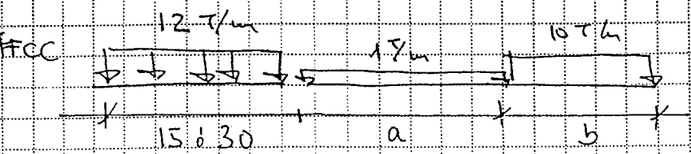
$g_{2,barandillas} = 1,08\ T/m$

$g_2 = g_{2,bal} + 4,41\ T/m$

$g_{2\,TOTAL}$

$g_{2,balasto\ mp}^{K} = 1,30\ g_{balasto}^{K} = 13,98\ T/m \Rightarrow 18,39\ T/m$

$g_{2,balasto\ mf}^{K} = 0,7\ g_{balasto}^{K} = 7,53\ T/m \Rightarrow 11,94$



$q_{paseo} = 0,5 \times 1,5 \times 2 = 1,5\ T/m \rightarrow 50\%$ concom. $(0,75\ T/m)$

Frenado y Arranque (EC)

$F_f = 20 \cdot L = 20 \cdot 122 = 248$ T/vía

$F_a = 33 \cdot 122 = 102$ T/vía

a) $F_f + F_f = 496$ T/vía → más desfavorable

$F_a + F_f = 350$ T/vía

Interacción vía estructura (EC)

$F_{rk} = (40,8 + 0,5 \cdot L) = 103$ T/vía

$F_{rk\ TOTAL} = 206$ T/vía

Efecto lazo (EC)

F = 10 T

Viento

$p_w = 0,171$ T/m² ($v_{ref} = 28$ m/s, entorno III)

TOTAL FUERZA HORIZONTAL LONGITUDINAL

$F_{max} = 1,0 \cdot 496 + 206 = 553$ T

C = Coeficiente reducción s/EC-1.3

C = 0,70

TITULO DEL PROYECTO

Proyecto: viga continua

Vista - casos: 1A5



Données - Chargements

	Caso	Tipo de carga	Lista	Valores de carga
	1	sobrecarga uniforme	1A5	PZ=-18.39(T/m)
	2	sobrecarga uniforme	1A5	PZ=-11.94(T/m)
	3	sobrecarga uniforme	1	PZ=-24.00(T/m)
	3	carga trapezoidal	2	PZ2=-24.00(T/m) PZ1=-24.00(T/m) X2=10.00(m) X1=0.0(m) gl
	3	carga trapezoidal	2	PZ2=-20.00(T/m) PZ1=-20.00(T/m) X2=27.00(m) X1=10.00(m)
	3	sobrecarga uniforme	3A5	PZ=-20.00(T/m)
	4	carga trapezoidal	1	PZ2=-24.00(T/m) PZ1=-24.00(T/m) X2=20.00(m) X1=5.00(m) g
	4	sobrecarga uniforme	3A5	PZ=-20.00(T/m)
	4	carga trapezoidal	2	PZ2=-20.00(T/m) PZ1=-20.00(T/m) X2=27.00(m) X1=15.00(m)
	4	carga trapezoidal	2	PZ2=-24.00(T/m) PZ1=-24.00(T/m) X2=15.00(m) X1=0.0(m) gl
	4	carga trapezoidal	1	PZ2=-10.00(T/m) PZ1=-10.00(T/m) X2=5.00(m) X1=0.0(m) glo
	5	sobrecarga uniforme	1	PZ=-10.00(T/m)
	5	carga trapezoidal	2	PZ2=-10.00(T/m) PZ1=-10.00(T/m) X2=12.00(m) X1=0.0(m) gl
	5	carga trapezoidal	2	PZ2=-24.00(T/m) PZ1=-24.00(T/m) X2=27.00(m) X1=12.00(m)
	5	carga trapezoidal	3	PZ2=-24.00(T/m) PZ1=-24.00(T/m) X2=15.00(m) X1=0.0(m) gl
	5	carga trapezoidal	3	PZ2=-20.00(T/m) PZ1=-20.00(T/m) X2=27.00(m) X1=15.00(m)
	5	sobrecarga uniforme	4 5	PZ=-20.00(T/m)
	6	sobrecarga uniforme	1A5	PZ=-6.75(T/m)

ROBOT v 13.5.0
Autor : PEDELTA, S.L.
Dirección :

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Archivo : viga continua.rtd
Proyecto : viga continua

sistema de coordenadas global - Caso: 2 (g2k,balasto inf)

Filtrar	Nudo	Caso
Lista completa	1A6	1A6
Selección	1A6	2
Número total	6	6
Número seleccion	6	1

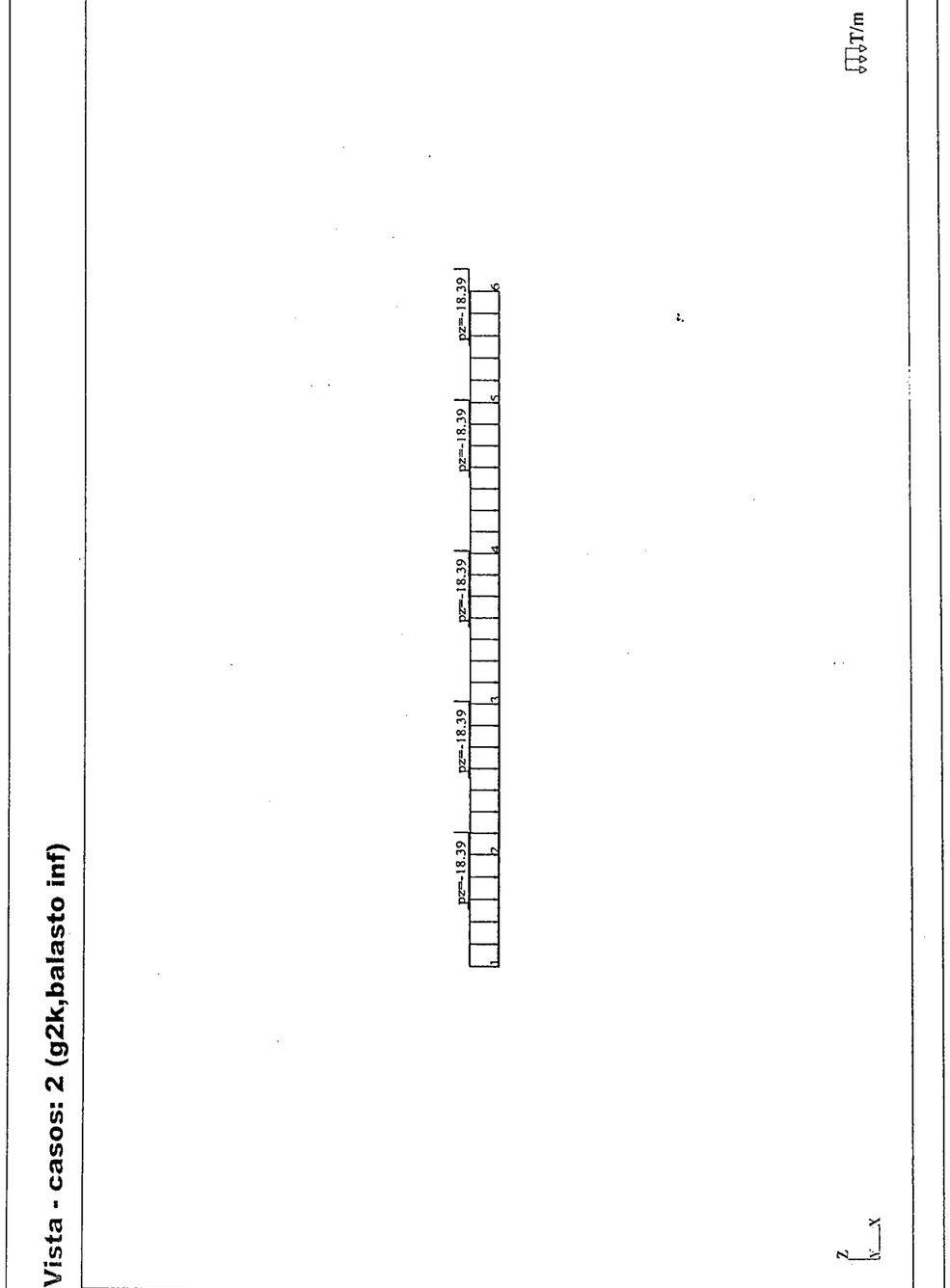
sistema de coordenadas global - Casos: 1A6

Nudo/Caso	FX (T)	FZ (T)	MY (Tm)
1/ 1	0.0	132.50	-0.00
1/ 2	0.0	86.03	0.0
1/ 3	0.0	176.14	0.0
1/ 4	0.0	114.48	0.00
1/ 5	0.0	64.04	0.0
1/ 6	0.0	5.40	-0.00
2/ 1	0.0	479.60	-0.00
2/ 2	0.0	311.38	-0.00
2/ 3	0.0	607.77	0.00
2/ 4	0.0	608.63	-0.00
2/ 5	0.0	304.38	-0.00
2/ 6	0.0	19.56	0.0
3/ 1	0.0	500.50	-0.00
3/ 2	0.0	324.96	0.00
3/ 3	0.0	546.43	-0.00
3/ 4	0.0	559.58	0.00
3/ 5	0.0	628.50	0.00
3/ 6	0.0	20.41	-0.00
4/ 1	0.0	500.50	0.0
4/ 2	0.0	324.96	-0.00
4/ 3	0.0	543.88	-0.00
4/ 4	0.0	540.90	0.0
4/ 5	0.0	560.26	0.0
4/ 6	0.0	20.41	-0.00
5/ 1	0.0	479.60	0.00
5/ 2	0.0	311.38	0.00
5/ 3	0.0	521.70	0.0
5/ 4	0.0	522.54	0.00
5/ 5	0.0	517.85	0.0
5/ 6	0.0	19.56	0.0
6/ 1	0.0	132.50	0.0
6/ 2	0.0	86.03	0.0
6/ 3	0.0	144.08	-0.00
6/ 4	0.0	143.88	0.0
6/ 5	0.0	144.97	0.0
6/ 6	0.0	5.40	-0.00
Caso 1	g2k.balsto sup		
Suma final	0.0	2225.19	-0.00
Suma de reaccion	0.0	2225.19	-134624.00
Suma de esfuerzo	0.0	-2225.19	134624.00
Verificación	0.0	-0.00	0.0
Precisión:	1.54924e-016	2.91437e-032	

Nudo/Caso	FX (T)	FZ (T)	MY (Tm)
Caso 2	g2k,balasto inf		
Suma final	0.0	1444.74	-0.00
Suma de reaccion	0.0	1444.74	-87406.77
Suma de esfuerzo	0.0	-1444.74	87406.77
Verificación	0.0	0.0	0.00
Precisión:	1.78961e-016	1.93414e-032	
Caso 3	sobrecarga e1 y e2		
Suma final	0.0	2540.00	-0.00
Suma de reaccion	0.0	2540.00	-148210.00
Suma de esfuerzo	0.0	-2540.00	148210.00
Verificación	0.0	0.00	0.0
Precisión:	0.0	8.94688e-032	
Caso 4	sobrecarga p1 y p4		
Suma final	0.0	2490.00	0.00
Suma de reaccion	0.0	2490.00	-148685.00
Suma de esfuerzo	0.0	-2490.00	148685.00
Verificación	0.0	0.00	0.0
Precisión:	0.0	2.32745e-032	
Caso 5	sobrecarga p2 y p3		
Suma final	0.0	2220.00	-0.00
Suma de reaccion	0.0	2220.00	-146930.00
Suma de esfuerzo	0.0	-2220.00	146930.00
Verificación	0.0	0.00	0.0
Precisión:	1.42453e-016	2.92801e-032	
Caso 6	SOBRECARGA ACERA		
Suma final	0.0	90.75	-0.00
Suma de reaccion	0.0	90.75	-5490.38
Suma de esfuerzo	0.0	-90.75	5490.38
Verificación	0.0	0.0	0.00
Precisión:	1.18711e-016	1.91485e-032	

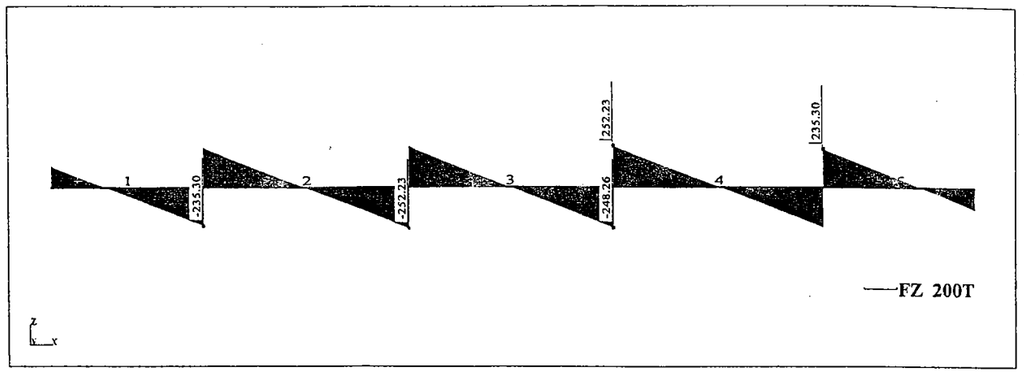
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Dirección :

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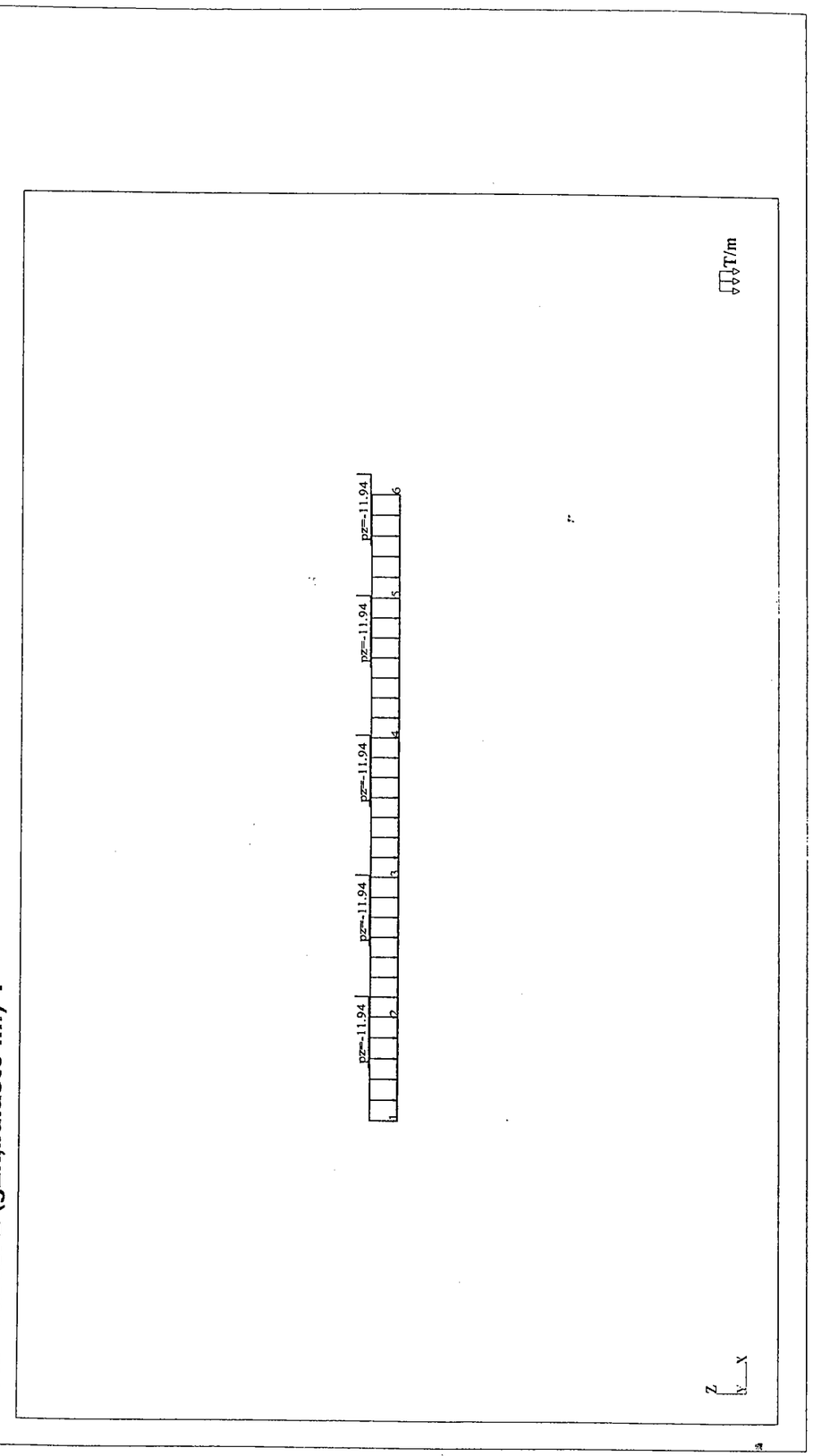
Vista - casos: 2 (g2k,balasto inf)

Diagramas:2 - FZ; casos: 1 (g2k.balsto sup) 1

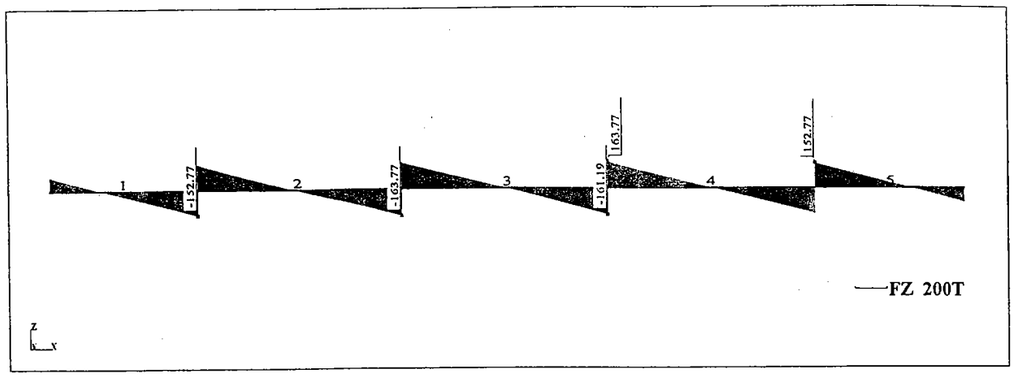


	FZ (T)
Tipo (color) de línea	
Escala : (cm) =	305.9
MAX	252.23
Barra	4
Punto	x = 0.0000
Caso	1
MIN	-252.23
Barra	2
Punto	x = 1.0000
Caso	1

Vista - casos: 2 (g2k,balasto inf) 1

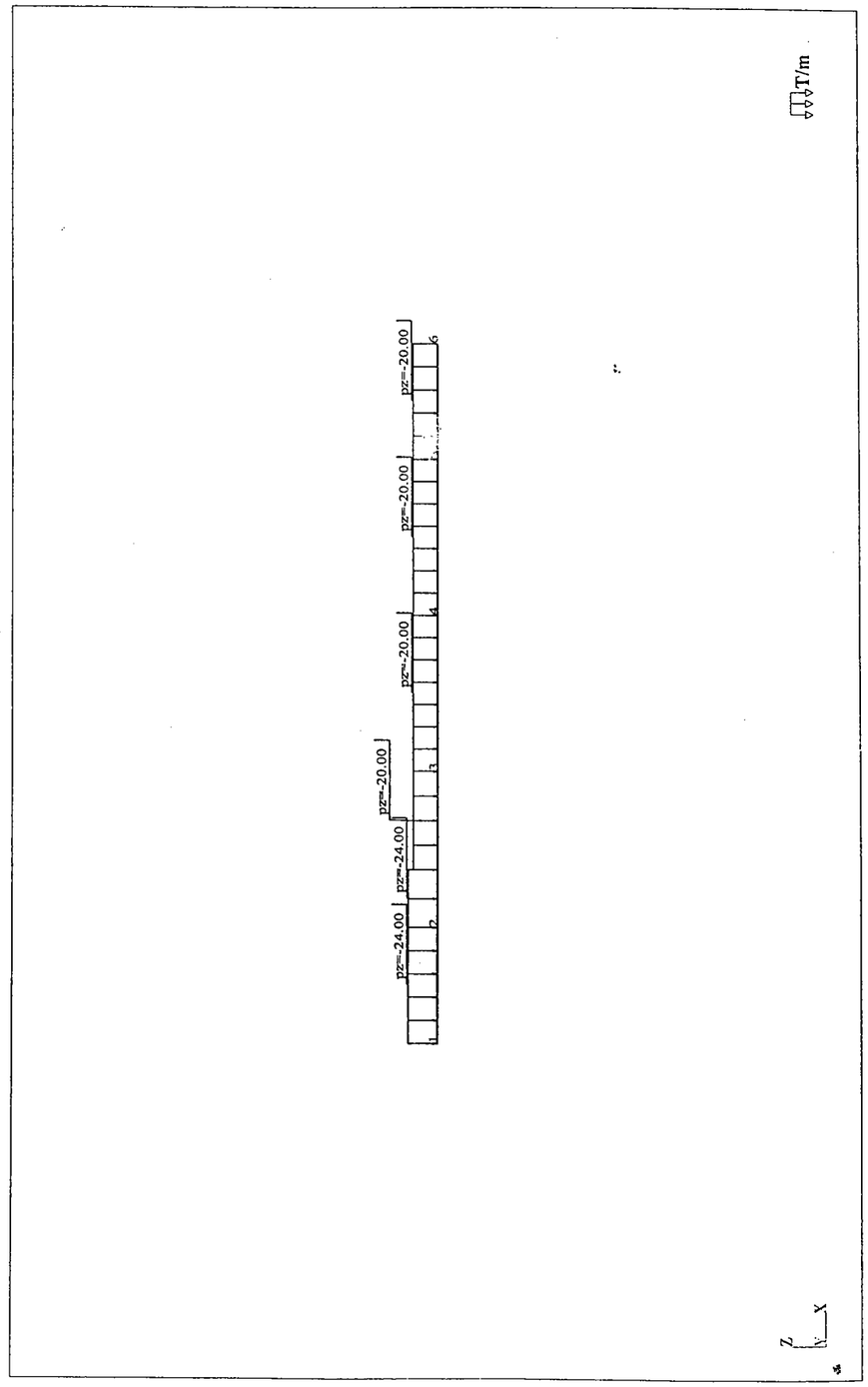


Diagramas:2 - FZ; casos: 2 (g2k,balasto inf) 1

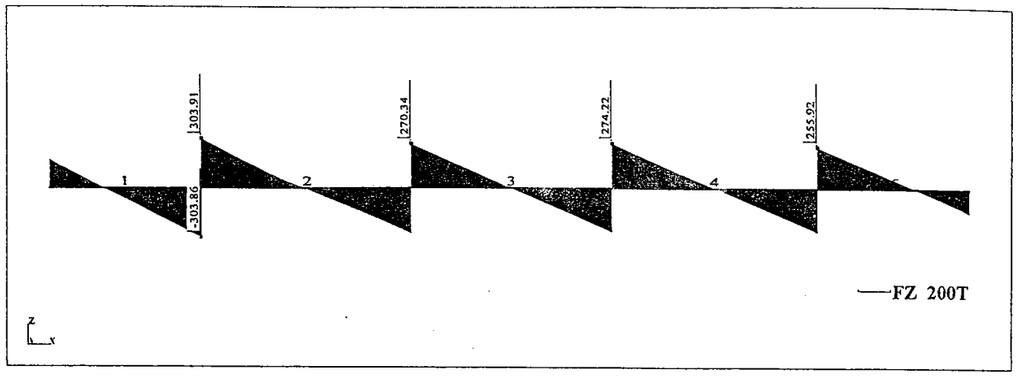


	FZ (T)
Tipo (color) de línea	
Escala : (cm) =	305.9
MAX	163.77
Barra	4
Punto	x = 0.0000
Caso	2
MIN	-163.77
Barra	2
Punto	x = 1.0000
Caso	2

Vista - casos: 3 (sobrecarga e1 y e2)

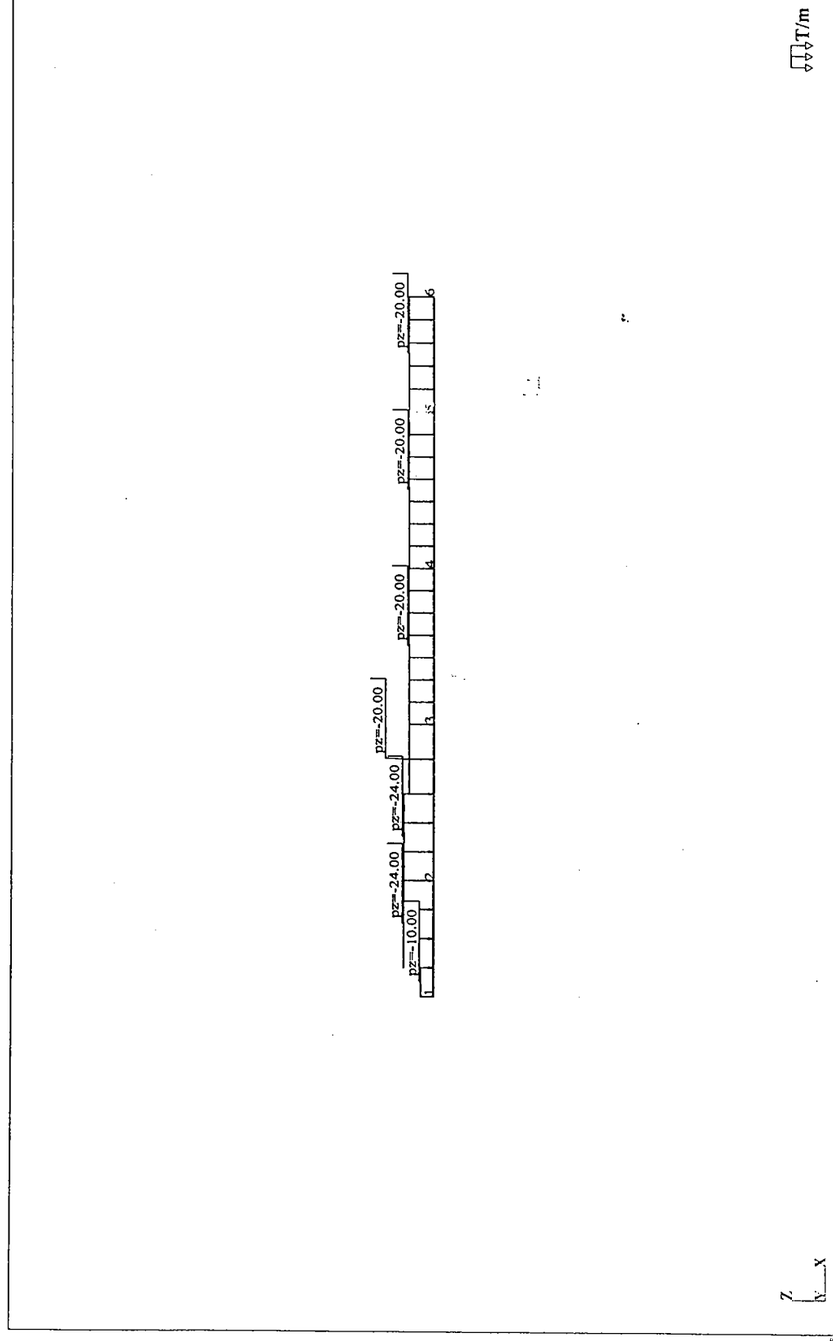


Diagramas:2 - FZ; casos: 3 (sobrecarga e1 y e2) 1

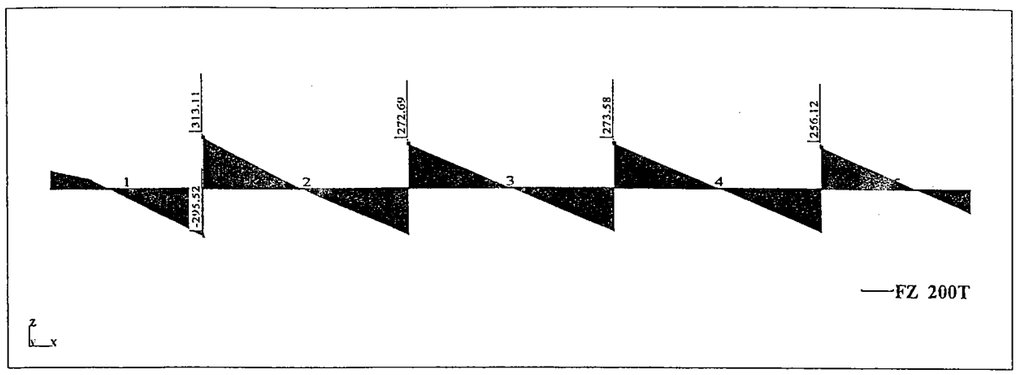


	FZ (T)
Tipo (color) de línea	
Escala : (cm) =	305.9
MAX	303.91
Barra	2
Punto	x = 0.0000
Caso	3
MIN	-303.86
Barra	1
Punto	x = 1.0000
Caso	3

Vista - casos: 4 (sobrecarga p1 y p4) 1

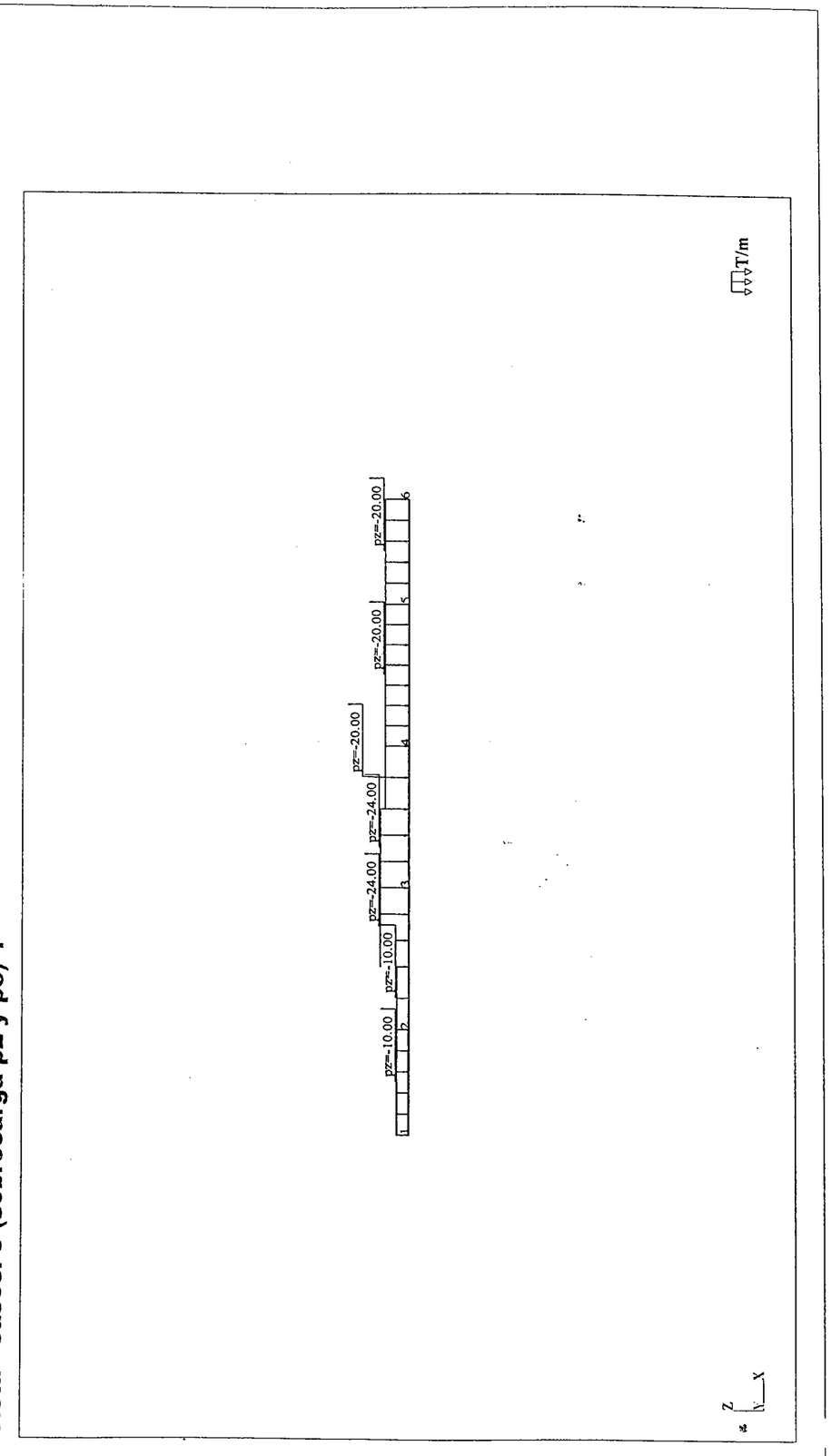


Diagramas:2 - FZ; casos: 4 (sobrecarga p1 y p4) 1

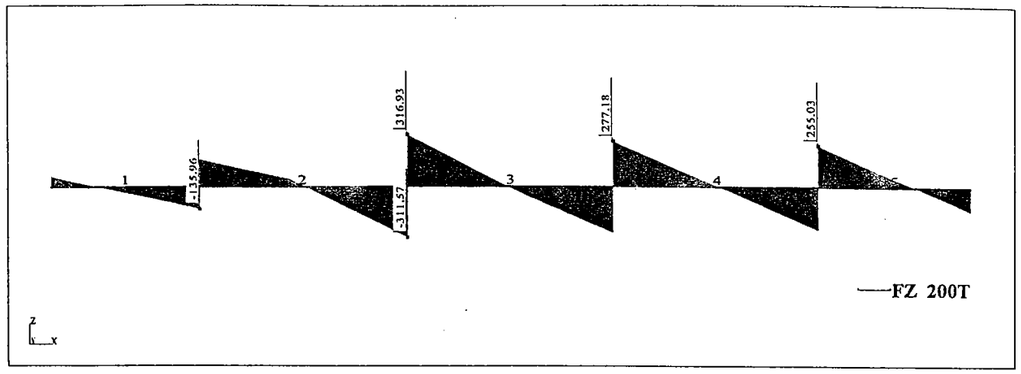


	FZ (T)
Tipo (color) de línea	
Escala : (cm) =	305.9
MAX	313.11
Barra	2
Punto	x = 0.0000
Caso	4
MIN	-295.52
Barra	1
Punto	x = 1.0000
Caso	4

Vista - casos: 5 (sobrecarga p2 y p3) 1



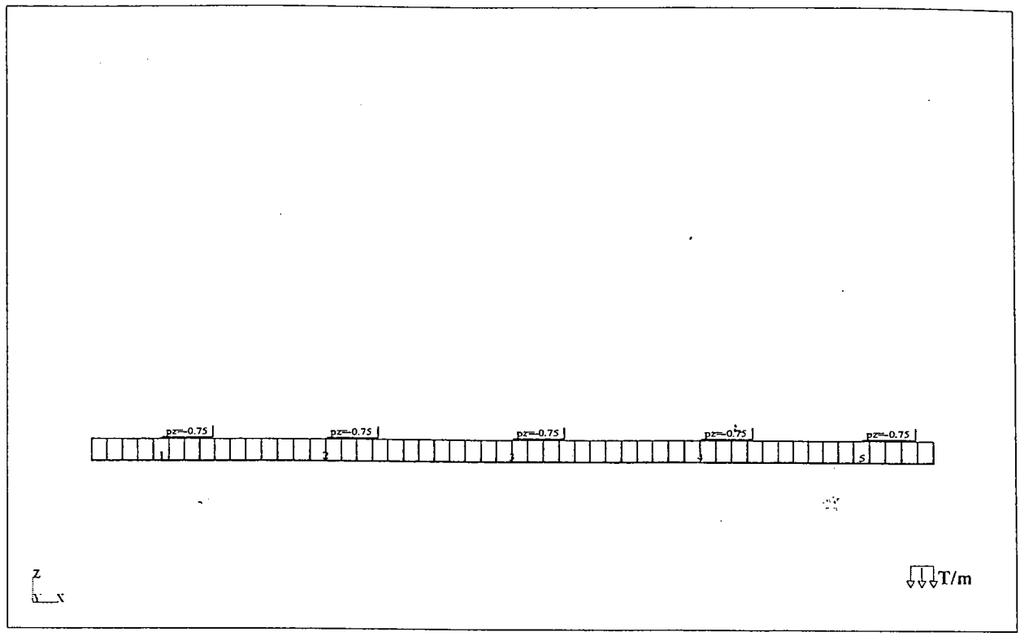
Diagramas:2 - FZ; casos: 5 (sobrecarga p2 y p3) 1



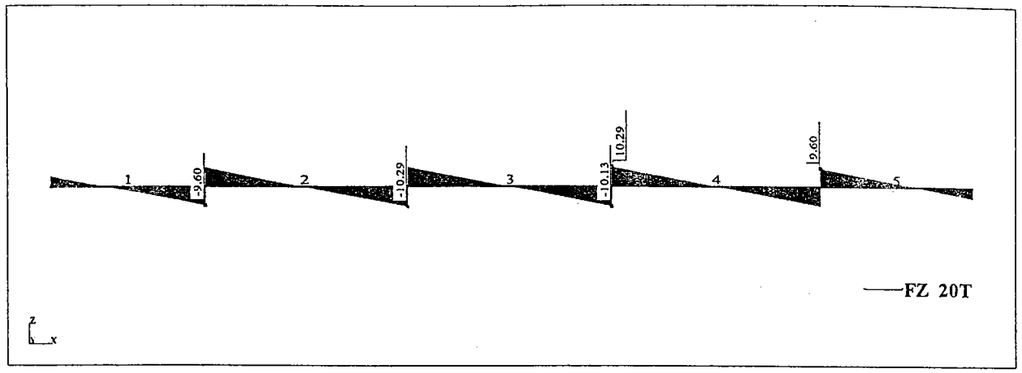
	FZ (T)
Tipo (color) de línea	
Escala : (cm) =	305.9
MAX	316.93
Barra	3
Punto	x = 0.0000
Caso	5
MIN	311.57
Barra	2
Punto	x = 1.0000
Caso	5

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Vista - casos: 6 (SOBRECARGA ACERA)



Diagramas:4 - FZ; casos: 6 (SOBRECARGA ACERA)



	FZ (T)
Tipo (color) de línea	
Escala : (cm) =	25.5
MAX	10.29
Barra	4
Punto	x = 0.0000
Caso	6
MIN	-10.29
Barra	2
Punto	x = 1.0000
Caso	6

U.T.E. TECSA-DRAGADOS
AVE MADRID-BARCELONA
SUBTRAMO V: LLEIDA-MARTORELL
VALLS. VIADUCTO-1

REACCIONES VERTICALES

	ESTRIBO 1 Y 2		PILAS 1 Y 4		PILAS 2 Y 3	
	APOYO 1	APOYO 2	APOYO 1	APOYO 2	APOYO 1	APOYO 2
VIGA+LOSA (Tn)	78.140	78.140	282.829	282.829	295.155	295.15
ACERAS (Tn)	5.764	5.764	20.863	20.863	21.773	21.77
BALASTO (Tn)	30.838	30.838	111.619	111.619	116.483	116.48
TREN MAXIMA (Tn)	106.169	106.169	310.943	310.943	336.476	336.47
TREN MINIMA (Tn)	-19.261	-19.261	-22.588	-22.588	-23.397	-23.39
SOBRECARGA ACERA (Tn)	4.755	4.755	17.212	17.212	17.962	17.96
MAX (Tn)	225.667	225.667	743.466	743.466	787.849	787.84
MIN (Tn)	95.482	95.482	392.723	392.723	410.013	410.01

REACCIONES HORIZONTALES (EN CABEZA DE PILA)

	ESTRIBO 1	PILA 1	PILAS 2 Y 3	PILA 4	ESTRIBO 2 ANCLADO
LONGITUDINALES					
FRENADO U.I.C.(Tn)					508.4

ROZAMIENTO CONSIDERADO EN TEFLÓN: 0.03 DE CARGAS PERMANENTES

TRANSVERSALES					
VIENTO (Tn)	12.88	30.268	34.776	30.268	12.88
EFECTO DE LAZO (Tn)	5	5	5	5	5

REACCIONES VERTICALES

	ESTRIBO 1 Y 2		PILAS 1 Y 4		PILAS 2 Y 3	
	APOYO 1	APOYO 2	APOYO 1	APOYO 2	APOYO 1	APOYO 2
VIGA +LOSA						
g2,BALASTO SUP.	66.25	66.25	239.80	239.80	250.25	250.25
g2,BALASTO INF.	43.01	43.01	155.69	155.69	162.48	162.48
TREN MÁXIMA	88.07	88.07	304.31	304.31	314.25	314.25
SOBRECARGA ACERA,CONC	2.70	2.70	9.78	9.78	10.20	10.20

4. VERIFICACIÓN DE FUSTES

VERIFICACIÓN D OPORTES AISLADOS A PANDEO SEGUN RMA EHE
Referencia proyecto:UTE ALT CAMP PILA 3, ESTRUCTURA 1
ELS transversal

Cuestiones geométricas

Longitud del soporte (m)	10.15	
Factor de longitud de pandeo (alfa)	2	Nota sobre el valor de alfa:

Tipo de soporte	Alfa
biempotrado	0.5
biarticulado	1
articulado-empotrado	0.7
en ménsula	2
biempotrado con extremos desplazables	1

Longitud de pandeo (m)	20.3	
Dimensión del soporte en el plano de pandeo (m)	1.7	
Radio de giro de la sección (m)	0.425	
Esbeltez mecánica	48	APLICAR MÉTODO SIMPLIFICADO

Cálculo de esfuerzos de 2o orden (sólo método simplificado)

Axial (T)	943.54	
Momento (mT)	240.35	
Excentricidad de primer orden (m) (soportes traslacionales)	0.255	
Factor de armado (beta)	1.5	Nota sobre el valor de beta:

Tipo de armadura	Beta
toda la armadura es	
perpendicular al plano de pandeo	1
paralela al plano de pandeo	3
hay armadura en las 4 caras	1.5

Resistencia fyk del acero (Kp/cm2)	5100	
Parámetro de fluencia (epsilon)	0.004	Nota sobre el valor de epsilon

el axil cuasipermanente	Epsilon
no supera el 70% del total	0.003
supera el 70% del total	0.004

Excentricidad adicional (m)	0.224	
Excentricidad total (m)	0.478	
Axil de segundo orden (T)	**943.54**	
Momento de segundo orden (mT)	**451.5**	

VERIFICACIÓN DE SOPORTES AISLADOS A PANDEO SEGUN NORMA EHE
Referencia proyecto:UTE ALT CAMP PILA 3, ESTRUCTURA 1
ELS longitudinal

Cuestiones geométricas

Longitud del soporte (m)	12.32	
Factor de longitud de pandeo (alfa)	2	Nota sobre el valor de alfa:

Tipo de soporte	Alfa
biempotrado	0.5
biarticulado	1
articulado-empotrado	0.7
en ménsula	2
biempotrado con extremos desplazables	1

Longitud de pandeo (m)	24.64	
Dimensión del soporte en el plano de pandeo (m)	1.7	
Radio de giro de la sección (m)	0.425	
Esbeltez mecánica	58	APLICAR MÉTODO SIMPLIFICADO

Cálculo de esfuerzos de 2o orden (sólo método simplificado)

Axial (T)	943.5	
Momento (mT)	581.26	
Excentricidad de primer orden (m) (soportes traslacionales)	0.616	
Factor de armado (beta)	1.5	Nota sobre el valor de beta:

Tipo de armadura	Beta
toda la armadura es	
perpendicular al plano de pandeo	1
paralela al plano de pandeo	3
hay armadura en las 4 caras	1.5

Resistencia fyk del acero (Kp/cm2)	5100	
Parámetro de fluencia (epsilon)	0.004	Nota sobre el valor de epsilon

el axil cuasipermanente	Epsilon
no supera el 70% del total	0.003
supera el 70% del total	0.004

Excentricidad adicional (m)	0.368	
Excentricidad total (m)	0.984	
Axil de segundo orden (T)	**945.5**	
Momento de segundo orden (mT)	**928.0**	

VERIFICACIÓN DE SOPORTES AISLADOS A PANDEO SEGUN NORMA EHE
Referencia proyecto:UTE ALT CAMP PILA 3, ESTRUCTURA 1
ELU transversal

Cuestiones geométricas

Longitud del soporte (m)	10.15
Factor de longitud de pandeo (alfa)	2

Nota sobre el valor de alfa:

Tipo de soporte	Alfa
biempotrado	0.5
biarticulado	1
articulado-empotrado	0.7
en ménsula	2
biempotrado con extremos desplazables	1

Longitud de pandeo (m)	20.3
Dimensión del soporte en el plano de pandeo (m)	0.75
Radio de giro de la sección (m)	0.188
Esbeltez mecánica	108

APLICAR MÉTODO GENERAL

Cálculo de esfuerzos de 2o orden (sólo método simplificado)

Axial (T)	1333.5
Momento (mT)	360.52
Excentricidad de primer orden (m) (soportes traslacionales)	0.270
Factor de armado (beta)	1.5

Nota sobre el valor de beta:

Tipo de armadura	Beta
toda la armadura es	
perpendicular al plano de pandeo	1
paralela al plano de pandeo	3
hay armadura en las 4 caras	1.5

Resistencia fyk del acero (Kp/cm2)	5100
Parámetro de fluencia (epsilon)	0.004

Nota sobre el valor de epsilon

el axil cuasipermanente	Epsilon
no supera el 70% del total	0.003
supera el 70% del total	0.004

Excentricidad adicional (m)	0.565
Excentricidad total (m)	0.836
Axil de segundo orden (T)	**1333.5**
Momento de segundo orden (mT)	**1114.2**

VERIFICACIÓN DE SOPORTES AISLADOS A PANDEO SEGUN NORMA EHE
Referencia proyecto:UTE ALT CAMP PILA 3, ESTRUCTURA 1
ELU longitudinal

Cuestiones geométricas

Longitud del soporte (m)	12.32
Factor de longitud de pandeo (alfa)	2

Nota sobre el valor de alfa:

Tipo de soporte	Alfa
biempotrado	0.5
biarticulado	1
articulado-empotrado	0.7
en ménsula	2
biempotrado con extremos desplazables	1

Longitud de pandeo (m)	24.64
Dimensión del soporte en el plano de pandeo (m)	1.7
Radio de giro de la sección (m)	0.425
Esbeltez mecánica	58

APLICAR MÉTODO SIMPLIFICADO

Cálculo de esfuerzos de 2o orden (sólo método simplificado)

Axial (T)	1333.5
Momento (mT)	821.49
Excentricidad de primer orden (m) (soportes traslacionales)	0.616
Factor de armado (beta)	1.5

Nota sobre el valor de beta:

Tipo de armadura	Beta
toda la armadura es	
perpendicular al plano de pandeo	1
paralela al plano de pandeo	3
hay armadura en las 4 caras	1.5

Resistencia fyk del acero (Kp/cm2)	5100
Parámetro de fluencia (epsilon)	0.004

Nota sobre el valor de epsilon

el axil cuasipermanente	Epsilon
no supera el 70% del total	0.003
supera el 70% del total	0.004

Excentricidad adicional (m)	0.368
Excentricidad total (m)	0.984
Axil de segundo orden (T)	**1333.5**
Momento de segundo orden (mT)	**1311.6**

PEDELTA, S.L.
INGENIERÍA CIVIL

ALT - CAMP	ESTRUCTURA 1
Fecha:	Hoja:

VERIFICACIÓN DE FUSTES

PILA 3

Momento en base de pila

$M_{x\,k}$ = 47.18 x 12.32 = 581.26 $M_{x\,d}$ = 66.68 x 12.32 = 821.49

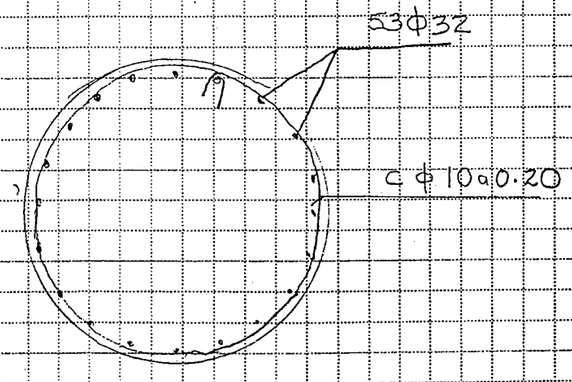
$M_{y\,k}$ = 23.68 x 10.15 = 240.35 $M_{y\,d}$ = 35.52 x 10.15 = 360.57

N_k = 943.54 N_d = 1333.50

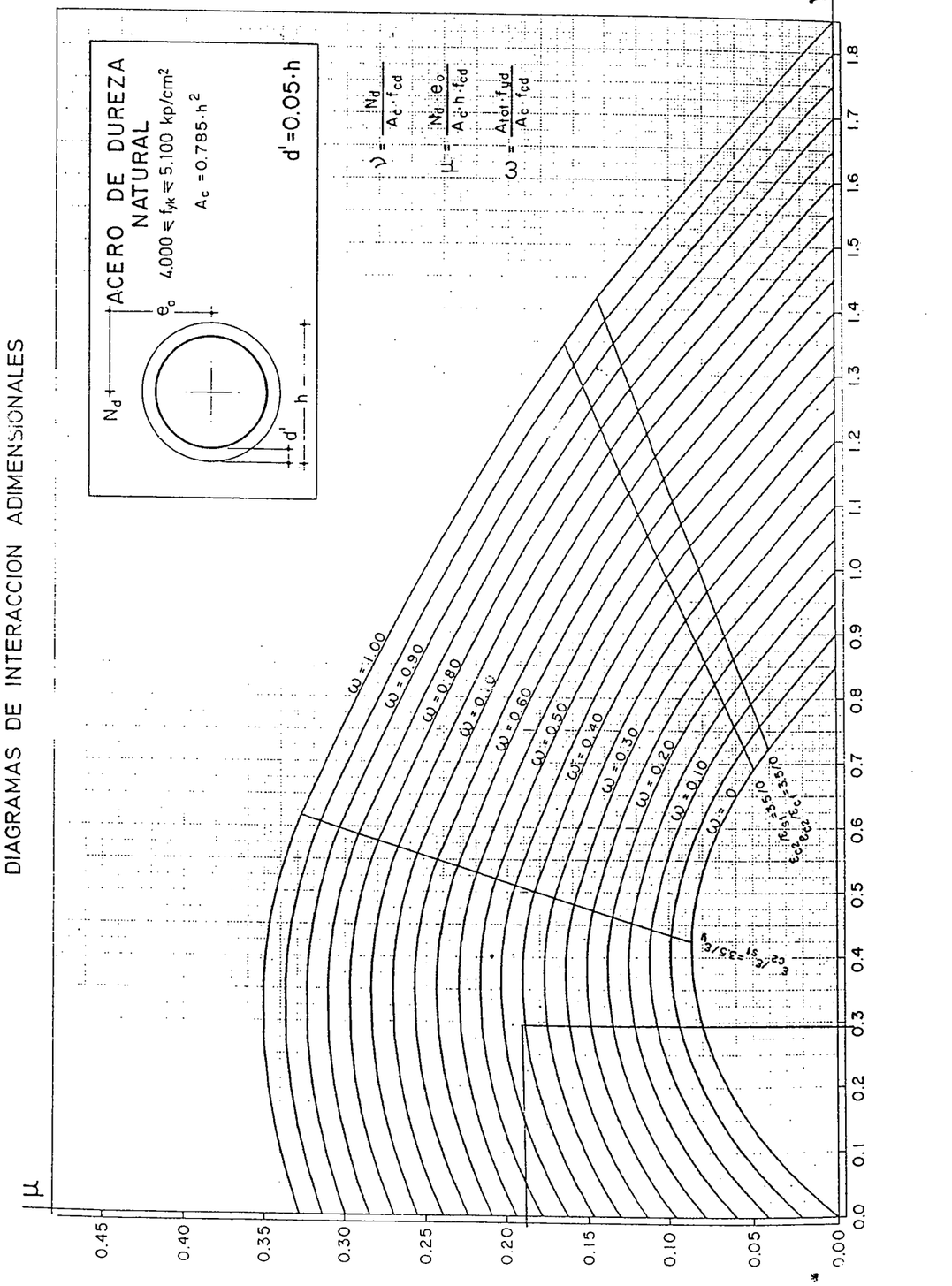
Momentos de 2º Orden

$M_{x\,k}$ = 928.00 $M_{x\,d}$ = 1311.60

$M_{y\,k}$ = 451.50 m-T $M_{y\,d}$ = 1114.20



DIAGRAMAS DE INTERACCION ADIMENSIONALES



Momento último de la sección:

$A_s = 426.12\ cm^2$

$A_c = 22698\ cm^2$

$f_{yd} = 4430\ Kp/cm^2$

$f_{cd} = 200\ Kp/cm^2$

$\omega = \frac{426.12 \cdot 4430}{22698 \cdot 200} = 0.41$

$\nu = \frac{1333.50 \cdot 10^3}{22698 \cdot 200} = 0.29$

$\mu = 0.19$

$M_u = 0.19 \times 22698 \times 170 \times 200 = 146630\ m\text{-}T$

5. ESTRIBO 1

GEOMETRÍA

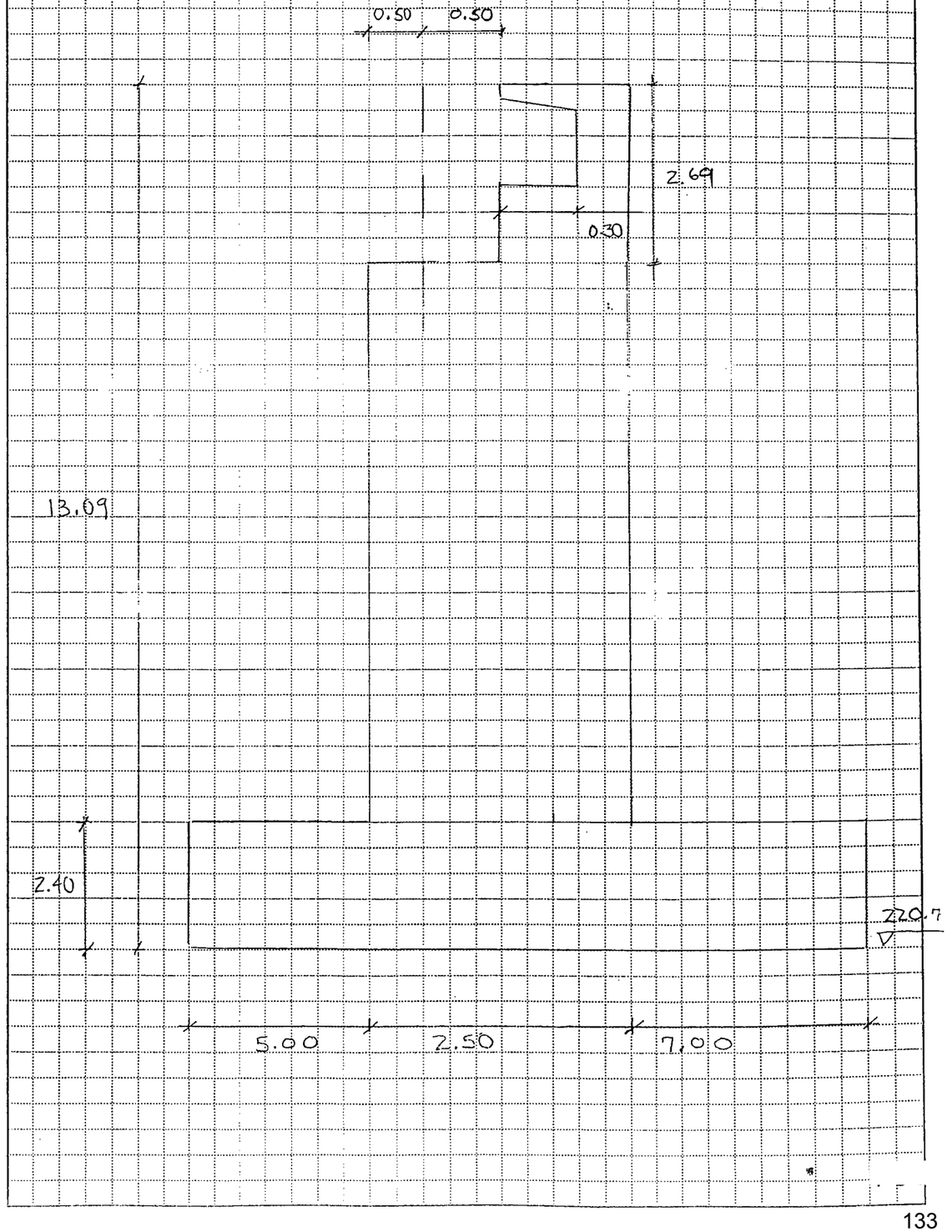
PEDELTA, S.L.
INGENIERÍA CIVIL

ALT - CAMP

ESTRUCTURA 1

Fecha:

Hoja:



CARGAS SOBRE PILA ELS

ESTRIBO 1

CASO INICIAL	ESTRIBO 1				
	APOYO 1			APOYO 2	
	Fz	Fx	Fy	Fz	Fx
g1+P	78.14			78.14	
g2	66.25			66.25	
q100%	106.17			106.17	
viento			10.44		
viento concomitante			17.54		
Frenado		277.00			
interacción vía estructura		0.00			
g1+g2+rozamiento+viento	148.35	7.42	10.44	140 43	7.02
g1+g2+q100%+rozamiento+viento concomitante+0.6*frenado+0.6*	265.31	179.47	17.54	232.76	288.62
g1+g2+q100%+rozamiento+frenado+0.6*viento concomitante+0.6*	261.84	290.09	10.52	239.28	11.96
g1+g2+q100%+rozamiento+ive+0.6*viento concomitante+0.6*frena	261.84	179.29	10.52	239.28	11.96

ACCIONES EN CORONACIÓN

CARGAS SOBRE PILA ELU

CASO INICIAL	ESTRIBO 1				
	APOYO 1			APOYO 2	
	Fz	Fx	Fy	Fz	Fx
g1+P	105.49			105.49	
g2	89.44			89.44	
q100%	159.25			159.25	
viento			15.66		
viento concomitante			26.31		
Frenado		415.50			
interacción vía estructura		0.00			
g1+g2+rozamiento+viento	200.87	10.04	15.66	188.98	9.45
g1+g2+q100%+rozamiento+viento concomitante+0.6*frenado+0.6*	381.32	268.37	26.31	327.04	431.85
g1+g2+q100%+rozamiento+frenado+0.6*viento concomitante+0.6*	366.31	433.82	15.79	342.05	17.10
g1+g2+q100%+rozamiento+ive+0.6*viento concomitante+0.6*fren	366.31	267.62	15.79	342.05	17.10

5.3 CÁLCULO DE ESFUERZOS Y DIMENSIONAMIENTO

El cálculo y dimensionamiento de los estribos se detalla en las páginas siguientes. Las hipótesis de cálculo se exponen a continuación:

1. El cálculo se realiza en la hipótesis clásica como muro con acciones en coronación debidas a las reacciones horizontales y verticales transmitidas por el tablero. Los empujes del terreno se han calculado para un coeficiente de empuje K= 0,33 y una densidad del terreno de 2,0 T/m^3. No se han considerado eventuales empujes hidrostáticos al colocar un adecuado drenaje en el trasdós del estribo.

2. En el cálculo de la seguridad del estribo frente al vuelco, deslizamiento y tensiones máximas se han verificado las siguientes condiciones (ver resultados en listados de cálculo).

   Coeficiente de Seguridad al vuelco, $CS,v \geq 1,80$

   Coeficiente de Seguridad al deslizamiento $CS,d \geq 1,50$

   Tensión máxima del terreno en puntera $\sigma_{max} \leq 1,33\ \sigma_{admisible}$

   Con $\sigma_{admisible}$ **= 3,5 Kp/cm^2** en el Estribo 1 y coeficientes de rozamiento terreno-zapata μ **= 0,5** en los dos estribos.

3. El dimensionamiento de las armaduras de flexión y cortante del muro y zapata se realiza con los criterios de la Normativa vigente para estructuras de hormigón (EHE). Los coeficientes de seguridad de las acciones corresponden con un **nivel de control intenso** γ_{fg} **=1,35 y** γ_{fq} **=1,50.**

PROGRAMA DE CALCULO DE ESTRIBOS DE PUENTE
==========

REFERENCIA ESTRIBO: UTE ALT-CAMP. ESTRIBO 1.

DATOS DE GEOMETRIA (S/ESQUEMA)
==========

B1	B2	B3	B4	B5	B6	B7	B8	B9	(m)
1.10	1.16	0.00	2.50	0.00	0.50	5.00	2.50	7.00	

H	H1	H2	H3	H4	H5	H6	H7	(m)
13.09	2.69	0.00	0.00	0.00	2.40	2.34	0.35	

ANCHO DEL ESTRIBO (m) = 14.00
ANCHO DE LA ZAPATA (m) = 14.80
NUMERO DE APOYOS = 2

DATOS DE ACCIONES
==========

REACCION MAXIMA (T/m) = 33.67
REACCION MINIMA (T/m) = 16.96
FZA. HORIZONTAL MAXIMA (T/m) = 46.43
FZA. HORIZONTAL CON FRENADO (T/m) = 46.43
FZA. HORIZONTAL SIN SOBRECARGA (T/m) = 14.71
SOBRECARGA EN TERRAPLEN (T/m) = 3.00

DATOS DEL TERRENO
==========

ANGULO DE ROZAMIENTO INTERNO = 30.00
DENSIDAD DEL TERRENO (T/m3) = 2.00
COEF. DE EMPUJE HORIZONTAL = 0.33
COEF. DE ROZAMIENTO ZAPATA-TERRENO = 0.55
ALTURA DE TIERRAS SOBRE LA PUNTERA (m) = 0.00

REFERENCIA ESTRIBO: UTE ALT-CAMP. ESTRIBO 1.

VERIFICACION DE LA ZAPATA
==========

CALCULO DE PESOS Y MOMENTOS RESPECTO AL EXTREMO DE LA PUNTERA

VOL. HORMIGON	MASA	DISTANCIA	MOMENTO
1	7.80	6.68	52.11
2	0.00	7.26	0.00
3	0.00	6.13	0.00
4	0.00	0.00	0.00
5	50.00	6.25	312.50
6	87.00	7.25	630.75

VOL. TIERRAS	MASA	DISTANCIA	MOMENTO
1	38.95	10.88	423.79
2	0.00	10.76	0.00
3	0.00	0.00	0.00
4	56.00	13.33	746.54
5	0.00	2.50	0.00

TENSIONES MAXIMAS EN EL TERRENO

HIPOTESIS DE MAXIMA FUERZA HORIZONTAL:

REACCION VERTICAL SOBRE LA ZAPATA (T/m) = 295.14
EXCENTRICIDAD DE LA REACCION RESP. PUNTERA (m) = 5.94

TENSION EN PUNTERA SMAX (T/M2) = 29.67
TENSION MINIMA EN TALON SMIN (T/M2) = 8.83
LONGITUD DE CONTACTO ZAPATA-SUELO (m) = 14.50

HIPOTESIS CON FUERZA HORIZONTAL FRENADO + TEMP. + EFECT. DIF.:

REACCION VERTICAL SOBRE LA ZAPATA (T/m) = 286.78
EXCENTRICIDAD DE LA REACCION RESP. PUNTERA (m) = 5.96

TENSION EN PUNTERA SMAX (T/M2) = 28.73
TENSION MINIMA EN TALON SMIN (T/M2) = 8.68
LONGITUD DE CONTACTO ZAPATA-SUELO (m) = 14.50

HIPOTESIS CON FUERZA HORIZONTAL TEMP. + EFECT. DIF.:

REACCION VERTICAL SOBRE LA ZAPATA (T/m) = 278.43
EXCENTRICIDAD DE LA REACCION RESP. PUNTERA (m) = 6.13

TENSION EN PUNTERA SMAX (T/M2) = 26.55
TENSION MINIMA EN TALON SMIN (T/M2) = 9.77
LONGITUD DE CONTACTO ZAPATA-SUELO (m) = 14.50

REFERENCIA ESTRIBO: UTE ALT-CAMP. ESTRIBO 1.

COEFICIENTE DE SEGURIDAD FRENTE A DESLIZAMIENTO

HIPOTESIS DE MAXIMA FUERZA HORIZONTAL:

EMPUJE HORIZONTAL (T/m) = 107.17
ROZAMIENTO ZAPATA-SUELO (T/m) = 164.24

COEF. DE SEGURIDAD A DESLIZAMIENTO = 1.53

HIPOTESIS CON FUERZA HORIZONTAL TEMP. + EFECT. DIF.:

EMPUJE HORIZONTAL (T/m) = 75.45
ROZAMIENTO ZAPATA-SUELO (T/m) = 155.05

COEF. DE SEGURIDAD A DESLIZAMIENTO = 2.05

Se ha tomado el coeficiente de empuje al reposo para la puntera

COEFICIENTE DE SEGURIDAD FRENTE A VUELCO

HIPOTESIS DE MAXIMA FUERZA HORIZONTAL:

MOMENTO ESTABILIZADOR (mT/m) = 2587.93
MOMENTO VOLCADOR (mT/m) = 646.93

COEF. DE SEGURIDAD AL VUELCO = 4.00

HIPOTESIS CON FUERZA HORIZONTAL FRENADO + TEMP. + EFECT. DIF.:

MOMENTO ESTABILIZADOR (mT/m) = 2587.93
MOMENTO VOLCADOR (mT/m) = 646.93

COEF. DE SEGURIDAD AL VUELCO = 4.00

HIPOTESIS CON FUERZA HORIZONTAL TEMP. + EFECT. DIF.:

MOMENTO ESTABILIZADOR (mT/m) = 2496.04
MOMENTO VOLCADOR (mT/m) = 306.01

COEF. DE SEGURIDAD AL VUELCO = 8.16

REFERENCIA ESTRIBO: UTE ALT-CAMP. ESTRIBO 1.

CALCULO DE ESFUERZOS CARACTERISTICOS EN SECCIONES CRITICAS

SECCION	Z-zap	AXIL	FLECTOR	CORTANTE	ARMADURAS (cm2) Compr.	Tracc.
MURETE		7.80	5.78	5.10	0.1	17.4
APOYO LOSA		7.80	5.78	5.10	0.1	17.4
	8.00	41.47	43.92	51.53	0.7	37.6
		24.76	31.39	51.53		
	7.20	46.47	86.10	53.97	0.8	37.6
		29.76	73.57	53.97		
	6.40	51.47	130.40	56.84	0.9	37.6
		34.76	117.87	56.84		
	5.60	56.47	177.18	60.14	1.0	37.6
		39.76	164.65	60.14		
	4.80	61.47	226.77	63.87	1.1	37.6
		44.76	214.24	63.87		
	4.00	66.47	279.52	68.02	1.2	37.6
		49.76	266.99	68.02		
	3.20	71.47	335.76	72.59	1.3	39.4
		54.76	323.23	72.59		
	2.40	76.47	395.84	77.60	1.4	48.2
		59.76	383.31	77.60		
	1.60	81.47	460.10	83.02	1.5	57.7
		64.76	447.57	83.02		
	0.80	86.47	528.88	88.88	1.6	68.2
		69.76	516.35	88.88		
	0.00	91.47	602.52	95.16	1.6	79.7
		74.76	589.99	95.16		
PUNTERA ZAPATA		0.00	354.33	79.58	0.0	56.5
TALON ZAPATA		0.00	-447.65	-85.69	0.0	73.5
		0.00	-455.38	-87.00		

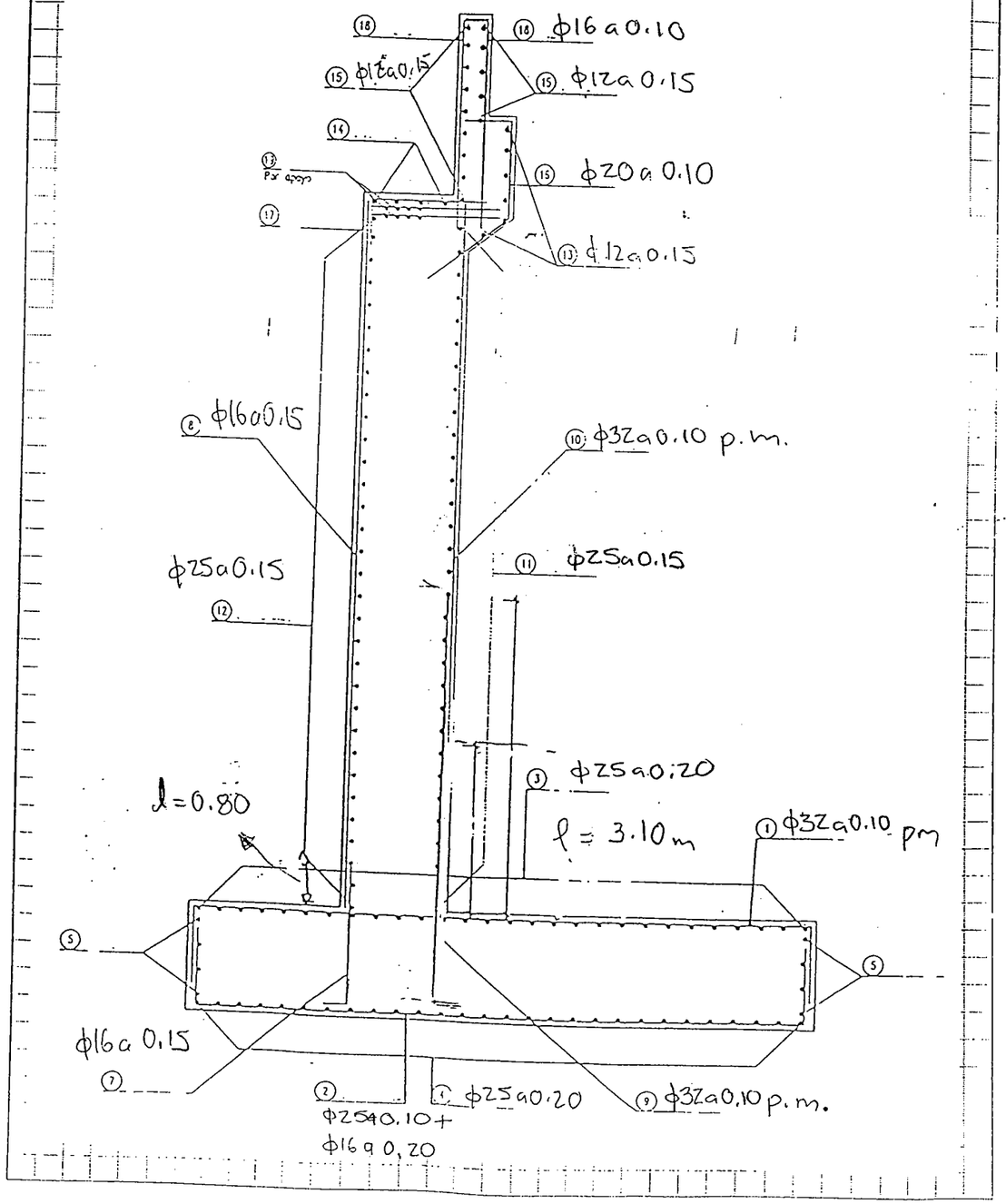
Z_ZAP= Altura medida desde la cara superior de la zapata

PEDELTA, S.L.
INGENIERÍA DE ESTRUCTURAS

Fecha:

Hoja:

SECCION TIPO ARMADO ESTRIBOS



DIMENSIONAMIENTO DE ALETAS

PEDELTA, S.L.
INGENIERÍA CIVIL

ALT-CAMP | ESTRUCTURA 1

Fecha: | Hoja:

DISEÑO DE ALETAS

CARGAS

- Peso propio : $\gamma_c = 2.5 T/m^3$

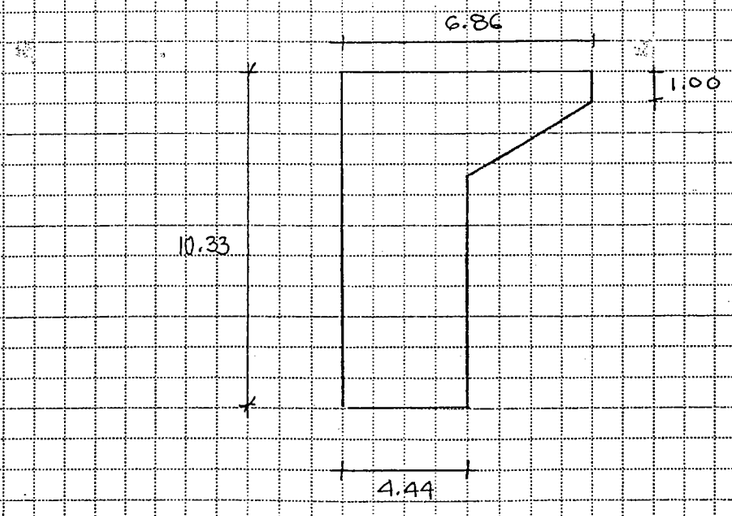
- Empuje de tierras

Empuje Activo : $ka = 0.33$

- Sobrecarga de uso :

$q = 3 T/m^2$

GEOMETRÍA



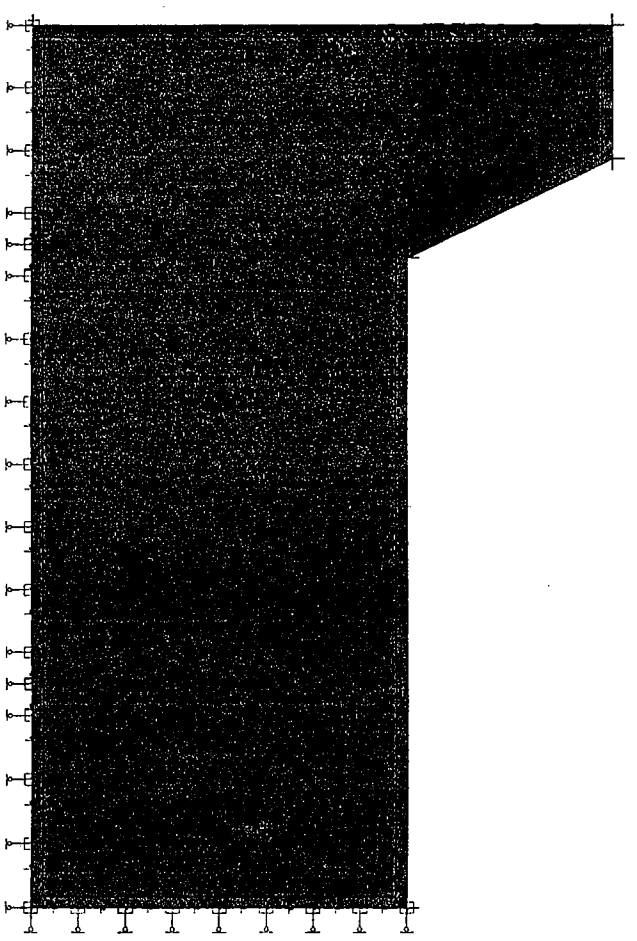
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Proyecto : aletas

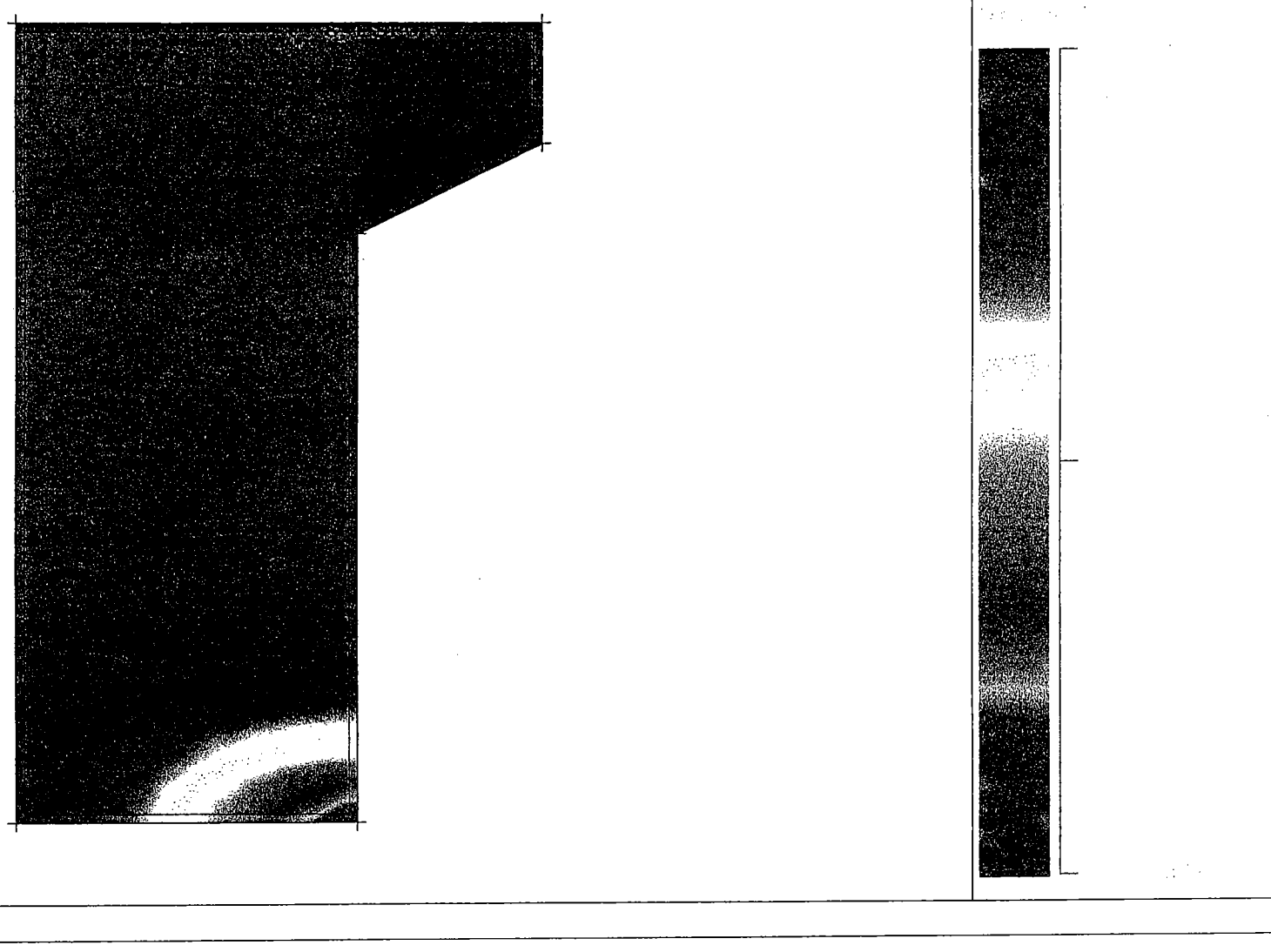
Données - Chargements

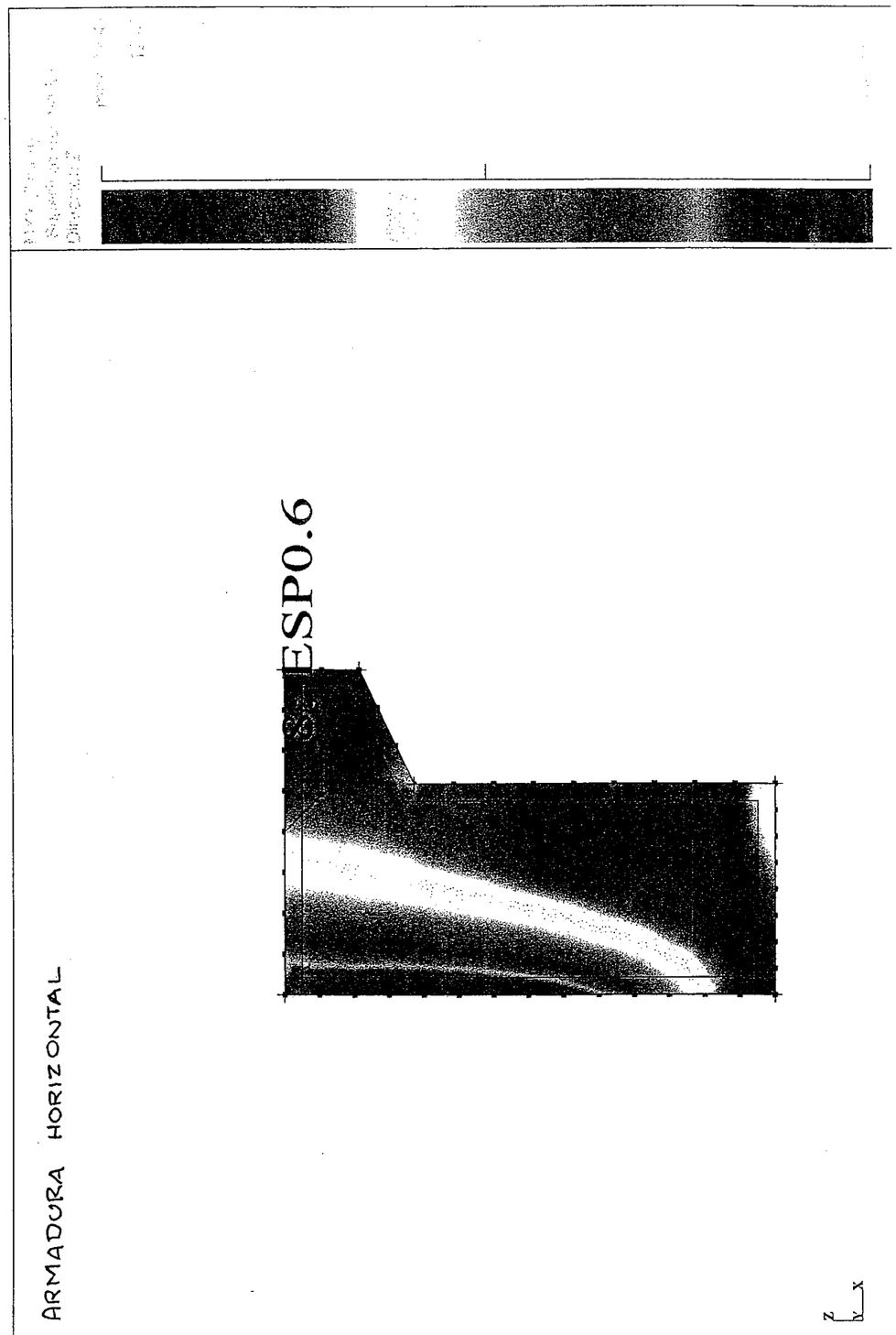
	Caso	Tipo de carga	Lista	Valores de carga
	1	peso propio	8	PZ Menos
	2	(EF) superficial 3p (c	8	PY1=0.99(T/m^2) PY2=7.81(T/m^2) PY3=7.81(T/m^2) N1X=0.0

MODELO DE CÁLCULO



ARMADURA VERTICAL





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Proyecto : aletas

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INGENIERÍA CIVIL

ALT - CAMP	ESTRUCTURA 1
Fecha:	Hoja:

Materiales :

Hormigón : HA-30 / P / 20 / IIa fcd = 20 MPa

Acero : B500S fyd = 510 MPa

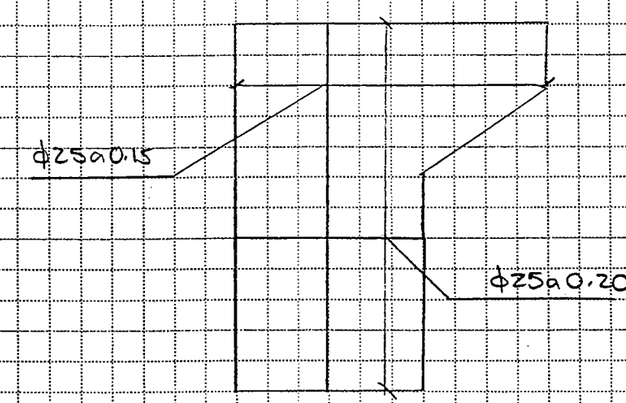
Md_T = 50.30 m-T

A_s = 20.87 cm^2

Md_{TL} = 63.27 m-T

A_s = 26.60 cm^2

ARMADURAS PRINCIPALES

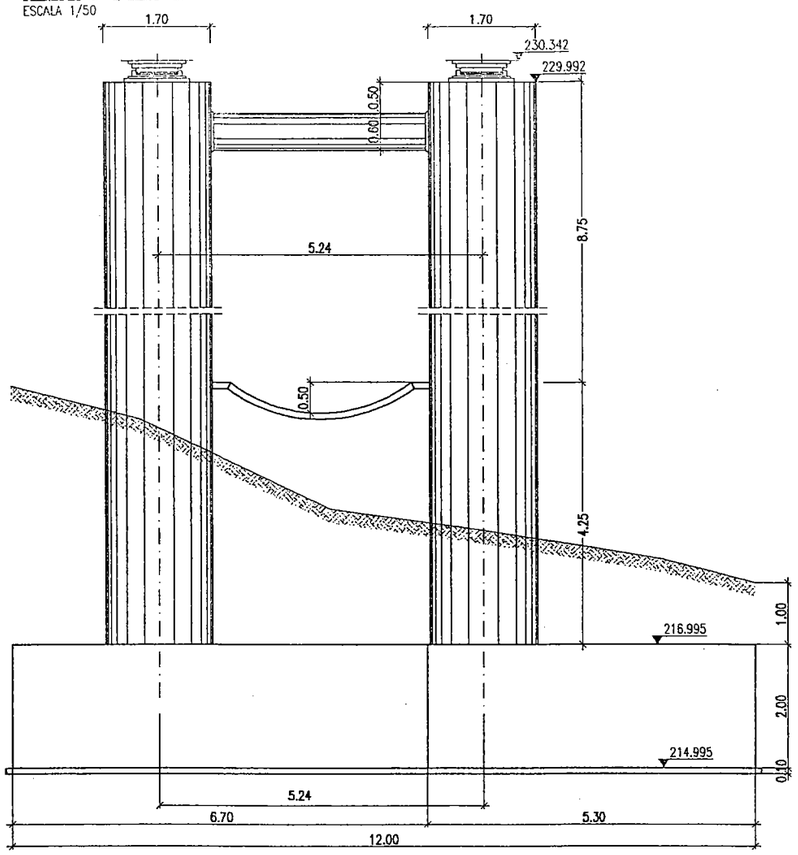


6. PILAS 2 y 3

GEOMETRÍA

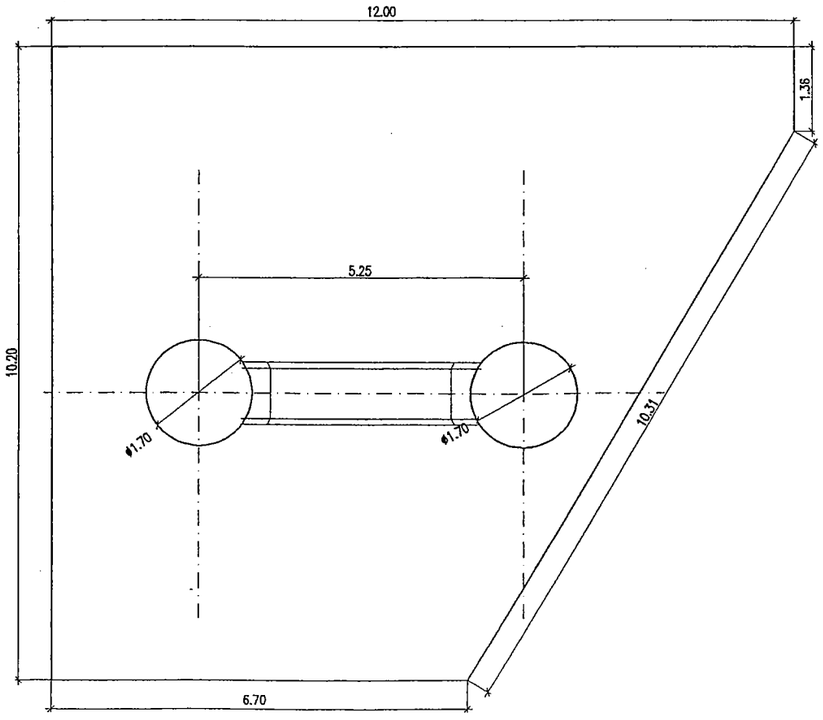
ALZADO PILA 2

ESCALA 1/50



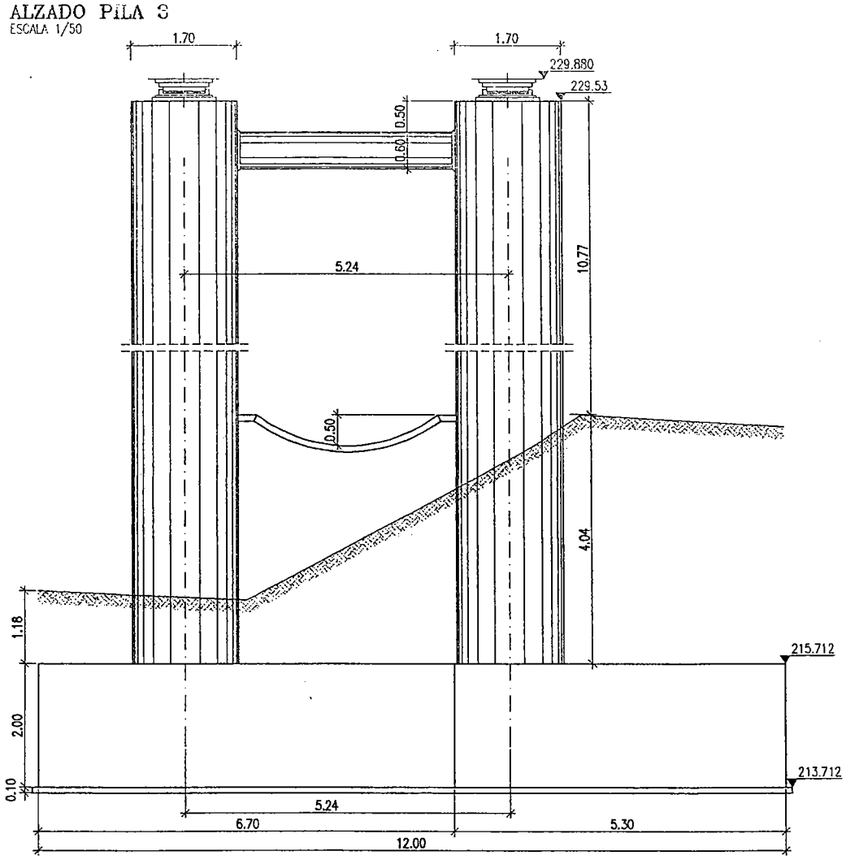
PLANTA PILA 2

ESCALA 1/50



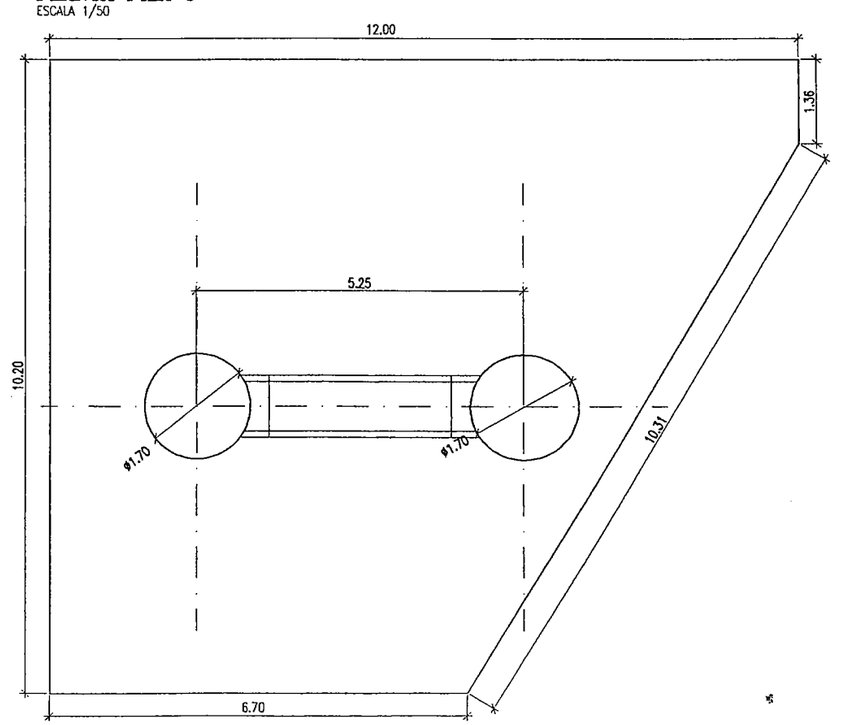
ALZADO PILA 3

ESCALA 1/50



PLANTA PILA 3

ESCALA 1/50

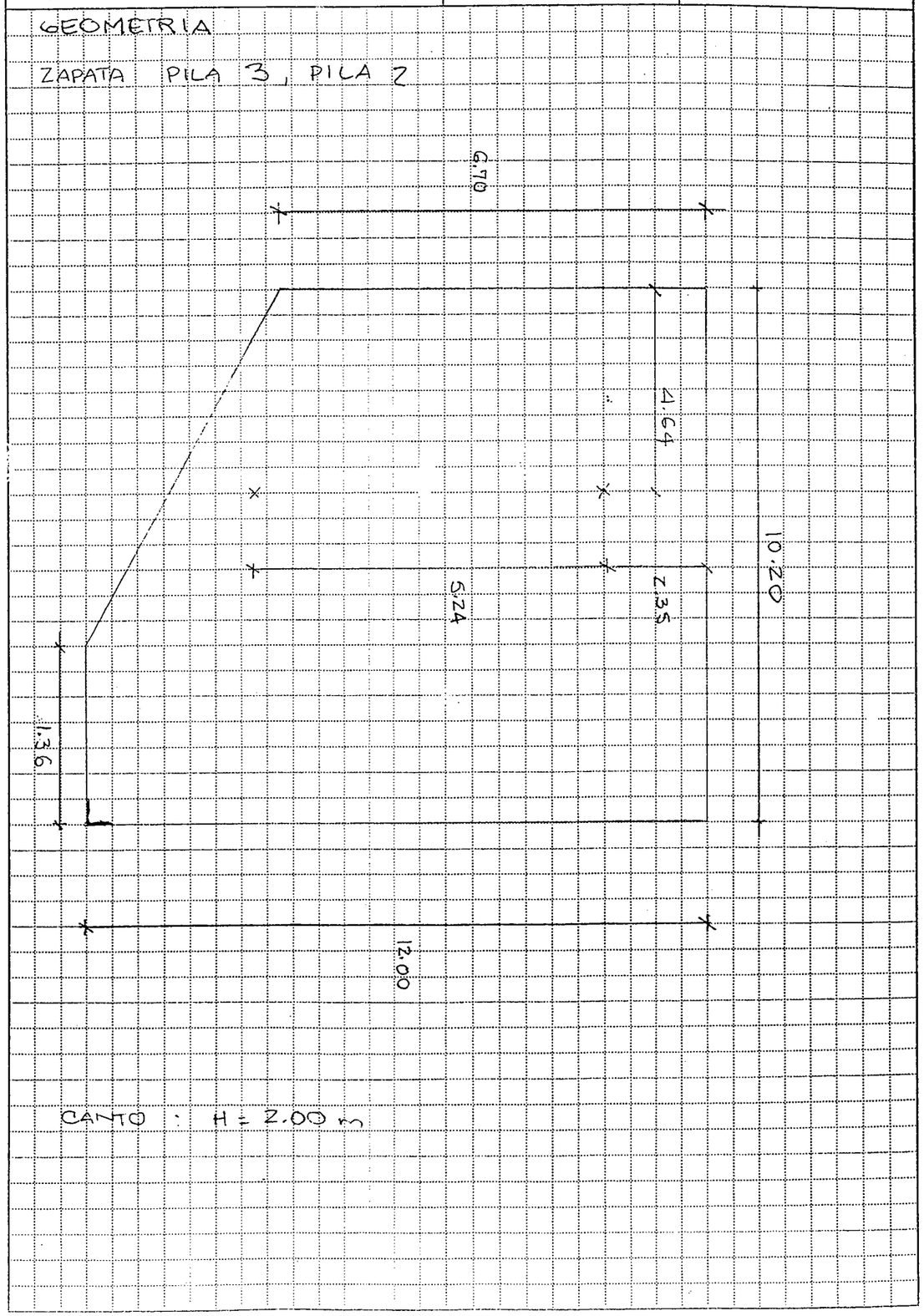


PEDELTA, S.L.
INGENIERÍA CIVIL

ALT - CAMP	ESTRUCTURA 1
Fecha:	Hoja:

GEOMETRIA

ZAPATA PILA 3, PILA 2



ACCIONES EN CORONACIÓN

CARGAS SOBRE PILA ELS PILA 2

CASO INICIAL	PILA 2				
	APOYO 1			APOYO 2	
	Fz	Fx	Fy	Fz	Fx
g1+P	295.16			295.16	
g2	250.25			250.25	
q100%	354.44			354.44	
viento			28.19		
viento concomitante			47.36		
g1+g2+rozamiento+viento	556.11	27.81	28.19	534.70	26.74
g1+g2+q100%+rozamiento+viento concomitante	943.54	47.18	47.36	856.14	42.81

CARGAS SOBRE PILA ELU

CASO INICIAL	PILA 2				
	APOYO 1			APOYO 2	
	Fz	Fx	Fy	Fz	Fx
g1+P	398.46			398.46	
g2	337.84			337.84	
q100%	531.66			531.66	
viento			42.28		
viento concomitante			71.04		
g1+g2+rozamiento+viento	752.35	37.62	42.28	720.24	36.01
g1+g2+q100%+rozamiento+viento concomitante	1333.50	66.68	71.04	1202.40	60.12

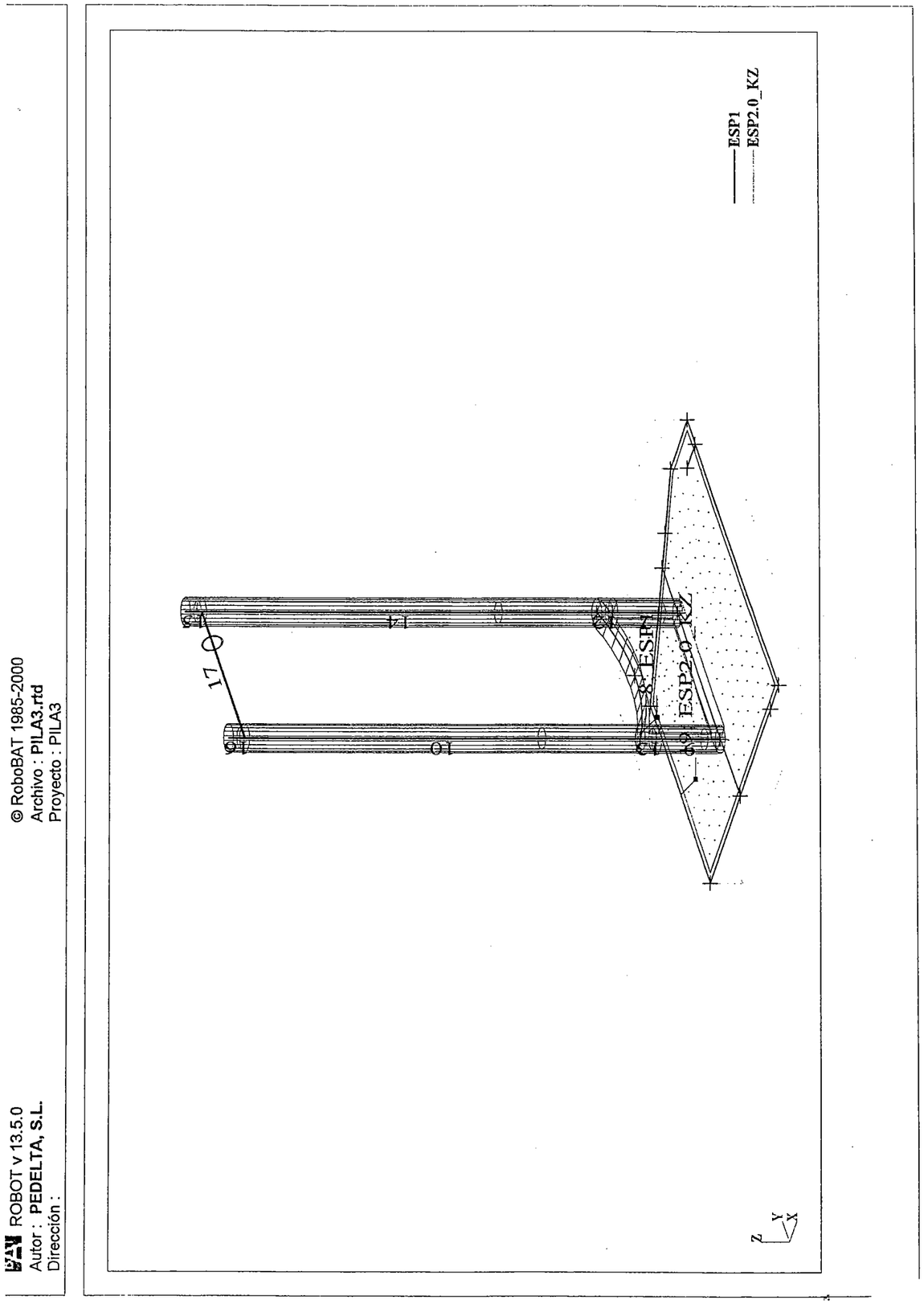
CARGAS SOBRE PILA ELS PILA 3

CASO INICIAL	PILA 3				
	APOYO 1			APOYO 2	
	Fz	Fx	Fy	Fz	Fx
g1+P	295.16			295.16	
g2	250.25			250.25	
q100%	354.44			354.44	
viento			28.19		
viento concomitante			47.36		
g1+g2+rozamiento+viento	556.11	27.81	28.19	534.70	26.74
g1+g2+q100%+rozamiento+viento concomitante	943.54	47.18	47.36	856.14	42.81

CARGAS SOBRE PILA ELU

CASO INICIAL	PILA 3				
	APOYO 1			APOYO 2	
	Fz	Fx	Fy	Fz	Fx
g1+P	398.46			398.46	
g2	337.84			337.84	
q100%	531.66			531.66	
viento			42.28		
viento concomitante			71.04		
g1+g2+rozamiento+viento	752.35	37.62	42.28	720.24	36.01
g1+g2+q100%+rozamiento+viento concomitante	1333.50	66.68	71.04	1202.40	60.12

MODELO DE CÁLCULO Y DIMENSIONAMIENTO (VIENTO DIRECCIÓN ESTE)



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Proyecto : PILA3
ROBOT v 13.5.0
Autor : PEDELTA, S.L.
Dirección :

Données - Sections

	Nombre de la sección	Lista de barras	SX (m^2)	SY (m^2)	SZ (m^2)	IX (m^4)	IY (m^4)
	TRON 48x2.9	17	0.000	0.000	0.000	0.000	0.000
	S C_1.7	7 9 10 12A16	2.270	1.915	1.915	0.820	0.410

	IZ (m^4)
	0.000
	0.410

Données - Chargements

	Caso	Tipo de carga	Lista	Valores de carga
	1	peso propio	7A10 12A14	PZ Menos
	2	(EF) uniforme	19	PZ=-2.50(T/m^2) proyectada
	3	fuerza nodal	1	FX=-27.81(T) FY=-28.19(T) FZ=-556.11(T)
	3	fuerza nodal	12	FX=-26.74(T) FZ=-534.70(T)
	4	fuerza nodal	1	FX=-47.18(T) FY=-47.36(T) FZ=-943.54(T)
	4	fuerza nodal	12	FX=-42.81(T) FZ=-856.14(T)
	5	fuerza nodal	1	FX=-37.62(T) FY=-42.28(T) FZ=-752.35(T)
	5	fuerza nodal	12	FX=-36.01(T) FZ=-720.24(T)
	6	fuerza nodal	1	FX=-66.68(T) FY=-71.04(T) FZ=-1333.50(T)
	6	fuerza nodal	12	FX=-60.12(T) FZ=-1202.40(T)

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Proyecto : PILA3

combinaciones

- Casos: 7 8 10

Combinación	Nombre	Tipo de análisis	Naturaleza de	Naturaleza de caso
7 (K)	COMB1	Combinación lin	SGU	permanente
8 (K)	COMB2	Combinación lin	SGU	permanente
10 (K)	COMB4	Combinación lin	SGN	permanente

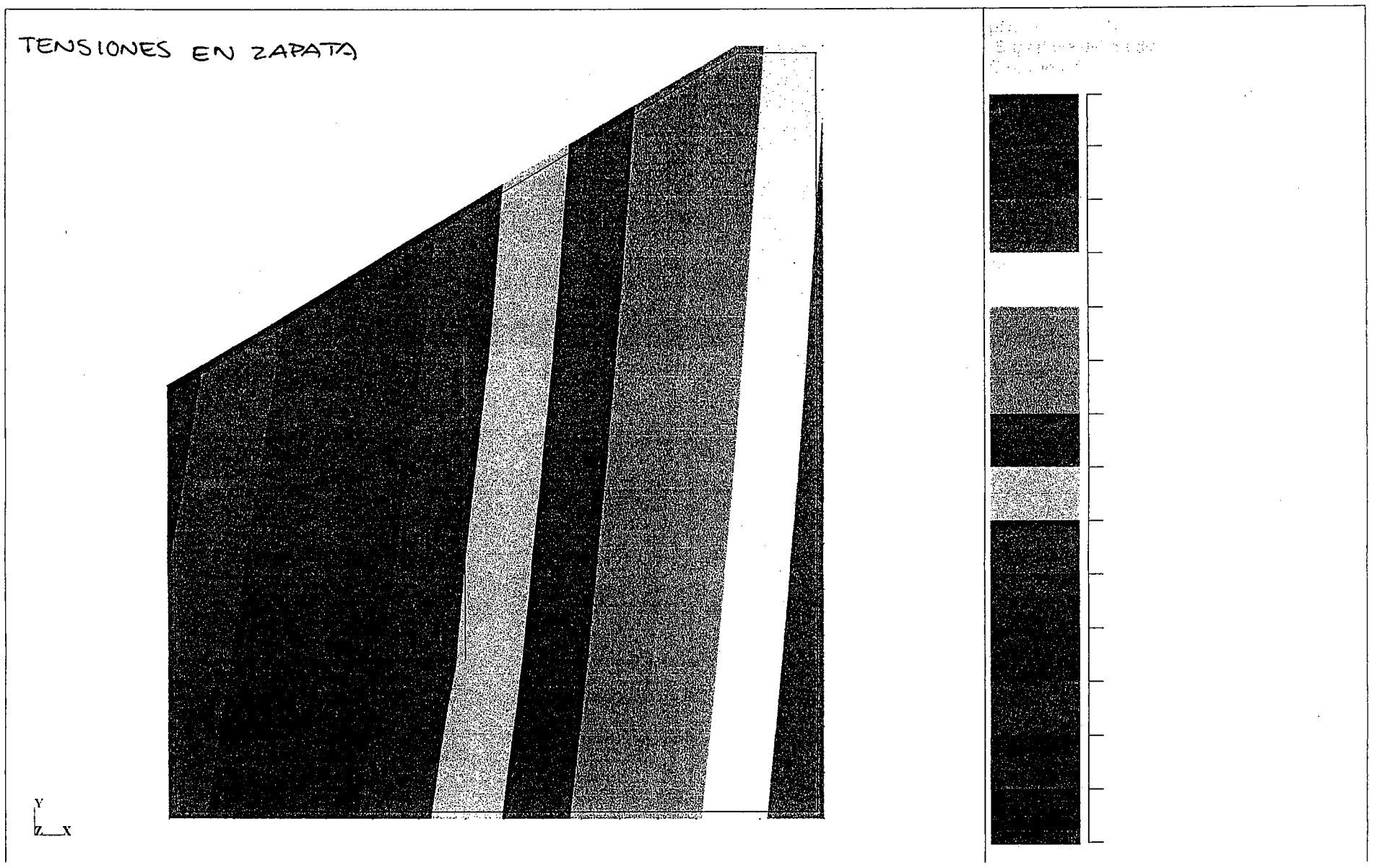
Combinación	Definición
7 (K)	(1+2+3)*1.00
8 (K)	(1+2+4)*1.00
10 (K)	(1+2)*1.35+4*1.00

ROBOT v 13.5.0
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Archivo : **PILA3.rtd**
Proyecto : PILA3

E.L.S Combinación 2

TENSIONES EN ZAPATA

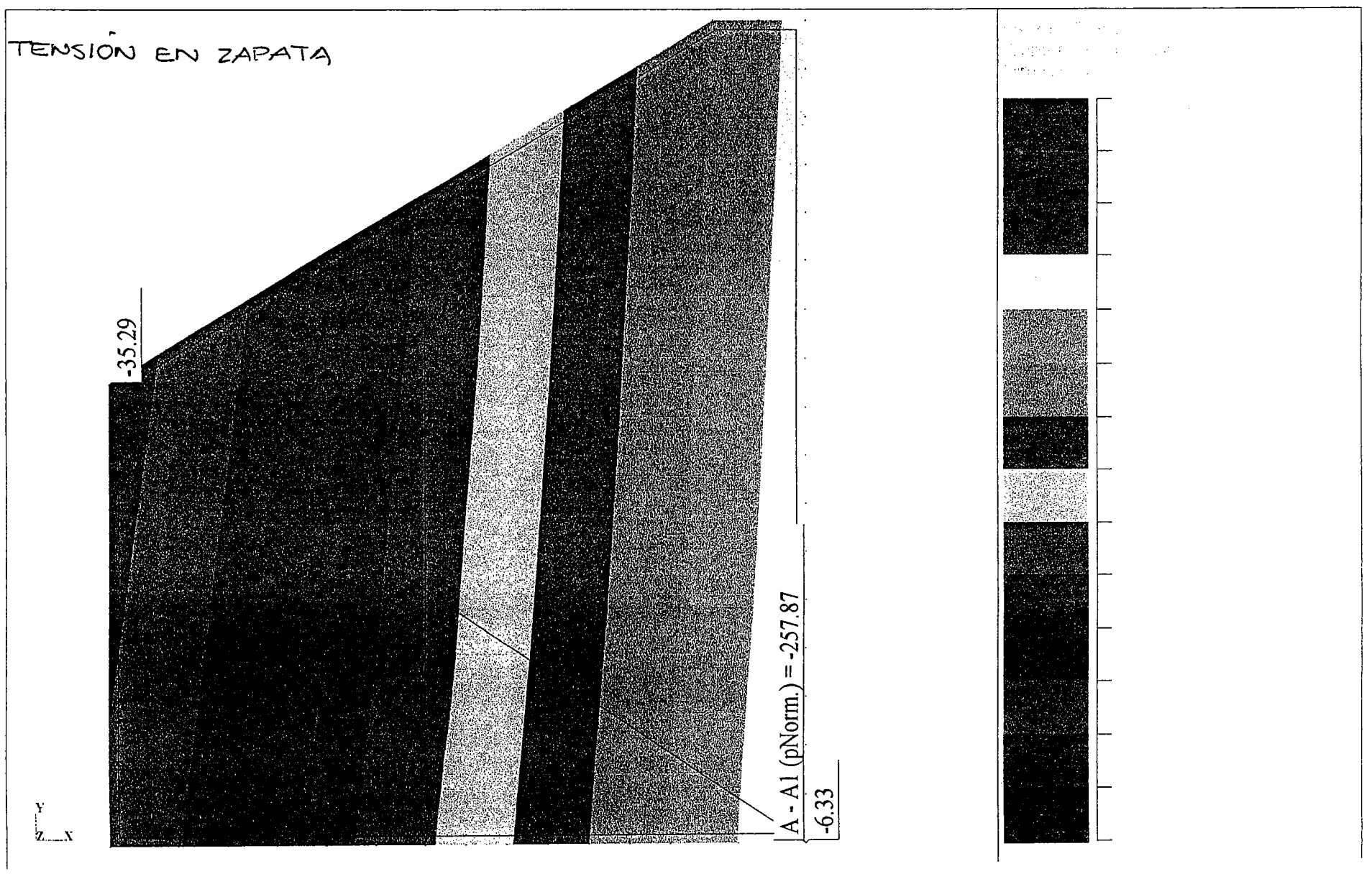


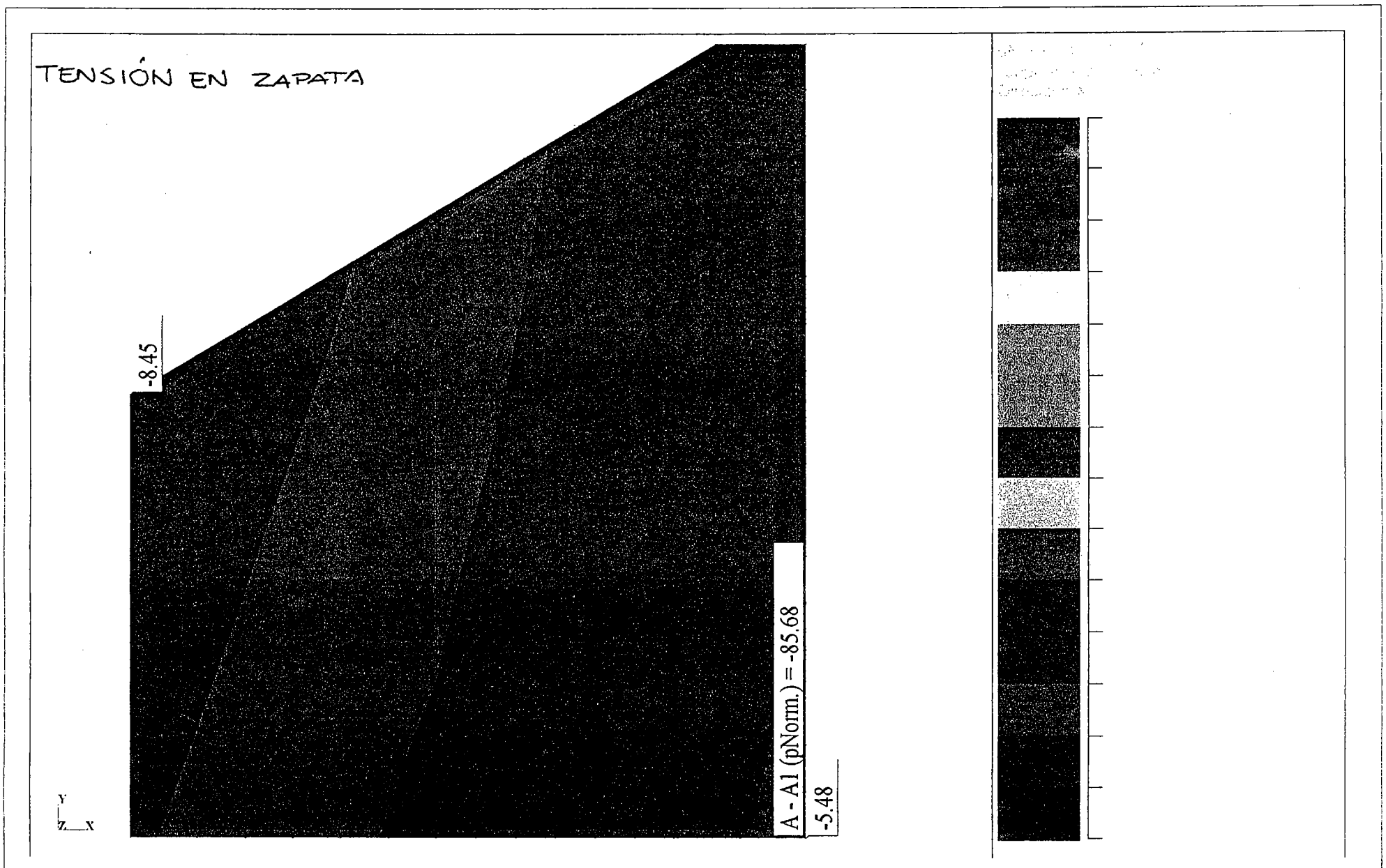
ROBOT v 13.5.0
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Archivo : **PILA3.rtd**
Proyecto : PILA3

E.L.S. Combinación 1

TENSIÓN EN ZAPATA




TENSIÓN EN ZAPATA
-8.45
A - A1 (pNorm.) = -85.68
-5.48
Y
Z
X

TENSIÓN EN ZAPATA
-2.50
A - A1 (pNorm.) = -30.51
-2.50
Y
Z
X

PEDELTA, S.L.
ENGINYERIA CIVIL

ALT-CAMP	PILAS 2 y 3
Data:	Full:

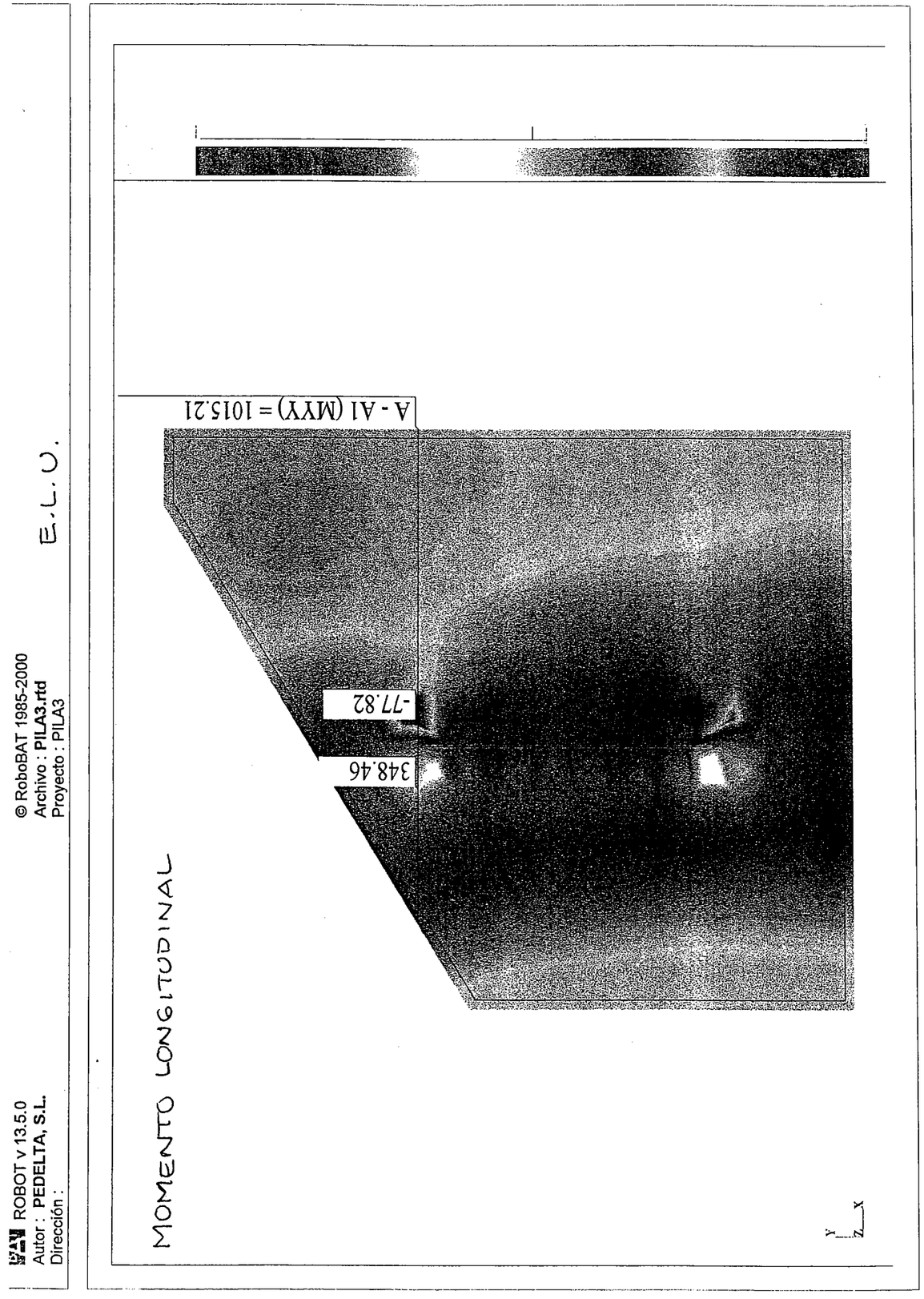
TENSIÓN EN ZAPATA

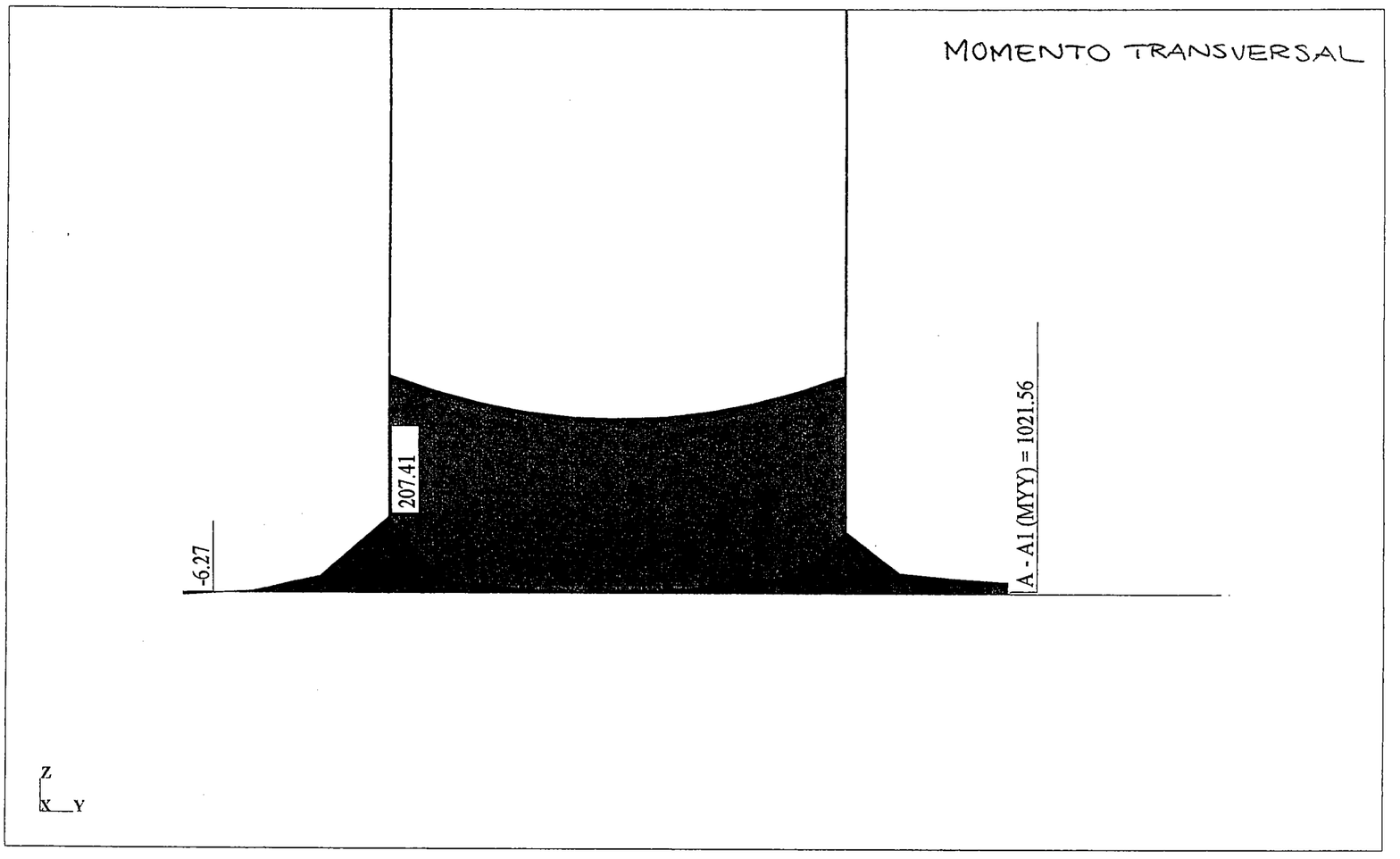
$\sigma_{máx} = 52.43 - 8.45 - 2.50 = 41.48$ T/m2

$\sigma_{mín} = -6.33 + 5.48 + 2.50 = 1.65$ T/m^2

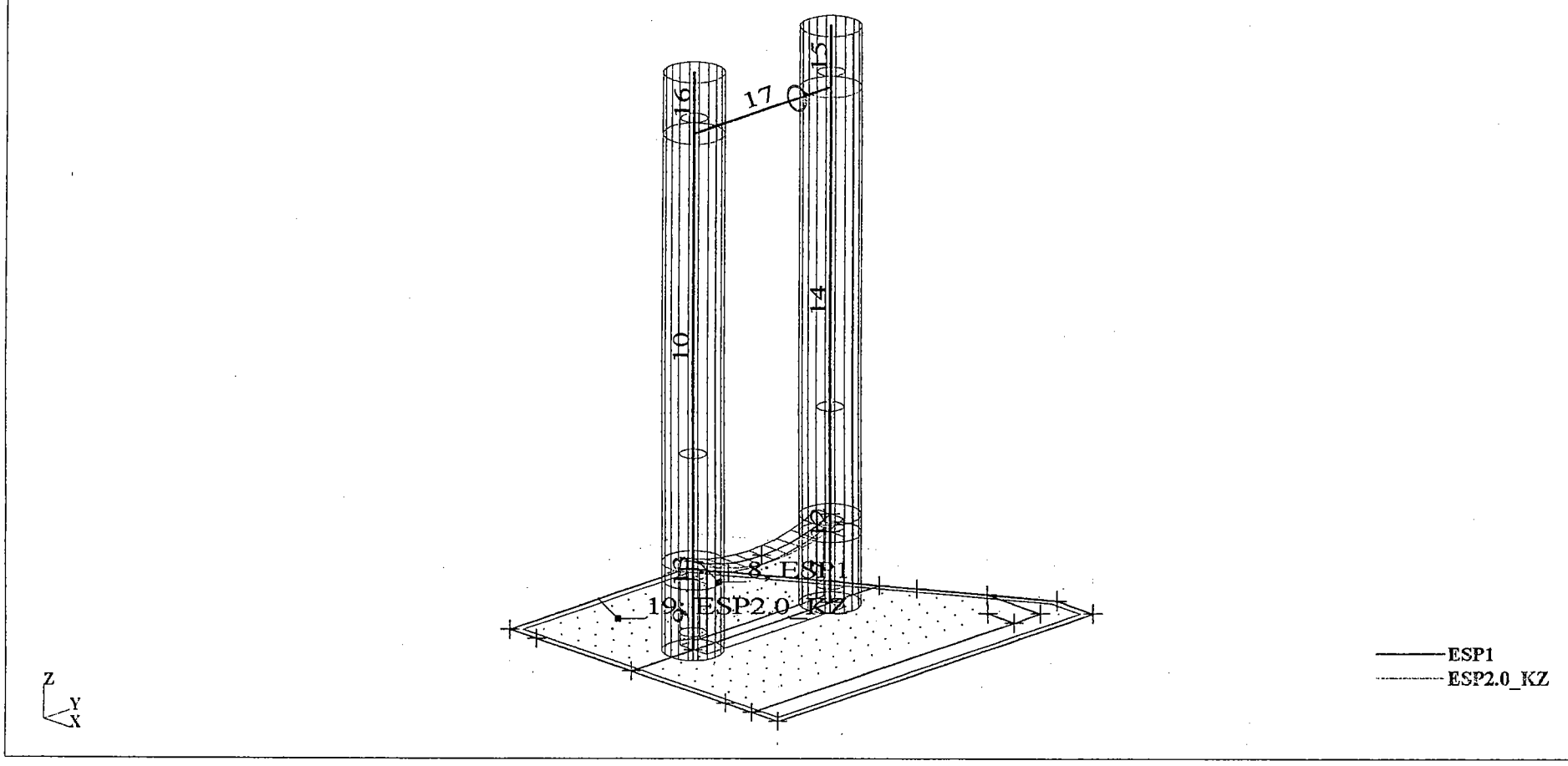
$\sigma_{máx} = 35 \times 1.30 = 45.5$ ✓ O.K.

$\sigma_{min} = 0$ ✓ O.K.



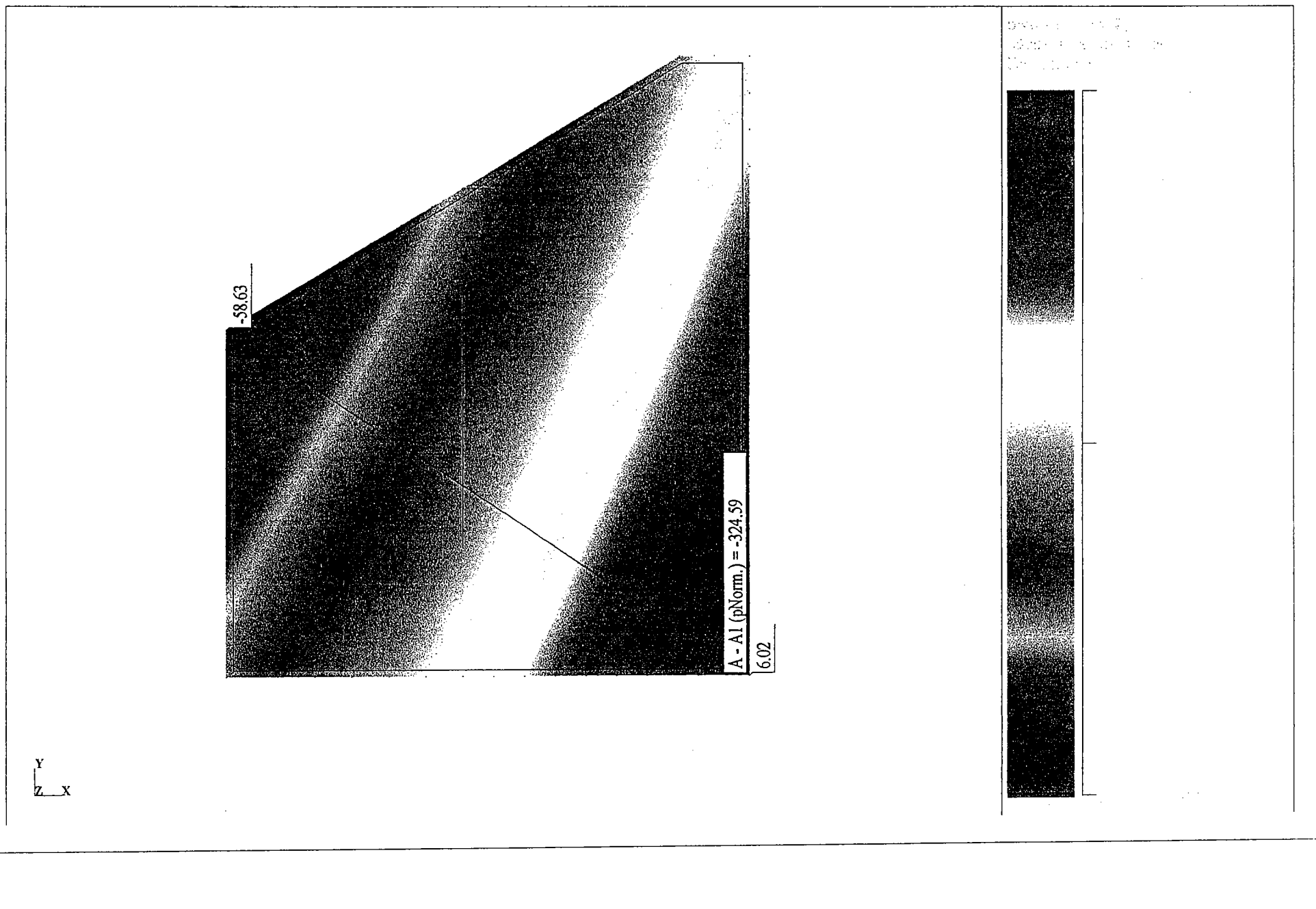


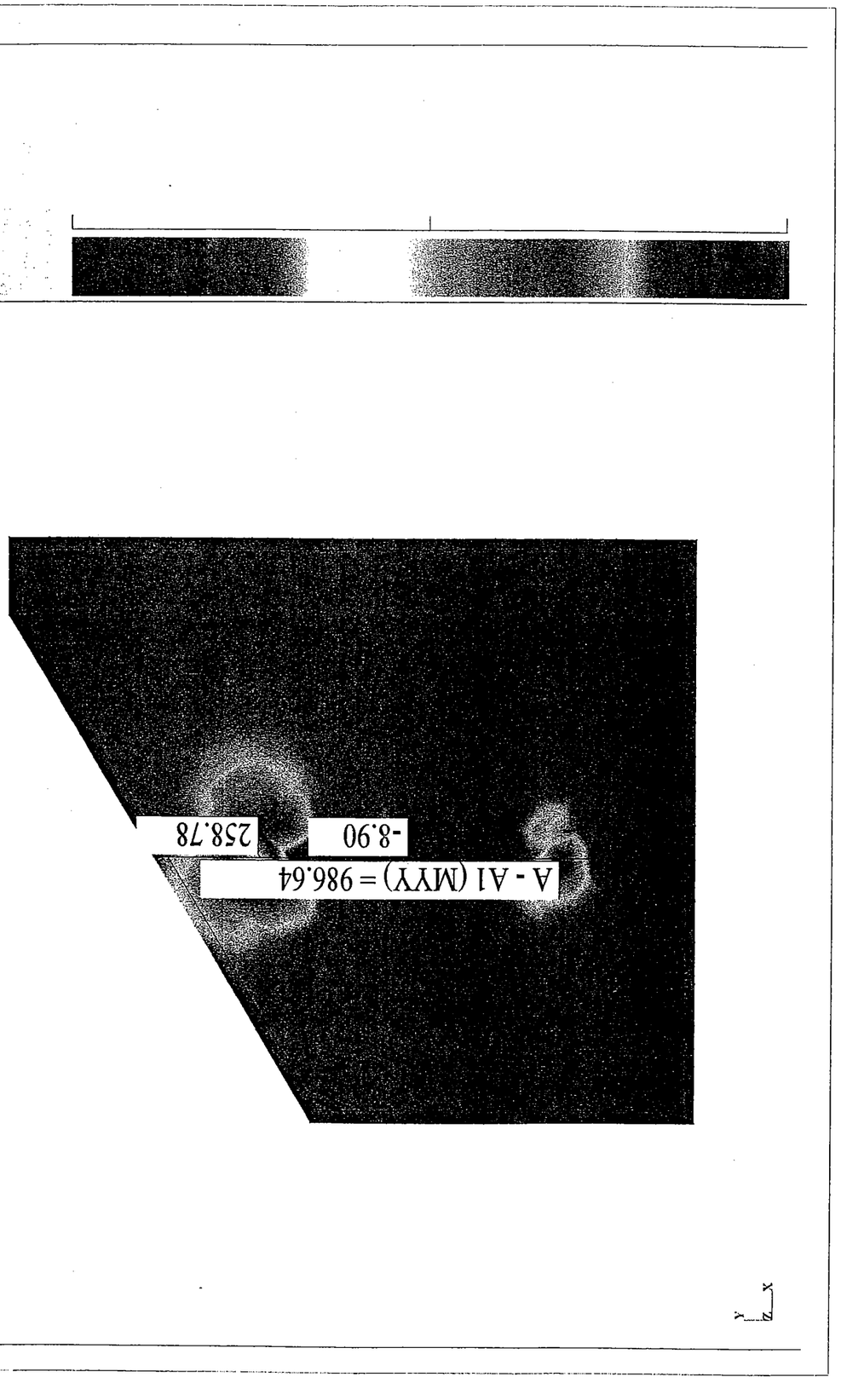
MODELO DE CÁLCULO Y
DIMENSIONAMIENTO
(VIENTO DIRECCIÓN OESTE)



ROBOT v 13.5.0
Autor : **PEDELTA, S.L.**
Dirección :

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Archivo : **PILA3b.rtd**
Proyecto : PILA3b





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Archivo : PILA3b.rtd
Proyecto : PILA3b
ROBOT v 13.5.0
Autor : PEDELTA, S.L.
Dirección :

PEDELTA, S.L.
ENGINYERIA CIVIL

ALT - CAMP | PILAS 2 y 3

Data: | Full:

DIMENSIONAMIENTO DE LA ZAPATA

MATERIALES :

HORMIGÓN :

H-25/B/20/IIa

f_{ck} = 25 MPa

ACERO

B500S

f_{yk} = 510 MPa

d = 190 cm

Momento de diseño sentido longitudinal

Md = 348 m-T

As = 52,15

ϕ25a0.10 + ϕ16a0.20

Momento de diseño sentido transversal

Md = 207 m-T

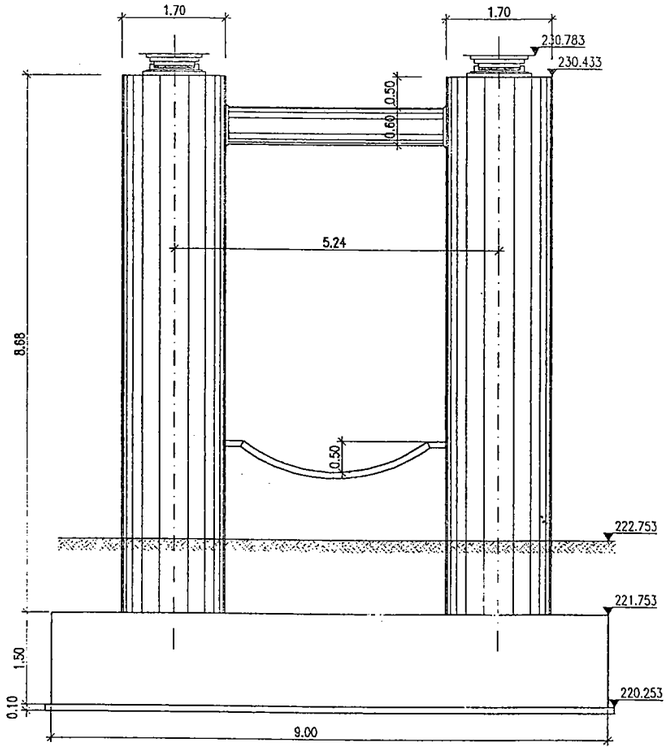
As = 32,13 m-T

ϕ25a0.15

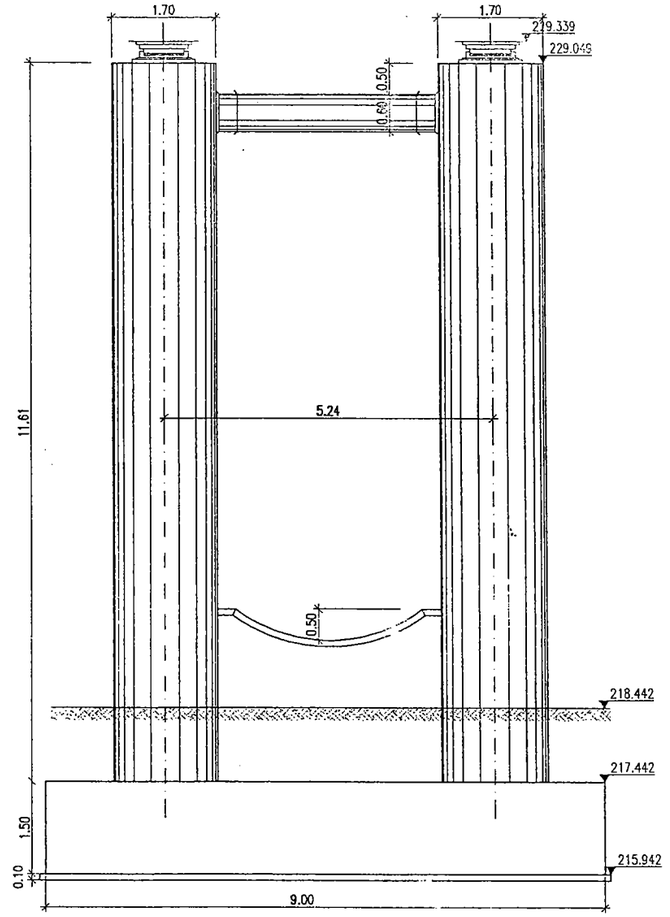
7. PILAS 3 y 4

GEOMETRÍA

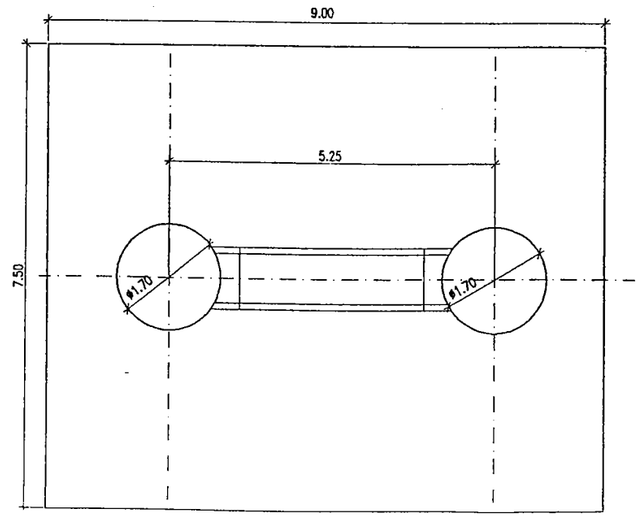
ALZADO PILA 1
ESCALA 1/50



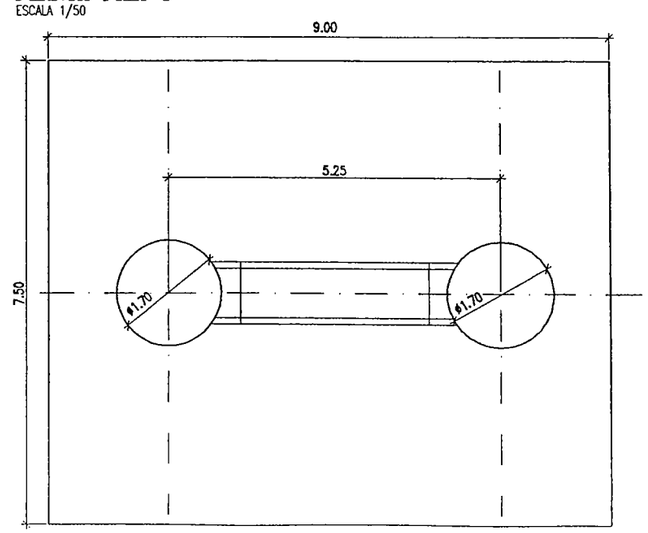
ALZADO PILA 4
ESCALA 1/50



PLANTA PILA 1
ESCALA 1/50



PLANTA PILA 4
ESCALA 1/50



ACCIONES EN CORONACIÓN

CARGAS SOBRE PILA ELS PILA 1

CASO INICIAL	PILA 1				
	APOYO 1			APOYO 2	
	Fz	Fx	Fy	Fz	Fx
g1+P	282.83			282.83	
g2	239.80			239.80	
q100%	328.16			328.16	
viento			24.53		
viento concomitante			41.22		
g1+g2+rozamiento+viento	531.95	26.60	24.53	513.31	25.67
g1+g2+q100%+rozamiento+viento concomitante	889.95	44.50	41.22	811.62	40.58

CARGAS SOBRE PILA ELU

CASO INICIAL	PILA 1				
	APOYO 1			APOYO 2	
	Fz	Fx	Fy	Fz	Fx
g1+P	381.82			381.82	
g2	323.73			323.73	
q100%	492.23			492.23	
viento			36.80		
viento concomitante			61.83		
g1+g2+rozamiento+viento	719.53	35.98	36.80	691.57	34.58
g1+g2+q100%+rozamiento+viento concomitante	1256.52	62.83	61.83	1139.04	56.95

CARGAS SOBRE PILA ELS PILA 4

CASO INICIAL	PILA 4				
	APOYO 1			APOYO 2	
	Fz	Fx	Fy	Fz	Fx
g1+P	282.83			282.83	
g2	239.80			239.80	
q100%	328.16			328.16	
viento			24.53		
viento concomitante			41.22		
g1+g2+rozamiento+viento	531.95	26.60	24.53	513.31	25.67
g1+g2+q100%+rozamiento+viento concomitante	889.95	44.50	41.22	811.62	40.58

CARGAS SOBRE PILA ELU

CASO INICIAL	PILA 4				
	APOYO 1			APOYO 2	
	Fz	Fx	Fy	Fz	Fx
g1+P	381.82			381.82	
g2	323.73			323.73	
q100%	492.23			492.23	
viento			36.80		
viento concomitante			61.83		
g1+g2+rozamiento+viento	719.53	35.98	36.80	691.57	34.58
g1+g2+q100%+rozamiento+viento concomitante	1256.52	62.83	61.83	1139.04	56.95

DIMENSIONAMIENTO

HOJA DE INTRODUCCIÓN DE DATOS BÁSICOS DEL PROBLEMA

DATOS GENERALES DEL PROYECTO

Referencia de proyecto: UTE Alt-camp. ESTRUCTURA 1. Pila 1.

Fecha: feb-01

GEOMETRÍA DE LA PILA

Hp (m) =	8.68
Exc_Fz (m) =	2.62
Htier (m) =	1.00
Hzap (m) =	1.50
a (m) =	9.00
b (m) =	7.50
a1 (m) =	1.70
a2 (m) =	1.70

CARACTERÍSTICAS MATERIALES

Hormigón: fck (kp/cm2) = 300

Acero pasivo: fyk (kp/cm2) = 5100

☑ ELU

Calcular zapata

COEFICIENTES DE SEGURIDAD

Minoración materiales:

γc =	1.5
γy =	1.15

Mayoración acciones:

γg =	1.35
γq =	1

E.L.S

ESFUERZOS EN FUSTE 1

Fx1 (t) =	39.11
Fy1 (t) =	20.61
Fz1 (t) =	782.18
Mx1 (mt) =	0.00
My1 (mt) =	0.00

ESFUERZOS EN FUSTE 2

Fx2 (t) =	35.19
Fy2 (t) =	20.61
Fz2 (t) =	703.85
Mx2 (mt) =	0.00
My2 (mt) =	0.00

E.L.U.

ESFUERZOS EN FUSTE 1

Fx1 (t) =	55.55
Fy1 (t) =	30.92
Fz1 (t) =	1111.04
Mx1 (mt) =	0.00
My1 (mt) =	0.00

ESFUERZOS EN FUSTE 2

Fx2 (t) =	49.68
Fy2 (t) =	30.92
Fz2 (t) =	993.55
Mx2 (mt) =	0.00
My2 (mt) =	0.00

PILA 1, ALT CAMP

E.L.S

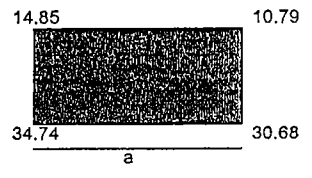
ESFUERZOS EN BASE DE PILA

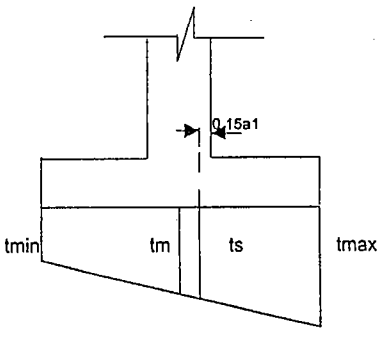
Fzp	1486.03 [T]	hz	1.50 [m]
Fxp	74.3 [T]	a1	1.70 [m]
Fyp	41.22 [T]	ht	1.00 [m]
Mxp	419.6196 [m-T]	a	9.00 [m]
Myp	-551.1494 [m-T]	b	7.50 [m]
		hp	8.68 [m]
		a2	1.70 [m]

TENSIONES EN ESQUINAS DE ZAPATA

Fz	1536.66 [T]
Mx	839.24 [m-T]
My	205.22 [m-T]

Fz/(a.b)=	22.77	
6.Mx/(a.b^2)=	9.95	
6.My/(b.a^2)=	2.03	
T1	30.68 [T/m2]	
T2	10.79 [T/m2]	
T3	34.74 [T/m2]	
T4	14.85 [T/m2]	
tm	24.79 [t/m2]	20.74
ts	26.37 [t/m2]	22.32
Mk	159.01 [m-t]	138.84



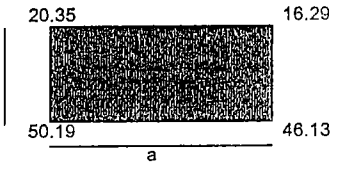


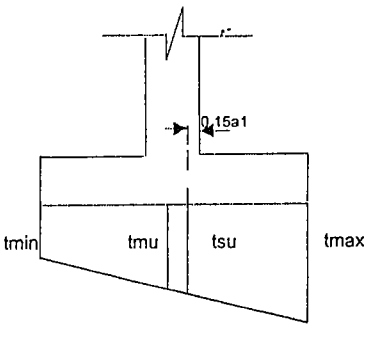
E.L.U

TENSIONES EN ESQUINAS DE ZAPATA

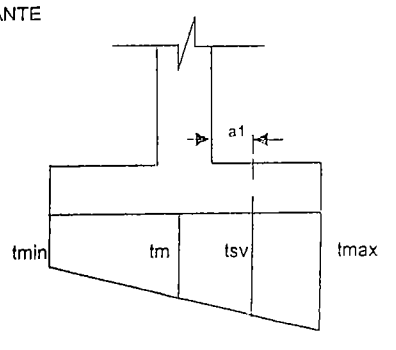
Fzd	2243.81 [T]
Mxd	1258.86 [m-T]
Myd	205.22 [m-T]

Fz/(a.b)=	33.24	
6.Mx/(a.b^2)=	14.92	
6.My/(b.a^2)=	2.03	
T1u	46.13 [T/m2]	
T2u	16.29 [T/m2]	
T3u	50.19 [T/m2]	
T4u	20.35 [T/m2]	
tmu	35.27	31.21 [t/m2]
tsu	37.64	33.58 [t/m2]
Md	228.96	208.79 [m-t]





CORTANTE



tsv	42.03	39.82 [t/m2]
Vd	55.33	54.00 [T]
76.85		

CALCULO DE ARMADURA DE FLEXIÓN

M(Kpxcm)	2.29E+07
N(Kp)(COMPRESION POSITIVA)	0
B(cm)	100
D(cm)	194
Fcd(kp/cm2)	166.6
H(cm)	150
Fyd(kp/cm2)	4434.8

a	1
b	-388
c	3233.71565

POSICION FIBRA NEUTRA(cm)	**8.52147201**
ARMADURA NECESARIA(cm2)	**27.2103737**

PILA 1, ESTRUCTURA 1

DATOS GENERALES DEL PROYECTO

Referencia de proyecto: UTE Alt-camp. ESTRUCTURA 1. Pila 4.

Fecha: feb-01

GEOMETRÍA DE LA PILA

Hp (m) =	11.61
Exc_Fz (m) =	2.62
Htier (m) =	1.00
Hzap (m) =	1.50
a (m) =	9.00
b (m) =	7.50
a1 (m) =	1.70
a2 (m) =	1.70

CARACTERÍSTICAS MATERIALES

Hormigón: fck (kp/cm2) = 300

Acero pasivo: fyk (kp/cm2) = 5100

☑ ELU

Calcular zapata

COEFICIENTES DE SEGURIDAD

Minoración materiales:

γc =	1.5
γy =	1.15

Mayoración acciones:

γg =	1.35
γq =	1

E.L.S

ESFUERZOS EN FUSTE 1

Fx1 (t) =	39.11
Fy1 (t) =	20.61
Fz1 (t) =	782.18
Mx1 (mt) =	0.00
My1 (mt) =	0.00

ESFUERZOS EN FUSTE 2

Fx2 (t) =	35.19
Fy2 (t) =	20.61
Fz2 (t) =	703.85
Mx2 (mt) =	0.00
My2 (mt) =	0.00

E.L.U.

ESFUERZOS EN FUSTE 1

Fx1 (t) =	55.55
Fy1 (t) =	30.92
Fz1 (t) =	1111.04
Mx1 (mt) =	0.00
My1 (mt) =	0.00

ESFUERZOS EN FUSTE 2

Fx2 (t) =	49.68
Fy2 (t) =	30.92
Fz2 (t) =	993.55
Mx2 (mt) =	0.00
My2 (mt) =	0.00

PILA 4, ESTRUCTURA 1

E.L.S

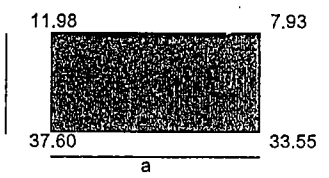
ESFUERZOS EN BASE DE PILA

Fzp	1486.03 [T]	hz	1.50 [m]
Fxp	74.3 [T]	a1	1.70 [m]
Fyp	41.22 [T]	ht	1.00 [m]
Mxp	540.39 [m-T]	a	9.00 [m]
Myp	-768.85 [m-T]	b	7.50 [m]
		hp	11.61 [m]
		a2	1.70 [m]

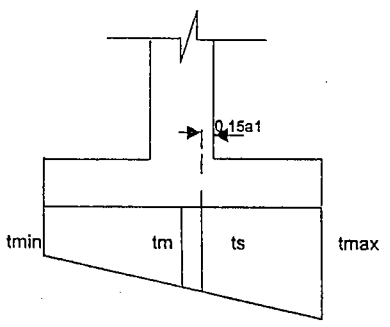
TENSIONES EN ESQUINAS DE ZAPATA

Fz	1536.66 [T]
Mx	1080.79 [m-T]
My	205.22 [m-T]

Fz/(a.b)=	22.77
6.Mx/(a.b^2)=	12.81
6.My/(b.a^2)=	2.03



T1	33.55 [T/m2]
T2	7.93 [T/m2]
T3	37.60 [T/m2]
T4	11.98 [T/m2]



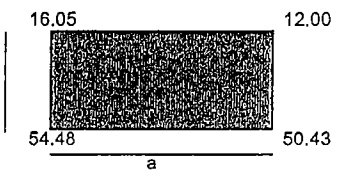
tm	24.79 [t/m2]	20.74
ts	26.82 [t/m2]	22.77
Mk	169.26 [m-t]	149.09

E.L.U

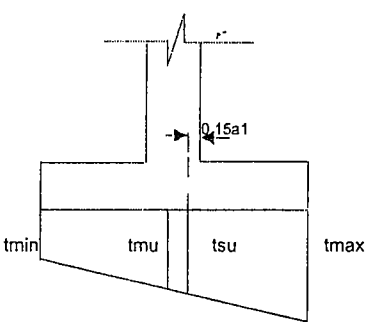
TENSIONES EN ESQUINAS DE ZAPATA

Fzd	2243.81 [T]
Mxd	1621.18 [m-T]
Myd	205.22 [m-T]

Fz/(a.b)=	33.24
6.Mx/(a.b^2)=	19.21
6.My/(b.a^2)=	2.03

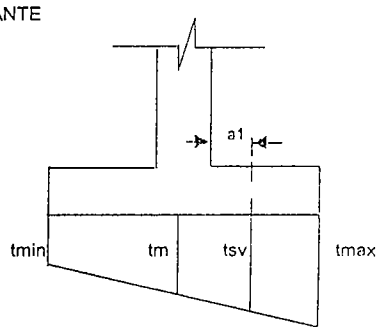


T1u	50.43 [T/m2]
T2u	12.00 [T/m2]
T3u	54.48 [T/m2]
T4u	16.05 [T/m2]



tmu	35.27	31.21 [t/m2]
tsu	38.32	34.26 [t/m2]
Md	244.34	224.17 [m-t]

CORTANTE



tsv	43.98	41.76 [t/m2]
Vd	59.08	57.75 [T]
	83.43	

PILA 1, ESTRUCTURA 1

M(Kpxcm)	2.44E+07
N(Kp)(COMPRESION POSITIVA)	0
B(cm)	100
D(cm)	144
Fcd(kp/cm2)	166.6
H(cm)	150
Fyd(kp/cm2)	4434.8

a	1
b	-288
c	3450.91185

POSICION FIBRA NEUTRA(cm)	12.5272342
ARMADURA NECESARIA(cm2)	40.0013898

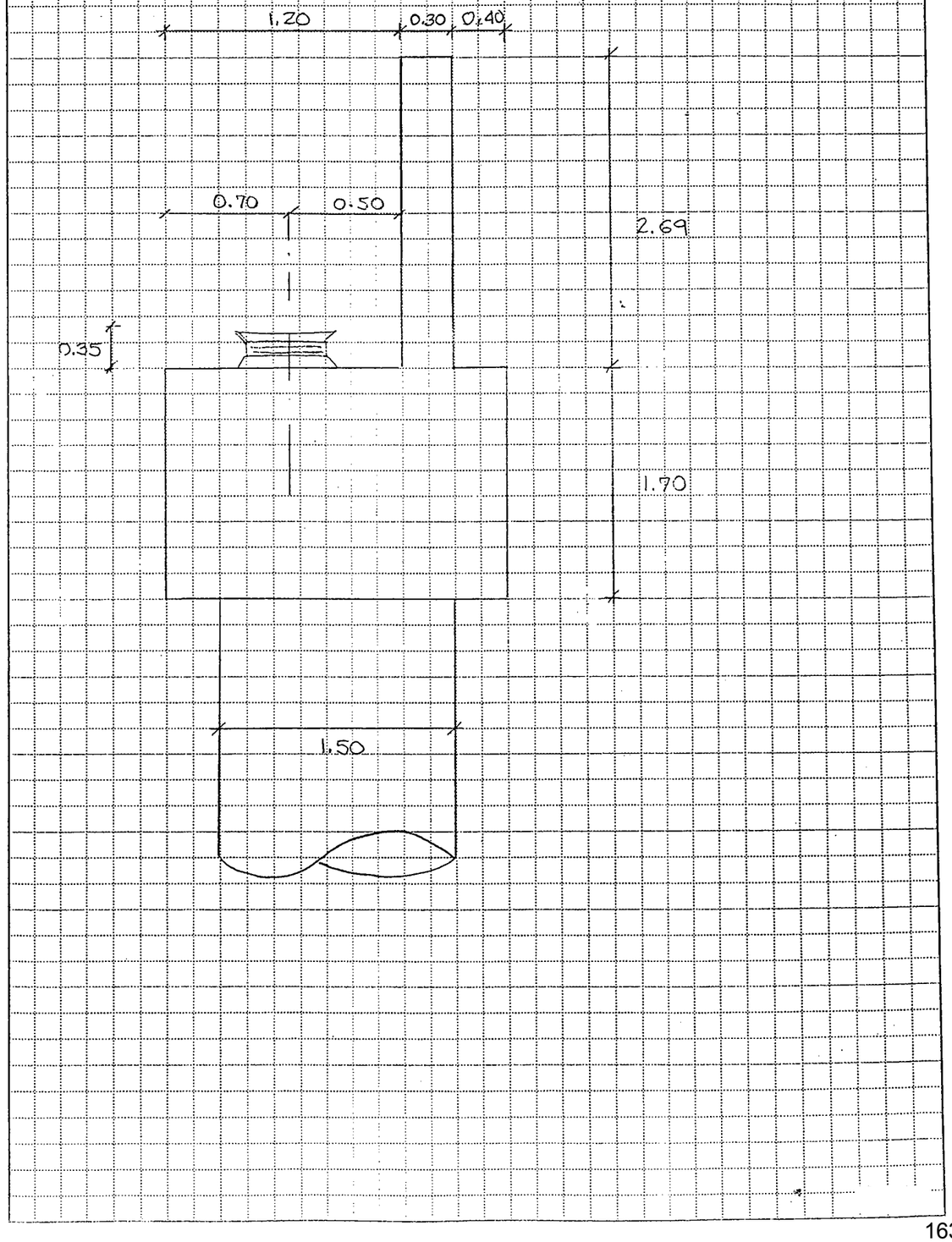
8. ESTRIBO 2

PEDELTA, S.L.
ENGINYERIA CIVIL

ALT CAMP | ESTRIBO 2

Data: | Full:

8.1 GEOMETRIA:



PEDELTA, S.L. ENGINYERIA CIVIL	ALT CAMP	ESTRIBO 2
	Data:	Full:

8.2 ACCIONES EN CORONACIÓN:

g_1 = 78.140 × 2	=		156.28 T
g_2, balasto sup =	66.25 T × 2	=	132.50 T
g_2, balasto inf =	43.01 T × 2	=	86.02 T
Tren máxima =	88.077 × 2	=	176.14 T
Sobrecarga acera, con =	2.707 × 2	=	5.40 T

R_{min} = 288.78 T/ESTRIBO

$R_{máx}$ = 475.72 T/ESTRIBO

FUERZAS HORIZONTALES = 12.52 T/ud (ROZAMIENTO)

Peso propio cargadero:

$g_{1c} = (14.00 \times 2.69 \times 0.30 + 14.00 \times 1.70 \times 1.90) \times 2.5$

g_{1c} = 141.30 T

DIMENSIONAMIENTO

CRITERIOS DE CIMENTACIÓN

- DEBIDO A LAS EXCESIVAS CARGAS DE TIERRAS A TRANSMITIR SOBRE EL TERRENO DE CIMENTACIÓN (15 m.), SE ADOPTA UNA CIMENTACIÓN CON PILOTES.

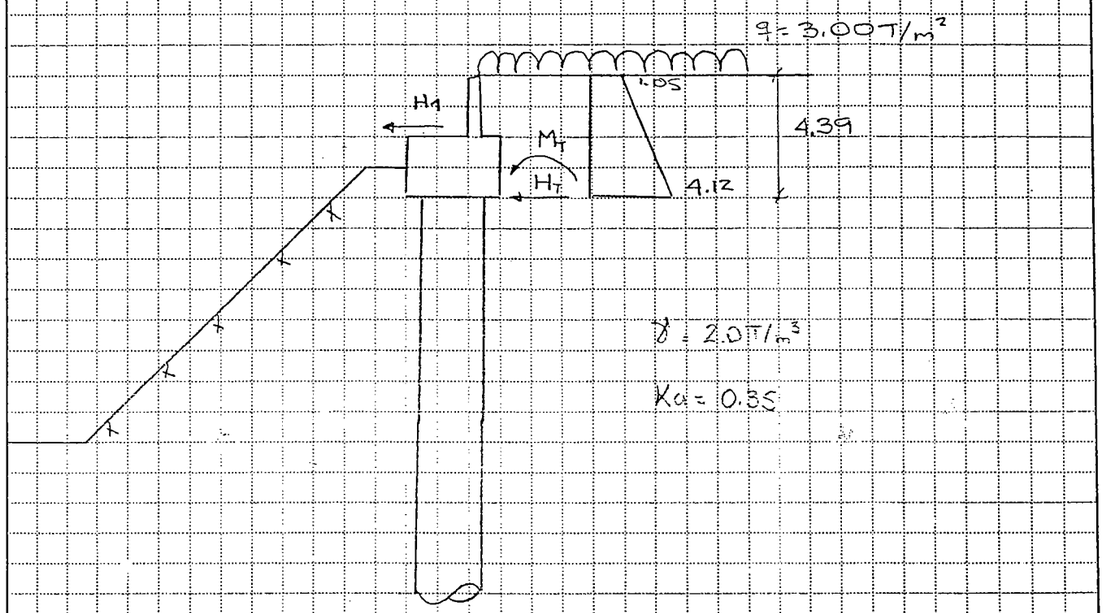
- LA CIMENTACIÓN SE EFECTUARÁ MEDIANTE PILOTES HORMIGONADOS "IN SITU" SOBREPASANDO EL MATERIAL DE TERRAPLEN Y PENETRANDO EN EL TERRENO NATURAL UNA LONGITUD DE 6 DIÁMETROS.

- SE ADOPTARA COMO RESISTENCIA EN PUNTA, LA CARGA DE TRABAJO DEL HORMIGÓN $9_{cdm} = 40\ Kg/cm^2$

- LOS PILOTES SON DE 1,50m DE DIÁMETRO Y LAS CARGAS MÁXIMAS EN CABEZA DE PILOTE SON DEL ORDEN DE 320 T, SIN QUE ESTEN SOMETIDOS A TRACCIÓN BAJO NINGUNA HIPÓTESIS DE CÁLCULO.

PEDELTA, S.L.
ENGINYERIA CIVIL
ALT CAMP | ESTRIBO 2
Data: | Full:

CÁLCULO DE PILOTES

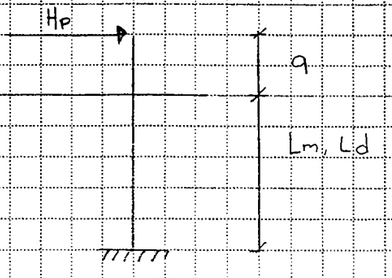


$H_T = [(1.05 \times 4.39) + (3.07 \times 4.39 \times 0.5)] \times 14 = 158.57$ T/ESTRIBO

$M_T = [4.61 \times 2.20 + 6.739 \times 1.46] \times 14 = 280.04$ m-T/ESTRIBO

$H_1 = 25.04$ T/ESTRIBO.

MÓDELO DE MENSULA DE LONGITUD EQUIVALENTE:



PEDELTA, S.L.
ENGINYERIA CIVIL

ALT CAMP	ESTRUCTURA 1
Data:	Full:

LONGITUD ELÁSTICA

$$L_e = \sqrt[4]{\frac{I_p E_p}{K_s}} = \sqrt[4]{\frac{0.2485 \times 2750000}{500}} = 6.08 \text{ m}$$

K_s	200	T/m^3 (SUELO COHESIVO CONSISTENCIA MEDIA
	500	

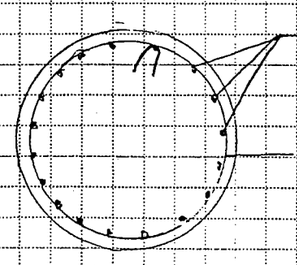
$L_m = 0.5\ L_e = 3.04$ m

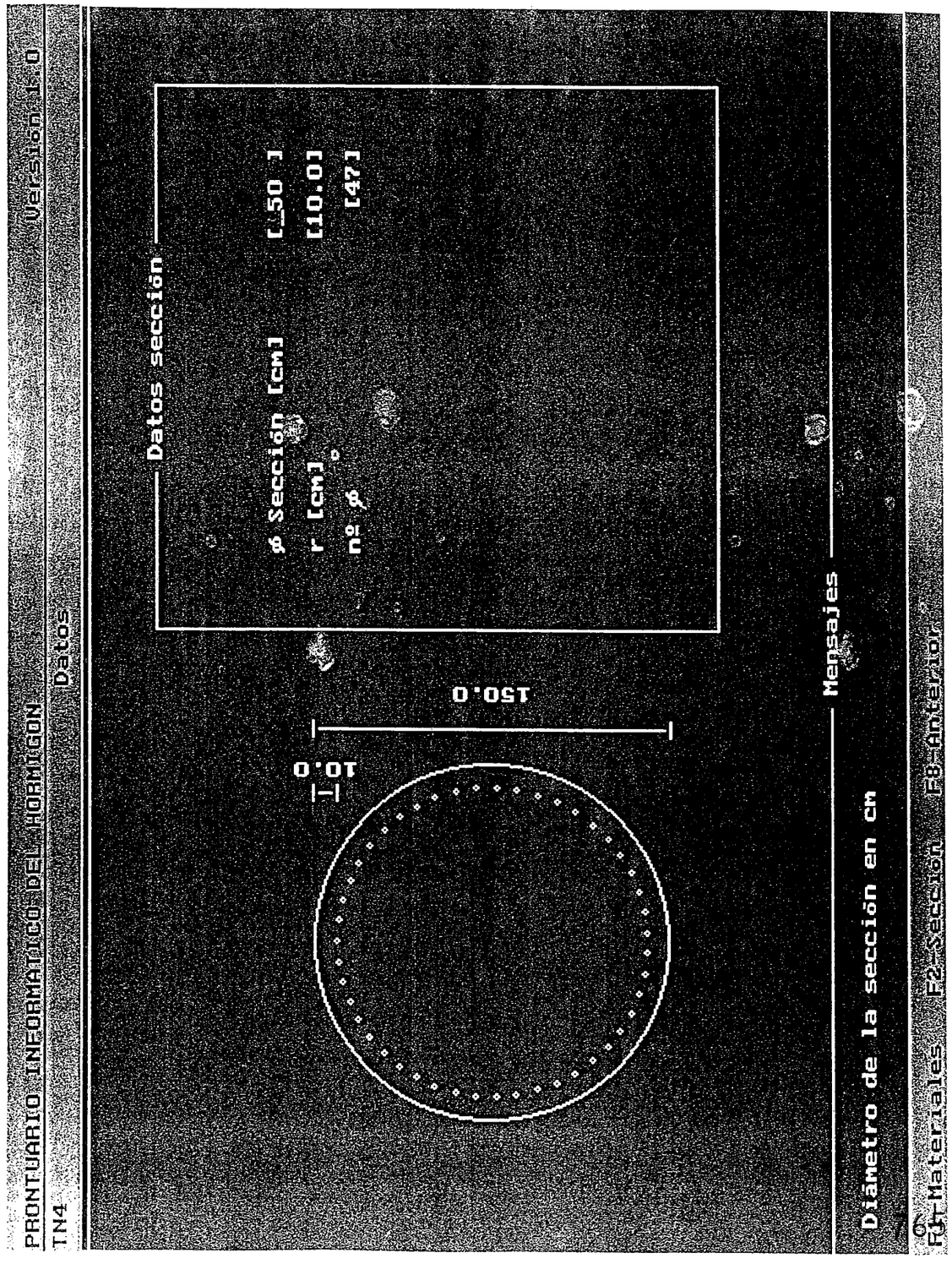
$H_p = 153.87/2 \times 1.6 + 25.04 \times 1.6 = 167.16$

$M_p = 280.04/2 \times 1.6 + 25.04 \times 1.90 \times 1.6 = 300.15$

$$a = \frac{M_p}{H_p} = 1.79$$

$M_d = H_p\ (L_m + a) = 167.16\ (3.04 + 1.79) = 807.41$ m-T





PRONTUARIO INFORMATICO DEL HORMIGON — Version 1.0

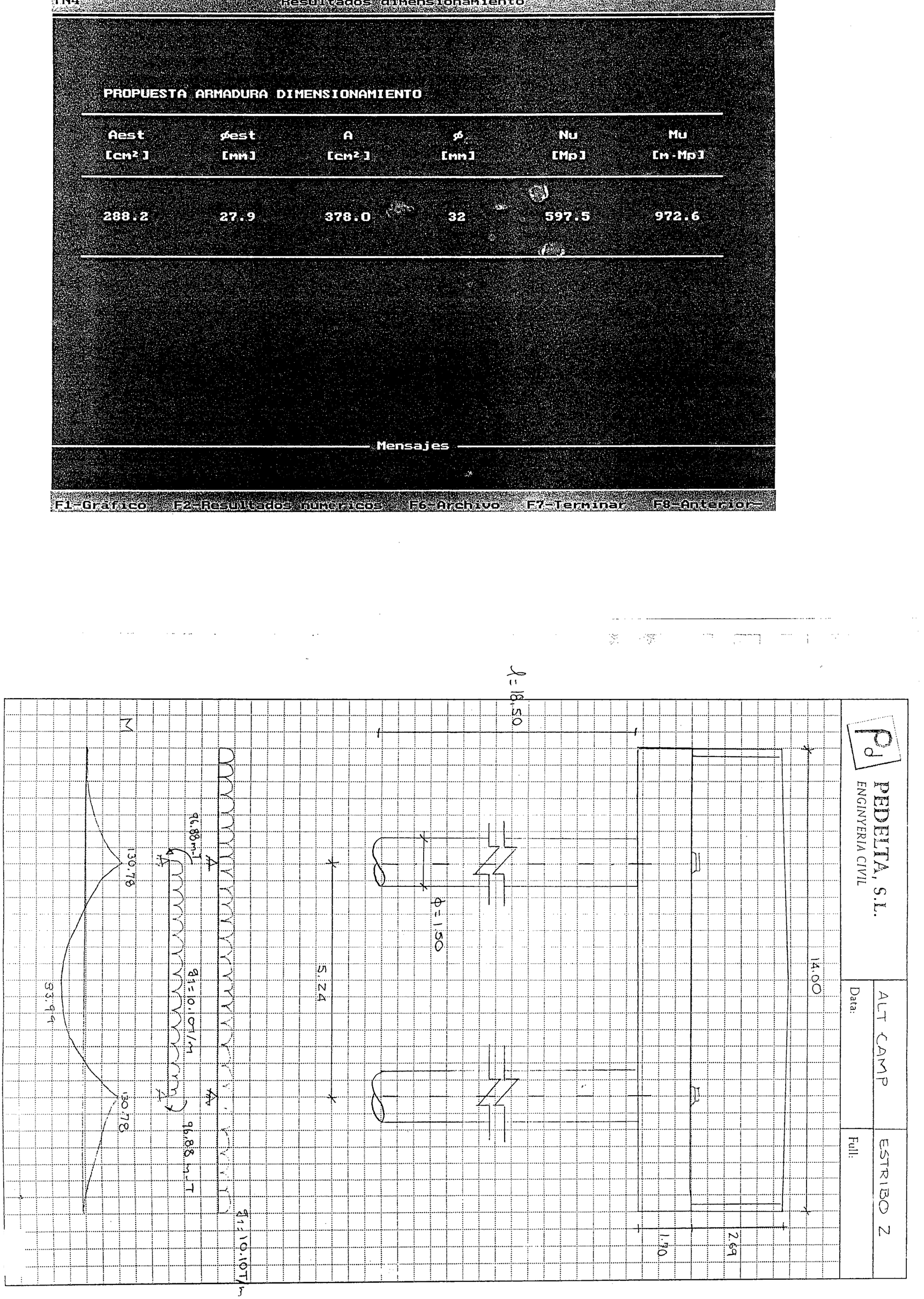
TN4 — Resultados dimensionamiento

PROPUESTA ARMADURA DIMENSIONAMIENTO

Aest [cm²]	øest [mm]	A [cm²]	ø [mm]	Nu [Mp]	Mu [m·Mp]
288.2	27.9	378.0	32	597.5	972.6

Mensajes

F1-Gráfico F2-Resultados numéricos F6-Archivo F7-Terminar F8-Anterior



U.T.E.
ALT CAMP

DRAGADOS - TECSA

CÁLCULO DE LAS PILAS 2 Y 3 DE LA ESTRUCTURA 1 DE LA VARIANTE DE ALT CAMP.

PEDELTA, S.L.
INGENIERÍA CIVIL

BARCELONA,
JULIO 2001

CÁLCULO DE LAS PILAS Y ESTRIBOS DE LA ESTRUCTURA 1 DE LA VARIANTE DE ALT CAMP.

ÍNDICE DEL ANEJO DE CÁLCULO

1 ANTECEDENTES

2 ACCIONES, MATERIALES, COEFICIENTES DE SEGURIDAD Y NORMATIVAS

- 2.1 Acciones
- 2.2 Coeficientes de seguridad, materiales, niveles de control y normativas
- 2.3 Ambientes, recubrimientos, fisuración y cuantías mínimas
- 2.4 Hipótesis de combinación de esfuerzos

3 CÁLCULO DE PILA

- 3.1 Geometría
- 3.2 Acciones en coronación
- 3.3 Cálculo de esfuerzos y dimensionamiento

1 ANTECEDENTES

A petición del ingeniero Sr. D. José Miguel González de la Unión temporal Dragados - Tecsa se redacta el presente documento donde se justifican las dimensiones y armado de las pilas 2 y 3 de la estructura 1 de la variante de Alt Camp.

Los cálculos de los diferentes elementos de la infraestructura del viaducto están basados en las reacciones del tablero suministrada por la empresa Research & Concret.

2 ACCIONES, MATERIALES, COEFICIENTES DE SEGURIDAD Y NORMATIVAS

2.1 ACCIONES

En el cálculo de los elementos estructurales se han considerado las siguientes acciones:

Acciones permanentes (G):

g1, PESO PROPIO.

El peso propio de los distintos elementos se ha calculado a partir de su geometría (secciones transversales) adoptando una densidad de valor $\gamma c = 2.5$ T/m^3.

g2, PESO DEL BALASTO Y CARGAS MUERTAS

Las cargas permanentes distintas del propio peso del tablero son las siguientes:

- Balasto.
- Vías y traviesas.
- Conductos de cableado y paseos.
- Soportes de catenarias.
- Impostas y barandillas.

El peso de balasto sobre el tablero se calcula a partir de la plataforma en la estructura de vía tomando como densidad $\gamma = 1.6$ t/m^3

Se obtiene $g_{2,\,balasto} = 10.75$ T/m.

De acuerdo con las bases de cálculo se adoptarán para esta carga los siguientes valores característicos superior e inferior:

valor inferior (0.70 x peso medio) g2, bal, inf = 7.53 T/m de tablero
valor superior (1.30 x peso medio) g2, bal, sup = 13.98 T/m de tablero

Se consideran dos hipótesis de desbalastado.

- 50% de una vía en toda su longitud.
- 100% de una vía sobre 15 metros.

El peso de vías y traviesas para la plataforma con doble vía es:

$g_{2,vías+traviesas} = 2 \times (0.52 + 0.12) = 2 \times 0.64 = 1.28$ T/m de tablero
(trav) + (carril)

El peso de los conductos para cableados y zona de paseos es:

$g_{2,conductos} = 0.3$ T/m (peso de 1 canaleta)

El peso de la imposta y barandilla es:

Se toma $g_{2,imposta+barandilla} = 1.4$ T/m, de acuerdo a la sección tipo de plataforma.

	g2, medio (T/m)	g2, sup (T/m)	g2, inf (T/m)
Balasto	10.75	13.98	7.53
Vías y traviesas	1.28	1.28	1.28
Conductos cableado	0.60	0.60	0.60
Imposta y barandillas	1.40	1.40	1.40
	14.03 T/m	**17.26 T/m**	**10.81 T/m**

Tabla 1. Carga permanente, g2

ACCIONES DEBIDAS AL TERRENO

Carga sobre zapatas y empuje de las tierras en alzados de estribos y aletas, con una densidad 2,0 T/m^3 y un ángulo de rozamiento interno de 30 ° (con presiones horizontales correspondientes a un empuje con coeficiente Ko= 0.33). En el trasdós de estribos se coloca una sobrecarga de uso de 3 T/m^2.

1 ANTECEDENTES

A petición del ingeniero Sr. D. José Miguel González de la Unión temporal Dragados - Tecsa se redacta el presente documento donde se justifican las dimensiones y armado de las pilas 2y 3 de la estructura 1 de la variante de Alt Camp.

Los cálculos de los diferentes elementos de la infraestructura del viaducto están basados en las reacciones del tablero suministrada por la empresa Research & Concret.

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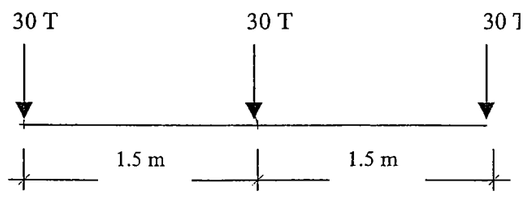
SOBRECARGAS DE USO. COMPONENTES VERTICALES.

Se utilizará la envolvente de esfuerzos debidos a los trenes de carga de IPF-75 y del Eurocódigo 1 (parte 3, acciones en puentes) EC1-3 tomando como coeficiente de impacto se adoptará en cada caso el que corresponda.

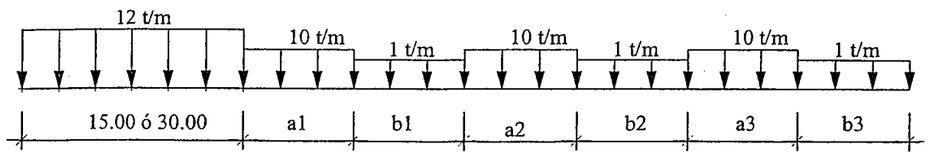
Los coeficientes de impacto no afectan al cálculo de apoyos, pilas y estribos, salvo aquellos casos en que la unión tablero-estructura sea de tipo rígido. Esto conduciría a que el coeficiente de impacto afectaría a la subestructura para las fuerzas de frenado, transmitida al estribo a través del tope rígido longitudinal, y fuerza centrífuga, transmitida a través de apoyos tipo POT guiados. No obstante, la presencia del balasto supone una liberación en la rigidez de la transmisión de las fuerzas horizontales a los apoyos y topes, por lo que no se considera el coeficiente de impacto para estas acciones.

De acuerdo con la normativa IPF-75 Existen dos trenes de carga

Tipo A Por cada vía: Q_A = 3 ejes de 30 T separados 1.50 m



Tipo B Por cada vía: Sobrecarga uniforme de 12 T/m sobre 15 ó 30 metros, más un conjunto de cuchillos de carga de 10 T/m y 1 T/m de longitud arbitraria.

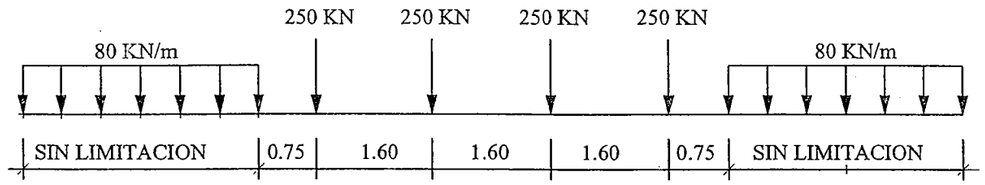


El tren tipo A suele condicionar el trabajo local de reparto de la losa y el tren tipo B condiciona el dimensionamiento general de la mayor parte de los Estados Límites Últimos o de Servicio.

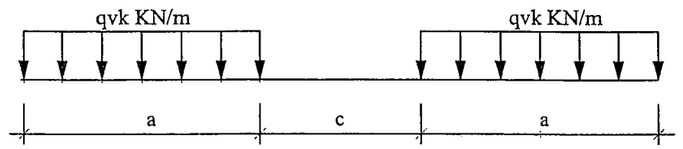
No se admite reducción de cargas por simultaneidad entre ambas vías. En cualquier caso se debe contemplar la posibilidad de un ripado de la vía respecto al eje teórico de 0.30 m.

El tren de cargas de Eurocódigo 1 (parte 3, acciones en puentes) EC1-3 se define de acuerdo con las configuraciones indicadas en las 2 figuras siguientes. En ambos casos, a efectos de cálculo se contemplará un eventual ripado de la vía de 0.30 m.

Tren tipo 71



Modelo de carga SW



Se considera adicionalmente un tren pesado equivalente al siguiente esquema de cargas (SW/0) ó (SW2) en una de las vías y el tren estandar tipo 71 en la otra vía.

	SW0	SW2
Q_{vk} (kN)	133	150
a (m)	15	25
b (m)	5,3	7

De acuerdo con la IPF-75, para algunas comprobaciones específicas asociadas a combinaciones de carga con viento transversal se considerará un tren sin carga de 12.5 KN/m.

En los paseos laterales se contemplará una sobrecarga sobrecarga de uno de 0.4 T/m^2, sólo el 50 % dicha carga es compatible con el tráfico ferroviario.

SOBRECARGAS DE USO. COMPONENTES HORIZONTALES.

- *EFECTO LAZO*

En la estructura se considerará una única fuerza transversal concomitante con la sobrecarga vertical para contemplar el efecto lazo. El valor de dicha carga (que no debe ser mayorada con el coeficiente de impacto) es el siguiente:

Según IPF-75 $H_T = 5$ T para el conjunto de ambas vías, aplicada a cota superior del carril.

Según EC1 $H_T = 10.2$ T para el conjunto de ambas vías, aplicada a cota superior del carril.

- *EFECTOS DE FRENADO Y ARRANQUE*

Se adopta la Norma EC1 ya que las acciones definidas en la IPF75 son mucho más favorables. (1/8 de la carga frente a 1/4). Esta fuerza se considerará actuando sobre la cota superior del carril y no se mayorarán por el coeficiente de impacto.

Fuerzas de arranque (por vía) LM71 y SW

$F_a = 33$ (KN/m) × L(m) ≤ 1.000 KN Se tomará Fa= 102 T/vía

Fuerzas de frenado (por vía)

$F_f = 20$ (KN/m) × L(m) ≤ 6.000 (KN) LM71 y SW0

$F_f = 35$ (KN/m) × L(m) SW2

Condiciona el frenado del tren tipo, con una fuerza total de valor: $F_f = 249$ T/vía que deberá resistir el tope longitudinal ubicado en el estribo.

En la combinación de acciones de frenado y arranque sobre el tablero se considera la reducción que permite EC1 debido a la continuidad de vías más allá del tablero (Coeficiente reductor 0.90).

En los dos tramos se supondrá frenado simultáneo en dos vías (combinación más desfavorable).

Se reducirán al 50% si se considera concominantes con la fuerza centrífuga.

- *INTERACCIÓN VÍA - ESTRUCTURA*

Se colocará un punto fijo de tablero en el estribo 1 y libertad de movimientos en el otro extremo. Se dispondrá aparato de dilatación de vía en el extremo móvil. Con ello, y según las especificaciones del Eurocódigo 1 las acciones horizontales a considerar son las siguientes:

- *ACCIONES TÉRMICAS VÍA-ESTRUCTURA*

$F_{TK} = \pm (40.8 + 0.51\ LT) = 103$ T/vía ≤ 112 T/vía ⇒ $F_{tk} = 206$ T (en 2 vías).

- *ACCIONES DE FRENADO Y ARRANQUE*

La longitud del tramo continuo aconseja considerar reducción de frenado por interacción vía estructura, tomando un coeficiente de reducción 0.70.

- *EMPUJE SOBRE BARANDILLAS.*

En el elemento superior de la barandilla se considera una fuerza horizontal de valor 1.5 kN/m actuando de modo simultáneo con la sobrecarga uniforme.

ACCIONES CLIMÁTICAS

- *VIENTO*

Al estar la estructura ubicada en la zona de costa de la provincia de Tarragona la velocidad de cálculo se puede determinar a partir de una velocidad de referencia de v_{ref}=28 m/s corregida con los siguientes parámetros multiplicadores:

Ct = factor de topografía

Cr = factor de riesgo (se toma un periodo de retorno de 100 años)

Cz = factor de altura (se adopta un entorno Tipo II, zona rural plana con algunos obstáculos)

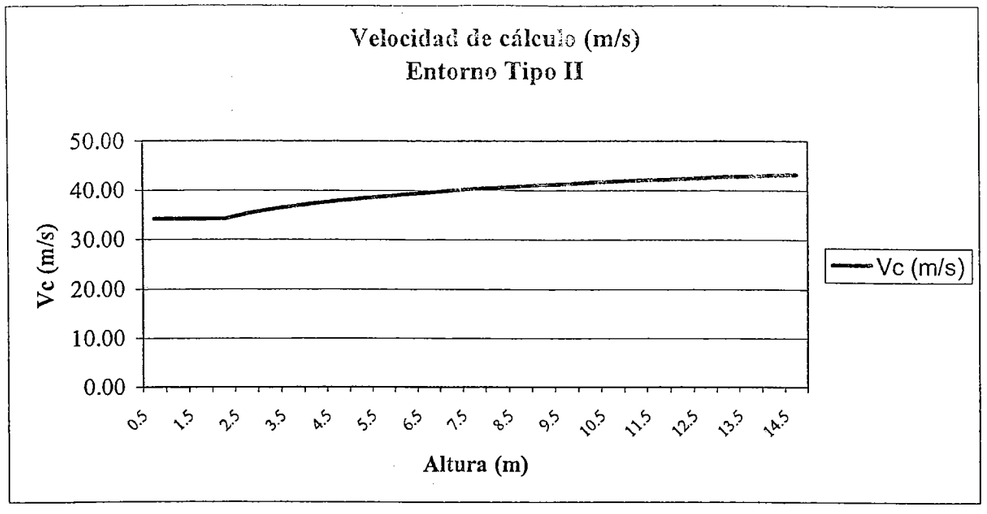
Cg = factor de ráfaga

$$Cz = Kz \ln(\frac{z}{zo}) \quad si \quad z \geq z_{min}$$

$$Cz = Kz \ln(\frac{z_{min}}{zo}) \quad si \quad z \leq z_{min}$$

$$Cg = \sqrt{\left(1 + \frac{7Kz}{CzCt}\right)}$$

Vref=28 m/s, Ct=1.0 y Cr=1.04



Para un entorno Tipo II

Kz= 0.19 zo = 0.05m zmin = 4 m

Para determinar el empuje de viento sobre el tablero, la velocidad de cálculo es:

$$Vc = Ct \cdot Cr \cdot Cz \cdot Cg \cdot Vref = 50.2 \text{ m/s}$$

Por lo que el empuje horizontal ejercido por el viento en el tablero es:

$$F = C_D \cdot A \cdot (1/2 \rho V_c^2) = 0.45 \quad T/m$$

Cuando se combina con la sobrecarga se reduce en un 50% esta acción.

- ***NIEVE***

Según al IAP (y el borrador de la nueva IPF) se debe aplicar una carga de nieve sobre la superficie de tablero en la que no se considere sobrecarga de uso. Para el cálculo del tablero se considera la posibilidad de tener sobrecarga en toda su superficie, por lo tanto no es necesario aplicar la sobrecarga de nieve.

2.2 COEFICIENTES DE SEGURIDAD, MATERIALES, NIVELES DE CONTROL Y NORMATIVAS

HORMIGONES

- Hormigón de Limpieza..... HM-15
- Cimentaciones..... HA-25 / 20 / B / IIa
- Alzados de pilas y estribos... HA-30 / 20 / B / IIIa

Control del hormigón NORMAL

γc= 1.50 (Situación persistente o transitoria)
γc= 1.30 (Situación accidental)

ACEROS

- Acero corrugado para la armadura pasiva B500S, con $f_{yk} > 500$ MPa (5100 Kp/cm^2)

Control de los aceros NORMAL

γs= 1.15 (Situación persistente o transitoria)
γs= 1.0 (Situación accidental)

CONTROL DE EJECUCIÓN

El control de ejecución será INTENSO (γ_g= 1.35 y γ_{fq}= 1.50) en tablero, pilas y estribos de acuerdo con las especificaciones de la normativa EHE.

NORMATIVAS Y BASES DE CÁLCULO

Para el establecimiento de acciones y las combinaciones necesarias para la obtención de las solicitaciones de cálculo que se emplearán en la comprobación de los diferentes Estados Límite se realizarán los cálculos empleando la normativa IPF-75 y los criterios especificados en los Eurocódigos, adoptándose el más desfavorable de ambos.

Cálculo según IPF-75

Para el cálculo de las acciones se utilizarán las siguientes instrucciones.

- Instrucción relativa a las acciones a considerar en el Proyecto de Puentes de Ferrocarril", correspondiente a la O.M. 25 de Junio de 1.975 (IPF-75).

- Norma de construcción Sismorresistente: Parte general y edificación (NCSE-94)" R.D. 29 de Diciembre de 1.994.

Para el cálculo de las acciones ambientales se utilizará la siguiente instrucción.

- Instrucción relativa a las acciones a considerar en el proyecto de puentes de carretera IAP, aprobada Orden de12 de febrero de 1998.

- Instrucción para el proyecto de estructuras de hormigón estructural EHE, aprobada por el Real Decreto 2661/1998 de 11 de diciembre.

- Normativa Sismoresistente NCSE-94.

- Instrucción relativa a las acciones a considerar en el proyecto de Puentes de Carreteras I.A.P. 12 de Febrero de 1998.

Para establecer las hipótesis y combinaciones de cálculo y sus correspondientes coeficientes de ponderación se utilizarán las siguientes Instrucciones:

- Instrucción de Hormigón Estructural (EHE) R.D. 2661/1998 de 11 de Diciembre.

Cálculo según Eurocódigos y EHE

- Eurocódigo 1: *Bases de proyecto y acciones. Parte 3. Cargas de tráfico en puentes.* UNE-ENV 1991-3. Octubre 1997. (EC1.1.3.)

Para establecer las hipótesis y combinaciones de cálculo y sus correspondientes coeficientes de ponderación se utilizarán las siguientes Instrucciones:

- Eurocódigo 1: *Bases de proyecto y acciones en estructuras. Parte 1; Bases de proyecto.* UNE-ENV 1991-1, Octubre 1997 (EC1.1)

Para dimensionamiento y comprobación de secciones se actuará, en todo momento, de acuerdo con la normativa española;

- Instrucción de Hormigón Estructural EHE. R.D. 2661/1998 de 11 de Diciembre

Para el análisis de la interacción vía-estructura se empleará la siguiente norma:

- Norma U.I.C. Ficha 774.3 R. 1ª edición. Febrero 1999 (U.I.C. 774.3).

Subsidiariamente, y en lo no contemplado en las normas anterioriores se emplearán las siguientes:

- Norma UIC. Ficha 776.1. 3ª edición. 1 de Julio de 1.979. (U.I.C. 776.1)

- Norma UIC. Ficha 774-2. 1ª Edición. 1 de Julio de 1.974. (U.I.C. 774.2)

- Norma UIC. Ficha 702.0. 2ª Edición. 1 de Enero de 1.974. (U.I.C. 702.0)

2.3 AMBIENTES, RECUBRIMIENTOS, FISURACIÓN Y CUANTÍAS MÍNIMAS

De acuerdo con la normativa EHE se consideran los ambientes indicados en la tabla siguiente.

Elemento	Ambiente	Recubrimiento de Armadura pasiva (mm)	Límite de abertura de fisura Wmax (mm)	
			Hormigón armado	Hormigón postesado
Alzados de pilas y estribos	IIIa	30	0.2	-
Cimentaciones	IIa	30	0.3	-
Pilotes	IIa	75	0.3	-

Las cuantías mínimas de armadura pasiva B500S serán las expuestas en la siguiente tabla (EHE, art. 4.3.5)

Elemento	Posición	Tipo	Cuantía geométrica o/oo
Zapatas	cara superior o inferior	transversal o longitudinal	0.90
Pilotes	vertical	-	4.0
Pilas	vertical	-	4.0
Alzados de estribos y aletas (1)	horizontal	lado tierras	1.07
		lado visto	2.13
	vertical	lado tierras	0.90
		lado visto	0.30
Tablero	cara superior o inferior	transversal o longitudinal	0.90

(1) las cuantías geométricas horizontales se pueden reducir un 50 % si se colocan juntas de contracción distanciadas menos de 7,5 m.

2.4 HIPÓTESIS DE COMBINACIÓN DE ESFUERZOS

Se han considerado las combinaciones de hipótesis de las acciones recogidas en la Normativa EHE, basados en la teoría de Estados Límites, para las distintas situaciones de cálculo de la estructura.

2.4.1 ESTADOS LÍMITES ÚLTIMOS

Las hipótesis de cálculo consideradas son:

- Situaciones persistentes o transitorias

$$\sum_{j \geq 1} \gamma_{Gj} G_{kj} + \sum_{j \geq 1} \gamma_{Gj} G^*_{kj} + \gamma_{Q1} Q_{k1} + \sum_{i > 1} \gamma_{Qi} \Psi_{0i} Q_{ki}$$

- Situaciones accidentales

$$\sum_{j \geq 1} \gamma_{Gaj} G_{kj} + \sum_{j \geq 1} \gamma_{Gj} G^*_{kj} + \gamma_A A_k + \Psi_{11} Q_{k1} + \sum_{i > 1} \gamma_{Qi} \Psi_{2i} Q_{ki}$$

- Situaciones accidentales de sismo

$$\sum_{j \geq 1} G_{kj} + \sum_{j \geq 1} \gamma_{Gj} G^*_{kj} + \gamma_i A_{Ed} + \sum_{i > 1} \gamma_{Qi} \Psi_{2i} Q_{ki}$$

donde:

G = Valor característico de las cargas permanentes.
G* = Valor característico de las cargas permanentes de valor no constante.
Q_{k1} = Valor característico de la carga variable dominante.
A_k = Valor característico de la acción accidental
A_{eq} = Valor característico de la acción sísmica, calculado según la Norma Sismorresistente.

Los coeficientes de seguridad y de combinación de acciones empleados se definen en la EHE.

Barcelona, 10 de Julio del 2001

Fdo. Leonardo A. Rosillo
Ing. Civil Msc

Fdo: Juan A. Sobrino Almunia
Dr. Ingeniero de Caminos

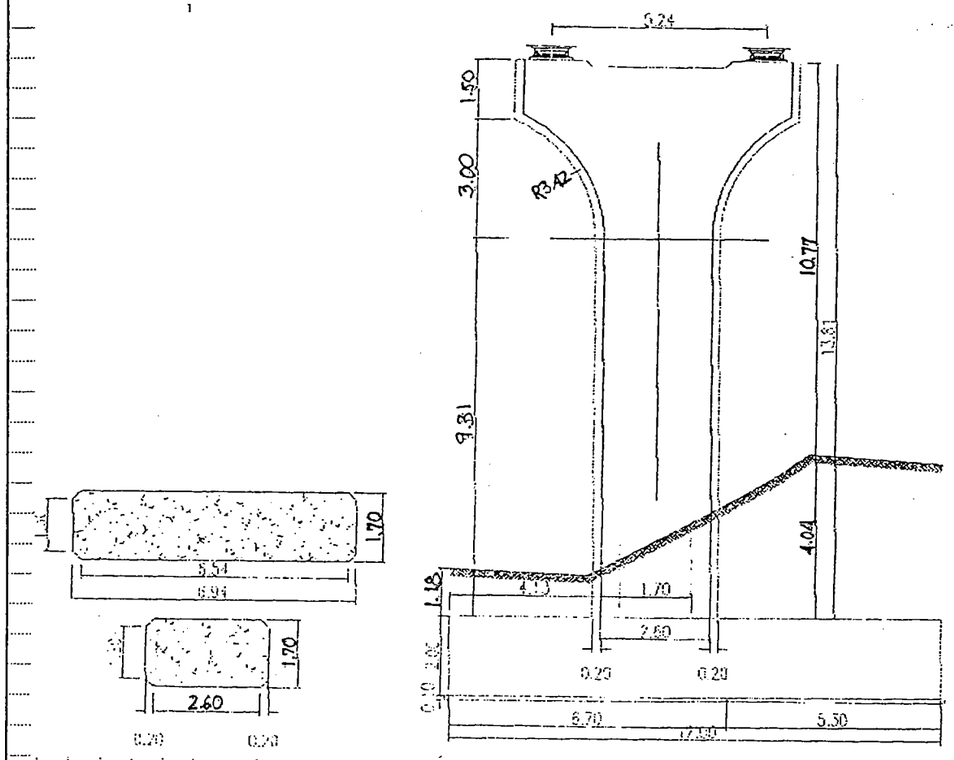
PEDELTA, S.L.
INGENIERÍA CIVIL

ALT CAMP PILA 2 Y 3

Fecha:

Hoja:

GEOMETRÍA DE LA PILA



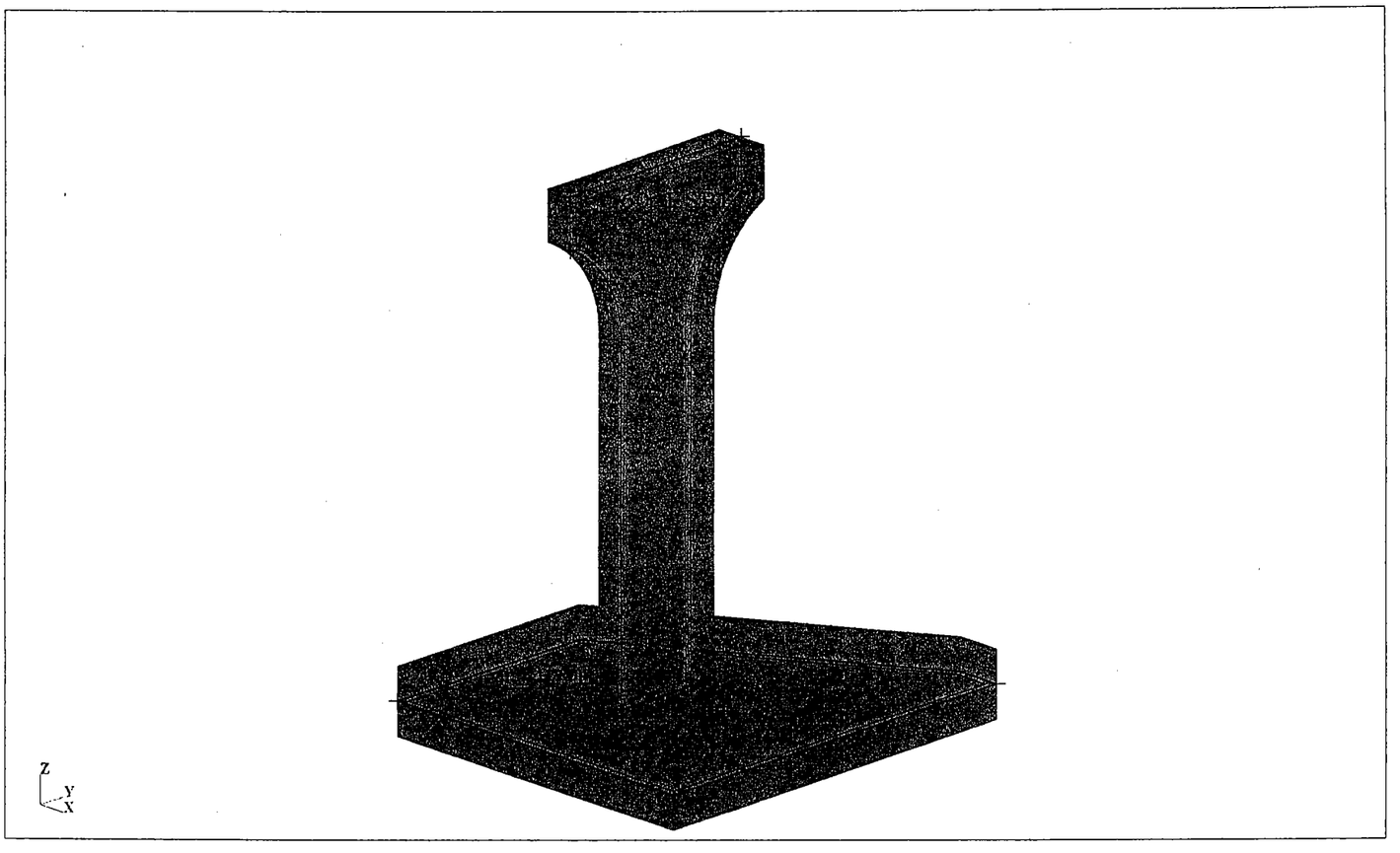
MATERIALES:

HORMIGÓN: HA-30 / B / 20 / IIIa

ACERO: B500S

MODELO DE CÁLCULO

MODEL DE CÁLCUL



ACCIONES EN CORONACIÓN

Caso	Nombre del caso	Naturaleza	tipo de análisis
1	PESO PROPIO	permanente	Estático lineal
2	SOBRECARGA DE TIERRAS	permanente	Estático lineal
3	G1+G2+ROZAMIENTO+VIENTO (E.L.S)	permanente	Estático lineal
4	G1+G2+q100%+ROZAMIENTO+VIENTO	permanente	Estático lineal
5	G1+G2+ROZAMIENTO+VIENTO (E.L.U.)	explotación	Estático lineal
6	G1+G2+q100%+ROZAMIENTO +VIENTO	explotación	Estático lineal
7	COMB1	permanente	Combinación lineal
8	COMB2	permanente	Combinación lineal
10	COMB4	permanente	Combinación lineal

	Caso	Tipo de carga	Lista	Valores de carga
	1	peso propio	47 60	PZ Menos
	2	(EF) superficial 3p	47	PZ1=-4,04(T/m^2) PZ2=-4,04(T/m^2) PZ3=-1,18(T/m^2) N
	3	fuerza nodal	12	FX=-27,81(T) FY=28,19(T) FZ=-556,11(T)
	3	fuerza nodal	469	FX=-26,74(T) FZ=-534,70(T)
	4	fuerza nodal	12	FX=-47,18(T) FY=47,36(T) FZ=-943,54(T)
	4	fuerza nodal	469	FX=-42,81(T) FZ=-856,14(T)
	5	fuerza nodal	12	FX=-37,62(T) FY=42,26(T) FZ=-752,35(T)
	5	fuerza nodal	469	FX=-36,01(T) FZ=-720,24(T)
	6	fuerza nodal	12	FX=-66,68(T) FY=71,04(T) FZ=-1333,50(T)
	6	fuerza nodal	469	FX=-60,12(T) FZ=-1202,40(T)

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Autor : PEDELTA-Juan Sobrino
Dirección :
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Archivo : PILA3bmodificada.rtd
Proyecto : PILA3bmodificada

sistema de coordenadas global - Casos: 1A8 10

Filtrar	Nudo	Caso
Lista completa	1A481 484A494 499A753	1A8 10
Selección	110 127 338 464	1A8 10
Número total	747	9
Número seleccionado	4	9

sistema de coordenadas global - Casos: 1A8 10

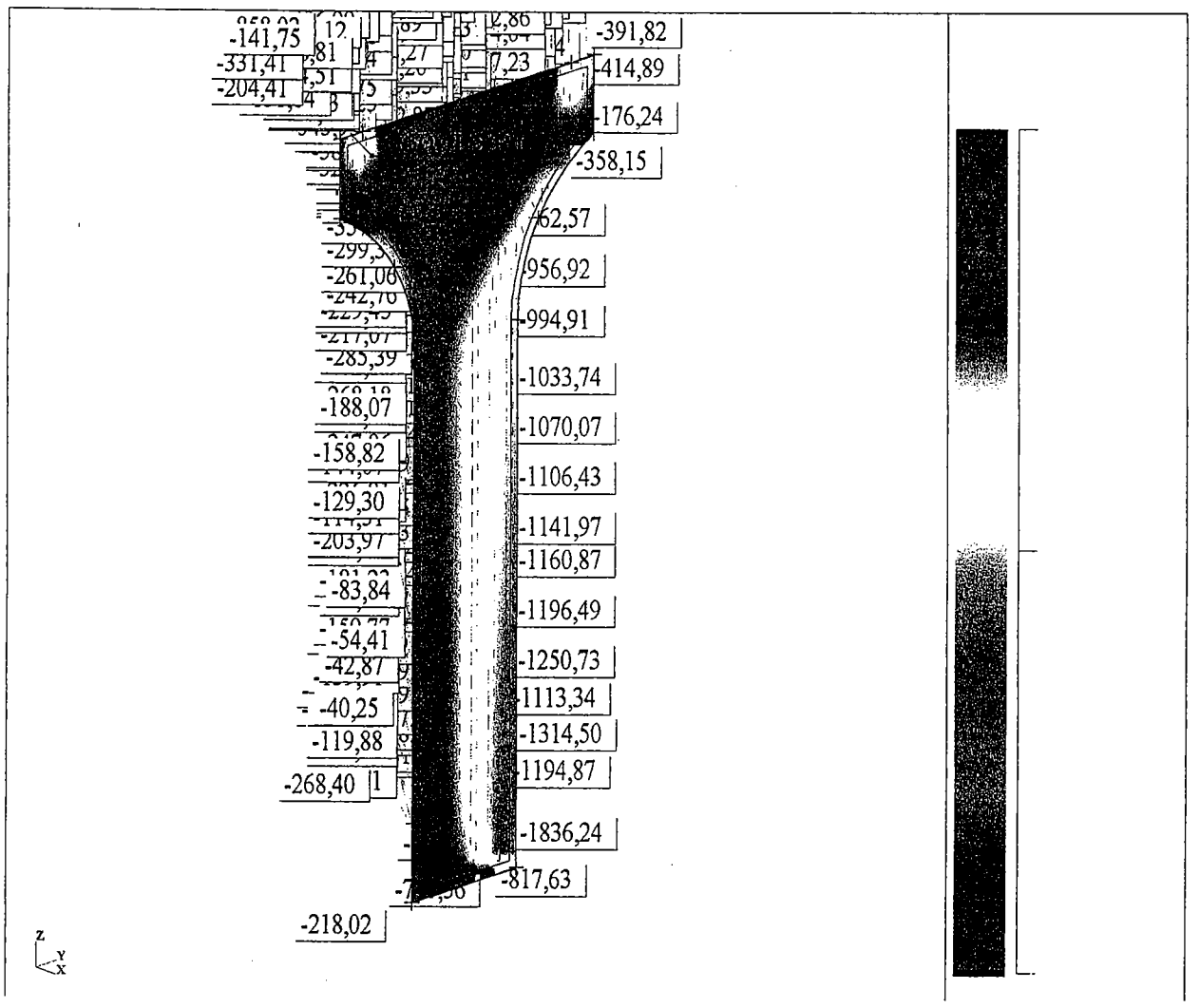
Nudo/Caso	FX (T)	FY (T)	FZ (T)
Caso 1	PESO PROPIO		
Suma final	0,0	0,0	0,0
Suma de reacciones <	0,00	0,00	696,70
Suma de esfuerzos	0,0	0,0	-696,70
Verificación	0,00	0,00	-0,00
Precisión:	2,72860e-010	1,93751e-024	
Caso 2	SOBRECARGA DE TIERRAS		
Suma final	0,0	0,0	0,0
Suma de reacciones <	0,00	-0,00	281,99
Suma de esfuerzos	0,0	0,0	-281,99
Verificación	0,00	-0,00	-0,00
Precisión:	1,05540e-006	2,08194e-024	
Caso 3	G1+G2+ROZAMIENTO+VIENTO (E.L.S)		
Suma final	0,0	0,0	0,0
Suma de reacciones <	54,55	-28,19	1090,81
Suma de esfuerzos	-54,55	28,19	-1090,81
Verificación	0,00	0,00	-0,00
Precisión:	8,80594e-011	1,15106e-022	
Caso 4	G1+G2+q100%+ROZAMIENTO+VIENTO CONCOMI		
Suma final	0,0	0,0	0,0
Suma de reacciones <	89,99	-47,36	1799,68
Suma de esfuerzos	-89,99	47,36	-1799,68
Verificación	0,00	0,00	-0,00
Precisión:	1,29013e-010	1,03527e-022	
Caso 5	G1+G2+ROZAMIENTO+VIENTO (E.L.U.)		
Suma final	0,0	0,0	0,0
Suma de reacciones <	73,63	-42,26	1472,59
Suma de esfuerzos	-73,63	42,26	-1472,59
Verificación	0,00	0,00	-0,00
Precisión:	7,12125e-011	1,09431e-022	
Caso 6	G1+G2+q100%+ROZAMIENTO +VIENTO CONCOM		
Suma final	0,0	0,0	0,0
Suma de reacciones <	126,80	-71,04	2535,90
Suma de esfuerzos	-126,80	71,04	-2535,90
Verificación	0,00	0,00	-0,00
Precisión:	1,27523e-010	1,20649e-022	

Fecha : 26/06/01

Nudo/Caso	FX (T)	FY (T)	FZ (T)
Caso 7 (K)	**COMB1**		
Suma final	0,0	0,0	0,0
Suma de reacciones <	54,55	-28,19	2069,49
Suma de esfuerzos	-54,55	28,19	-2069,49
Verificación	0,00	0,00	-0,00
Precisión:	1,05576e-006	1,19126e-022	
Caso 8 (K)	**COMB2**		
Suma final	0,0	0,0	0,0
Suma de reacciones <	89,99	-47,36	2778,36
Suma de esfuerzos	-89,99	47,36	-2778,36
Verificación	0,00	0,00	-0,00
Precisión:	1,05580e-006	1,07546e-022	
Caso 10 (K)	**COMB4**		
Suma final	0,0	0,0	0,0
Suma de reacciones <	126,80	-71,04	3857,12
Suma de esfuerzos	-126,80	71,04	-3857,12
Verificación	0,00	0,00	-0,00
Precisión:	1,42529e-006	1,26075e-022	

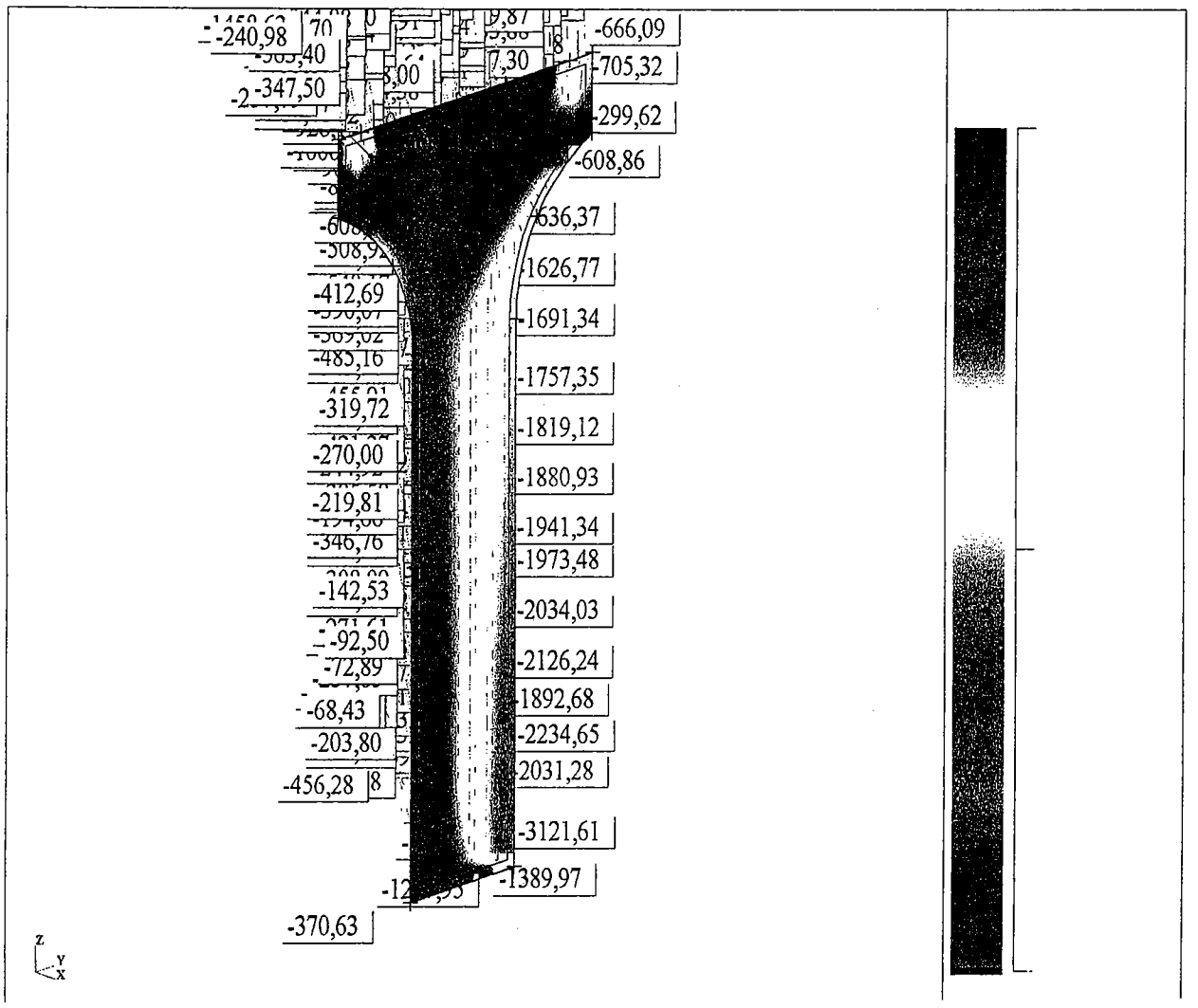
CÁLCULO DE ESFUERZOS

Mapas - sXX (T/m^2) Superficie del medio Dirección Z casos: 10 (COMB4) 2



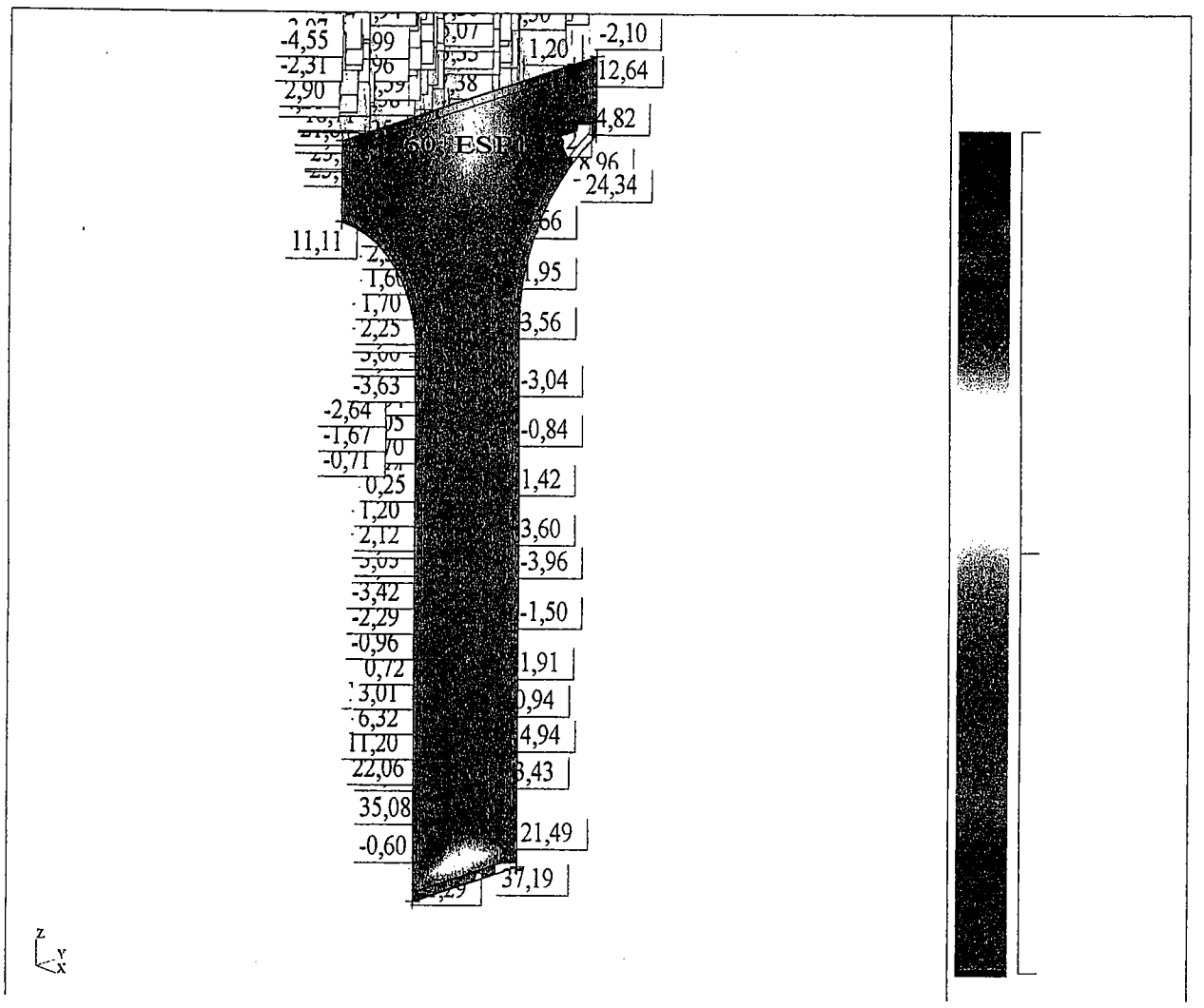
Fecha : 26/06/01

Mapas - NXX (T/m) Superficie del medio Dirección Z casos: 10 (COMB4) 1



Fecha : 26/06/01

Mapas - MYY (Tm/m) Superficie del medio Dirección Z casos: 10 (COMB4) 2

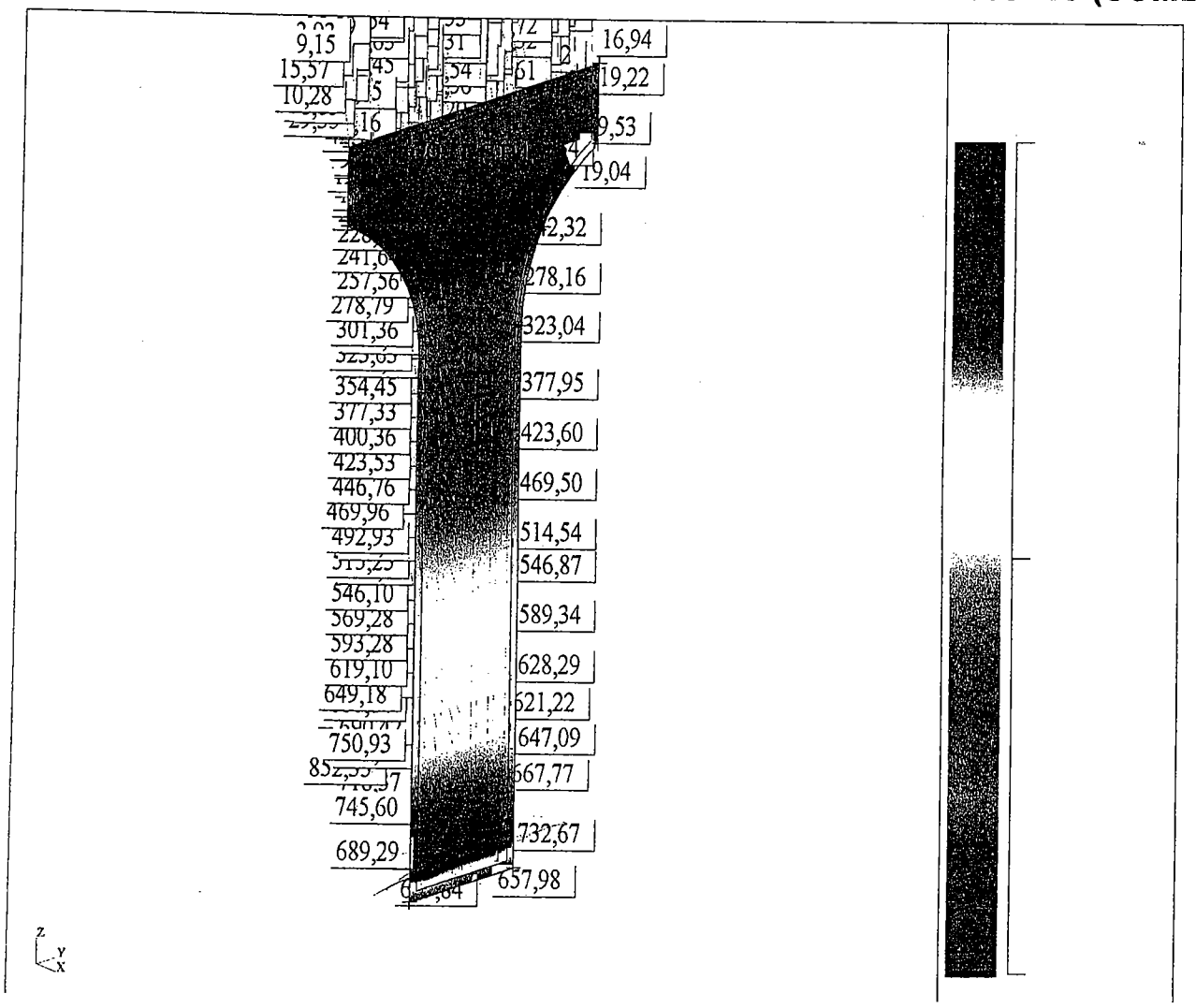


Fecha : 26/06/01

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Autor : **PEDELTA-Juan Sobrino**
Dirección :

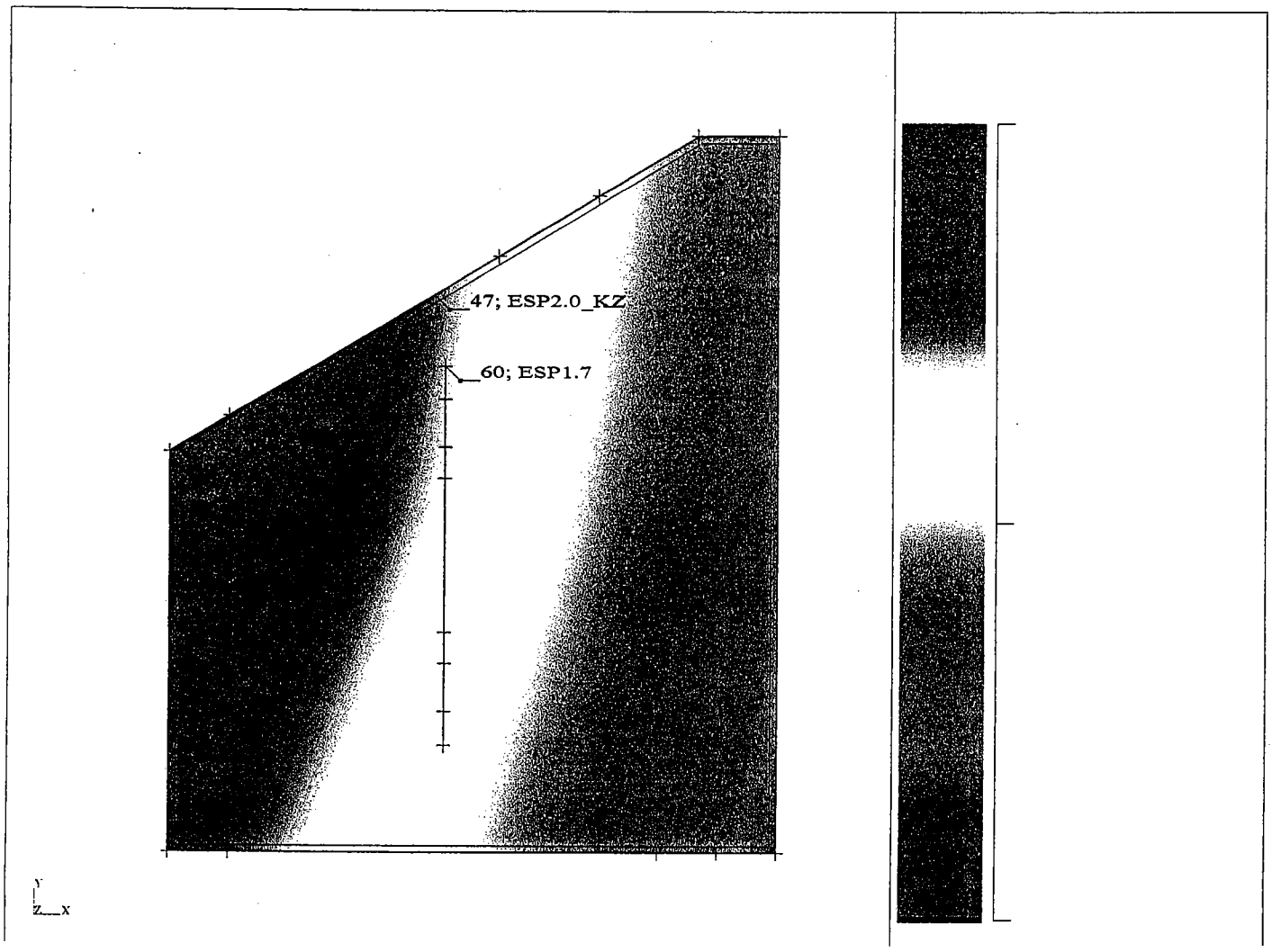
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Archivo : **PILA3bmodificada.rtd**
Proyecto : PILA3bmodificada

Mapas - MXX (Tm/m) Superficie del medio Dirección Z casos: 10 (COMB4) 1



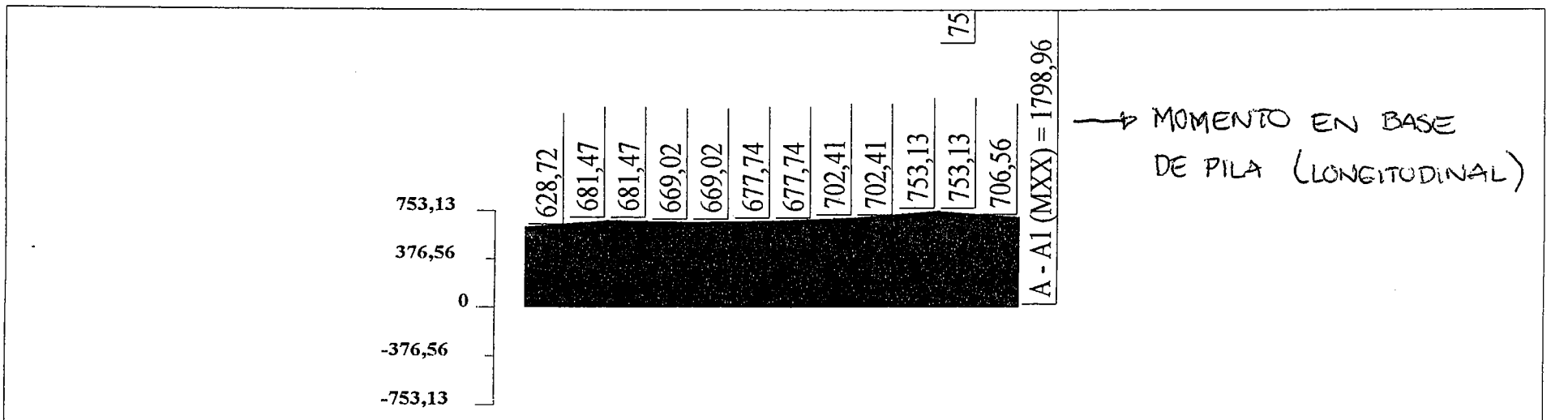
Fecha : 26/06/01

Mapas:1 - pNorm. (T/m^2) Superficie del medio Dirección Y casos: 7 (COMB1) 1



Fecha : 26/06/01

Análisis de los diagramas en los cortes - MXX (Tm/m) Superficie del medio Dirección X casos: 10 (COMB4)



MXX (Tm/m) Superficie del medio Dirección X, Caso: 10 (COMB4)

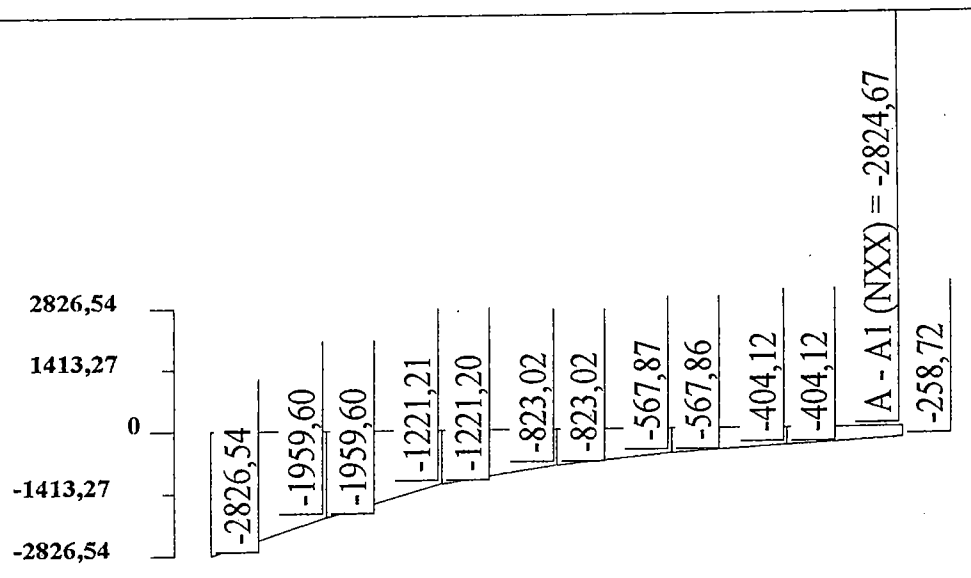
Valores

	MXX (Tm/m)
Valor actual	0,0
para el corte	A - A1
en el punto	0 0

Fecha : 27/06/01

	MXX (Tm/m)
punto (a)	706,56
punto (b)	702,41
punto (c)	753,13
punto (d)	753,12
punto (e)	702,41
punto (f)	677,74
punto (g)	677,74
punto (h)	669,02
punto (i)	669,02
punto (j)	681,47
punto (k)	681,47

Análisis de los diagramas en los cortes:2 - NXX (T/m) Superficie del medio Dirección X casos: 10 (COMB4)



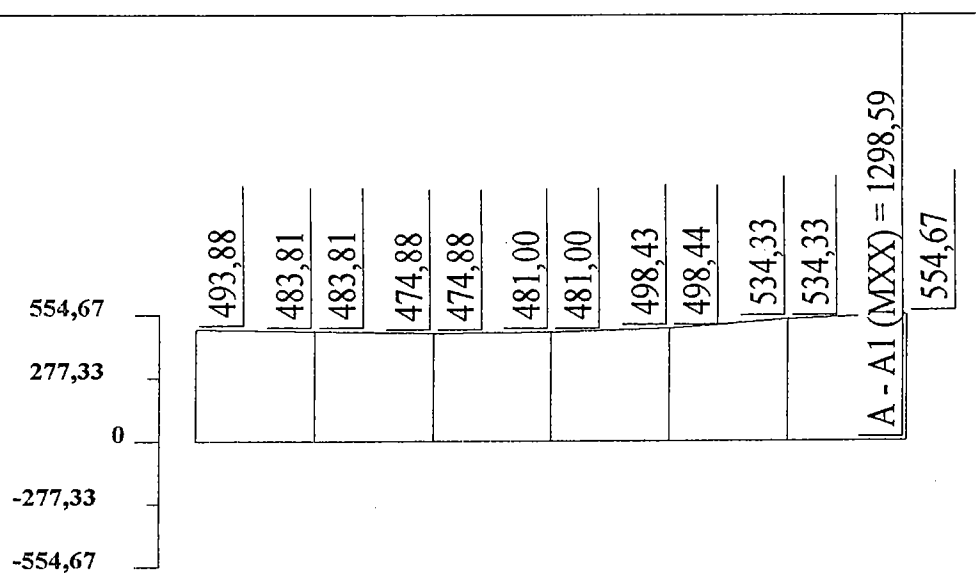
NXX (T/m) Superficie del medio Dirección X, Caso: 10 (COMB4)

Valores

	NXX (T/m)
Valor actual	0,0

	NXX (T/m)
para el corte	A - A1
en el punto	0 0
punto (a)	-567,86
punto (b)	-404,12
punto (c)	-404,12
punto (d)	-567,87
punto (e)	-823,02
punto (f)	-823,02
punto (g)	-1221,20
punto (h)	-1221,21
punto (i)	-1959,60
punto (j)	-1959,60

Análisis de los diagramas en los cortes:1 - MXX (Tm/m) Superficie del medio Dirección X casos: 8 (COMB2)



MXX (Tm/m) Superficie del medio Dirección X, Caso: 8 (COMB2)

Valores

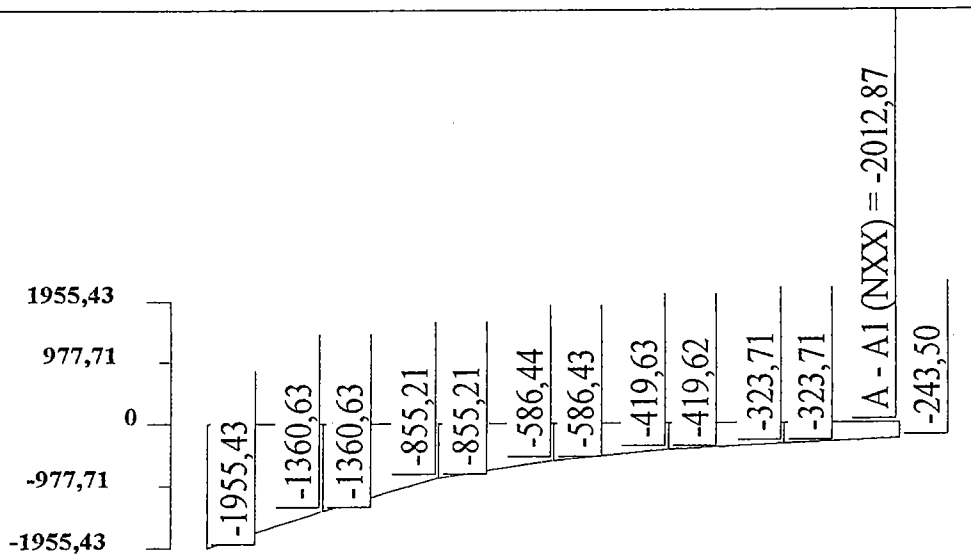
	MXX (Tm/m)

	MXX (Tm/m)
Valor actual	0,0
para el corte	A - A1
en el punto	0 0
punto (a)	493,88
punto (b)	498,44
punto (c)	534,33
punto (d)	534,33
punto (e)	498,43
punto (f)	481,00
punto (g)	481,00
punto (h)	474,88
punto (i)	483,81
punto (j)	483,81

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Autor : **PEDELTA-Juan Sobrino**
Dirección :

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Archivo : **PILA3bmodificada.rtd**
Proyecto : PILA3bmodificada

Análisis de los diagramas en los cortes:2 - NXX (T/m) Superficie del medio Dirección X casos: 8 (COMB2)



NXX (T/m) Superficie del medio Dirección X, Caso: 8 (COMB2)

Valores

	NXX (T/m)
Valor actual	0,0

para el corte / en el punto	NXX (T/m)
	A - A1
	0 0
punto (a)	-419,62
punto (b)	-323,71
punto (c)	-323,71
punto (d)	-419,63
punto (e)	-586,43
punto (f)	-586,44
punto (g)	-855,21
punto (h)	-855,21
punto (i)	-1360,63
punto (j)	-1360,63

PEDELTA, S.L.
INGENIERÍA CIVIL

ALT CAMP PILA 2 y 3

Fecha:

Hoja:

ESFUERZOS DE DISEÑO SIN PANDEO

Nd = 2824.67 T
Mdx = 1798.86 m-T
Mdy = 981.06 m-T

Nk = 2012.87 T
Mkx = 1298.59 m-T
Mky = 654.04 m-T

ESFUERZOS DE DISEÑO CON PANDEO

Nd = 2824.67 T
Mdx = 2617.60 m-T
Mdy = 1451.40 m-T

Nk = 2012.87 T
Mkx = 1182.7 m-T
Mky = 985.7 m-T

CÁLCULO DEL MOMENTO RESISTENTE DE LA SECCIÓN

$f_{ct,k} = 0.21 \sqrt[3]{30^2} = 202\ T/m^2$

CÁLCULO DE ESFUERZOS DE SEGUNDO ORDEN

VERIFICACIÓN DE SOPORTES AISLADOS A PANDEO SEGUN NORMA EHE

Referencia proyecto:UTE ALT CAMP PILA 3, ESTRUCTURA 1

ELS transversal

Cuestiones geométricas

Longitud del soporte (m)	13,81	
Factor de longitud de pandeo (alfa)	1,7	Nota sobre el valor de alfa:

Tipo de soporte	Alfa
biempotrado	0,5
biarticulado	1
articulado-empotrado	0,7
en ménsula	2
biempotrado con extremos desplazables	1

Longitud de pandeo (m)	23,477	
Dimensión del soporte en el plano de pandeo (m)	2,6	
Radio de giro de la sección (m)	0,751	
Esbeltez mecánica	31	NO ES NECESARIO COMPROBAR A PANDEO

Cálculo de esfuerzos de 2o orden (sólo método simplificado)

Axial (T)	2012,87	
Momento (mT)	654,04	
Excentricidad de primer orden (m) (soportes traslacionales)	0,325	
Factor de armado (beta)	1,5	Nota sobre el valor de beta:

Tipo de armadura	Beta
toda la armadura es	
perpendicular al plano de pandeo	1
paralela al plano de pandeo	3
hay armadura en las 4 caras	1,5

Resistencia fyk del acero (Kp/cm2)	5100	
Parámetro de fluencia (epsilon)	0,004	Nota sobre el valor de epsilon

el axil cuasipermanente	Epsilon
no supera el 70% del total	0,003
supera el 70% del total	0,004

Excentricidad adicional (m)	0,165	
Excentricidad total (m)	0,490	
Axil de segundo orden (T)	**2012,87**	
Momento de segundo orden (mT)	985,7	

VERIFICACIÓN DE SOPORTES AISLADOS A PANDEO SEGU[N] NORMA EHE
Referencia proyecto:UTE ALT CAMP PILA 3, ESTRUCTURA 1
ELS longitudinal

Cuestiones geométricas

Longitud del soporte (m)	13,81	
Factor de longitud de pandeo (alfa)	1,7	Nota sobre el valor de alfa:

Tipo de soporte	Alfa
biempotrado	0,5
biarticulado	1
articulado-empotrado	0,7
en ménsula	2
biempotrado con extremos desplazables	1

Longitud de pandeo (m)	23,477	
Dimensión del soporte en el plano de pandeo (m)	1,7	
Radio de giro de la sección (m)	0,491	
Esbeltez mecánica	48	APLICAR MÉTODO SIMPLIFICADO

Cálculo de esfuerzos de 2o orden (sólo método simplificado)

Axial (T)	2012,87	
Momento (mT)	1298,59	
Excentricidad de primer orden (m) (soportes traslacionales)	0,645	
Factor de armado (beta)	1,5	Nota sobre el valor de beta:

Tipo de armadura	Beta
toda la armadura es	
perpendicular al plano de pandeo	1
paralela al plano de pandeo	3
hay armadura en las 4 caras	1,5

Resistencia fyk del acero (Kp/cm2)	5100	
Parámetro de fluencia (epsilon)	0,004	Nota sobre el valor de epsilon

	Epsilon
el axil cuasipermanente	
no supera el 70% del total	0,003
supera el 70% del total	0,004

Excentricidad adicional (m)	0,290
Excentricidad total (m)	0,935
Axil de segundo orden (T)	**2012,87**
Momento de segundo orden (mT)	**1882,7**

VERIFICACIÓN DE SOPORTES AISLADOS A PANDEO SEGUN NORMA EHE
Referencia proyecto:UTE ALT CAMP PILA 3, ESTRUCTURA 1
ELU transversal

Cuestiones geométricas

Longitud del soporte (m)	13,81	
Factor de longitud de pandeo (alfa)	1,7	Nota sobre el valor de alfa:

Tipo de soporte	Alfa
biempotrado	0,5
biarticulado	1
articulado-empotrado	0,7
en ménsula	2
biempotrado con extremos desplazables	1

Longitud de pandeo (m)	23,477	
Dimensión del soporte en el plano de pandeo (m)	2,6	
Radio de giro de la sección (m)	0,751	
Esbeltez mecánica	31	NO ES NECESARIO COMPROBAR A PANDEO

Cálculo de esfuerzos de 2o orden (sólo método simplificado)

Axial (T)	2824,67	
Momento (mT)	981,06	
Excentricidad de primer orden (m) (soportes traslacionales)	0,347	
Factor de armado (beta)	1,5	Nota sobre el valor de beta:

Tipo de armadura	Beta
toda la armadura es	
perpendicular al plano de pandeo	1
paralela al plano de pandeo	3
hay armadura en las 4 caras	1,5

Resistencia fyk del acero (Kp/cm2)	5100	
Parámetro de fluencia (epsilon)	0,004	Nota sobre el valor de epsilon

	Epsilon
el axil cuasipermanente	
no supera el 70% del total	0,003
supera el 70% del total	0,004

Excentricidad adicional (m)	0,166
Excentricidad total (m)	0,514
Axil de segundo orden (T)	**2824,67**
Momento de segundo orden (mT)	**1451,4**

VERIFICACIÓN E SOPORTES AISLADOS A PANDEO SEGU ORMA EHE

Referencia proyecto:UTE ALT CAMP PILA 3, ESTRUCTURA 1

ELU longitudinal

Cuestiones geométricas

Longitud del soporte (m)	13,81	
Factor de longitud de pandeo (alfa)	1,7	Nota sobre el valor de alfa:

Tipo de soporte	Alfa
biempotrado	0,5
biarticulado	1
articulado-empotrado	0,7
en ménsula	2
biempotrado con extremos desplazables	1

Longitud de pandeo (m)	23,477	
Dimensión del soporte en el plano de pandeo (m)	1,7	
Radio de giro de la sección (m)	0,491	
Esbeltez mecánica	48	APLICAR MÉTODO SIMPLIFICADO

Cálculo de esfuerzos de 2o orden (sólo método simplificado)

Axial (T)	2824,67	
Momento (mT)	1798,86	
Excentricidad de primer orden (m) (soportes traslacionales)	0,637	
Factor de armado (beta)	1,5	Nota sobre el valor de beta:

Tipo de armadura	Beta
toda la armadura es	
perpendicular al plano de pandeo	1
paralela al plano de pandeo	3
hay armadura en las 4 caras	1,5

Resistencia fyk del acero (Kp/cm2)	5100	
Parámetro de fluencia (epsilon)	0,004	Nota sobre el valor de epsilon

el axil cuasipermanente	Epsilon
no supera el 70% del total	0,003
supera el 70% del total	0,004

Excentricidad adicional (m)	0,290	
Excentricidad total (m)	0,927	
Axil de segundo orden (T)	**2824,67**	
Momento de segundo orden (mT)	**2617,6**	

CÁLCULO DEL MOMENTO ÚLTIMO DE LA SECCIÓN Y DIMENSIONAMIENTO DE ARMADURAS

PEDELTA, S.L.- INGENIERIA DE ESTRUCTURAS, BARCELONA

PROGRAMA DE CALCULO DE LA RESPUESTA A FLEXION
DE SECCIONES DE HORMIGON ARMADO O PRETENSADO

Referencia de la seccion:

CARACTERISTICAS DE LA SECCION

AREA	(m2)	=	4.42000
INERCIA	(m4)	=	1.06448
CANTO	(m)	=	1.700
V_SUP	(m)	=	0.850
V_INF	(m)	=	0.850
fc	(T/m2)	=	3000.000
No de Trapecios		=	301

MOMENTO RESPUESTA FRENTE A FISURACION-DESCOMPRESION

Mcrac,pos	(mT)	=	1175.65	Curvatura (m-1)=	0.000301
Mcrac,neg	(mT)	=	-1169.64	Curvatura (m-1)=	-0.000300
Mdescomp,pos	(mT)	=	893.30	Mdescomp,neg (mT)=	-888.72
Mdescomp,EC_2	(mT)	=	0.00		

CARACTERISTICAS DE LOS ACEROS

TIPO	COTA (m)	AREA (cm2)	PRESOL.	TENS_FINAL
1	0.05	104.55	0.00	-4434.78
1	0.30	104.55	0.00	-4434.78
1	1.49	104.55	0.00	4434.78
1	1.74	104.55	0.00	4434.78

RESPUESTA ULTIMA A FLEXION

AXIL CONCOMITANTE	(T)	=	-2824.67
MOMENTO ULTIMO	(mT)	=	2809.29
PROF. FIBRA NEUTRA	(m)	=	0.79
CURVATURA ULTIMA	(m-1)	=	0.004428
DEFORM. HORMIGON		=	0.003500
DEF. ACERO INF.		=	0.004204
TENS.ACERO INF.	(Kp/cm2)	=	4434.78

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PROGRAMA DE CALCULO DE LA RESPUESTA A FLEXION
DE SECCIONES DE HORMIGON ARMADO O PRETENSADO

Referencia de la seccion:

DIAGRAMA MOMENTO - CURVATURA

C(m-1)	M(mTm)	Eps_csup	Eps_sinf	X(m)	S_ACEROINF
0.000040	63.92	0.00040	-0.00033	9.968	-695.49
0.000081	142.28	0.00044	-0.00030	5.416	-621.39
0.000121	220.58	0.00047	-0.00026	3.900	-547.73
0.000242	454.80	0.00058	-0.00016	2.389	-329.41
0.000523	1003.51	0.00083	0.00008	1.594	160.80
0.000805	1359.17	0.00106	0.00034	1.318	712.91
0.001087	1625.38	0.00127	0.00062	1.167	1307.51
0.001369	1852.64	0.00147	0.00091	1.072	1921.04
0.001650	2057.35	0.00166	0.00121	1.007	2541.90
0.001932	2246.37	0.00186	0.00151	0.961	3162.36
0.002214	2421.81	0.00205	0.00180	0.927	3778.37
0.002496	2584.16	0.00226	0.00209	0.904	4380.48
0.002777	2655.22	0.00245	0.00238	0.884	4434.78
0.003059	2715.61	0.00265	0.00267	0.867	4434.78
0.003341	2770.85	0.00285	0.00296	0.853	4434.78
0.003623	2783.56	0.00302	0.00329	0.833	4434.78
0.003904	2795.09	0.00319	0.00361	0.816	4434.78
0.004186	2805.15	0.00335	0.00393	0.800	4434.78

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PROGRAMA DE CALCULO DE LA RESPUESTA A FLEXION
DE SECCIONES DE HORMIGON ARMADO O PRETENSADO

Referencia de la seccion:

MOMENTO RESPUESTA FRENTE A FISURACION-DESCOMPRESION

Mcrac,pos	(mT)	=	1175.65	Curvatura (m-1)=	0.000301
Mcrac,neg	(mT)	=	-1169.64	Curvatura (m-1)=	-0.000300
Mdescomp,pos	(mT)	=	893.30	Mdescomp,neg (mT)=	-888.72
Mdescomp,EC_2	(mT)	=	0.00		

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PROGRAMA DE CALCULO DE LA RESPUESTA A FLEXION
DE SECCIONES DE HORMIGON ARMADO O PRETENSADO

Referencia de la seccion:

VERIFICACION DE LA SECCION FISURADA

VERIFICACION DE LA SECCION FISURADA

SOLICITACIONES

AXIL (T) = -2824.670
MOMENTO (mT) = 1882.700

TENSIONES Y DEFORMACIONES

HORMIGON :

fc_sup (T/m2) = 1591.20
Eps_c = 0.001494
Prof. fibra neutra X(m) = 1.06

ACERO :

CAPA	Incr. Tension (Kp/mc2)	Eps_tot	Tension (Kp/mc2)
1	-2989.64	-0.001424	-2989.64
2	-2250.38	-0.001072	-2250.38
3	1268.47	0.000604	1268.47
4	2007.73	0.000956	2007.73

MOMENTO RESPUESTA FRENTE A FISURACION-DESCOMPRESION

Mcrac,pos	(mT) =	1316.83	Curvatura (m-1)=	0.000338
Mcrac,neg	(mT) =	-1310.09	Curvatura (m-1)=	-0.000336
Mdescomp,pos	(mT) =	893.30	Mdescomp,neg (mT)=	-888.72
Mdescomp,EC_2	(mT) =	0.00		

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PROGRAMA DE CALCULO DE LA RESPUESTA A FLEXION
DE SECCIONES DE HORMIGON ARMADO O PRETENSADO

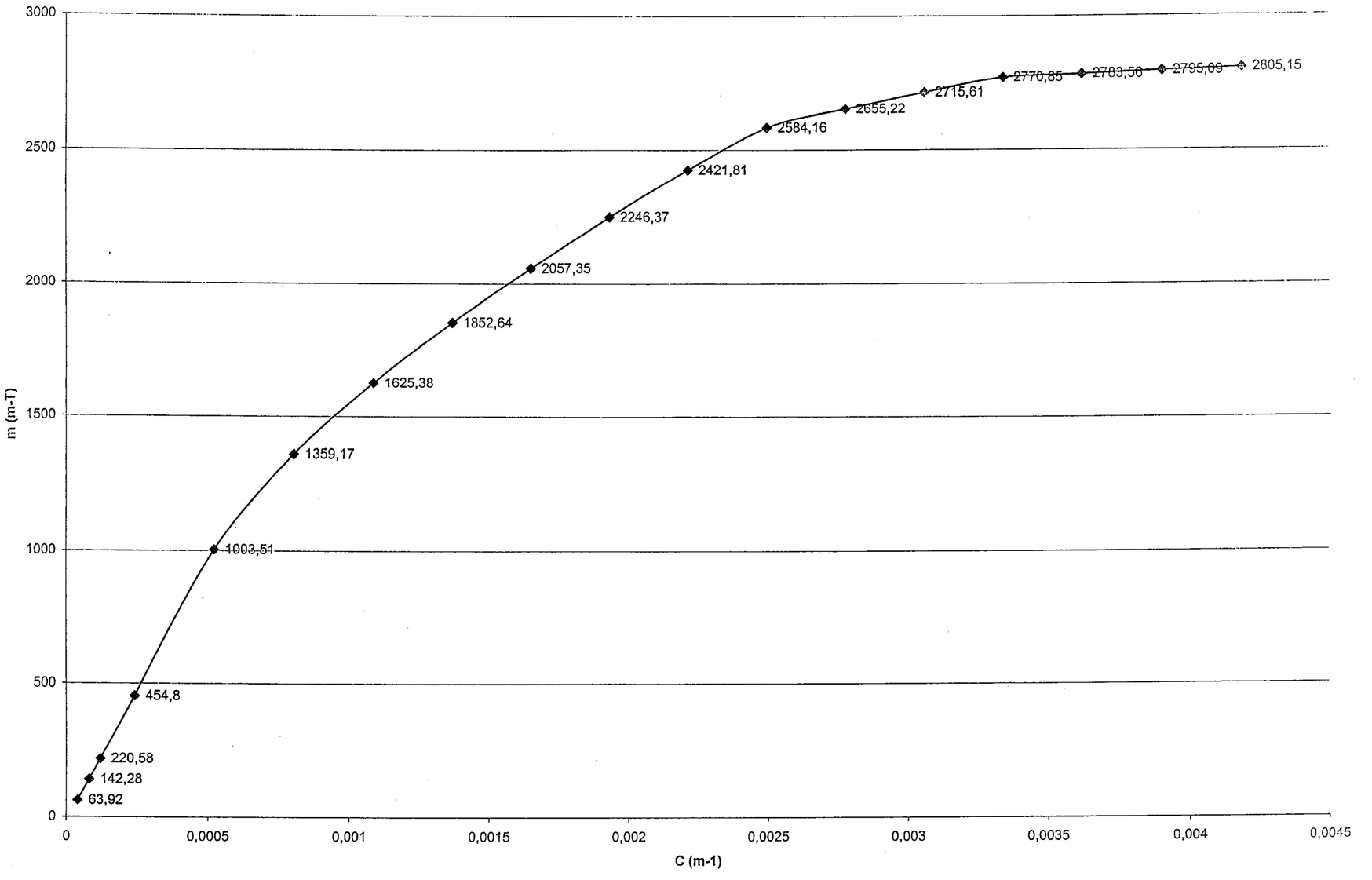
Referencia de la seccion:

MOMENTO RESPUESTA FRENTE A FISURACION-DESCOMPRESION

Mcrac,pos	(mT) =	1316.83	Curvatura (m-1)=	0.000338
Mcrac,neg	(mT) =	-1310.09	Curvatura (m-1)=	-0.000336
Mdescomp,pos	(mT) =	893.30	Mdescomp,neg (mT)=	-888.72
Mdescomp,EC_2	(mT) =	0.00		

COMPROBACION ANCHO DE FISURAS

Ssr	(Kp/cm2)	=	759.26
Acef	(m2)	=	0.650000
Sep,m	(mm)	=	139.47
Ep_s,m		=	0.000888
W,k	(mm)	=	0.21



CÁLCULO DE LONGITUDES DE ANCLAJE DE LAS BARRAS CORRUGADAS

Hilti Española S.A. Isla de Java, 35. 28034 MADRID

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Fecha / Date: 18/07/01
Página/ Page:

De / From:	OFICINA TECNICA	Fax:	+ 34 91 358 06 37
Ref.:	CO		
A / To:	PEDELTA S.L INGENIERIA CIVIL	Fax:	934940878
Att. / Att. of:	LEONARDO ROSILLO	TEL	934300094
Copia a / Copy to:		Fax:	
		Tel.:	+ 34 91 334 2335

En caso de no recibir este Fax en buenas condiciones, por favor comuníquelo al
If you should not receive this transmission in good shape please call:

ASUNTO: FIJACIÓN DE CORRUGADOS CON RESINA HILTI HIT RE500
OBRA:

Estimado cliente:

De acuerdo con su consulta nos es grato remitirle nuestra recomendación.

En la documentción adjunta se han recogido los datos facilitados por usted, la justificación de la solución con anclajes más adecuada calculada según la información técnica de HILTI y todos los datos necesarios para su correcta ejecución en obra.

Todos los cálculos se han realizado bajo las siguientes hipótesis:

1. Material base: Hormigón HA-30, sin fisuras, de resistencia característica a compresión $f_{ck} \geq 300$ Kp/cm^2.
2. Corrugado de acero B 500 S de límite elástico $f_{yk} \geq 5100$ Kp/cm^2 y diámetro ∅ 32
3. Taladro efectuado a rotación con equipo de diamante o con martillo rotopercutor y limpieza del mismo tal y como figura en el procedimiento de colocación adjunto
4. La transmisión de las fuerzas del anclaje al hormigón requiere un dimensionamiento adecuado de estos elementos como estructuras de hormigón armado. Se indican sólo datos relativos a la armadura conectada con resina, entendiendo que en la zapata se dispondrá el resto de la armadura necesaria para el correcto funcionamiento del conjunto y que ha de ser prevista por el autor del proyecto o dirección facultativa de la obra.

Recordamos que la OFICINA TECNICA DE HILTI, facilita asesoramiento sobre aplicaciones con productos Hilti, si bien la idoneidad o no de las mismas debe ser verificada por el autor del proyecto o dirección facultativa de la obra.

Esperando haberle sido útiles quedamos a su disposición para esta o cualquier otra consulta que pueda necesitar.

Oficina Técnica
Hilti Española, S. A.

Hilti Española S.A. Isla de Java, 35. 28034 MADRID

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DATOS

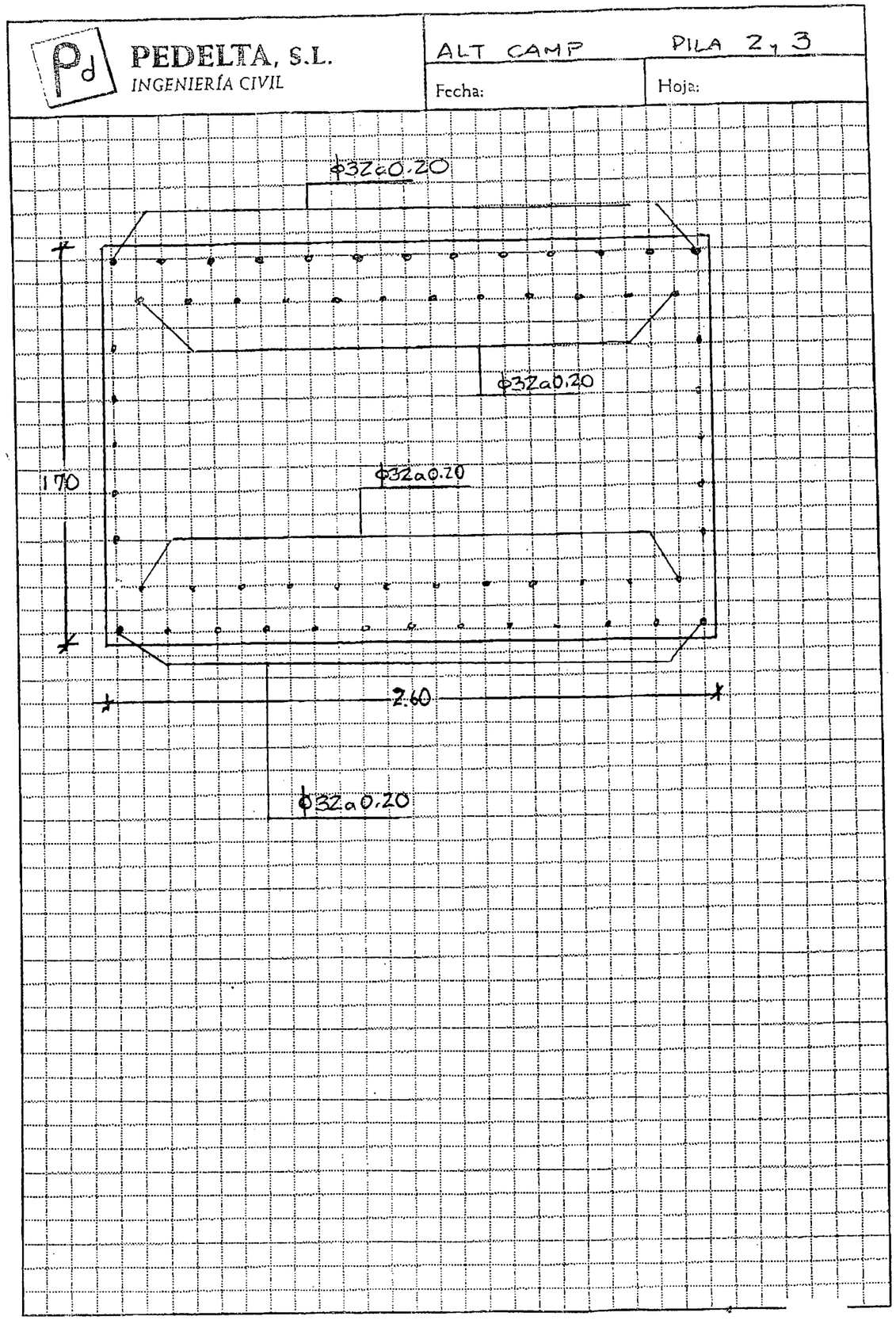
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DATOS FACILITADOS POR EL CLIENTE:

- DISPOSICIÓN EN PLANTA DE LOS CORRUGADOS Y GEOMETRÍA DE LA ZAPATA SEGÚN CROQUIS ADJUNTO
- CARACTERISTICAS DEL MATRIAL BASE:

  ZAPATA DE HORMIGÓN DE fck>= 30 MPa

  ESPESOR DE LA ZAPATA ≥2000 mm



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DATOS DE COLOCACION

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DATOS DE COLOCACIÓN:

HIT RE500 + ∅ 32

D: Diámetro del taladro en el material base	=	40 mm
E: Profundidad del taladro en el material base	=	1800 mm
B: Espesor mínimo del material base	=	----- mm

La disposición de corrugados en planta y alzado así como las separaciones entre ellos están recogidas en el croquis adjunto, según la información facilitada por ustedes.

La resina RE500 se puede colocar tanto en taladros efectuados con diamante como en taladros realizados con martillo percutor. Se deben limpiar bien los agujeros y procurar que esten secos. Si se colocara en taladros húmedos la resistencia se reduciría en un 30%. Posteriormente, se inyecta la resina rellenando los 2/3 del taladro y se introducirá el corrugado con una ligera rotación para facilitar su correcta distribución por todo el redondo.

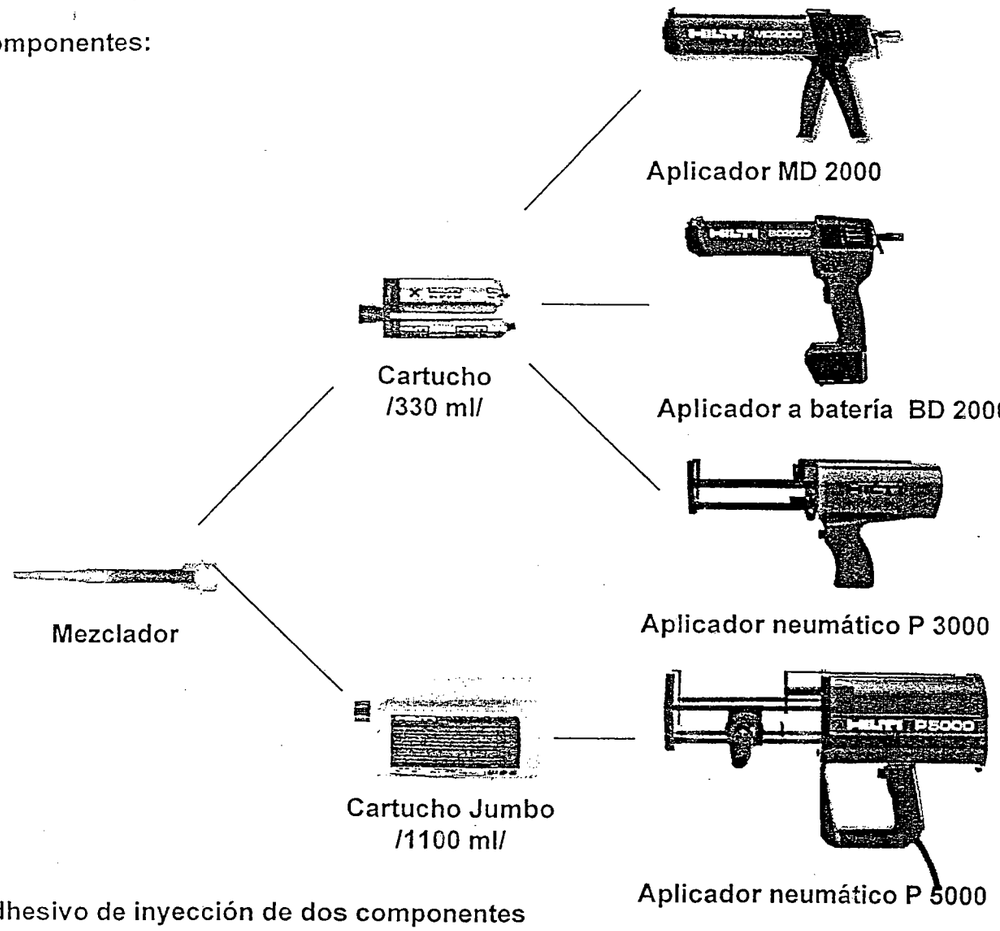
Para cualquier duda o aclaración pueden ponerse en contacto con el comercial de su zona de trabajo o con el departamento técnico de HILTI ESPAÑOLA S.A.

I. Información de Producto Hilti HIT-RE 500

1. El completo sistema de inyección bajo diferentes condiciones de aplicación.

El sistema de inyección Hilti HIT-RE 500 ha sido pensado para ser seguro y fácil de aplicar, dando como resultado fijaciones de alta calidad.

Componentes:



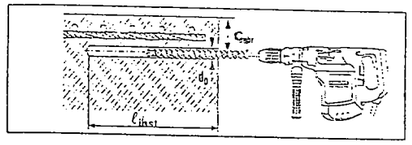
2. Adhesivo de inyección de dos componentes

Hilti HIT-RE 500 es un adhesivo con alta capacidad para la fijación a posteriori de armaduras en hormigón armado y varillas roscadas para efectuar anclajes en hormigón. Su innovadora fórmula asegura:

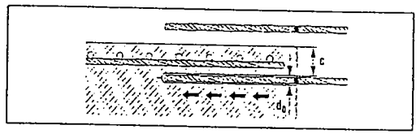
- **Prestaciones:**
  - Altos valores de carga en un gran rango de diámetros (8 a 40 mm)
  - Trabajo óptimo para un rango de temperaturas de entre –5 y + 40°C
  - Posibilidad de hacer los taladros usando equipos de diamante, taladros a rotopercusión, taladros neumáticos
  - Poco sensible a taladros húmedos y de diámetro mayor al necesario
  - Color rojo para comprobar fácilmente la correcta colocación
  - Apoyo técnico de fácil entendimiento para rapidez en el diseño

Manual de técnicas de fijación
B 2.11 Corrugados–Armadura colocada a posteriori

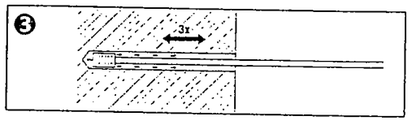
7. Procedimiento de ejecución para corrugados en taladros de gran profundidad



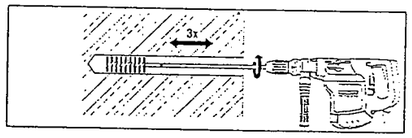
Determine la posición de la armadura existente.
Mantenga la distancia c al eje del plano de la armadura existente.
Mantenga el taladro alineado con el borde y con la armadura existente.



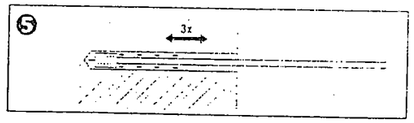
Marque la profundidad de empotramiento en la barra (l_{inst}) p.ej. con cinta.
Compruebe la profundidad (l_v) y que la barra entra fácilmente en el taladro.



Limpie el taladro con aire comprimido introduciendo el prolongador hasta el fondo (presión del aire ≥ 6 bar. o 90 psi).



Limpie el taladro con el cepillo usando un prolongador de según la profundidad del mismo



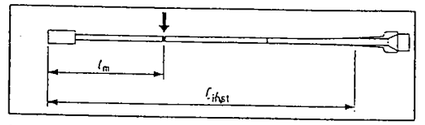
Limpie con aire comprimido.



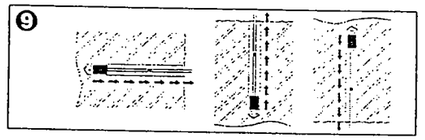
Use prolongador según la profundidad del taladro.



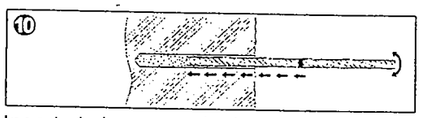
Ponga el pistón de repulsión en la boquilla del mezclador.



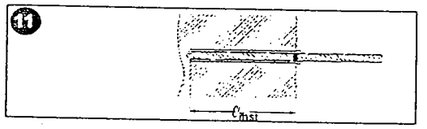
Marque la profundidad de inyección (l_m) en el prolongador.



Inyecte el mortero desde el fondo del orificio evitando la formación de bolsas de aire.



Inserte la barra en el taladro con un continuo movimiento rotatorio.



Control de colocación:
- Sale mortero del taladro.
- La marca de colocación es visible en la superficie del hormigón.

Máxima profundidad de empotramiento recomendada para cada aplicador

max l_{inst} [cm]			Mezclador	Prolongador del mezclador
MD2000 P3000	BD2000	P5000		
70	70		HIT-RE-M	HIT-EXT 9/1000
		200		HIT-EXT 16/700

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JUSTIFICACIÓN DEL CALCULO

CALCULO DE LA LONGITUD BASICA .

1. INTRODUCCIÓN.

El diseño de la fijación (empotramiento del corrugado en la zapata) debe seguir los criterios de "hormigón armado" y no la teoría de anclajes en hormigón en masa, dado que el material base (zapata) ha sido diseñada para cumplir los requisitos de transferencia de carga del código de hormigón armado.

2. HIPÓTESIS DE CALCULO

- Materiales:

  Hormigón: HA 30 / P / 20 / IIIa γ_c=1.5 (C30/37)

  Acero: B 500 S γ_s=1.15

- Según el manual Hilti B2.11 la tensión de adherencia característica de la resina HIT RE-500 para un hormigón C20/25, diámetro de corrugado ∅32, taladros realizados a rotopercusión o con diamante y en hormigones húmedos es:

  τ_{bk}= 7.7 MPa.

- El coeficiente de mayoración de la tensión de adherencia por tener un hormigón C30/37 es:

  γ_B=1.06

- El coeficiente parcial de seguridad es:

  $\gamma_{mc,N} = \gamma_c \times \gamma_{mc,2} = 1.5 \times 1.44 = 2.16$

  donde:

γ_c= coeficiente parcial de seguridad de hormigón (tabla 5.3 EC2)

$\gamma_{mc,2}$= tiene en cuentea la ejecución del taladro y que éste no esté perfectamente limpio

- Por tanto la tensión de adherencia de diseño es:

250 kg/cm² = 25 MPa

$$\tau_{bd}=(\tau_{bk} \times \gamma_B) X\ 1/\gamma_{mc,N} = 3.77 \text{ MPa}$$

- No obstante, debido a la posible existencia de esfuerzos dinámicos frente a los cuales el comportamiento de la resina RE- 500 es adecuado si el fallo de la fijación esta gobernada por la rotura dúctil del acero, es necesario considerar un coeficiente de minoración de la tensión de adherencia. Adoptamos el valor γ_d=1.4 para dicho coeficiente. Tomaremos, por tanto, una tensión de adherencia τ_{bd}= **$3.77/\gamma_d$=2.7 MPa.**

3. CALCULO DE LA LONGITUD BASICA EN PROLONGACIÓN RECTA .(l_b)

$$A_S \times f_{yu} = \prod x \varnothing \times l_b \times \tau_{bd} \Rightarrow$$

$$l_b = (A_s \times f_{yu})\ x1/(\varnothing \times \prod \times \tau_{bd})$$

Donde:

- $A_s = \prod \times 32^2\ x1/4 = 804.2\ mm^2$
- f_{yu} = 600 MPa
- $\varnothing$ = 32 mm
- τ_{bd}=2.7 Mpa
- $\prod$=3.14

Por tanto :

l_b=(804.2 x 600) x1/(32 x 3.14 x 2.7)=1778.5 mm

ADOPTAMOS: l_b = 1.8 m

U.T.E.

ALT CAMP

DRAGADOS - TECSA

CÁLCULO DEL ESTRIBO 2 DE LA ESTRUCTURA E-1

PEDELTA, S.L.
INGENIERÍA CIVIL

BARCELONA,
OCTUBRE 2001

CÁLCULO DEL ESTRIBO 2 DE LA ESTRUCTURA E-1

ÍNDICE DEL ANEJO DE CÁLCULO

1 ANTECEDENTES

2 ACCIONES, MATERIALES, COEFICIENTES DE SEGURIDAD Y NORMATIVAS

- 2.1 Acciones
- 2.2 Coeficientes de seguridad, materiales, niveles de control y normativas
- 2.3 Ambientes, recubrimientos, fisuración y cuantías mínimas
- 2.4 Hipótesis de combinación de esfuerzos

3 ESTRIBO 2

- 3.1 Geometría
- 3.2 Acciones en coronación
- 3.3 Cálculo de esfuerzos y dimensionamiento

1 ANTECEDENTES

A petición del ingeniero Sr. D. José Miguel González de la Unión Temporal de Empresas Dragados - Tecsa se redacta el presente documento donde se justifican las dimensiones y armado del estribo 2 de la estructura 1 del subtramo V del tramo Lleida-Martorell de la línea de alta velocidad Madrid-Barcelona-Frontera francesa.

Los cálculos de los diferentes elementos de la infraestructura del viaducto están basados en las reacciones del tablero suministradas por la empresa Research & Concrete.

2 ACCIONES, MATERIALES, COEFICIENTES DE SEGURIDAD Y NORMATIVAS

2.1 ACCIONES

En el cálculo de los elementos estructurales se han considerado las siguientes acciones:

Acciones permanentes (G):

g1, PESO PROPIO.

El peso propio de los distintos elementos se ha calculado a partir de su geometría (secciones transversales) adoptando una densidad de valor γc =2.5 T/m3.

g2, PESO DEL BALASTO Y CARGAS MUERTAS

Las cargas permanentes distintas del propio peso del tablero son las siguientes:

- Balasto.
- Vías y traviesas.
- Conductos de cableado y paseos.
- Soportes de catenarias.
- Impostas y barandillas.

El peso de balasto sobre el tablero se calcula a partir de la plataforma en la estructura de vía tomando como densidad $\gamma = 1.6$ t/m^3

Se obtiene $g_{2,\,balasto} = 10.75$ T/m.

De acuerdo con las bases de cálculo se adoptarán para esta carga los siguientes valores característicos superior e inferior:

valor inferior (0.70 x peso medio) g2, bal, inf = 7.53 T/m de tablero
valor superior (1.30 x peso medio) g2, bal, sup = 13.98 T/m de tablero

Se consideran dos hipótesis de desbalastado.

- 50% de una vía en toda su longitud.
- 100% de una vía sobre 15 metros.

El peso de vías y traviesas para la plataforma con doble vía es:

$g_{2,vías+traviesas} = 2 \times (0.52 + 0.12) = 2 \times 0.64 = 1.28$ T/m de tablero
(trav) + (carril)

El peso de los conductos para cableados y zona de paseos es:

$g_{2,conductos} = 0.3$ T/m (peso de 1 canaleta)

El peso de la imposta y barandilla es:

Se toma $g_{2,imposta+barandilla} = 1.4$ T/m, de acuerdo a la sección tipo de plataforma.

	g2, medio (T/m)	g2, sup (T/m)	g2, inf (T/m)
Balasto	10.75	13.98	7.53
Vías y traviesas	1.28	1.28	1.28
Conductos cableado	0.60	0.60	0.60
Imposta y barandillas	1.40	1.40	1.40
	14.03 T/m	**17.26 T/m**	**10.81 T/m**

Tabla 1. Carga permanente, g2

ACCIONES DEBIDAS AL TERRENO

Carga sobre zapatas y empuje de las tierras en alzados de estribos y aletas, con una densidad 2,0 T/m^3 y un ángulo de rozamiento interno de 30 ° (con presiones horizontales correspondientes a un empuje con coeficiente de empuje activo Ka= 0.33). En el trasdós de estribos se coloca una sobrecarga de uso de 3 T/m^2.

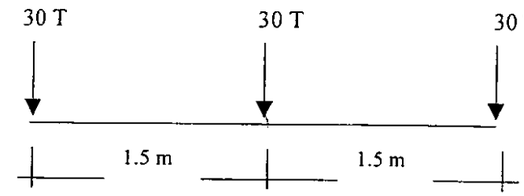
SOBRECARGAS DE USO. COMPONENTES VERTICALES.

Se utilizará la envolvente de esfuerzos debidos a los trenes de carga de IPF-75 y del Eurocódigo 1 (parte 3, acciones en puentes) EC1-3 tomando como coeficiente de impacto se adoptará en cada caso el que corresponda.

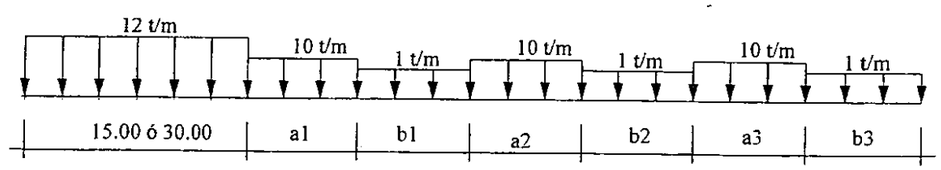
Los coeficientes de impacto no afectan al cálculo de apoyos, pilas y estribos, salvo aquellos casos en que la unión tablero-estructura sea de tipo rígido. Esto conduciría a que el coeficiente de impacto afectaría a la subestructura para las fuerzas de frenado, transmitida al estribo a través del tope rígido longitudinal, y fuerza centrífuga, transmitida a través de apoyos tipo POT guiados. No obstante, la presencia del balasto supone una liberación en la rigidez de la transmisión de las fuerzas horizontales a los apoyos y topes, por lo que no se considera el coeficiente de impacto para estas acciones.

De acuerdo con la normativa IPF-75 Existen dos trenes de carga

Tipo A Por cada vía: Q_A = 3 ejes de 30 T separados 1.50 m



Tipo B Por cada vía: Sobrecarga uniforme de 12 T/m sobre 15 ó 30 metros, más un conjunto de cuchillos de carga de 10 T/m y 1 T/m de longitud arbitraria.

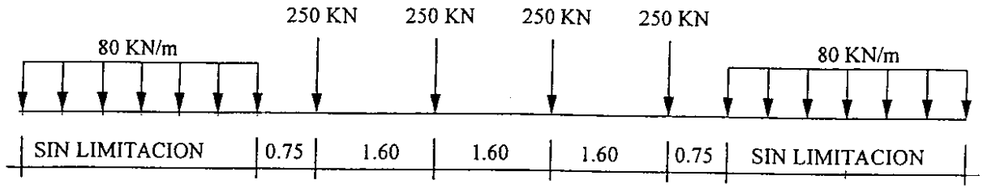


El tren tipo A suele condicionar el trabajo local de reparto de la losa y el tren tipo B condiciona el dimensionamiento general de la mayor parte de los Estados Límites Últimos o de Servicio.

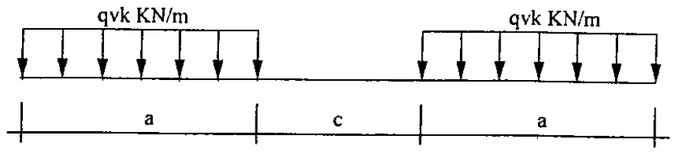
No se admite reducción de cargas por simultaneidad entre ambas vías. En cualquier caso se debe contemplar la posibilidad de un ripado de la vía respecto al eje teórico de 0.30 m.

El tren de cargas de Eurocódigo 1 (parte 3, acciones en puentes) EC1-3 se define de acuerdo con las configuraciones indicadas en las 2 figuras siguientes. En ambos casos, a efectos de cálculo se contemplará un eventual ripado de la vía de 0.30 m.

Tren tipo 71



Modelo de carga SW



Se considera adicionalmente un tren pesado equivalente al siguiente esquema de cargas (SW/0) ó (SW2) en una de las vías y el tren estandar tipo 71 en la otra vía.

	SW0	SW2
Q_{vk} (kN)	133	150
a (m)	15	25
b (m)	5,3	7

De acuerdo con la IPF-75, para algunas comprobaciones específicas asociadas a combinaciones de carga con viento transversal se considerará un tren sin carga de 12.5 KN/m.

En los paseos laterales se contemplará una sobrecarga sobrecarga de uno de 0.4 T/m^2, sólo el 50 % dicha carga es compatible con el tráfico ferroviario.

SOBRECARGAS DE USO. COMPONENTES HORIZONTALES.

ROZAMIENTO APARATOS DE APOYO

Dado el tipo de aparato de apoyo tipo POT que se utilizan, en el cual el desplazamiento longitudinal es libre, consideraremos un 5% de la reacción vertical como fuerza máxima horizontal sobre el aparato de apoyo.

ACCIONES CLIMÁTICAS

- *VIENTO*

Al estar la estructura ubicada en la zona de costa de la provincia de Tarragona la velocidad de cálculo se puede determinar a partir de una velocidad de referencia de Vref=28 m/s corregida con los siguientes parámetros multiplicadores:

Ct = factor de topografía

Cr = factor de riesgo (se toma un periodo de retorno de 100 años)

Cz = factor de altura (se adopta un entorno Tipo II, zona rural plana con algunos obstáculos)

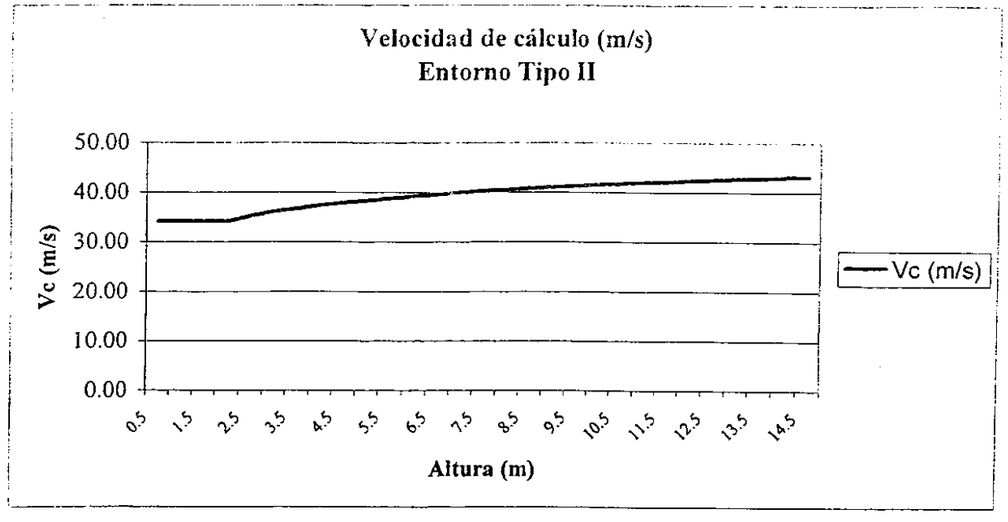
Cg = factor de ráfaga

$$Cz = Kz \ln(\frac{z}{zo}) \quad si \quad z \geq z_{min}$$

$$Cz = Kz \ln(\frac{z_{min}}{zo}) \quad si \quad z \leq z_{min}$$

$$Cg = \sqrt{\left(1 + \frac{7Kz}{CzCt}\right)}$$

Vref=28 m/s, Ct=1.0 y Cr=1.04



Para un entorno Tipo II

Kz= 0.19 zo = 0.05m zmin = 4 m

Para determinar el empuje de viento sobre el tablero, la velocidad de cálculo es:

$$Vc = Ct \cdot Cr \cdot Cz \cdot Cg \cdot Vref = 50.2 \text{ m/s}$$

Por lo que el empuje horizontal ejercido por el viento en el tablero es:

$$F = C_D \cdot A \cdot (1/2 \rho V_c^2) = 0.45 \text{ T/m}$$

Cuando se combina con la sobrecarga se reduce en un 50% esta acción.

- ***NIEVE***

Según al IAP (y el borrador de la nueva IPF) se debe aplicar una carga de nieve sobre la superficie de tablero en la que no se considere sobrecarga de uso. Para el cálculo del tablero se considera la posibilidad de tener sobrecarga en toda su superficie, por lo tanto no es necesario aplicar la sobrecarga de nieve.

2.2 COEFICIENTES DE SEGURIDAD, MATERIALES, NIVELES DE CONTROL Y NORMATIVAS

HORMIGONES

- Hormigón de Limpieza..... HM-15
- Cimentación..... HA-25 / B / 20 / IIa
- Alzado de estribo..... HA-30 / B / 20 / IIa

Control del hormigón NORMAL

γc= 1.50 (Situación persistente o transitoria)
γc= 1.30 (Situación accidental)

ACEROS

- Acero corrugado para la armadura pasiva B500S, con f_{yk} > 500MPa (5100kp/cm^2)

Control de los aceros NORMAL

γs= 1.15 (Situación persistente o transitoria)
γs= 1.0 (Situación accidental)

CONTROL DE EJECUCIÓN

El control de ejecución será INTENSO (γ_g= 1.35 y γ_{fq}= 1.50) de acuerdo con las especificaciones de la normativa EHE.

NORMATIVAS Y BASES DE CÁLCULO

Para el establecimiento de acciones y las combinaciones necesarias para la obtención de las solicitaciones de cálculo que se emplearán en la comprobación de los diferentes Estados Límite se realizarán los cálculos empleando la normativa IPF-75 y los criterios especificados en los Eurocódigos, adoptándose el más desfavorable de ambos.

Cálculo según IPF-75

Para el cálculo de las acciones se utilizarán las siguientes instrucciones.

- Instrucción relativa a las acciones a considerar en el Proyecto de Puentes de Ferrocarril", correspondiente a la O.M. 25 de Junio de 1.975 (IPF-75).

- Norma de construcción Sismorresistente: Parte general y edificación (NCSE-94)" R.D. 29 de Diciembre de 1.994.

Para el cálculo de las acciones ambientales se utilizará la siguiente instrucción.

- Instrucción relativa a las acciones a considerar en el proyecto de puentes de carretera IAP, aprobada Orden de12 de febrero de 1998.

- Instrucción para el proyecto de estructuras de hormigón estructural EHE, aprobada por el Real Decreto 2661/1998 de 11 de diciembre.

- Normativa Sismoresistente NCSE-94.

- Instrucción relativa a las acciones a considerar en el proyecto de Puentes de Carreteras I.A.P. 12 de Febrero de 1998.

Para establecer las hipótesis y combinaciones de cálculo y sus correspondientes coeficientes de ponderación se utilizarán las siguientes Instrucciones:

- Instrucción de Hormigón Estructural (EHE) R.D. 2661/1998 de 11 de Diciembre.

Cálculo según Eurocódigos y EHE

- Eurocódigo 1: *Bases de proyecto y acciones. Parte 3. Cargas de tráfico en puentes*. UNE-ENV 1991-3. Octubre 1997. (EC1.1.3.)

Para establecer las hipótesis y combinaciones de cálculo y sus correspondientes coeficientes de ponderación se utilizarán las siguientes Instrucciones:

- Eurocódigo 1: *Bases de proyecto y acciones en estructuras. Parte 1; Bases de proyecto.* UNE-ENV 1991-1, Octubre 1997 (EC1.1)

Para dimensionamiento y comprobación de secciones se actuará, en todo momento, de acuerdo con la normativa española;

- Instrucción de Hormigón Estructural EHE. R.D. 2661/1998 de 11 de Diciembre

Para el análisis de la interacción vía-estructura se empleará la siguiente norma:

- Norma U.I.C. Ficha 774.3 R. 1ª edición. Febrero 1999 (U.I.C. 774.3).

Subsidiariamente, y en lo no contemplado en las normas anterioriores se emplearán las siguientes:

- Norma UIC. Ficha 776.1. 3ª edición. 1 de Julio de 1.979. (U.I.C. 776.1)

- Norma UIC. Ficha 774-2. 1ª Edición. 1 de Julio de 1.974. (U.I.C. 774.2)

- Norma UIC. Ficha 702.0. 2ª Edición. 1 de Enero de 1.974. (U.I.C. 702.0)

2.3 AMBIENTES, RECUBRIMIENTOS, FISURACIÓN Y CUANTÍAS MÍNIMAS

De acuerdo con la normativa EHE se consideran los ambientes indicados en la tabla siguiente.

Elemento	Ambiente	Recubrimiento de Armadura pasiva (mm)	Límite de abertura de fisura Wmax (mm)	
			Hormigón armado	Hormigón postesado
Alzados de estribos	IIa	30	0.3	-
Cimentaciones	IIa	30	0.3	-

Las cuantías mínimas de armadura pasiva B500S serán las expuestas en la siguiente tabla (EHE, art. 4.3.5)

Elemento	Posición	Tipo	Cuantía geométrica o/oo
Zapatas	cara superior o inferior	transversal o longitudinal	0.90
Alzados de estribos y aletas (1)	horizontal	lado tierras	1.07
		lado visto	2.13
	vertical	lado tierras	0.90
		lado visto	0.30

(1) las cuantías geométricas horizontales se pueden reducir un 50 % si se colocan juntas de contracción distanciadas menos de 7,5 m.

2.4 HIPÓTESIS DE COMBINACIÓN DE ESFUERZOS

Se han considerado las combinaciones de hipótesis de las acciones recogidas en la Normativa EHE, basados en la teoría de Estados Límites, para las distintas situaciones de cálculo de la estructura.

2.4.1 ESTADOS LÍMITES ÚLTIMOS

Las hipótesis de cálculo consideradas son:

- Situaciones persistentes o transitorias

$$\sum_{j \geq 1} \gamma_{Gj}\, G_{kj} + \sum_{j \geq 1} \gamma_{Gj}\, G^*_{kj} + \gamma_{Q1}\, Q_{k1} + \sum_{i > 1} \gamma_{Qi}\, \Psi_{0i}\, Q_{ki}$$

- Situaciones accidentales

$$\sum_{j \geq 1} \gamma_{Gaj}\, G_{kj} + \sum_{j \geq 1} \gamma_{Gj}\, G^*_{kj} + \gamma_A\, A_k + \Psi_{11}\, Q_{k1} + \sum_{i > 1} \gamma_{Qi}\, \Psi_{2i}\, Q_{ki}$$

- Situaciones accidentales de sismo

$$\sum_{j \geq 1} G_{kj} + \sum_{j \geq 1} \gamma_{Gj}\, G^*_{kj} + \gamma_i\, A_{Ed} + \sum_{i > 1} \gamma_{Qi}\, \Psi_{2i}\, Q_{ki}$$

donde:

G = Valor característico de las cargas permanentes.
G^* = Valor característico de las cargas permanentes de valor no constante.
Q_{k1} = Valor característico de la carga variable dominante.
A_k = Valor característico de la acción accidental
A_{eq} = Valor característico de la acción sísmica, calculado según la Norma Sismorresistente.

Los coeficientes de seguridad y de combinación de acciones empleados se definen en la EHE.

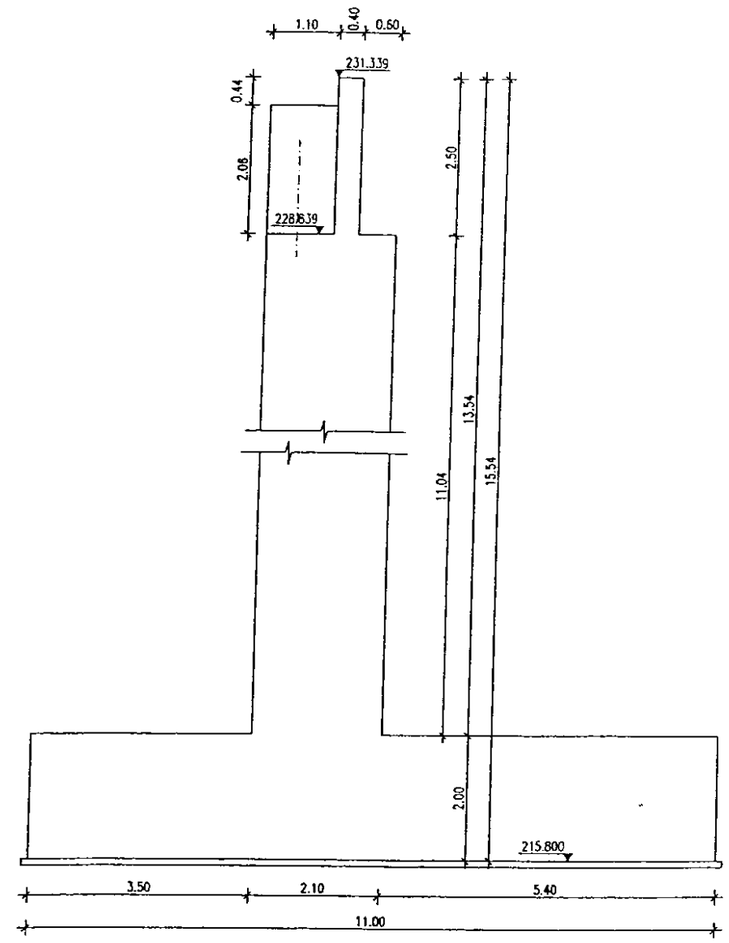
Barcelona, Octubre del 2001

Fdo. Leonardo A. Rosillo
Ing. Civil Msc

Fdo: Juan A. Sobrino Almunia
Dr. Ingeniero de Caminos

3. ESTRIBO 2

3.1 GEOMETRÍA



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Obra: CAMP | ESTRIBO 2
Data: | Full.

3.2 ACCIONES EN CORONACIÓN

g_1 = 78.140 × 2 =		156.28 T
g_2, balasto sup =	66.25 T × 2 =	132.50 T
g_2, balasto inf =	43.01 T × 2 =	86.02 T
Tierra máxima =	88.07 T × 2 =	176.14 T
Sobrecarga acera con =	2.707 × 2 =	5.40 T

Rmín = 288.78 T/ESTRIBO

Rmáx = 473.72 T/ESTRIBO

FUERZAS HORIZONTALES H = 32 T/ml (FRENADO)

3.3 CÁLCULO DE ESFUERZOS Y DIMENSIONAMIENTO

El cálculo y dimensionamiento de los estribos se detalla en las páginas siguientes. Las hipótesis de cálculo se exponen a continuación:

1. El cálculo se realiza en la hipótesis clásica de muro con acciones en coronación debidas a las reacciones horizontales y verticales transmitidas por el tablero. Los empujes del terreno se han calculado para un coeficiente de empuje activo Ka= 0,33 y una densidad del terreno de 2,0 T/m^3. No se han considerado eventuales empujes hidrostáticos al colocar un adecuado drenaje en el trasdós del estribo.

2. En el cálculo de la seguridad del estribo frente a vuelco, deslizamiento y tensiones máximas se han verificado las siguientes condiciones (ver resultados en listados de cálculo).

   Coeficiente de seguridad al vuelco: $CS,v \geq 1,80$

   Coeficiente de seguridad al deslizamiento: $CS,d \geq 1,50$

   Tensión máxima del terreno en puntera: $\sigma_{máx} \leq 1,33\ \sigma_{admisible}$

   siendo la $\sigma_{admisible}$ = **3,5 kp/cm^2** y el coeficiente de rozamiento terreno-zapata μ = **0,55**.

3. El dimensionamiento de las armaduras de flexión y cortante del muro y zapata se realiza con los criterios de la Normativa vigente para estructuras de hormigón (EHE). Los coeficientes de seguridad de las acciones corresponden con un **nivel de control intenso** γ_{fg} **=1,35 y** γ_{fq} **=1,50.**

PROGRAMA DE CALCULO DE ESTRIBOS DE PUENTES

REFERENCIA ESTRIBO: ALT CAMP ESTRIBO 2 VIADUCTO 1

DATOS DE GEOMETRIA (CROQUIS)

B1	B2	B3	B4	B5	B6	B7	B8	B9	(m)
1.10	0.40	0.60	2.10	0.00	0.50	3.50	2.10	5.40	

H	H1	H2	H3	H4	H5	H6	H7	(m)
15.57	1.70	1.00	0.00	0.00	2.00	2.35	0.35	

ANCHO DEL ESTRIBO (m) = 14.00
ANCHO DE LA ZAPATA (m) = 14.40
NUMERO DE APOYOS = 2

DATOS DE ACCIONES

REACCION MAXIMA (T/m) = 33.98
REACCION MINIMA (T/m) = 20.63
FZA. HORIZONTAL MAXIMA (T/m) = 2.51
FZA. HORIZONTAL CON FRENADO (T/m) = 1.49
FZA. HORIZONTAL SIN SOBRECARGA (T/m) = 1.49
SOBRECARGA EN TERRAPLEN (T/m) = 3.00

DATOS DEL TERRENO

ANGULO DE ROZAMIENTO INTERNO = 30.00
DENSIDAD DEL TERRENO (T/m3) = 2.00
COEF. DE EMPUJE HORIZONTAL = 0.33
COEF. DE ROZAMIENTO ZAPATA-TERRENO = 0.55
ALTURA DE TIERRAS SOBRE LA PUNTERA (m) = 7.00

$\sigma_{adm} = 3.5$ Kp/cm²

$\sigma_{max,punt.} = 1.33\ \sigma_{adm} = 4,66$ Kp/cm²

REFERENCIA ESTRIBO: ALT CAMP ESTRIBO 2 VIADUCTO 1

VERIFICACION DE LA ZAPATA

CALCULO DE PESOS Y MOMENTOS RESPECTO AL PARAMENTO DE LA PUNTERA

VOL. HORMIGON	MASA	DISTANCIA	MOMENTO
1	2.70	4.80	12.96
2	0.00	5.00	0.00
3	0.00	4.55	0.00
4	0.00	0.00	0.00
5	57.07	4.55	259.66
6	55.00	5.50	302.50

VOL. TIERRAS	MASA	DISTANCIA	MOMENTO
1	32.40	8.00	259.20
2	0.00	8.30	0.00
3	0.00	0.00	0.00
4	58.70	10.10	592.74
5	49.00	1.75	85.75

TENSIONES MAXIMAS EN EL TERRENO

HIPOTESIS DE MAXIMA FUERZA HORIZONTAL:

REACCION VERTICAL SOBRE LA ZAPATA (T/m) = 306.85
EXCENTRICIDAD DE LA REACCION RESP. PUNTERA (m) = 4.25

TENSION EN PUNTERA SMAX (T/M2) = 45.63 ✓
TENSION MINIMA EN TALON SMIN (T/M2) = 8.61
LONGITUD DE CONTACTO ZAPATA-SUELO (m) = 11.00

HIPOTESIS CON FUERZA HORIZONTAL FRENADO + TEMP. + EFECT. DIF.:

REACCION VERTICAL SOBRE LA ZAPATA (T/m) = 300.17
EXCENTRICIDAD DE LA REACCION RESP. PUNTERA (m) = 4.30

TENSION EN PUNTERA SMAX (T/M2) = 43.94 ✓
TENSION MINIMA EN TALON SMIN (T/M2) = 9.15
LONGITUD DE CONTACTO ZAPATA-SUELO (m) = 11.00

HIPOTESIS CON FUERZA HORIZONTAL TEMP. + EFECT. DIF.:

REACCION VERTICAL SOBRE LA ZAPATA (T/m) = 293.49
EXCENTRICIDAD DE LA REACCION RESP. PUNTERA (m) = 4.40

TENSION EN PUNTERA SMAX (T/M2) = 41.55 ✓
TENSION MINIMA EN TALON SMIN (T/M2) = 10.33
LONGITUD DE CONTACTO ZAPATA-SUELO (m) = 11.00

REFERENCIA ESTRIBO: ALT CAMP ESTRIBO 2 VIADUCTO 1

COEFICIENTE DE SEGURIDAD FRENTE A DESLIZAMIENTO

HIPOTESIS DE MAXIMA FUERZA HORIZONTAL:

EMPUJE HORIZONTAL (T/m) = 85.14
ROZAMIENTO ZAPATA SUELO (T/m) = 195.50

COEF. DE SEGURIDAD A DESLIZAMIENTO = 2.30 ✓

HIPOTESIS CON FUERZA HORIZONTAL TEMP. + EFECT. DIF.

EMPUJE HORIZONTAL (T/m) = 84.12
ROZAMIENTO ZAPATA-SUELO (T/m) = 188.15

COEF. DE SEGURIDAD A DESLIZAMIENTO = 2.24 ✓

Se ha tomado el coeficiente de empuje al reposo para la puntera

COEFICIENTE DE SEGURIDAD FRENTE A VUELCO

HIPOTESIS DE MAXIMA FUERZA HORIZONTAL:

MOMENTO ESTABILIZADOR (mT/m) = 1872.94
MOMENTO VOLCADOR (mT/m) = 451.15

COEF. DE SEGURIDAD AL VUELCO = 4.14

HIPOTESIS CON FUERZA HORIZONTAL FRENADO + TEMP. + EFECT. DIF.:

MOMENTO ESTABILIZADOR (mT/m) = 1872.94
MOMENTO VOLCADOR (mT/m) = 438.75

COEF. DE SEGURIDAD AL VUELCO = 4.27 ✓

HIPOTESIS CON FUERZA HORIZONTAL TEMP. + EFECT. DIF.:

MOMENTO ESTABILIZADOR (mT/m) = 1819.53
MOMENTO VOLCADOR (mT/m) = 438.75

COEF. DE SEGURIDAD AL VUELCO = 4.15

REFERENCIA ESTRIBO: ALT CAMP ESTRIBO 2 VIADUCTO 1

CALCULO DE ESFUERZOS CARACTERISTICOS EN SECCIONES CRITICAS

SECCION	Z zap	AXIL	FLECTOR	CORTANTE	ARMADURAS (cm2) Compr.	Tracc.
MURETE		2.70	5.28	5.08	0.0	6.0
APOYO LOSA		5.79	5.78	5.08	0.1	15.0
	10.87	49.68	24.67	7.58	0.7	31.6
		50.14	8.22	0.47		
	9.78	45.89	34.70	10.93	0.8	31.6
		33.03	22.25	6.57		
	8.70	51.09	48.86	15.17	0.9	31.6
		37.74	37.90	12.66		
	7.61	56.80	68.00	20.13	1.0	31.6
		43.45	56.87	18.76		
	6.52	62.51	92.95	25.80	1.1	31.6
		49.15	80.85	24.86		
	5.43	68.21	124.18	31.59	1.2	31.6
		54.86	111.39	31.39		
	4.34	73.91	161.72	37.38	1.3	31.6
		60.57	149.46	38.69		
	3.26	79.63	205.57	43.17	1.4	31.6
		66.27	195.90	46.77		
	2.17	85.33	256.72	48.96	1.5	33.3
		71.98	251.57	55.43		
	1.09	91.04	313.19	54.75	1.6	45.1
		77.69	317.31	65.27		
	0.00	96.75	374.97	60.54	1.7	59.5
		83.40	393.98	75.69		
PUNTERA ZAPATA		0.00	184.06	56.05	0.0	35.0
TALON ZAPATA		0.00	-296.67	-72.23	0.0	57.5
		0.00	-294.26	-71.60		

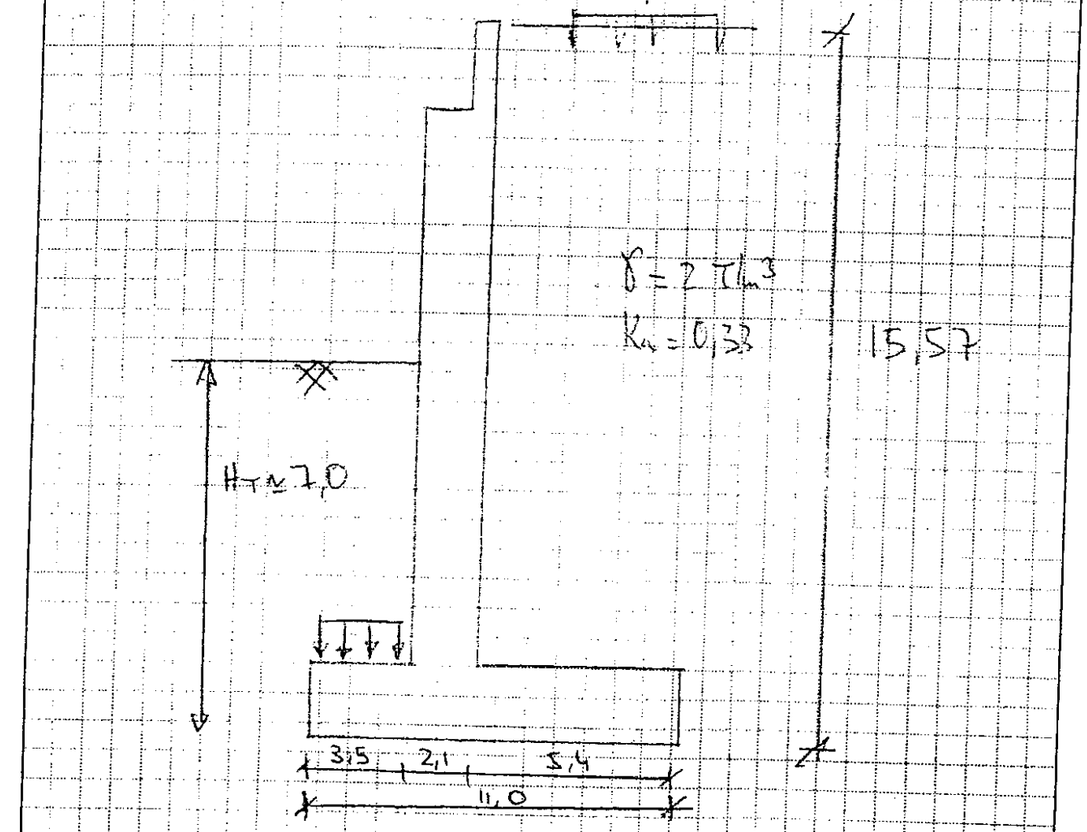
Z_ZAP= Altura medida desde la cara superior de la zapata

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Viaducto E-1

Fecha: 9-02-1 Hoja: 1/1

INFLUENCIA DEL EMPUJE DE TIERRAS EN PUNTERA SOBRE PLANO DE CIMENTACIÓN



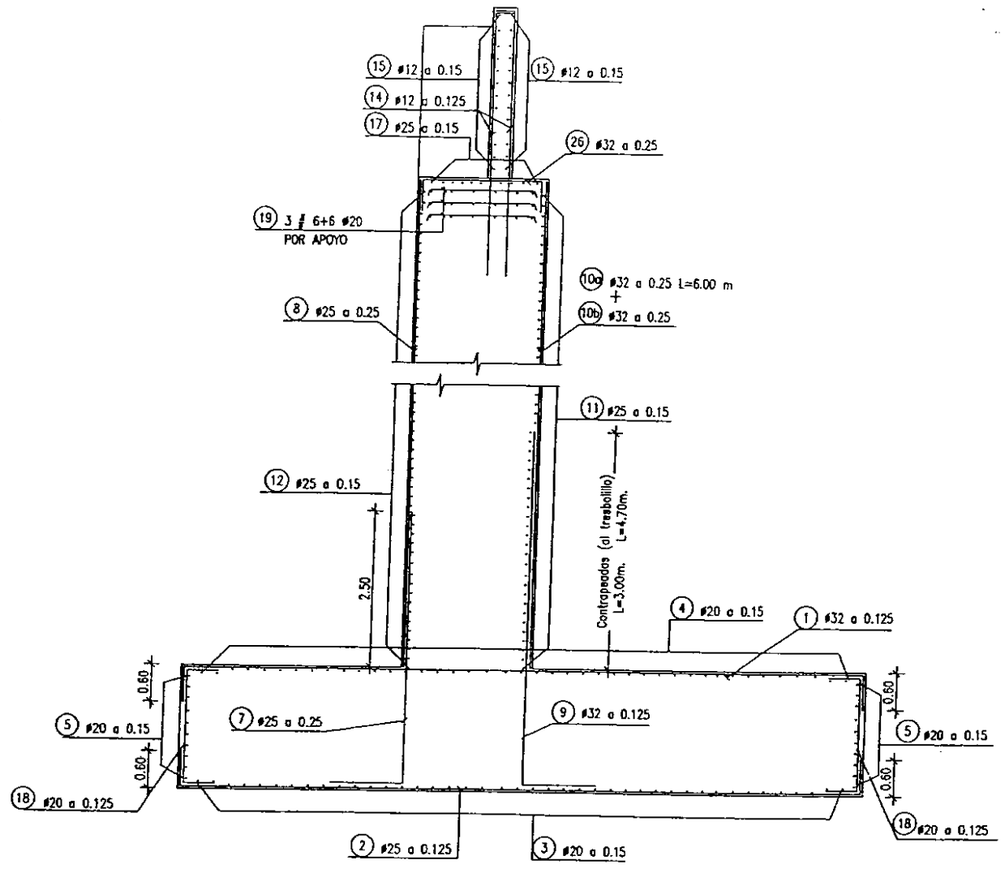
M_{E1}^{cim} = M Empuje tierras + Sobrecarga en trasdós

$= \frac{1}{6}\ 15{,}57^3\ \ 2\ 0{,}33 + \frac{1}{2}\ 15{,}57^2\ \ 3 \cdot 0{,}33 = 535\ mT/m$

M_{E2}^{cim} = M Empuje tierras por delante

$= \frac{1}{6}\ 9^3\ \ 2\ 0{,}33 = 80{,}2\ mT/m$

$\frac{M_{E2}}{M_{E1}} \approx 15\%$



NORTENPH

NEKANE MUNDUATE
Altsasu, 13 JUL. 2001

Ref. nº : 10215 / 0

DOCUMENTACION PROYECTO OBRA

L.A.V. MADRID-BARCELONA-FRONTERA FRANCESA

TRAMO: LLEIDA-MARTORELL V (I)

- PLANOS DE ALZADOS
- PLANOS DE PLANTAS
- PLANOS DE ZAPATAS
- ANEJOS DE CÁLCULO DE ZAPATAS
- ANEJOS DE CÁLCULO DE PIEZAS Y FICHAS DE FABRICACIÓN Estructura E-1

ENTRADA
Fecha 16 JUL 20
Núm.
☐ Gerente
☐ Jefe Obra
☒ Jefe Of. Técnica
☐ Jefe Ejecución
☐ Jefe Túneles
☐ Jefe Estructuras
☐ Jefe Topografía
☐ Jefe Administrat.
☒ Calidad / M. Ambiente
☐ Seguridad
ARCHIVO 211

NORTEN PREFABRICADOS DE HORMIGÓN S.L.
Bº Ugarriza, 1
E-48498 ARAKALDO (BIZKAIA)
Tel.: 946 727 726 Fax: 946 729 683

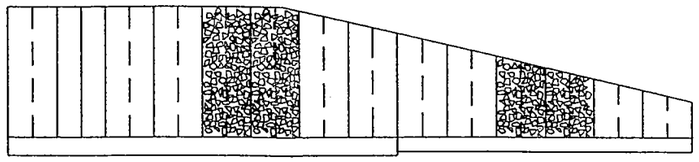
Polígono Ibarrea s.n.
E-31800 ALSASUA (NAVARRA)
Tel.: 948 468 000 - Fax: 948 468 ...

NORTEN PH

PLANOS

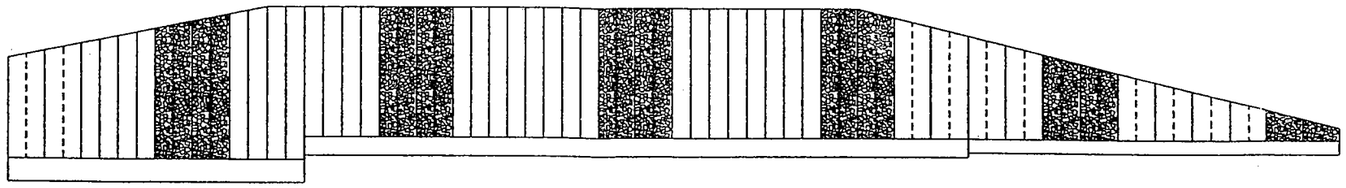
NORTEN PREFABRICADOS DE HORMIGÓN S.L.
Bº Ugarriza, 1
E-48498 ARAKALDO (BIZKAIA)
Tel.: 946 727 726 - Fax: 946 728 683
Apdo. de correos 64 - 01400 - LLODIO (ALAVA)

Polígono Ibarrea s.n.
E-31800 ALSASUA (NAVARRA)
Tel.: 948 468 000 - Fax:948 468 443



ALZADO DEL PERFIL DESARROLLADO POR SU CARA VISTA

| | | |



ALZADO DEL PERFIL DESARROLLADO POR SU CARA VISTA

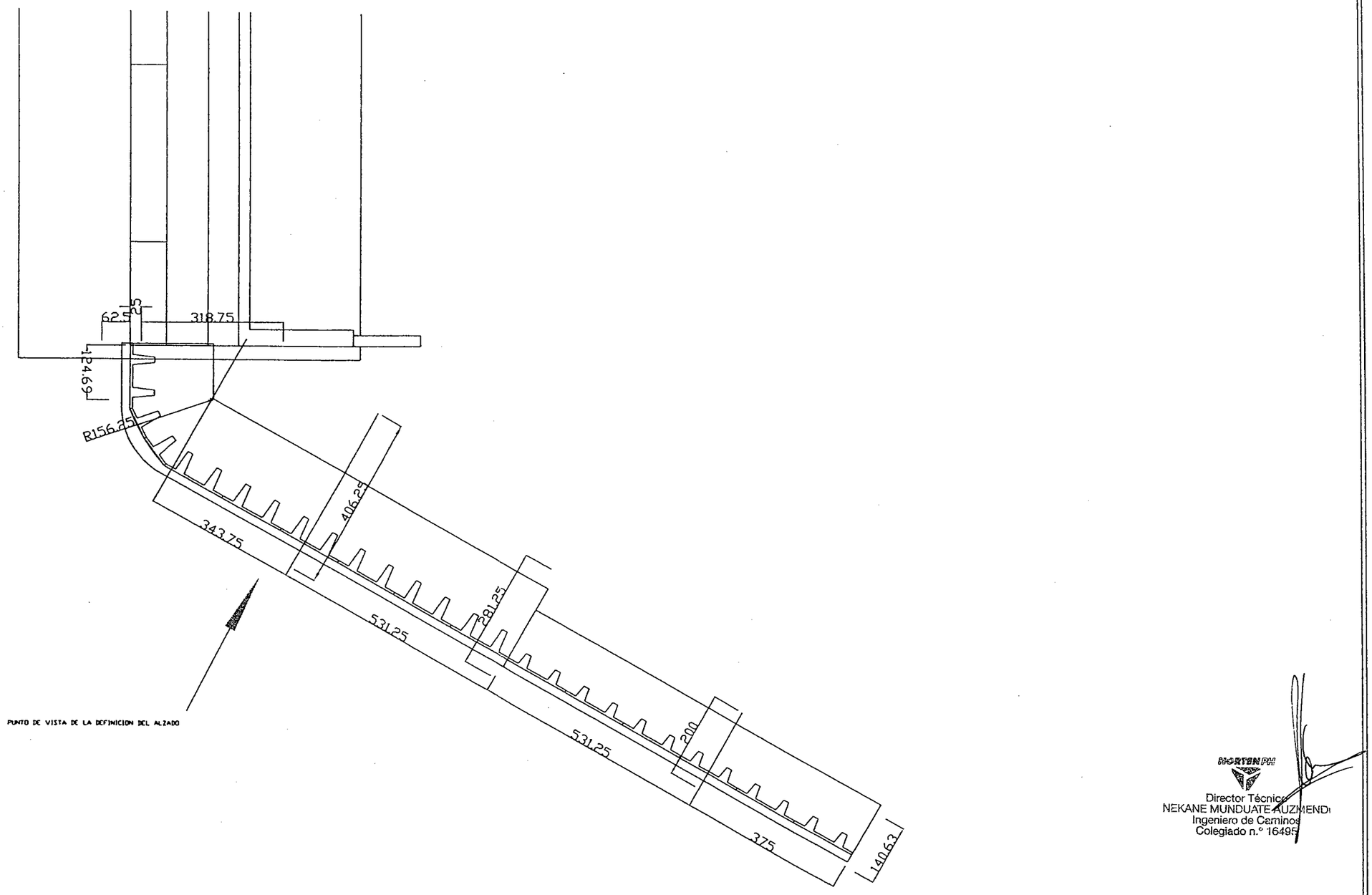
DISTANCIAS	Parciales	0.000	19.200	43.200	24.000
	Al origen	0.000	19.200	62.400	86.400
ZAPATAS	Tipo		Z-15T2	Z-12T2	Z-09T2
	Espesor		1.50	1.20	0.90
	Cota Cimentacion		-1.500	0.300	0.600
MURO	Cota Coronacion	6.570	7.060 / 7.550 / 7.795 / 8.040 / 8.285 / 8.530 / 8.775 / 9.020 / 9.265 / 9.510 / 9.755 / 10.000	10.000	8.235 / 7.646 / 7.058 / 6.469 / 5.881 / 5.292 / 4.704 / 4.115 / 3.527 / 2.938 / 2.350
	Altura media panel		8.315 / 8.805 / 9.173 / 9.418 / 9.662 / 9.907 / 10.152 / 10.398 / 10.643 / 10.888 / 11.133 / 11.378 / 11.500 / 11.500 / 9.700	9.700	9.553 / 9.259 / 8.818 / 8.229 / 7.341 / 6.752 / 6.164 / 5.575 / 4.987 / 4.398 / 3.810 / 3.221 / 2.633 / 2.044
	Anchura		2.400	1.200	2.400
TERRENO	Rasante superior	6.570	10.000	10.000	2.350
	Rasante inferior	0.000	0.000		1.500

NORTEN PH

Director Técnico
NEKANE MUNDIATE AUZMENDI
Ingeniero de Caminos
Colegiado nº

Titulo plano:			OBSERVACIONES	
L.A.V. MADRID-BARCELONA-FRN. TRAMO: LLEIDA-MARTORELL V			ALZADO MURO ESTRUCTURA E-2	
	Fecha	Nombre	Firma	Codigo
Dibujado	06/04/01	J.KASTOR		10118/1/3
Comprobado	06/04/01	NEKANE		
Escala 1/400		Plano de referencia		Sustituye a Sustituido por

NORTEN PH

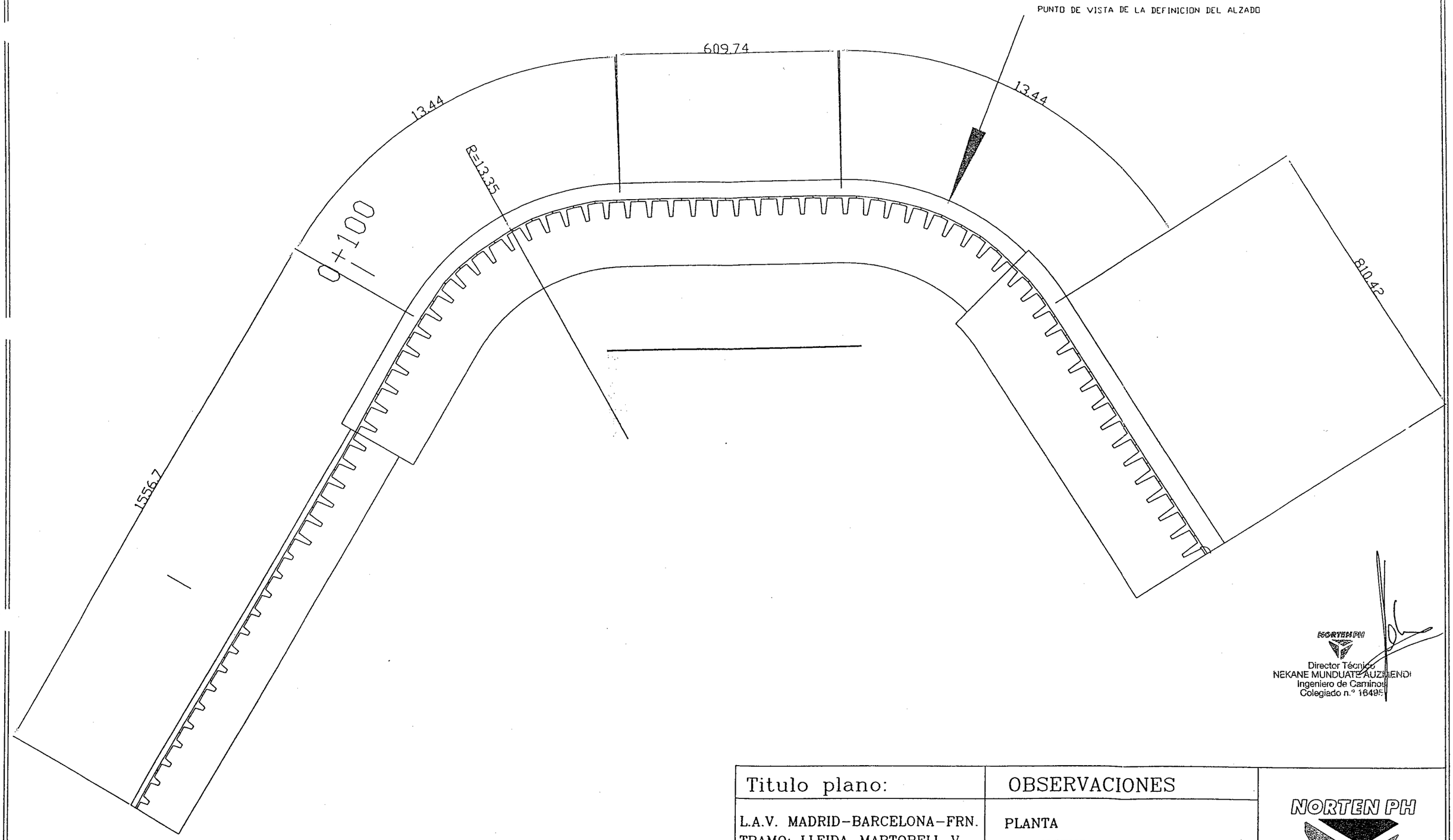


NORTEN PH

Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

Titulo plano:				OBSERVACIONES
L.A.V. MADRID-BARCELONA-FRN. TRAMO: LLEIDA-MARTORELL V				PLANTA ESTRUCTURA E-1
	Fecha	Nombre	Firma	Codigo
Dibujado	06/04/01	J.KASTOR		10118/1/3
Comprobado	06/04/01	NEKANE		
Escala 1/300		Plano de referencia		Sustituye a Sustituido por

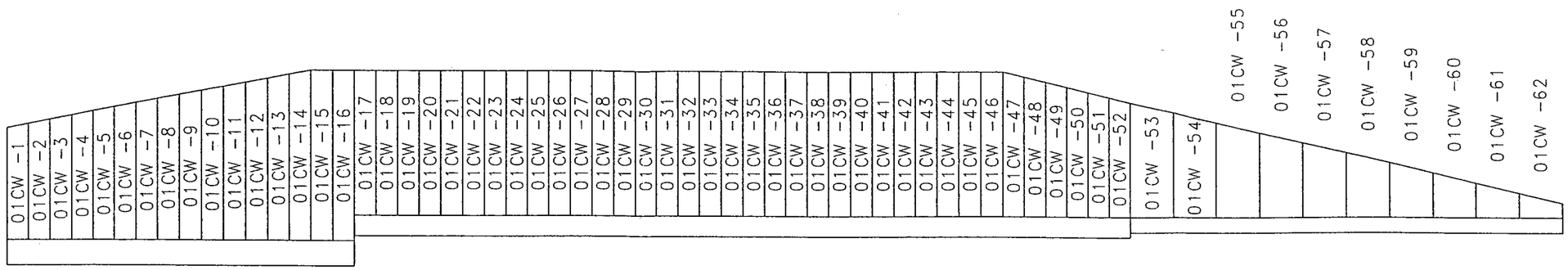
NORTEN PH



NORTEN PH
Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

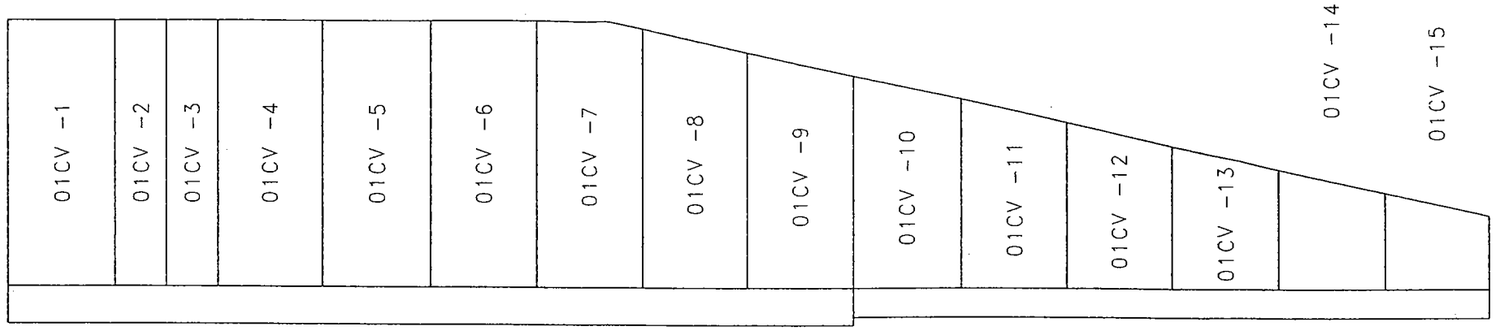
Titulo plano:				OBSERVACIONES
L.A.V. MADRID-BARCELONA-FRN. TRAMO: LLEIDA-MARTORELL V				PLANTA ESTRUCTURA E-2
	Fecha	Nombre	Firma	Codigo
Dibujado	06/04/01	J.KASTOR		10118/1/4
Comprobado	06/04/01	NEKANE		
Escala 1/500		Plano de referencia		Sustituye a Sustituido por

NORTEN PH



ALZADO DEL PERFIL DESARROLLADO POR SU CARA VISTA

DISTANCIAS	Parciales	0.00	19.20	43.20	24.00
	Al origen	0.00	19.20	62.40	86.40
ZAPATAS	Tipo	Z-15T2	Z-12T2	Z-09T2	
	Espesor	1.50	1.20	0.90	
	Cota Cimentacion	-1.500	0.300	0.600	
MURO	Cota Coronacion	6.570 6.815 7.060 7.305 7.550 7.795 8.040 8.285 8.530 8.775 9.020 9.265 9.510 9.755 10.000 9.706 9.412 9.117 8.823 8.529 8.235 7.941 7.646 7.058 6.469 5.881 5.292 4.704 4.115 3.527 2.938 2.350			
	Altura media panel	8.192 8.438 8.683 8.928 9.173 9.418 9.662 9.907 10.152 10.398 10.643 10.888 11.133 11.378 11.500 11.500 9.700 9.700 9.700



ALZADO DEL PERFIL DESARROLLADO POR SU CARA VISTA

DISTANCIAS	Parciales	0.00	19.20	14.40
	Al origen	0.00	19.20	33.60
ZAPATAS	Tipo	Z-09T	Z-07T	
	Espesor	0.90	0.70	
	Cota Cimentacion	-0.900	-0.700	
MURO	Cota Coronacion	6.390 6.390 6.390 6.390 6.390 6.390 6.390 6.207 5.651 5.095 4.539 3.984 3.428 2.872 2.316 1.760		
	Altura medio panel	7.290 7.290 7.290 7.290 7.290 7.290 7.198 6.829 6.273 5.517 4.961 4.406 3.850 3.294 2.738		
	Anchura	2.400 1.200	2.400	2.400

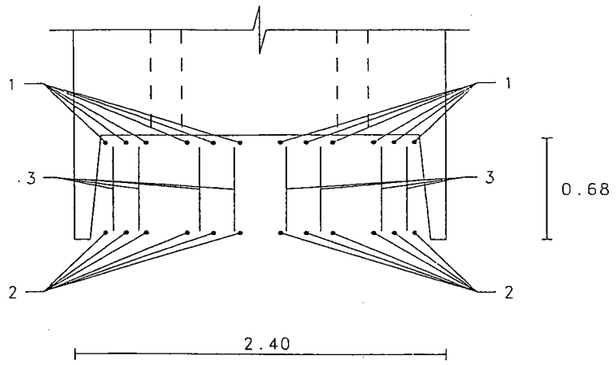
Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

AUTOR DEL ESTUDIO	TITULO DEL ESTUDIO	CODIGO	TITULO DEL PLANO			
NEKANE MUNDUATE	L.A.V. MADRID-BARCELONA-FRONT.FRANCESA TRAMO: LLEIDA-MARTORELL. SUBTRAMO V	10118 1 3	ESTRC.E-1 MURO EN EST.E-1	Inicio: 0.00 Fin 33.60	Fecha06/04/01 Hora: 17:58	ESCALA H=1:150 ESCALA V=1:150

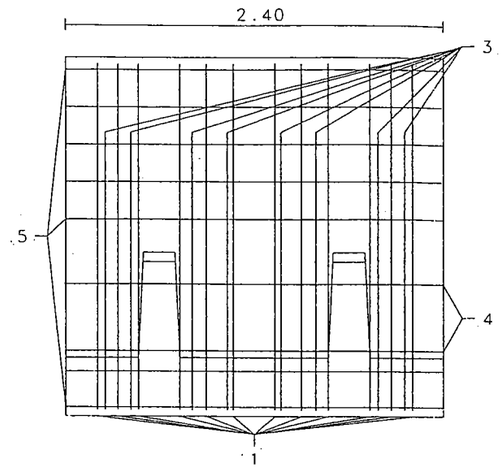
Hoja 1/1

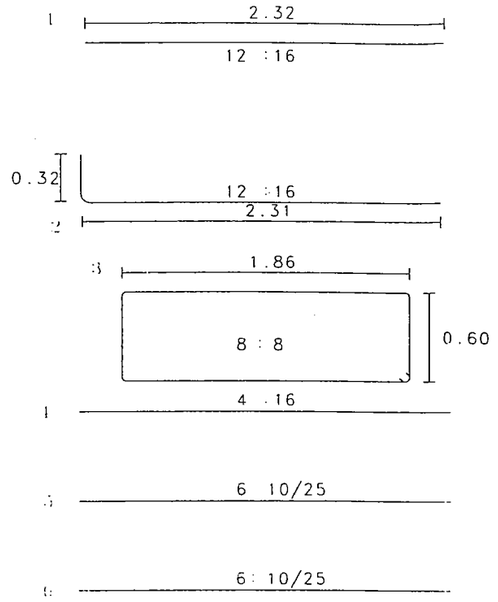
MATERIAL	ELEMENTO	CONTROL	MAYORACION	TIPO
ACERO	ZAPATA	INTENSO	1.15	B-500S
HORMIGON	ZAPATA	NORMAL	1.50	HA-25/P/15/IIb
EJECUCION	TODOS	INTENSO	Art.12 EHE	

ALZADO: BARRAS 1.2.3

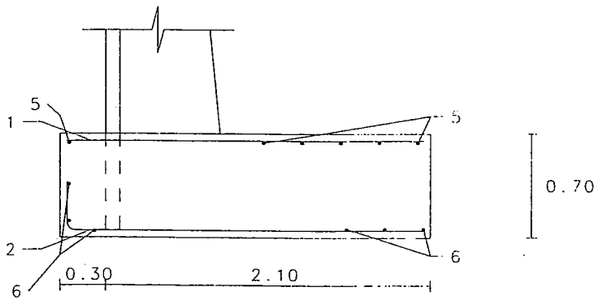


PLANTA SUPERIOR

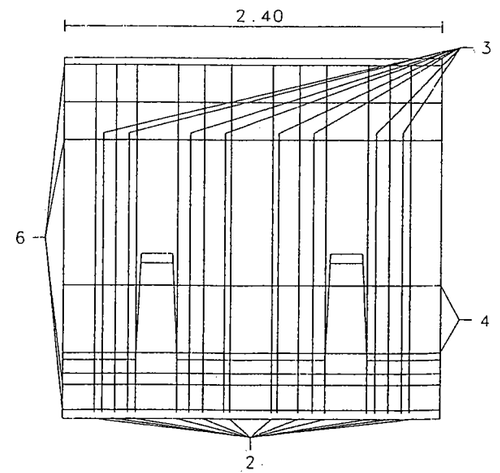




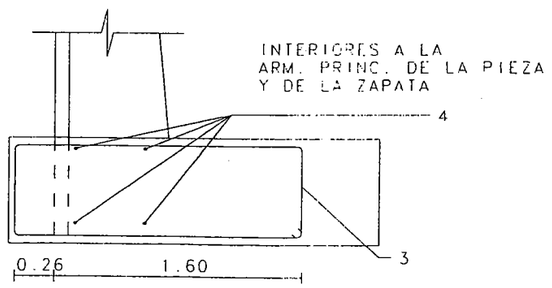
DISPOSICION DE LAS BARRAS 1.2.5.6



PLANTA INFERIOR



DISPOSICION DE LAS BARRAS 3.4





La longitud de las barras tipo 4. 5 y 6 sera funcion de la longitud de cada uno de los escalones de cimentacion
Las cotas se miden entre ejes
Rec. Nominal: 4 cm

Armadura por pieza			
Barra	n	(mm)	LT
1	12	16	2.32
2	12	16	2.62
3	8	8	4.98
4	4	16	2.40
5	6	10	2.40
6	6	10	2.40

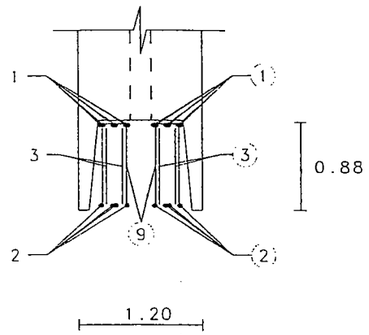
Anchura Pieza	N. Piezas	Espesor (e)	Puntera (a)	Talon (b)
2.400	6	0.70	0.30	2.10

M3 Horm. Zapatas	M3 Horm. Nivelacion	M2.Encof. Oculto	Kg. acero B-500S
24.18	3.74	20.16	853
MEDICIONES TOTALES			

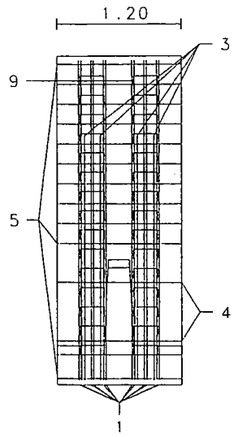
AUTOR DEL ESTUDIO	TITULO DEL ESTUDIO	CODIGO	TIPO DE ZAPATA	TENSION ADMISIBLE	Fecha:12/07/01	ESCALA H=1:40	Hoja 1/1 - -
NEKANE MUNDUATE	L.A.V. MADRID-BARCELONA-FRONT. FRANCESA TRAMO: LLEIDA-MARTORELLL. SUBTRAMO V	1782	Z-07T ANCHO 2.40	0.35 MPa	Hora:17:38		

MATERIAL	ELEMENTO	CONTROL	MAYORACION	TIPO
ACERO	ZAPATA	INTENSO	1.15	B-500S
HORMIGON	ZAPATA	NORMAL	1.50	HA-25/P/15/IIb
EJECUCION	TODOS	INTENSO	Art.12 EHE	

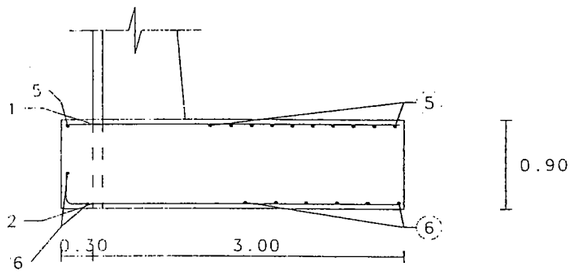
ALZADO: BARRAS 1,2,3,9



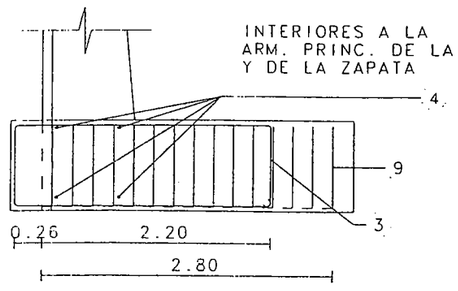
PLANTA SUPERIOR



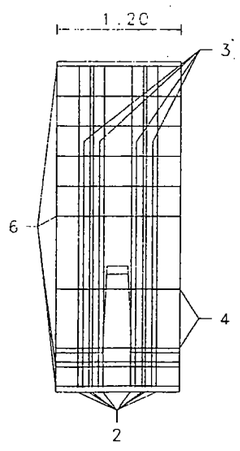
DISPOSICION DE LAS BARRAS 1,2,5,6

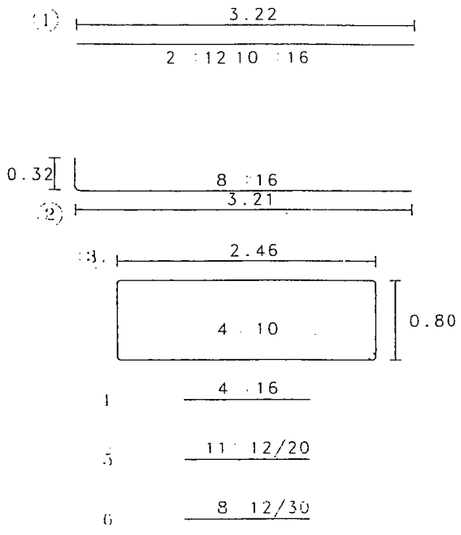


DISPOSICION DE LAS BARRAS 3,4,9



PLANTA INFERIOR





Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

La longitud de las barras tipo 4, 5 y 6 sera funcion de la longitud de cada uno de los escalones de cimentacion
Las cotas se miden entre ejes
Rec. Nominal: 4 cm

Armadura por pieza			
Barra	n	ø(mm)	LT
1	10	16	3.22
1	2	12	3.22
2	8	16	3.52
3	4	10	6.61
4	4	16	1.20
5	11	12	1.20
6	8	12	1.20
9	30	8	2.05

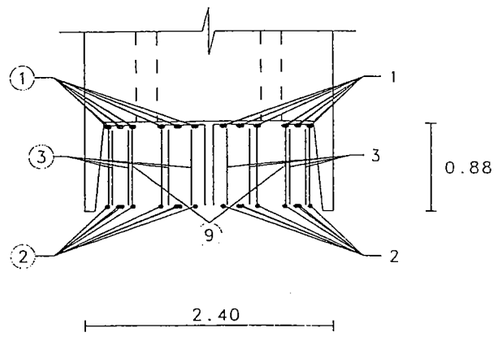
Anchura Pieza	N. Piezas	Espesor (e)	Puntera (a)	Talon (b)
1.200	2	0.90	0.30	3.00

M3 Horm. Zapatas	M3 Horm. Nivelacion	M2.Encof. Oculto	Kg. acero B-500S
7.12	0.84	4.32	339
MEDICIONES TOTALES			

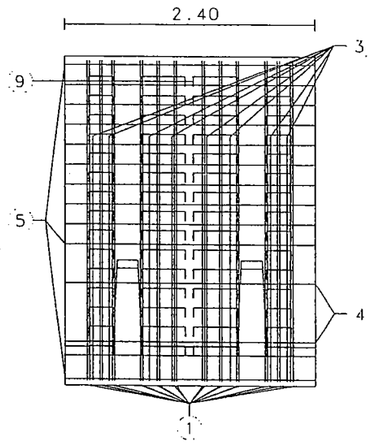
AUTOR DEL ESTUDIO	TITULO DEL ESTUDIO	CODIGO	TIPO DE ZAPATA	TENSION ADMISIBLE	Fecha:12/07/01	ESCALA H=1:60	Hoja 1/1
NEKANE MUNDUATE	L.A.V. MADRID-BARCELONA-FRONT. FRANCESA TRAMO: LLEIDA-MARTORELLL. SUBTRAMO V	1782	Z-09T ANCHO 1.20	0.35 MPa	Hora:17:38		

MATERIAL	ELEMENTO	CONTROL	MAYORACION	TIPO
ACERO	ZAPATA	INTENSO	1.15	B-500S
HORMIGON	ZAPATA	NORMAL	1.50	HA-25/P/15/IIb
EJECUCION	TODOS	INTENSO	Art.12 EHE	

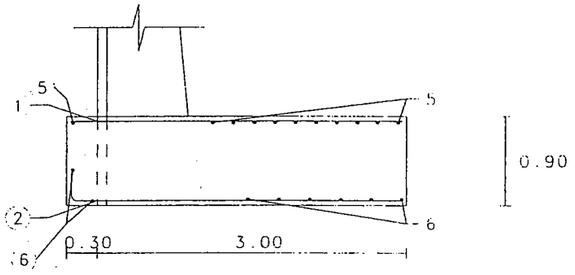
ALZADO: BARRAS 1.2.3.9



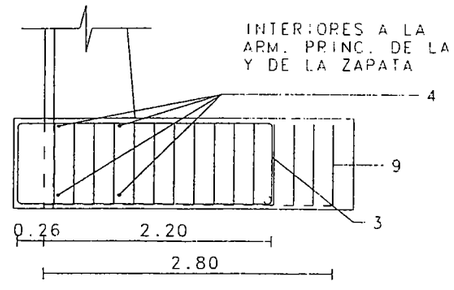
PLANTA SUPERIOR



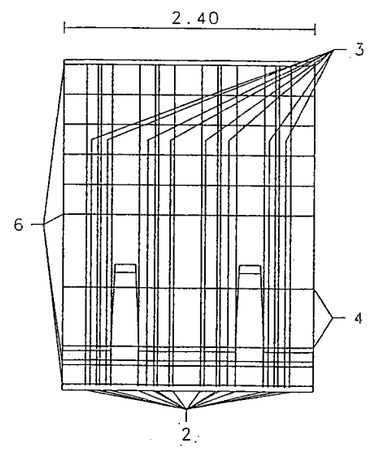
DISPOSICION DE LAS BARRAS 1.2.5.6

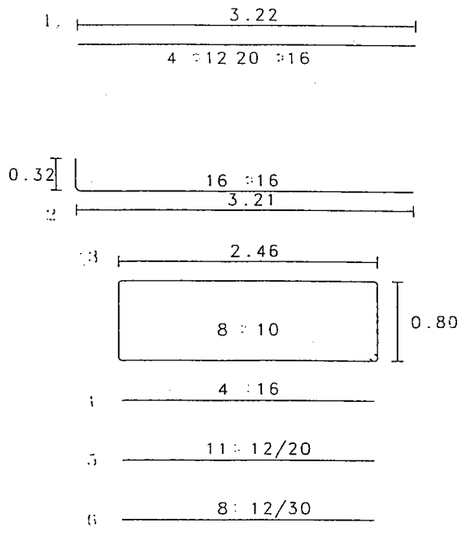


DISPOSICION DE LAS BARRAS 3.4.9



PLANTA INFERIOR





La longitud de las barras tipo 4, 5 y 6 sera funcion de la longitud de cada uno de los escalones de cimentacion
Las cotas se miden entre ejes
Rec. Nominal: 4 cm

Armadura por pieza			
Barra	n	(mm)	LT
1	20	16	3.22
1	4	12	3.22
2	16	16	3.52
3	8	10	6.61
4	4	16	2.40
5	11	12	2.40
6	8	12	2.40
9	60	8	2.05

Anchura Pieza	N. Piezas	Espesor (e)	Puntera (a)	Talon (b)
2.400	7	0.90	0.30	3.00

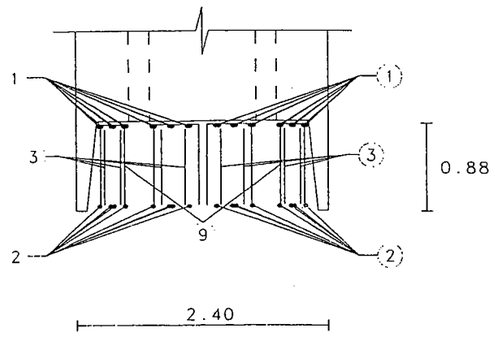
M3 Horm. Zapatas	M3 Horm. Nivelacion	M2.Encof. Oculto	Kg. acero B-500S
49.84	5.88	30.24	2370
MEDICIONES TOTALES			

INGETEIPH
Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16496

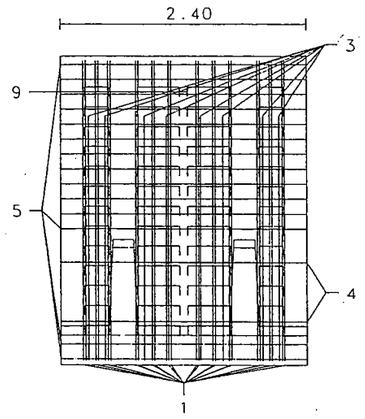
AUTOR DEL ESTUDIO	TITULO DEL ESTUDIO	CODIGO	TIPO DE ZAPATA	TENSION ADMISIBLE	Fecha:12/07/01	ESCALA H=1:60	Hoja 1/1
NEKANE MUNDUATE	L.A.V. MADRID-BARCELONA-FRONT. FRANCESA TRAMO: LLEIDA-MARTORELLL. SUBTRAMO V	1782	Z-09I ANCHO 2.40	0.35 MPa	Hora:17:38		

MATERIAL	ELEMENTO	CONTROL	MAYORACION	TIPO
ACERO	ZAPATA	INTENSO	1.15	B-500S
HORMIGON	ZAPATA	NORMAL	1.50	HA-25/P/15/IIb
EJECUCION	TODOS	INTENSO	Art.12 EHE	

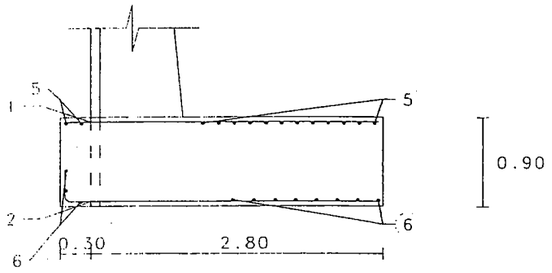
ALZADO: BARRAS 1.2.3.9



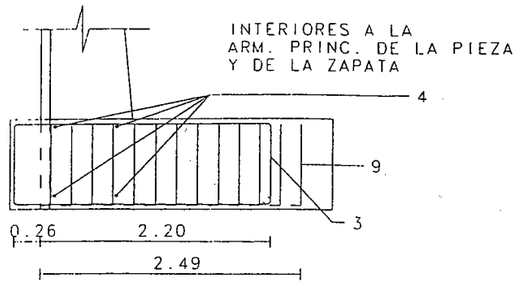
PLANTA SUPERIOR



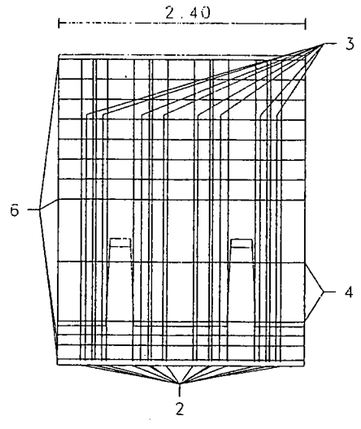
DISPOSICION DE LAS BARRAS 1.2.5.6

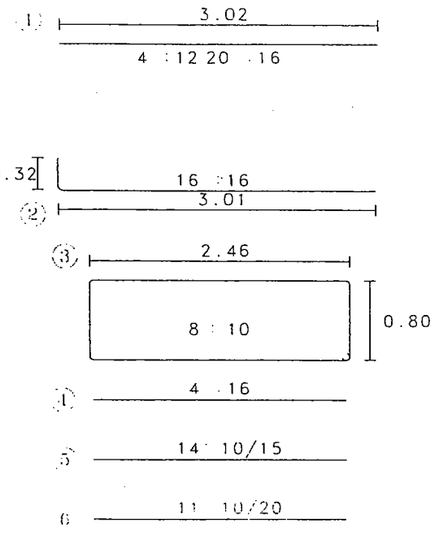


DISPOSICION DE LAS BARRAS 3.4.9



PLANTA INFERIOR





Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

La longitud de las barras tipo 4, 5 y 6 sera funcion de la longitud de cada uno de los escalones de cimentacion
Las cotas se miden entre ejes
Rec. Nominal: 4 cm

Armadura por pieza			
Barra	n	⌀(mm)	LT
1	20	16	3.02
1	4	12	3.02
2	16	16	3.32
3	8	10	6.61
4	4	16	2.40
5	14	10	2.40
6	11	10	2.40
9	52	8	2.05

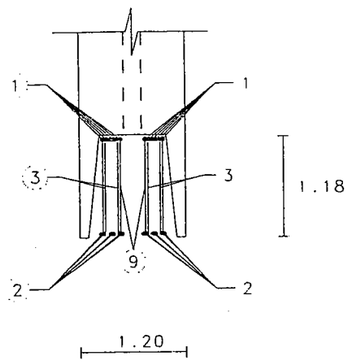
Anchura Pieza	N. Piezas	Espesor (e)	Puntera (a)	Talon (b)
2.400	10	0.90	0.30	2.80

M3 Horm. Zapatas	M3 Horm. Nivelacion	M2.Encof. Oculto	Kg. acero B-500S
66.90	7.92	43.20	3166
MEDICIONES TOTALES			

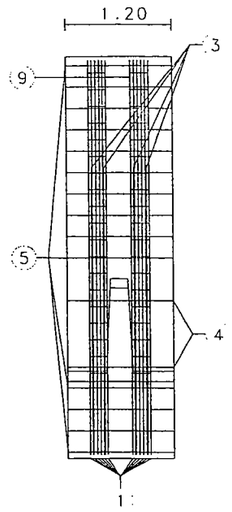
AUTOR DEL ESTUDIO	TITULO DEL ESTUDIO	CODIGO	TIPO DE ZAPATA	TENSION ADMISIBLE	Fecha:12/07/01		
NEKANE MUNDUATE	L.A.V. MADRID-BARCELONA-FRONT. FRANCESA TRAMO: LLEIDA-MARTORELLL. SUBTRAMO V	1782	Z-09T2 ANCHO 2.40	0.35 MPa	Hora:17:38	ESCALA H=1:60	Hoja 1/1

MATERIAL	ELEMENTO	CONTROL	MAYORACION	TIPO
ACERO	ZAPATA	INTENSO	1.15	B-500S
HORMIGON	ZAPATA	NORMAL	1.50	HA-25/P/15/IIb
EJECUCION	TODOS	INTENSO	Art.12 EHE	

ALZADO: BARRAS 1.2.3.9



PLANTA SUPERIOR



1 — 4.62 — 10 ⌀20 2 ⌀25

2 — 2 ⌀12 10 ⌀16 — 4.62

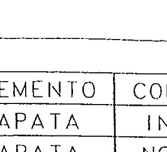
3 — 3.36 — 4 : 12 — 1.09

1 — 4 ⌀16

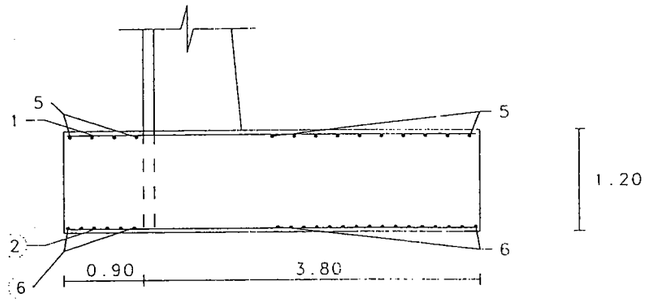
5 — 14 ⌀16/25

6 — 22 . 10/15

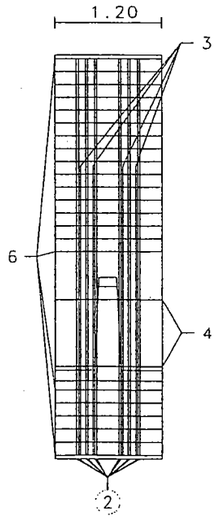
38 : 8 (8 a 20)



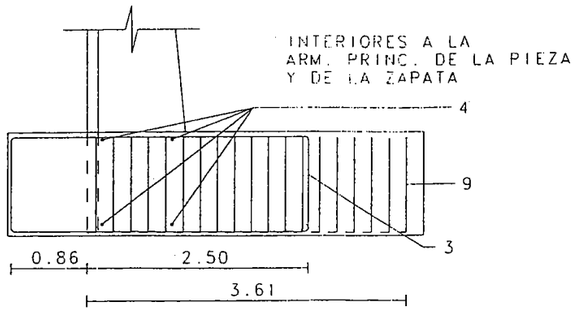
DISPOSICION DE LAS BARRAS 1.2.5.6



PLANTA INFERIOR



DISPOSICION DE LAS BARRAS 3.4.9





La longitud de las barras tipo 4. 5 y 6 sera funcion de la longitud de cada uno de los escalones de cimentacion
Las cotas se miden entre ejes
Rec. Nominal: 4 cm

Armadura por pieza			
Barra	n	(mm)	LT
1	2	25	4.62
1	10	20	4.62
2	10	16	4.62
2	2	12	4.62
3	4	12	9.01
4	4	16	1.20
5	14	16	1.20
6	22	10	1.20
9	38	8	2.62

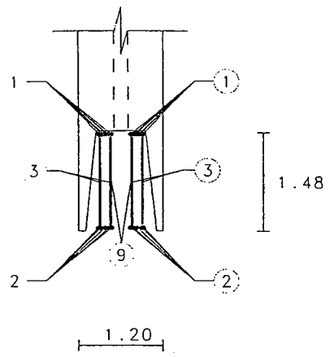
Anchura Pieza	N. Piezas	Espesor (e)	Puntera (a)	Talon (b)
1.200	36	1.20	0.90	3.80

M3 Horm. Zapatas	M3 Horm. Nivelacion	M2. Encof. Oculto	Kg. acero B-500S
243.36	21.17	103.68	12679
MEDICIONES TOTALES			

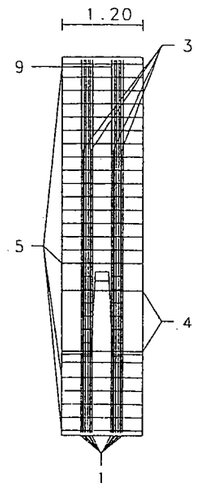
AUTOR DEL ESTUDIO	TITULO DEL ESTUDIO	CODIGO	TIPO DE ZAPATA	TENSION ADMISIBLE	Fecha: 12/07/01	ESCALA H=1:70	Hoja 1/1
NEKANE MUNDUATE	L.A.V. MADRID-BARCELONA-FRONT. FRANCESA TRAMO: LLEIDA-MARTORELLL. SUBTRAMO V	1782	Z-12T2 ANCHO 1.20	0.35 MPa	Hora: 17:38		

MATERIAL	ELEMENTO	CONTROL	MAYORACION	TIPO
ACERO	ZAPATA	INTENSO	1.15	B-500S
HORMIGON	ZAPATA	NORMAL	1.50	HA-25/P/15/IIb
EJECUCION	TODOS	INTENSO	Art.12 EHE	

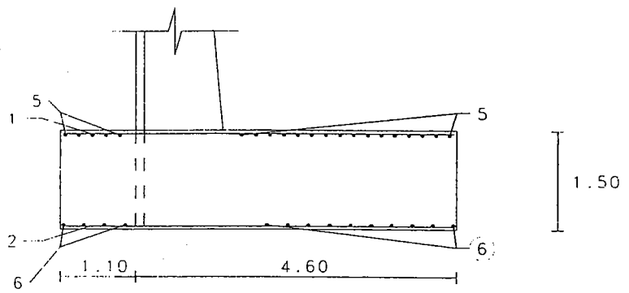
ALZADO: BARRAS 1,2,3,9



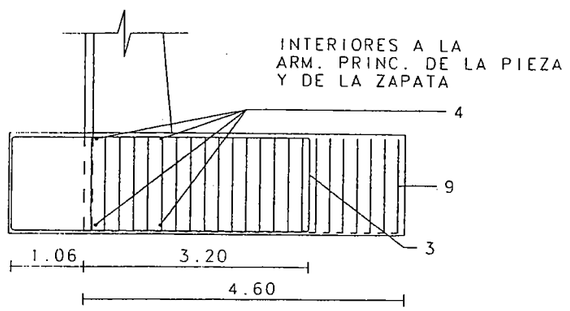
PLANTA SUPERIOR



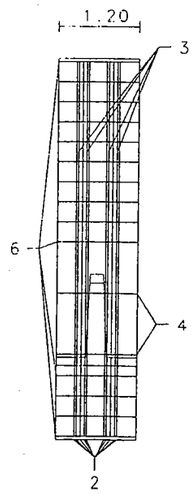
DISPOSICION DE LAS BARRAS 1,2,5,6

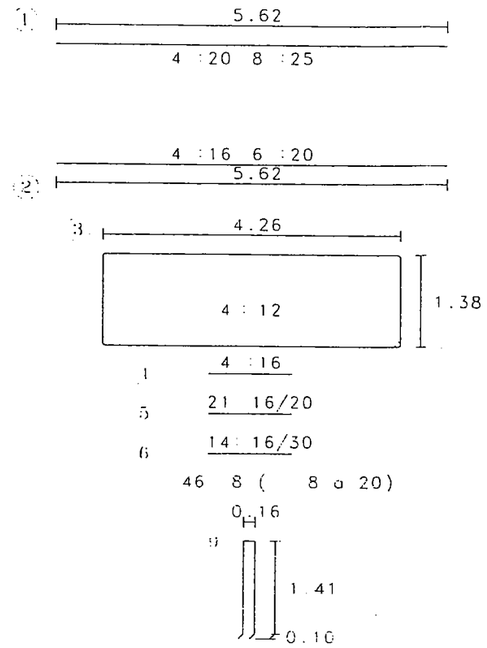


DISPOSICION DE LAS BARRAS 3,4,9



PLANIA INFERIOR







La longitud de las barras tipo 4, 5 y 6 sera funcion de la longitud de cada uno de los escalones de cimentacion
Las cotas se miden entre ejes
Rec. Nominal: 4 cm

Armadura por pieza			
Barra	n	ø(mm)	LT
1	8	25	5.62
1	4	20	5.62
2	6	20	5.62
2	4	16	5.62
3	4	12	11.40
4	4	16	1.20
5	21	16	1.20
6	14	16	1.20
9	46	8	3.19

Anchura Pieza	N. Piezas	Espesor (e)	Puntera (a)	Talon (b)
1.200	16	1.50	1.10	4.60

M3 Horm. Zapatas	M3 Horm. Nivelacion	M2.Encof. Oculto	Kg. acero B-500S
164.16	11.33	57.60	8312
MEDICIONES TOTALES			

AUTOR DEL ESTUDIO	TITULO DEL ESTUDIO	CODIGO	TIPO DE ZAPATA	TENSION ADMISIBLE	Fecha:12/07/01	ESCALA H=1:90	- -
NEKANE MUNDUATE	L.A.V. MADRID-BARCELONA-FRONT. FRANCESA TRAMO: LLEIDA-MARTORELLL. SUBTRAMO V	1782	Z-15T2 ANCHO 1.20	0.35 MPa	Hora:17:38		Hoja 1/1

NORTEN PH

ANEJOS DE CALCULO DE ZAPATAS

NORTEN PREFABRICADOS DE HORMIGÓN S.L.
Bº Ugarriza, 1
E-48498 ARAKALDO (BIZKAIA)
Tel.: 946 727 726 · Fax: 946 728 683
Apdo. de correos 64 · 01400 · LLODIO (ALAVA)

Polígono Ibarrea s.n.
E-31800 ALSASUA (NAVARRA)
Tel.: 948 468 000 · Fax:948 468 443

OREKIN ®

ANEJO DE CÁLCULOS DE ZAPATAS

CÓDIGO : 1782
DENOMINACIÓN : L.A.V. MADRID-BARCELONA-FRONT. FRANCESA
ZAPATA TIPO : Z-07T

CARACTERÍSTICAS DEL MURO

PANEL PREFABRICADO

- Altura total (m) : 5.52
- Anchura (m) : 2.40
- Tipo de nervio : 09/9/16-30/D
- Tipo de zapata : Z-07T

GEOMETRÍA DEL TERRENO

- Trasdós : ángulo del talud de tierras : 26.56
- Altura del talud de tierras (m) : 7.00

- Intradós : Altura de tierras (m) : 0.00

CARACTERÍSTICAS DE LOS MATERIALES

RESISTENCIAS CARACTERÍSTICAS (MPa)

- Acero (fyk) : 500.00
- Hormigón (fck) : 25.00

DENSIDAD (kN/m3)

- Densidad del hormigón : 25.00

RECUBRIMIENTO (cm)

- Recubrimiento nominal : 4.00

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NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado nº 15495

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ANEJO DE CÁLCULOS DE ZAPATAS

CÓDIGO : 1782
DENOMINACIÓN : L.A.V. MADRID-BARCELONA-FRONT. FRANCESA
ZAPATA TIPO : Z-07T

HIPÓTESIS :

PROPIEDADES DEL TERRENO

ÁNGULOS DE ROZAMIENTO

- Interno de tierras : 35.00
- Muro-tierras : 10.00
- Zapata-tierras : 30.00
- Cohesión : 0.00

DENSIDADES (kN/m3)

- Aparente : 20.00

EMPUJE ACTIVO

- Lambda horizontal : 0.249
- Lambda vertical : 0.044
- Lambda horizontal del talud : 0.372
- Lambda vertical del talud : 0.066

SEGURIDAD GENERAL

- Deslizamiento : 1.50
- Vuelco : 1.80

CARACTERÍSTICAS CIMENTACIÓN

- tensión admisible (MPa) : 0.35
- tensión máxima (MPa) : 0.44
- Tipo de ley : Triangular
- long.eficaz/long.total >= : 0.75

MAYORACIÓN DE ACCIONES

- Coeficiente general : 1.50
- Carga viva : 1.00
- Carga muerta : 1.00
- Empuje de tierras : 1.00
- Agua : 1.00
- Accidental : 1.00

COEFICIENTES DE SEGURIDAD DE LOS MATERIALES

- Minoración de la resistencia del hormigón : 1.50
- Minoración de la resistencia del acero : 1.15

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ANEJO DE CÁLCULOS DE ZAPATAS

CÓDIGO : 1782
DENOMINACIÓN : L.A.V. MADRID-BARCELONA-FRONT. FRANCESA
ZAPATA TIPO : Z-07T

COMPROBACIÓN FISURACIÓN

- Tipo de ambiente : IIb
- Anchura característica : 0.30

ACCIONES

SOBRECARGA UNIFORME EN EL TRASDÓS

- Valor (kN/m2) : 30.00
- Distancia al intradós (m) : 14.00

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ANEJO DE CÁLCULOS DE ZAPATAS

CÓDIGO : 1782
DENOMINACIÓN : L.A.V. MADRID-BARCELONA-FRONT. FRANCESA
ZAPATA TIPO : Z-07T

HIPÓTESIS :

RESULTADOS DEL CÁLCULO

DIMENSIONES DE LA ZAPATA (m)

- Espesor : 0.70
- Longitud de la puntera : 0.30
- Longitud del talón : 2.10
- Longitud total : 2.40
- Longitud eficaz : 2.10

ESTABILIDAD GENERAL

- Deslizamiento : 1.56
- Vuelco : 2.28
- Momento volcador (kNm): 160.26
- Momento estabilizador (kNm): 365.64
- Resultante horizontal en el trados (kN): 113.19
- Resultante horizontal en el intrados (kN): 0.00

TENSIONES EN EL TERRENO DE CIMENTACIÓN (MPa)

- En el extremo de la puntera : 0.28
- En el extremo del talón : 0.00

ESFUERZOS EN LA ZAPATA (POR ANCHO DE 1. m)

- Máximos momentos flectores en la puntera (kNm): 16.84
- Máximos momentos flectores en el talón (kNm): 238.52
- Momento torsor (kNm) : 96.70
- Esfuerzo cortante máximo (kN): 180.57

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ANEJO DE CÁLCULOS DE ZAPATAS

CÓDIGO : 1782
DENOMINACIÓN : L.A.V. MADRID-BARCELONA-FRONT. FRANCESA
ZAPATA TIPO : Z-07T

DIMENSIONES DE LA ZAPATA (m)

- Espesor : 0.70
- Longitud de la puntera : 0.30
- Longitud del talón : 2.10
- Longitud total : 2.40

ENVOLVENTE DE ESFUERZOS (POR ANCHO DE 1. m)

- Maximo momento en la puntera (kNm)
  - Positivo : 0.00
  - Negativo : 16.84
- Maximo momento en el talon (kNm)
  - Positivo : 238.52
  - Negativo : 0.00
- Torsion (kNm): 96.70
- Esfuerzo cortante máximo (kN) : 180.57

ARMADURA EN LA ZAPATA (POR ANCHO DE 1. m)

- Flexión en la puntera (cm2)
  - Positivo : 9.86
  - Negativo : 9.86
- Flexión en el talón (cm2)
  - Positivo : 9.86
  - Negativo : 9.86
- Torsión (cm2)
  - Armadura transversal : 1.38
  - Armadura longitudinal : 7.02
- Reparto superior : 1.97
- Reparto inferior : 1.97

El cortante se verifica Vd= 180.57KN < Vcu= 187.45KN

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ANEJO DE CÁLCULOS DE ZAPATAS

CÓDIGO : 1782
DENOMINACIÓN : L.A.V. MADRID-BARCELONA-FRONT. FRANCESA
ZAPATA TIPO : Z-09T

CARACTERÍSTICAS DEL MURO

PANEL PREFABRICADO

- Altura total (m) : 7.29
- Anchura (m) : 2.40
- Tipo de nervio : 09/9/16-30/D
- Tipo de zapata : Z-09T

GEOMETRÍA DEL TERRENO

- Trasdós : ángulo del talud de tierras : 26.56
- Altura del talud de tierras (m) : 3.00

- Intradós : Altura de tierras (m) : 0.00

CARACTERÍSTICAS DE LOS MATERIALES

RESISTENCIAS CARACTERÍSTICAS (MPa)

- Acero (fyk) : 500.00
- Hormigón (fck) : 25.00

DENSIDAD (kN/m3)

- Densidad del hormigón : 25.00

RECUBRIMIENTO (cm)

- Recubrimiento nominal : 4.00

NORTEHPH
Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

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ANEJO DE CÁLCULOS DE ZAPATAS

CÓDIGO : 1782
DENOMINACIÓN : L.A.V. MADRID-BARCELONA-FRONT. FRANCESA
ZAPATA TIPO : Z-09T

HIPÓTESIS :

PROPIEDADES DEL TERRENO

ÁNGULOS DE ROZAMIENTO

- Interno de tierras : 35.00
- Muro-tierras : 10.00
- Zapata-tierras : 30.00
- Cohesión : 0.00

DENSIDADES (kN/m3)

- Aparente : 20.00

EMPUJE ACTIVO

- Lambda horizontal : 0.249
- Lambda vertical : 0.044
- Lambda horizontal del talud : 0.372
- Lambda vertical del talud : 0.066

SEGURIDAD GENERAL

- Deslizamiento : 1.50
- Vuelco : 1.80

CARACTERÍSTICAS CIMENTACIÓN

- tensión admisible (MPa) : 0.35
- tensión máxima (MPa) : 0.44
- Tipo de ley : Triangular
- long.eficaz/long.total >= : 0.75

MAYORACIÓN DE ACCIONES

- Coeficiente general : 1.50
- Carga viva : 1.00
- Carga muerta : 1.00
- Empuje de tierras : 1.00
- Agua : 1.00
- Accidental : 1.00

COEFICIENTES DE SEGURIDAD DE LOS MATERIALES

- Minoración de la resistencia del hormigón : 1.50
- Minoración de la resistencia del acero : 1.15

NORTEHPH
Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

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ANEJO DE CÁLCULOS DE ZAPATAS

CÓDIGO : 1782
DENOMINACIÓN : L.A.V. MADRID-BARCELONA-FRONT. FRANCESA
ZAPATA TIPO : Z-09T

COMPROBACIÓN FISURACIÓN

- Tipo de ambiente : IIb
- Anchura característica : 0.30

ACCIONES

SOBRECARGA UNIFORME EN EL TRASDÓS

- Valor (kN/m2) : 30.00
- Distancia al intradós (m) : 6.00

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Colegiado n.º 16495

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ANEJO DE CÁLCULOS DE ZAPATAS

CÓDIGO : 1782
DENOMINACIÓN : L.A.V. MADRID-BARCELONA-FRONT. FRANCESA
ZAPATA TIPO : Z-09T

HIPÓTESIS :

RESULTADOS DEL CÁLCULO

DIMENSIONES DE LA ZAPATA (m)

- Espesor : 0.90
- Longitud de la puntera : 0.30
- Longitud del talón : 3.00
- Longitud total : 3.30
- Longitud eficaz : 2.98

ESTABILIDAD GENERAL

- Deslizamiento : 1.50
- Vuelco : 2.36
- Momento volcador (kNm): 440.23
- Momento estabilizador (kNm): 1038.23
- Resultante horizontal en el trados (kN): 239.19
- Resultante horizontal en el intrados (kN): 0.00

TENSIONES EN EL TERRENO DE CIMENTACIÓN (MPa)

- En el extremo de la puntera : 0.40
- En el extremo del talón : 0.00

ESFUERZOS EN LA ZAPATA (POR ANCHO DE 1. m)

- Máximos momentos flectores en la puntera (kNm): 24.82
- Máximos momentos flectores en el talón (kNm): 648.93
- Momento torsor (kNm) : 273.10
- Esfuerzo cortante máximo (kN): 377.42

Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

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ANEJO DE CÁLCULOS DE ZAPATAS

CÓDIGO : 1782
DENOMINACIÓN : L.A.V. MADRID-BARCELONA-FRONT. FRANCESA
ZAPATA TIPO : Z-09T

DIMENSIONES DE LA ZAPATA (m)

- Espesor : 0.90
- Longitud de la puntera : 0.30
- Longitud del talón : 3.00
- Longitud total : 3.30

ENVOLVENTE DE ESFUERZOS (POR ANCHO DE 1. m)

- Maximo momento en la puntera (kNm)
  - Positivo : 0.00
  - Negativo : 24.82
- Maximo momento en el talon (kNm)
  - Positivo : 648.93
  - Negativo : 4.30
- Torsion (kNm): 273.10
- Esfuerzo cortante máximo (kN) : 377.42

ARMADURA EN LA ZAPATA (POR ANCHO DE 1. m)

- Flexión en la puntera (cm2)
  - Positivo : 12.93
  - Negativo : 12.93
- Flexión en el talón (cm2)
  - Positivo : 18.61
  - Negativo : 12.93
- Torsión (cm2)
  - Armadura transversal : 2.36
  - Armadura longitudinal : 15.43
- Reparto superior : 3.72
- Reparto inferior : 2.59

Se necesita armadura de cortante
Vd= 377.42KN Vcu= 220.98KN Armadura a disponer= 8.32cm2/m

HORTENIA
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Colegiado n.º 16498

OREKIN®

ANEJO DE CÁLCULOS DE ZAPATAS

CÓDIGO : 1782
DENOMINACIÓN : L.A.V. MADRID-BARCELONA-FRONT. FRANCESA
ZAPATA TIPO : Z-09T2

CARACTERÍSTICAS DEL MURO

PANEL PREFABRICADO

- Altura total (m) : 7.34
- Anchura (m) : 2.40
- Tipo de nervio : 09/9/16-30/D
- Tipo de zapata : Z-09T2

GEOMETRÍA DEL TERRENO

- Trasdós : ángulo del talud de tierras : 26.56
- Altura del talud de tierras (m) : 9.00

- Intradós : Altura de tierras (m) : 0.00

CARACTERÍSTICAS DE LOS MATERIALES

RESISTENCIAS CARACTERÍSTICAS (MPa)

- Acero (fyk) : 500.00
- Hormigón (fck) : 25.00

DENSIDAD (kN/m3)

- Densidad del hormigón : 25.00

RECUBRIMIENTO (cm)

- Recubrimiento nominal : 4.00

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ANEJO DE CÁLCULOS DE ZAPATAS

CÓDIGO : 1782
DENOMINACIÓN : L.A.V. MADRID-BARCELONA-FRONT. FRANCESA
ZAPATA TIPO : Z-09T2

HIPÓTESIS :

PROPIEDADES DEL TERRENO

ÁNGULOS DE ROZAMIENTO

- Interno de tierras : 35.00
- Muro-tierras : 10.00
- Zapata-tierras : 30.00
- Cohesión : 0.00

DENSIDADES (kN/m3)

- Aparente : 20.00

EMPUJE ACTIVO

- Lambda horizontal : 0.249
- Lambda vertical : 0.044
- Lambda horizontal del talud : 0.372
- Lambda vertical del talud : 0.066

SEGURIDAD GENERAL

- Deslizamiento : 1.50
- Vuelco : 1.80

CARACTERÍSTICAS CIMENTACIÓN

- tensión admisible (MPa) : 0.35
- tensión máxima (MPa) : 0.44
- Tipo de ley : Triangular
- long.eficaz/long.total >= : 0.75

MAYORACIÓN DE ACCIONES

- Coeficiente general : 1.50
- Carga viva : 1.00
- Carga muerta : 1.00
- Empuje de tierras : 1.00
- Agua : 1.00
- Accidental : 1.00

COEFICIENTES DE SEGURIDAD DE LOS MATERIALES

- Minoración de la resistencia del hormigón : 1.50
- Minoración de la resistencia del acero : 1.15

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ANEJO DE CÁLCULOS DE ZAPATAS

CÓDIGO : 1782
DENOMINACIÓN : L.A.V. MADRID-BARCELONA-FRONT. FRANCESA
ZAPATA TIPO : Z-09T2

COMPROBACIÓN FISURACIÓN

- Tipo de ambiente : IIb
- Anchura característica : 0.30

ACCIONES

SOBRECARGA UNIFORME EN EL TRASDÓS

- Valor (kN/m2) : 30.00
- Distancia al intradós (m) : 18.00

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ANEJO DE CÁLCULOS DE ZAPATAS

CÓDIGO : 1782
DENOMINACIÓN : L.A.V. MADRID-BARCELONA-FRONT. FRANCESA
ZAPATA TIPO : Z-09T2

HIPÓTESIS :

RESULTADOS DEL CÁLCULO

DIMENSIONES DE LA ZAPATA (m)

- Espesor : 0.90
- Longitud de la puntera : 0.30
- Longitud del talón : 2.80
- Longitud total : 3.10
- Longitud eficaz : 2.51

ESTABILIDAD GENERAL

- Deslizamiento : 1.55
- Vuelco : 2.14
- Momento volcador (kNm): 380.69
- Momento estabilizador (kNm): 814.24
- Resultante horizontal en el trados (kN): 200.36
- Resultante horizontal en el intrados (kN): 0.00

TENSIONES EN EL TERRENO DE CIMENTACIÓN (MPa)

- En el extremo de la puntera : 0.41
- En el extremo del talón : 0.00

ESFUERZOS EN LA ZAPATA (POR ANCHO DE 1. m)

- Máximos momentos flectores en la puntera (kNm): 25.16
- Máximos momentos flectores en el talón (kNm): 598.43
- Momento torsor (kNm) : 232.42
- Esfuerzo cortante máximo (kN): 332.45

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ANEJO DE CÁLCULOS DE ZAPATAS

CÓDIGO : 1782
DENOMINACIÓN : L.A.V. MADRID-BARCELONA-FRONT. FRANCESA
ZAPATA TIPO : Z-09T2

DIMENSIONES DE LA ZAPATA (m)

- Espesor : 0.90
- Longitud de la puntera : 0.30
- Longitud del talón : 2.80
- Longitud total : 3.10

ENVOLVENTE DE ESFUERZOS (POR ANCHO DE 1. m)

- Maximo momento en la puntera (kNm)
  - Positivo : 0.00
  - Negativo : 25.16
- Maximo momento en el talon (kNm)
  - Positivo : 598.43
  - Negativo : 0.00
- Torsion (kNm): 232.42
- Esfuerzo cortante máximo (kN) : 332.45

ARMADURA EN LA ZAPATA (POR ANCHO DE 1. m)

- Flexión en la puntera (cm2)
  - Positivo : 12.93
  - Negativo : 12.93
- Flexión en el talón (cm2)
  - Positivo : 17.20
  - Negativo : 12.93
- Torsión (cm2)
  - Armadura transversal : 2.01
  - Armadura longitudinal : 13.13
- Reparto superior : 3.44
- Reparto inferior : 2.59

Se necesita armadura de cortante
Vd= 332.45KN Vcu= 215.28KN Armadura a disponer= 8.32cm2/m

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ANEJO DE CÁLCULOS DE ZAPATAS

CÓDIGO : 1782
DENOMINACIÓN : L.A.V. MADRID-BARCELONA-FRONT. FRANCESA
ZAPATA TIPO : Z-12T2

CARACTERÍSTICAS DEL MURO

PANEL PREFABRICADO

- Altura total (m) : 9.70
- Anchura (m) : 2.40
- Tipo de nervio : 15/9/16-30D
- Tipo de zapata : Z-12T2

GEOMETRÍA DEL TERRENO

- Trasdós : ángulo del talud de tierras : 26.56
- Altura del talud de tierras (m) : 3.50

- Intradós : Altura de tierras (m) : 0.00

CARACTERÍSTICAS DE LOS MATERIALES

RESISTENCIAS CARACTERÍSTICAS (MPa)

- Acero (fyk) : 500.00
- Hormigón (fck) : 25.00

DENSIDAD (kN/m3)

- Densidad del hormigón : 24.51

RECUBRIMIENTO (cm)

- Recubrimiento nominal : 4.00

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ANEJO DE CÁLCULOS DE ZAPATAS

CÓDIGO : 1782
DENOMINACIÓN : L.A.V. MADRID-BARCELONA-FRONT. FRANCESA
ZAPATA TIPO : Z-12T2

HIPÓTESIS :

PROPIEDADES DEL TERRENO

ÁNGULOS DE ROZAMIENTO

- Interno de tierras : 35.00
- Muro-tierras : 10.00
- Zapata-tierras : 30.00
- Cohesión : 0.00

DENSIDADES (kN/m3)

- Aparente : 20.00

EMPUJE ACTIVO

- Lambda horizontal : 0.249
- Lambda vertical : 0.044
- Lambda horizontal del talud : 0.372
- Lambda vertical del talud : 0.066

SEGURIDAD GENERAL

- Deslizamiento : 1.50
- Vuelco : 1.80

CARACTERÍSTICAS CIMENTACIÓN

- tensión admisible (MPa) : 0.35
- tensión máxima (MPa) : 0.44
- Tipo de ley : Triangular
- long.eficaz/long.total >= : 0.75

MAYORACIÓN DE ACCIONES

- Coeficiente general : 1.50
- Carga viva : 1.00
- Carga muerta : 1.00
- Empuje de tierras : 1.00
- Agua : 1.00
- Accidental : 1.00

COEFICIENTES DE SEGURIDAD DE LOS MATERIALES

- Minoración de la resistencia del hormigón : 1.50
- Minoración de la resistencia del acero : 1.15

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ANEJO DE CÁLCULOS DE ZAPATAS

CÓDIGO : 1782
DENOMINACIÓN : L.A.V. MADRID-BARCELONA-FRONT. FRANCESA
ZAPATA TIPO : Z-12T2

COMPROBACIÓN FISURACIÓN

- Tipo de ambiente : IIb
- Anchura característica : 0.30

ACCIONES

SOBRECARGA UNIFORME EN EL TRASDÓS

- Valor (kN/m2) : 30.00
- Distancia al intradós (m) : 7.00

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ANEJO DE CÁLCULOS DE ZAPATAS

CÓDIGO : 1782
DENOMINACIÓN : L.A.V. MADRID-BARCELONA-FRONT. FRANCESA
ZAPATA TIPO : Z-12T2

HIPÓTESIS :

RESULTADOS DEL CÁLCULO

DIMENSIONES DE LA ZAPATA (m)

- Espesor : 1.20
- Longitud de la puntera : 0.90
- Longitud del talón : 3.80
- Longitud total : 4.70
- Longitud eficaz : 4.70

ESTABILIDAD GENERAL

- Deslizamiento : 1.53
- Vuelco : 2.69
- Momento volcador (kNm): 993.46
- Momento estabilizador (kNm): 2675.27
- Resultante horizontal en el trados (kN): 401.04
- Resultante horizontal en el intrados (kN): 0.00

TENSIONES EN EL TERRENO DE CIMENTACIÓN (MPa)

- En el extremo de la puntera : 0.42
- En el extremo del talón : 0.02

ESFUERZOS EN LA ZAPATA (POR ANCHO DE 1. m)

- Máximos momentos flectores en la puntera (kNm): 219.87
- Máximos momentos flectores en el talón (kNm): 1382.92
- Momento torsor (kNm) : 633.43
- Esfuerzo cortante máximo (kN): 591.48

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ANEJO DE CÁLCULOS DE ZAPATAS

CÓDIGO : 1782
DENOMINACIÓN : L.A.V. MADRID-BARCELONA-FRONT. FRANCESA
ZAPATA TIPO : Z-12T2

DIMENSIONES DE LA ZAPATA (m)

- Espesor : 1.20
- Longitud de la puntera : 0.90
- Longitud del talón : 3.80
- Longitud total : 4.70

ENVOLVENTE DE ESFUERZOS (POR ANCHO DE 1. m)

- Maximo momento en la puntera (kNm)
  - Positivo : 0.00
  - Negativo : 219.87
- Maximo momento en el talon (kNm)
  - Positivo : 1382.92
  - Negativo : 0.00
- Torsion (kNm): 633.43
- Esfuerzo cortante máximo (kN) : 591.48

ARMADURA EN LA ZAPATA (POR ANCHO DE 1. m)

- Flexión en la puntera (cm2)
  - Positivo : 17.52
  - Negativo : 17.52
- Flexión en el talón (cm2)
  - Positivo : 28.84
  - Negativo : 17.52
- Torsión (cm2)
  - Armadura transversal : 3.08
  - Armadura longitudinal : 26.84
- Reparto superior : 5.77
- Reparto inferior : 3.50

Se necesita armadura de cortante
Vd= 591.47KN Vcu= 299.07KN Armadura a disponer= 8.32cm2/m

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ANEJO DE CÁLCULOS DE ZAPATAS

CÓDIGO : 1782
DENOMINACIÓN : L.A.V. MADRID-BARCELONA-FRONT. FRANCESA
ZAPATA TIPO : Z-15T2

CARACTERÍSTICAS DEL MURO

PANEL PREFABRICADO

- Altura total (m) : 11.50
- Anchura (m) : 2.40
- Tipo de nervio : 15/9/16-30D
- Tipo de zapata : Z-15T2

GEOMETRÍA DEL TERRENO

- Trasdós : ángulo del talud de tierras : 26.56
- Altura del talud de tierras (m) : 8.00

- Intradós : Altura de tierras (m) : 0.00

CARACTERÍSTICAS DE LOS MATERIALES

RESISTENCIAS CARACTERÍSTICAS (MPa)

- Acero (fyk) : 500.00
- Hormigón (fck) : 25.00

DENSIDAD (kN/m3)

- Densidad del hormigón : 24.51

RECUBRIMIENTO (cm)

- Recubrimiento nominal : 4.00

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ANEJO DE CÁLCULOS DE ZAPATAS

CÓDIGO : 1782
DENOMINACIÓN : L.A.V. MADRID-BARCELONA-FRONT. FRANCESA
ZAPATA TIPO : Z-15T2

HIPÓTESIS :

PROPIEDADES DEL TERRENO

ÁNGULOS DE ROZAMIENTO

- Interno de tierras : 35.00
- Muro-tierras : 10.00
- Zapata-tierras : 30.00
- Cohesión : 0.00

DENSIDADES (kN/m3)

- Aparente : 20.00

EMPUJE ACTIVO

- Lambda horizontal : 0.249
- Lambda vertical : 0.044
- Lambda horizontal del talud : 0.372
- Lambda vertical del talud : 0.066

SEGURIDAD GENERAL

- Deslizamiento : 1.50
- Vuelco : 1.80

CARACTERÍSTICAS CIMENTACIÓN

- tensión admisible (MPa) : 0.35
- tensión máxima (MPa) : 0.44
- Tipo de ley : Triangular
- long.eficaz/long.total >= : 0.75

MAYORACIÓN DE ACCIONES

- Coeficiente general : 1.50
- Carga viva : 1.00
- Carga muerta : 1.00
- Empuje de tierras : 1.00
- Agua : 1.00
- Accidental : 1.00

COEFICIENTES DE SEGURIDAD DE LOS MATERIALES

- Minoración de la resistencia del hormigón : 1.50
- Minoración de la resistencia del acero : 1.15

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Colegiado n.º 16495

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ANEJO DE CÁLCULOS DE ZAPATAS

CÓDIGO : 1782
DENOMINACIÓN : L.A.V. MADRID-BARCELONA-FRONT. FRANCESA
ZAPATA TIPO : Z-15T2

COMPROBACIÓN FISURACIÓN

- Tipo de ambiente : IIb
- Anchura característica : 0.30

ACCIONES

SOBRECARGA UNIFORME EN EL TRASDÓS

- Valor (kN/m2) : 30.00
- Distancia al intradós (m) : 16.00

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ANEJO DE CÁLCULOS DE ZAPATAS

CÓDIGO : 1782
DENOMINACIÓN : L.A.V. MADRID-BARCELONA-FRONT. FRANCESA
ZAPATA TIPO : Z-15T2

HIPÓTESIS :

RESULTADOS DEL CÁLCULO

DIMENSIONES DE LA ZAPATA (m)

- Espesor : 1.50
- Longitud de la puntera : 1.10
- Longitud del talón : 4.60
- Longitud total : 5.70
- Longitud eficaz : 5.70

ESTABILIDAD GENERAL

- Deslizamiento : 1.53
- Vuelco : 2.96
- Momento volcador (kNm): 1420.01
- Momento estabilizador (kNm): 4206.95
- Resultante horizontal en el trados (kN): 530.84
- Resultante horizontal en el intrados (kN): 0.00

TENSIONES EN EL TERRENO DE CIMENTACIÓN (MPa)

- En el extremo de la puntera : 0.44
- En el extremo del talón : 0.04

ESFUERZOS EN LA ZAPATA (POR ANCHO DE 1. m)

- Máximos momentos flectores en la puntera (kNm): 339.71
- Máximos momentos flectores en el talón (kNm): 2183.51
- Momento torsor (kNm) : 867.96
- Esfuerzo cortante máximo (kN): 698.36

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ANEJO DE CÁLCULOS DE ZAPATAS

CÓDIGO : 1782
DENOMINACIÓN : L.A.V. MADRID-BARCELONA-FRONT. FRANCESA
ZAPATA TIPO : Z-15T2

DIMENSIONES DE LA ZAPATA (m)

- Espesor : 1.50
- Longitud de la puntera : 1.10
- Longitud del talón : 4.60
- Longitud total : 5.70

ENVOLVENTE DE ESFUERZOS (POR ANCHO DE 1. m)

- Maximo momento en la puntera (kNm)
  - Positivo : 0.00
  - Negativo : 339.71
- Maximo momento en el talon (kNm)
  - Positivo : 2183.51
  - Negativo : 0.00
- Torsion (kNm): 867.96
- Esfuerzo cortante máximo (kN) : 698.36

ARMADURA EN LA ZAPATA (POR ANCHO DE 1. m)

- Flexión en la puntera (cm2)
  - Positivo : 22.11
  - Negativo : 22.11
- Flexión en el talón (cm2)
  - Positivo : 35.85
  - Negativo : 22.11
- Torsión (cm2)
  - Armadura transversal : 2.71
  - Armadura longitudinal : 29.42
- Reparto superior : 7.17
- Reparto inferior : 4.42

Se necesita armadura de cortante
Vd= 698.36KN Vcu= 363.59KN Armadura a disponer= 8.32cm2/m

Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 164

NORTENPH

ANEJOS DE CÁLCULO DE ENVOLVENTES

Y

FICHAS DE FABRICACIÓN

Estructura E-1

NORTEN PREFABRICADOS DE HORMIGÓN S.L.
Bº Ugarriza, 1
E-48498 ARAKALDO (BIZKAIA)
Tel.: 946 727 726 · Fax: 946 728 683
Apdo. de correos 64 · 01400 · LLODIO (ALAVA)

Polígono Ibarrea s.n.
E-31800 ALSASUA (NAVARRA)
Tel.: 948 468 000 · Fax:948 468 443

LICENCIA OREKIN®

ANEJO DE CÁLCULO DE ENVOLVENTE
CÓDIGO DEL PERFIL: 10118 1 3
GRUPO: 6

CARACTERÍSTICAS GEOMETRICAS Y DE LOS MATERIALES

ALTURA	(m)	: 7.199
ANCHURA	(m)	: 2.400
NERVIOS		: 2
CANTO TOTAL EN CORONACIÓN	(m)	: 0.278
PENDIENTE LONGITUDINAL DEL NERVIO		: 9.000
ESPESOR MÍNIMO DEL NERVIO	(m)	: 0.200
ESPESOR DE LAS ALAS	(m)	: 0.090
LONGITUD DEL ALA IZQUIERDA	(m)	: 0.600
LONGITUD DEL ALA DERECHA	(m)	: 0.600
DISTANCIA ENTRE NERVIOS	(m)	: 1.200
CODIGO DEL CABEZAL		: BASE DE CABEZAL
HORMIGÓN	(kg/cm2)	: 350
MINORACIÓN DEL HORMIGÓN		: 1.50
ACERO	(kg/cm2)	: 5100
MINORACIÓN DEL ACERO		: 1.15
RECUBRIMIENTO	(m)	: 0.030
COEFICIENTE DE ANCLAJE EN ZAPATA		: 15
COEFICIENTE DE ANCLAJE EN PIEZA		: 12
ALA EMPOTRADA		

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ACCIONES Y RESISTENCIAS

COEFICIENTE DE MAYORACIÓN : 1.50
FISURACIÓN (mm) : 0.300

CARGAS REPARTIDAS

HORIZONTALES

Y(m)	Ph(T/m2)
0.000	1.116
4.573	4.518
7.290	5.871

VERTICALES

Y(m)	X(m)	Pv(T/n)

NORTEMPRESA
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Ingeniero de Caminos
Colegiado n.º 16495

LICENCIA
OREKIN

ANEJO DE CÁLCULO DE ENVOLVENTE
CÓDIGO DEL PERFIL: 10118 1 3
GRUPO: 6
HIPÓTESIS : SERVICIO

NORTEMPRESA
Director Técnico
NEKANE MUNDUATE AIZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

x	h	d	ph	Nd/n	Ndrn/n	Vd/n	Vcu/n	Md/n	Fcc/n	ndrn	vcu	vda	md	delta
0.000	0.278	0.000	1.116	0.000	0.000	0.000	0.000	0.000	1.674	0.000	0.000	0.000	0.342	0.0190
0.199	0.296	0.000	1.264	0.000	0.000	0.316	0.000	0.000	1.896	0.000	0.000	0.132	0.388	0.0181
0.299	0.305	0.267	1.338	0.000	0.000	0.526	4.076	0.052	2.007	0.000	1.834	0.227	0.406	0.0177
0.399	0.314	0.276	1.412	0.000	0.000	0.755	4.214	0.109	2.119	0.000	1.896	0.329	0.422	0.0172
0.499	0.323	0.285	1.487	0.000	0.000	0.993	4.351	0.191	2.230	0.000	1.958	0.439	0.437	0.0168
0.599	0.332	0.294	1.561	0.000	0.000	1.241	4.489	0.300	2.342	0.000	2.020	0.555	0.452	0.0163
0.699	0.341	0.303	1.636	0.000	0.000	1.496	4.626	0.438	2.453	0.000	2.082	0.678	0.467	0.0159
0.799	0.350	0.312	1.710	0.000	0.000	1.760	4.764	0.605	2.565	0.000	2.144	0.806	0.483	0.0154
0.899	0.359	0.321	1.784	0.000	0.000	2.032	4.901	0.803	2.677	0.000	2.206	0.941	0.499	0.0150
0.999	0.368	0.330	1.859	0.000	0.000	2.312	5.039	1.034	2.788	0.000	2.267	1.081	0.515	0.0145
1.099	0.377	0.339	1.933	0.000	0.000	2.601	5.176	1.298	2.900	0.000	2.329	1.227	0.532	0.0141
1.199	0.386	0.348	2.008	0.000	0.000	2.897	5.314	1.598	3.011	0.000	2.391	1.380	0.549	0.0136
1.299	0.395	0.357	2.082	0.000	0.000	3.202	5.451	1.935	3.123	0.000	2.453	1.538	0.566	0.0132
1.399	0.404	0.366	2.156	0.000	0.000	3.515	5.589	2.310	3.235	0.000	2.515	1.701	0.583	0.0127
1.499	0.413	0.375	2.231	0.000	0.000	3.837	5.726	2.724	3.346	0.000	2.577	1.871	0.600	0.0123
1.599	0.422	0.384	2.305	0.000	0.000	4.166	5.864	3.179	3.458	0.000	2.639	2.047	0.618	0.0119
1.699	0.431	0.393	2.380	0.000	0.000	4.504	6.001	3.676	3.569	0.000	2.701	2.228	0.635	0.0114
1.799	0.440	0.402	2.454	0.000	0.000	4.850	6.139	4.217	3.681	0.000	2.762	2.414	0.652	0.0110
1.899	0.449	0.411	2.528	0.000	0.000	5.204	6.276	4.802	3.793	0.000	2.824	2.607	0.669	0.0106
1.999	0.458	0.420	2.603	0.000	0.000	5.567	6.414	5.434	3.904	0.000	2.886	2.805	0.687	0.0102
2.099	0.467	0.429	2.677	0.000	0.000	5.938	6.551	6.114	4.016	0.000	2.948	3.009	0.704	0.0097
2.199	0.476	0.438	2.752	0.000	0.000	6.316	6.688	6.842	4.127	0.000	3.010	3.218	0.721	0.0093
2.299	0.485	0.447	2.826	0.000	0.000	6.704	6.826	7.621	4.239	0.000	3.072	3.433	0.738	0.0089
2.399	0.494	0.434	2.900	0.000	0.000	7.015	6.628	8.452	4.350	0.000	2.983	3.653	0.755	0.0085
2.499	0.503	0.443	2.975	0.000	0.000	7.413	6.766	9.335	4.462	0.000	3.045	3.879	0.771	0.0081
2.599	0.512	0.452	3.049	0.000	0.000	7.820	6.903	10.273	4.574	0.000	3.107	4.111	0.788	0.0078
2.699	0.521	0.461	3.123	0.000	0.000	8.236	7.041	11.266	4.685	0.000	3.168	4.348	0.804	0.0074
2.799	0.530	0.470	3.198	0.000	0.000	8.659	7.178	12.317	4.797	0.000	3.230	4.591	0.820	0.0070
2.899	0.539	0.479	3.272	0.000	0.000	9.091	7.316	13.426	4.908	0.000	3.292	4.839	0.836	0.0066
2.999	0.548	0.488	3.347	0.000	0.000	9.531	7.453	14.594	5.020	0.000	3.354	5.093	0.852	0.0063
3.099	0.557	0.497	3.421	0.000	0.000	9.980	7.591	15.824	5.132	0.000	3.416	5.352	0.867	0.0059
3.199	0.566	0.497	3.495	0.000	0.000	10.384	7.598	17.116	5.243	0.000	3.419	5.617	0.882	0.0056
3.299	0.575	0.506	3.570	0.000	0.000	10.847	7.735	18.471	5.355	0.000	3.481	5.888	0.896	0.0053
3.399	0.584	0.515	3.644	0.000	0.000	11.319	7.873	19.892	5.466	0.000	3.543	6.164	0.910	0.0049
3.499	0.593	0.524	3.719	0.000	0.000	11.799	8.010	21.379	5.578	0.000	3.604	6.445	0.923	0.0046
3.599	0.602	0.533	3.793	0.000	0.000	12.287	8.147	22.934	5.690	0.000	3.666	6.732	0.936	0.0043
3.699	0.611	0.542	3.867	0.000	0.000	12.784	8.285	24.558	5.801	0.000	3.728	7.025	0.948	0.0040
3.799	0.620	0.535	3.942	0.000	0.000	13.155	8.167	26.252	5.913	0.000	3.675	7.323	0.959	0.0037
3.899	0.629	0.544	4.016	0.000	0.000	13.664	8.305	28.019	6.024	0.000	3.737	7.626	0.970	0.0035
3.999	0.638	0.553	4.091	0.000	0.000	14.182	8.442	29.858	6.136	0.000	3.799	7.935	0.979	0.0032
4.099	0.647	0.562	4.165	0.000	0.000	14.708	8.580	31.772	6.248	0.000	3.861	8.250	0.988	0.0029
4.199	0.656	0.571	4.239	0.000	0.000	15.242	8.717	33.761	6.359	0.000	3.923	8.569	0.995	0.0027
4.299	0.665	0.569	4.314	0.000	0.000	15.683	8.696	35.828	6.471	0.000	3.913	8.895	1.001	0.0024
4.399	0.674	0.578	4.388	0.000	0.000	16.231	8.834	37.973	6.582	0.000	3.975	9.225	1.005	0.0022
4.499	0.683	0.587	4.463	0.000	0.000	16.786	8.971	40.198	6.694	0.000	4.037	9.561	1.007	0.0020
4.599	0.692	0.596	4.531	0.000	0.000	17.348	9.108	42.504	6.796	0.000	4.099	9.901	1.007	0.0018
4.699	0.701	0.572	4.580	0.000	0.000	17.525	8.735	44.892	6.871	0.000	3.931	10.246	1.005	0.0016
4.799	0.710	0.581	4.630	0.000	0.000	18.090	8.873	47.363	6.945	0.000	3.993	10.595	1.000	0.0014
4.899	0.719	0.590	4.680	0.000	0.000	18.660	9.010	49.918	7.020	0.000	4.055	10.948	0.993	0.0012
4.999	0.728	0.599	4.730	0.000	0.000	19.235	9.148	52.558	7.095	0.000	4.116	11.306	0.984	0.0011
5.099	0.737	0.608	4.780	0.000	0.000	19.816	9.285	55.284	7.170	0.000	4.178	11.667	0.971	0.0000
5.199	0.746	0.617	4.829	0.000	0.000	20.400	9.422	58.097	7.244	0.000	4.240	12.032	0.955	0.0000
5.299	0.755	0.626	4.879	0.000	0.000	20.984	9.560	60.999	7.319	0.000	4.302	12.398	0.933	0.0000
5.399	0.764	0.635	4.929	0.000	0.000	21.564	9.697	63.991	7.394	0.000	4.364	12.765	0.905	0.0000
5.499	0.773	0.644	4.979	0.000	0.000	22.129	9.835	67.074	7.468	0.000	4.426	13.127	0.866	0.0000
5.599	0.782	0.636	5.029	0.000	0.000	22.406	9.713	70.251	7.543	0.000	4.371	13.479	0.811	0.0000
5.699	0.791	0.645	5.078	0.000	0.000	22.885	9.850	73.521	7.618	0.000	4.433	13.811	0.734	0.0000
5.799	0.800	0.654	5.128	0.000	0.000	23.281	9.988	76.886	7.692	0.000	4.495	14.110	0.627	0.0000
5.899	0.809	0.663	5.178	0.000	0.000	23.560	10.125	80.342	7.767	0.000	4.556	14.362	0.485	0.0000
5.999	0.818	0.672	5.228	0.000	0.000	23.689	10.263	83.883	7.842	0.000	4.618	14.552	0.324	0.0000
6.099	0.827	0.681	5.278	0.000	0.000	23.659	10.400	87.500	7.916	0.000	4.680	14.677	0.173	0.0000

ANEJO DE CÁLCULO DE ENVOLVENTE
CÓDIGO DEL PERFIL: 10118 1 3
GRUPO:

HIPÓTESIS : SERVICIO

x	h	d	ph	Nd/n	Ndrn/n	Vd/n	Vcu/n	Md/n	Fcc/n	ndrn	vcu	vda	md	delta
6.199	0.836	0.690	5.327	0.000	0.000	23.515	10.538	91.176	7.991	0.000	4.742	14.754	0.000	0.0000
6.299	0.845	0.699	5.377	0.000	0.000	23.443	10.675	94.599	8.066	0.000	4.804	14.844	0.000	0.0000

Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

ANEJO DE CÁLCULO DE ENVOLVENTE
CÓDIGO DEL PERFIL: 10118 1 3
GRUPO: 6

HIPÓTESIS : SERVICIO

Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

x	d	Aa1	Aa2	Aa	Atn	Ain	Ars	Wk	aa	aft	afi	ata	aia	wk
0.000	0.240	2.22	0.40	2.62	0.00	0.00	0.00	0.0000	0.00	1.41	1.18	1.41	1.18	0.0000
0.199	0.258	2.22	0.45	2.67	0.00	0.00	0.00	0.0000	0.13	1.61	1.18	1.67	1.25	0.0000
0.299	0.267	2.22	0.48	2.70	3.06	0.00	0.00	0.0000	0.00	1.68	1.18	1.68	1.18	0.0000
0.399	0.276	2.22	0.50	2.73	3.10	0.00	0.00	0.0000	0.00	1.75	1.18	1.75	1.18	0.0000
0.499	0.285	2.22	0.53	2.75	3.14	0.00	0.00	0.0000	0.00	1.82	1.18	1.82	1.18	0.0000
0.599	0.294	2.22	0.56	2.78	3.18	0.00	0.00	0.0000	0.00	1.88	1.18	1.88	1.18	0.0000
0.699	0.303	2.22	0.58	2.81	3.22	0.00	0.00	0.0000	0.00	1.95	1.18	1.95	1.18	0.0000
0.799	0.312	2.22	0.61	2.83	3.26	0.00	0.00	0.0000	0.00	2.01	1.18	2.01	1.18	0.0000
0.899	0.321	2.22	0.64	2.86	3.30	0.00	0.00	0.0000	0.00	2.08	1.18	2.08	1.18	0.0000
0.999	0.330	2.22	0.66	2.89	3.35	0.00	0.00	0.0000	0.00	2.15	1.18	2.15	1.18	0.0000
1.099	0.339	2.22	0.69	2.91	3.39	0.00	0.00	0.0000	0.00	2.23	1.18	2.23	1.18	0.1664
1.199	0.348	2.22	0.72	2.94	3.43	0.00	0.00	0.0000	0.00	2.30	1.18	2.30	1.18	0.1813
1.299	0.357	2.22	0.74	2.97	3.47	0.00	0.00	0.0000	0.00	2.37	1.18	2.37	1.18	0.1961
1.399	0.366	2.22	0.77	2.99	3.52	0.00	0.00	0.0000	0.00	2.45	1.18	2.45	1.18	0.2107
1.499	0.375	2.22	0.80	3.02	3.56	0.00	0.00	0.0000	0.00	2.53	1.18	2.53	1.18	0.1787
1.599	0.384	2.22	0.82	3.05	3.60	0.00	0.00	0.0000	0.00	2.60	1.18	2.60	1.18	0.1900
1.699	0.393	2.22	0.85	3.07	3.64	0.00	0.00	0.0000	0.00	2.68	1.18	2.68	1.18	0.2012
1.799	0.402	2.22	0.88	3.10	3.69	0.00	0.00	0.0000	0.00	2.75	1.18	2.75	1.18	0.2122
1.899	0.411	2.22	0.90	3.13	3.73	0.00	0.00	0.0000	0.00	2.83	1.22	2.83	1.22	0.2231
1.999	0.420	2.22	0.93	3.15	3.77	0.00	0.00	0.2999	0.00	2.91	1.27	2.91	1.27	0.2338
2.099	0.429	2.22	0.96	3.18	3.82	0.00	0.00	0.0000	0.04	2.99	1.32	3.00	1.34	0.2443
2.199	0.438	2.22	0.98	3.20	3.86	0.00	0.00	0.0000	0.13	3.06	1.38	3.12	1.44	0.2079
2.299	0.447	2.22	1.01	3.23	3.91	0.00	0.00	0.0000	0.21	3.14	1.43	3.25	1.54	0.2163
2.399	0.434	2.22	1.04	3.26	4.33	0.00	0.00	0.2586	0.41	3.21	1.48	3.42	1.69	0.2245
2.499	0.443	2.22	1.06	3.28	4.69	0.00	0.00	0.2949	0.50	3.29	1.53	3.54	1.78	0.2325
2.599	0.452	2.22	1.09	3.31	5.06	0.00	0.00	0.0000	0.59	3.37	1.59	3.66	1.88	0.2404
2.699	0.461	2.22	1.12	3.34	5.45	0.00	0.00	0.0000	0.68	3.44	1.64	3.78	1.98	0.2482
2.799	0.470	2.22	1.14	3.36	5.85	0.00	0.00	0.0000	0.77	3.51	1.69	3.90	2.08	0.2558
2.899	0.479	2.22	1.17	3.39	6.26	0.00	0.00	0.0000	0.85	3.59	1.75	4.01	2.17	0.2166
2.999	0.488	2.22	1.20	3.42	6.69	0.00	0.00	0.0000	0.94	3.66	1.80	4.13	2.27	0.2225
3.099	0.497	2.22	1.22	3.44	7.12	0.00	0.00	0.0000	1.03	3.73	1.85	4.24	2.37	0.2283
3.199	0.497	2.22	1.25	3.47	7.71	0.00	0.00	0.0000	1.17	3.79	1.91	4.38	2.49	0.2339
3.299	0.506	2.22	1.27	3.50	8.18	0.00	0.00	0.0000	1.26	3.86	1.96	4.49	2.59	0.2393
3.399	0.515	2.22	1.30	3.52	8.67	0.00	0.00	0.0000	1.35	3.93	2.01	4.60	2.68	0.2445
3.499	0.524	2.22	1.33	3.55	9.17	0.00	0.00	0.0100	1.43	3.99	2.07	4.70	2.78	0.2495
3.599	0.533	2.22	1.35	3.58	9.68	0.00	0.00	0.0200	1.52	4.05	2.12	4.81	2.88	0.2149
3.699	0.542	2.22	1.38	3.60	10.20	0.00	0.00	0.0300	1.61	4.10	2.17	4.91	2.98	0.2187
3.799	0.535	2.47	1.41	3.88	11.09	0.00	0.00	0.0400	1.80	4.16	2.22	5.06	3.13	0.2222
3.899	0.544	2.61	1.43	4.04	11.65	0.00	0.00	0.0500	1.89	4.20	2.28	5.15	3.22	0.2255
3.999	0.553	2.75	1.46	4.21	12.23	0.00	0.00	0.0600	1.98	4.25	2.33	5.24	3.32	0.2285
4.099	0.562	2.89	1.49	4.37	12.82	0.00	0.00	0.0700	2.07	4.29	2.38	5.32	3.41	0.2311
4.199	0.571	3.02	1.51	4.54	13.42	0.00	0.00	0.0800	2.15	4.32	2.43	5.40	3.51	0.2333
4.299	0.569	3.25	1.54	4.79	14.31	0.00	0.00	0.0900	2.31	4.35	2.48	5.51	3.63	0.2351
4.399	0.578	3.38	1.57	4.95	14.94	0.00	0.00	0.1000	2.40	4.37	2.52	5.57	3.72	0.2364
4.499	0.587	3.52	1.59	5.11	15.59	0.00	0.00	0.1100	2.49	4.38	2.57	5.62	3.81	0.2371
4.599	0.596	3.66	1.62	5.27	16.26	0.00	0.00	0.1200	2.57	4.38	2.61	5.67	3.89	0.2371
4.699	0.572	4.07	1.64	5.70	18.01	0.00	0.00	0.2631	2.92	4.37	2.64	5.83	4.10	0.2364
4.799	0.581	4.20	1.65	5.85	18.73	0.00	0.00	0.2751	3.01	4.35	2.67	5.85	4.18	0.2350
4.899	0.590	4.33	1.67	6.00	19.46	0.00	0.00	0.2874	3.09	4.32	2.70	5.86	4.24	0.2328
4.999	0.599	4.46	1.69	6.15	20.20	0.00	0.00	0.3000	3.18	4.27	2.71	5.86	4.29	0.2298
5.099	0.608	4.58	1.71	6.29	20.96	0.00	0.00	0.1700	3.26	4.21	2.70	5.84	4.33	0.2259
5.199	0.617	4.71	1.72	6.43	21.72	0.00	0.00	0.1800	3.34	4.13	2.68	5.80	4.35	0.2208
5.299	0.626	4.83	1.74	6.57	22.50	0.00	0.00	0.1900	3.42	4.03	2.63	5.75	4.34	0.2141
5.399	0.635	4.94	1.76	6.71	23.30	0.00	0.00	0.2000	3.50	3.90	2.55	5.65	4.30	0.2426
5.499	0.644	5.05	1.78	6.83	24.10	0.00	0.00	0.2100	3.58	3.72	2.43	5.51	4.21	0.2279
5.599	0.636	5.28	1.80	7.08	25.66	0.00	0.00	0.2660	3.79	3.47	2.25	5.36	4.15	0.2513
5.699	0.645	5.35	1.81	7.16	26.51	0.00	0.00	0.2748	3.85	3.12	2.03	5.04	3.95	0.2142
5.799	0.654	5.38	1.83	7.21	27.37	0.00	0.00	0.2837	3.89	2.64	1.75	4.59	3.69	0.1959
5.899	0.663	5.36	1.85	7.21	28.24	0.00	0.00	0.2927	3.91	2.02	1.41	3.98	3.37	0.0000
5.999	0.672	5.29	1.87	7.15	29.12	0.00	0.00	0.2600	3.91	1.33	1.18	3.29	3.13	0.0000
6.099	0.681	5.15	1.88	7.04	30.00	0.00	0.00	0.2700	3.88	1.18	1.18	3.12	3.12	0.0000

ANEJO DE CÁLCULO DE ENVOLVENTE
CÓDIGO DEL PERFIL: 10118 1 3
GRUPO: 6
HIPÓTESIS : SERVICIO

x	d	Aa1	Aa2	Aa	Atn	Ain	Ars	Wk	aa	aft	afi	ata	aia	wk
6.199	0.690	4.98	1.90	6.88	30.89	0.00	0.00	0.2800	3.84	0.00	1.18	1.92	3.10	0.0000
6.299	0.699	4.83	1.92	6.75	31.65	0.00	0.00	0.2900	3.80	0.00	0.00	1.90	1.90	0.0000

Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

ANEJO DE CÁLCULO DE ENVOLVENTE
CÓDIGO DEL PERFIL: 10118 1 3
GRUPO: 6

ENVOLVENTE DE ARMADOS

Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

x	Aa1	Aa2	Aa	Atn	Ain	Ars	aa	aft	afi	ata	aia
0.000	2.22	0.40	2.62	0.00	0.00	0.00	0.00	1.41	1.18	1.41	1.18
0.199	2.22	0.45	2.67	0.00	0.00	0.00	0.13	1.61	1.18	1.67	1.25
0.299	2.22	0.48	2.70	3.06	0.00	0.00	0.00	1.68	1.18	1.68	1.18
0.399	2.22	0.50	2.73	3.10	0.00	0.00	0.00	1.75	1.18	1.75	1.18
0.499	2.22	0.53	2.75	3.14	0.00	0.00	0.00	1.82	1.18	1.82	1.18
0.599	2.22	0.56	2.78	3.18	0.00	0.00	0.00	1.88	1.18	1.88	1.18
0.699	2.22	0.58	2.81	3.22	0.00	0.00	0.00	1.95	1.18	1.95	1.18
0.799	2.22	0.61	2.83	3.26	0.00	0.00	0.00	2.01	1.18	2.01	1.18
0.899	2.22	0.64	2.86	3.30	0.00	0.00	0.00	2.08	1.18	2.08	1.18
0.999	2.22	0.66	2.89	3.35	0.00	0.00	0.00	2.15	1.18	2.15	1.18
1.099	2.22	0.69	2.91	3.39	0.00	0.00	0.00	2.23	1.18	2.23	1.18
1.199	2.22	0.72	2.94	3.43	0.00	0.00	0.00	2.30	1.18	2.30	1.18
1.299	2.22	0.74	2.97	3.47	0.00	0.00	0.00	2.37	1.18	2.37	1.18
1.399	2.22	0.77	2.99	3.52	0.00	0.00	0.00	2.45	1.18	2.45	1.18
1.499	2.22	0.80	3.02	3.56	0.00	0.00	0.00	2.53	1.18	2.53	1.18
1.599	2.22	0.82	3.05	3.60	0.00	0.00	0.00	2.60	1.18	2.60	1.18
1.699	2.22	0.85	3.07	3.64	0.00	0.00	0.00	2.68	1.18	2.68	1.18
1.799	2.22	0.88	3.10	3.69	0.00	0.00	0.00	2.75	1.18	2.75	1.18
1.899	2.22	0.90	3.13	3.73	0.00	0.00	0.00	2.83	1.22	2.83	1.22
1.999	2.22	0.93	3.15	3.77	0.00	0.00	0.00	2.91	1.27	2.91	1.27
2.099	2.22	0.96	3.18	3.82	0.00	0.00	0.04	2.99	1.32	3.00	1.34
2.199	2.22	0.98	3.20	3.86	0.00	0.00	0.13	3.06	1.38	3.12	1.44
2.299	2.22	1.01	3.23	3.91	0.00	0.00	0.21	3.14	1.43	3.25	1.54
2.399	2.22	1.04	3.26	4.33	0.00	0.00	0.41	3.21	1.48	3.42	1.69
2.499	2.22	1.06	3.28	4.69	0.00	0.00	0.50	3.29	1.53	3.54	1.78
2.599	2.22	1.09	3.31	5.06	0.00	0.00	0.59	3.37	1.59	3.66	1.88
2.699	2.22	1.12	3.34	5.45	0.00	0.00	0.68	3.44	1.64	3.78	1.98
2.799	2.22	1.14	3.36	5.85	0.00	0.00	0.77	3.51	1.69	3.90	2.08
2.899	2.22	1.17	3.39	6.26	0.00	0.00	0.85	3.59	1.75	4.01	2.17
2.999	2.22	1.20	3.42	6.69	0.00	0.00	0.94	3.66	1.80	4.13	2.27
3.099	2.22	1.22	3.44	7.12	0.00	0.00	1.03	3.73	1.85	4.24	2.37
3.199	2.22	1.25	3.47	7.71	0.00	0.00	1.17	3.79	1.91	4.38	2.49
3.299	2.22	1.27	3.50	8.18	0.00	0.00	1.26	3.86	1.96	4.49	2.59
3.399	2.22	1.30	3.52	8.67	0.00	0.00	1.35	3.93	2.01	4.60	2.68
3.499	2.22	1.33	3.55	9.17	0.00	0.00	1.43	3.99	2.07	4.70	2.78
3.599	2.22	1.35	3.58	9.68	0.00	0.00	1.52	4.05	2.12	4.81	2.88
3.699	2.22	1.38	3.60	10.20	0.00	0.00	1.61	4.10	2.17	4.91	2.98
3.799	2.47	1.41	3.88	11.09	0.00	0.00	1.80	4.16	2.22	5.06	3.13
3.899	2.61	1.43	4.04	11.65	0.00	0.00	1.89	4.20	2.28	5.15	3.22
3.999	2.75	1.46	4.21	12.23	0.00	0.00	1.98	4.25	2.33	5.24	3.32
4.099	2.89	1.49	4.37	12.82	0.00	0.00	2.07	4.29	2.38	5.32	3.41
4.199	3.02	1.51	4.54	13.42	0.00	0.00	2.15	4.32	2.43	5.40	3.51
4.299	3.25	1.54	4.79	14.31	0.00	0.00	2.31	4.35	2.48	5.51	3.63
4.399	3.38	1.57	4.95	14.94	0.00	0.00	2.40	4.37	2.52	5.57	3.72
4.499	3.52	1.59	5.11	15.59	0.00	0.00	2.49	4.38	2.57	5.62	3.81
4.599	3.66	1.62	5.27	16.26	0.00	0.00	2.57	4.38	2.61	5.67	3.89
4.699	4.07	1.64	5.70	18.01	0.00	0.00	2.92	4.37	2.64	5.83	4.10
4.799	4.20	1.65	5.85	18.73	0.00	0.00	3.01	4.35	2.67	5.85	4.18
4.899	4.33	1.67	6.00	19.46	0.00	0.00	3.09	4.32	2.70	5.86	4.24
4.999	4.46	1.69	6.15	20.20	0.00	0.00	3.18	4.27	2.71	5.86	4.29
5.099	4.58	1.71	6.29	20.96	0.00	0.00	3.26	4.21	2.70	5.84	4.33
5.199	4.71	1.72	6.43	21.72	0.00	0.00	3.34	4.13	2.68	5.80	4.35
5.299	4.83	1.74	6.57	22.50	0.00	0.00	3.42	4.03	2.63	5.75	4.34
5.399	4.94	1.76	6.71	23.30	0.00	0.00	3.50	3.90	2.55	5.65	4.30
5.499	5.05	1.78	6.83	24.10	0.00	0.00	3.58	3.72	2.43	5.51	4.21
5.599	5.28	1.80	7.08	25.66	0.00	0.00	3.79	3.47	2.25	5.36	4.15
5.699	5.35	1.81	7.16	26.51	0.00	0.00	3.85	3.12	2.03	5.04	3.95
5.799	5.38	1.83	7.21	27.37	0.00	0.00	3.89	2.64	1.75	4.59	3.69
5.899	5.36	1.85	7.21	28.24	0.00	0.00	3.91	2.02	1.41	3.98	3.37
5.999	5.29	1.87	7.15	29.12	0.00	0.00	3.91	1.33	1.18	3.29	3.13
6.099	5.15	1.88	7.04	30.00	0.00	0.00	3.88	1.18	1.18	3.12	3.12

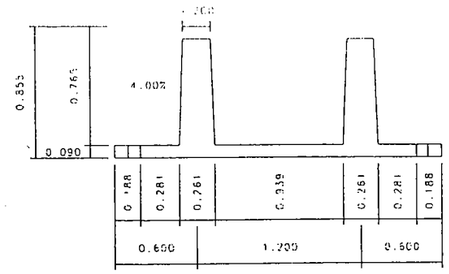
LICENCIA

OREKIN ®

ANEJO DE CÁLCULO DE ENVOLVENTE
CÓDIGO DEL PERFIL: 10118 1 3
GRUPO: 6

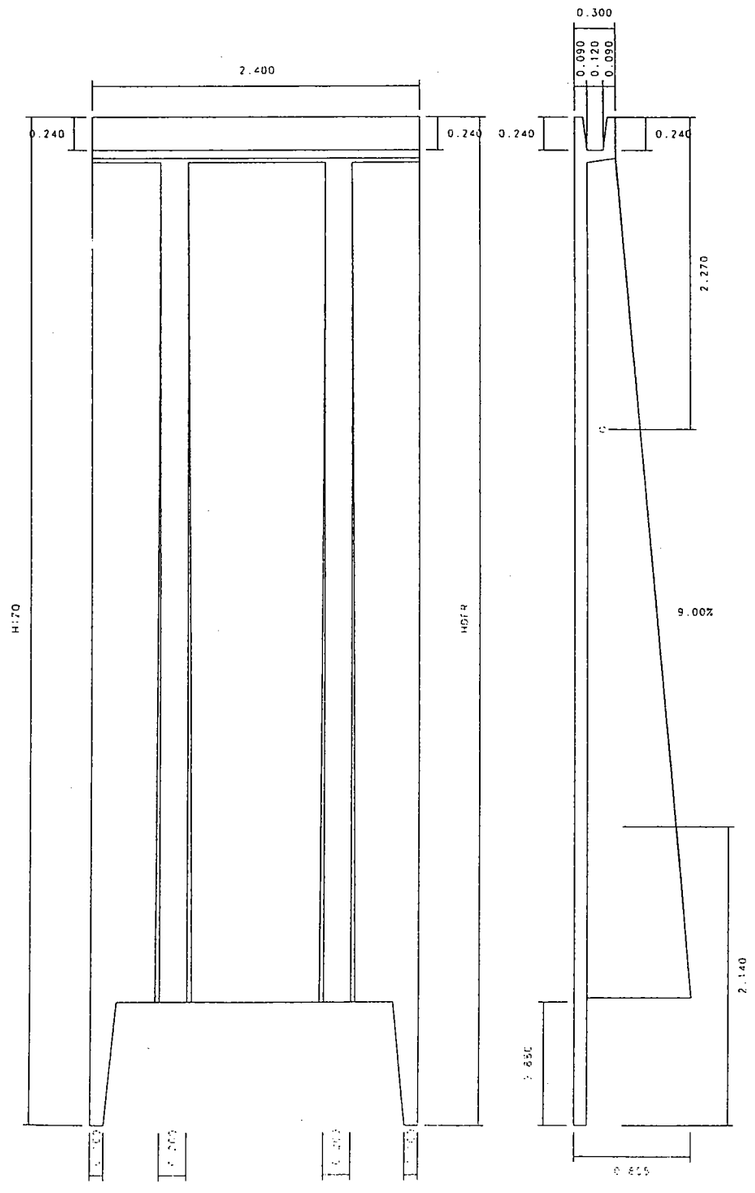
ENVOLVENTE DE ARMADOS

x	Aa1	Aa2	Aa	Atn	Ain	Ars	aa	aft	afi	ata	aia
6.199	4.98	1.90	6.88	30.89	0.00	0.00	3.84	0.00	1.18	1.92	3.10
6.299	4.83	1.92	6.75	31.65	0.00	0.00	3.80	0.00	0.00	1.90	1.90



EMPRESA	UTE ALT-CAMP		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-1		
PERFIL	10118 1 3 1	PED.30	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	7.21
M3 HORMIGON	2.81	fck (Kp/cm2)	350
KG ACERO	477.01	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	9/9/20	
GOMA ESTANDAR EN JUNTAS			
BERENJENO			

PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CV1	7.290	7.290	0.000	7.290



NORTENHI

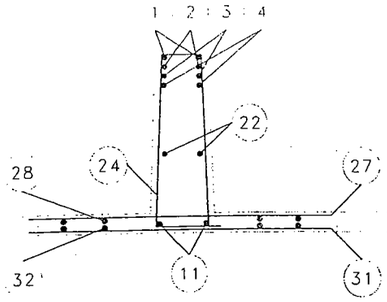
Director Técnico
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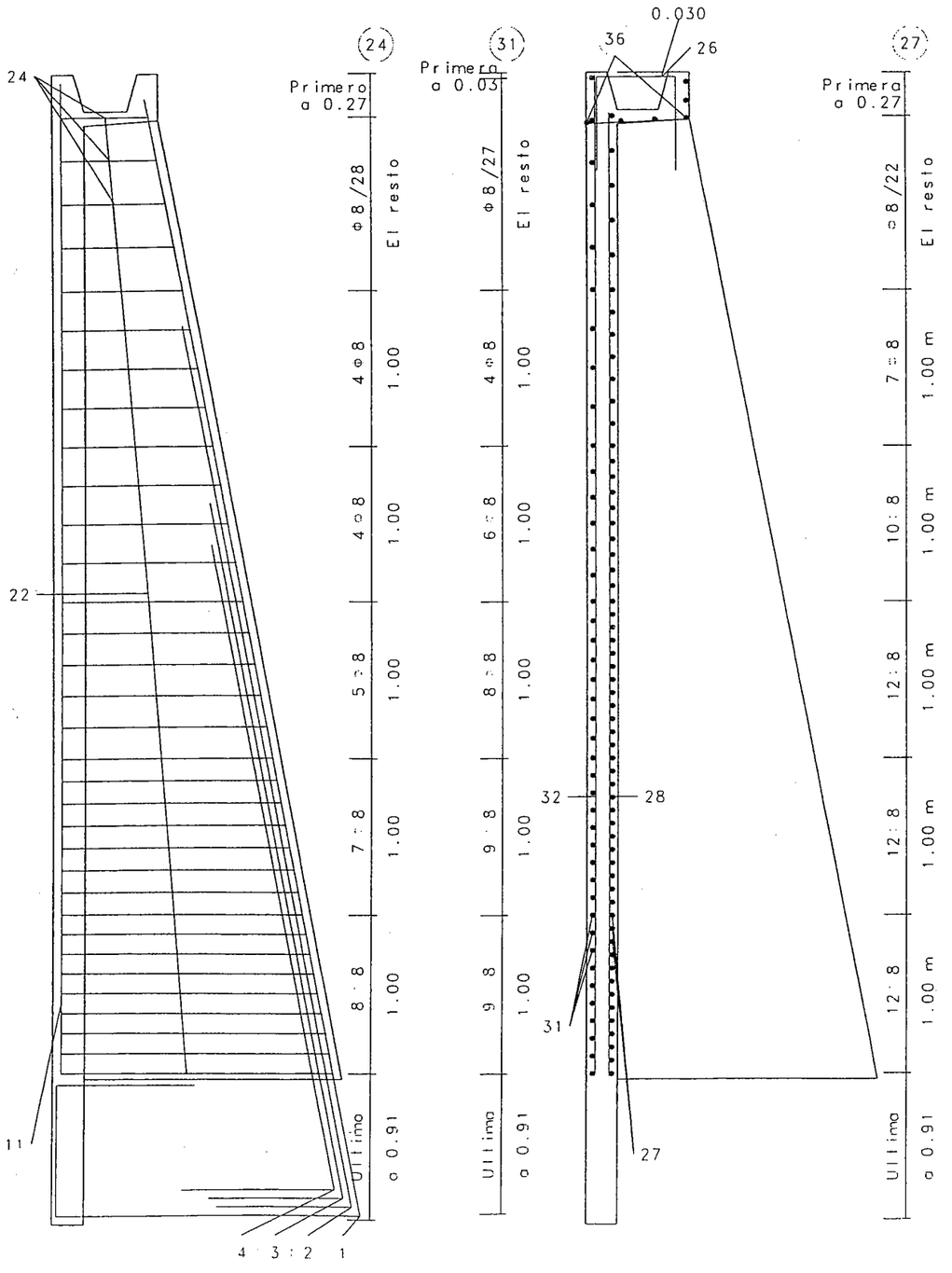
Director Técnico
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EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

REFER	H.MED
01CV1	7.290



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REFER	L1	R	Q
01CV1	9.027	7.130	6.350

EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2 Φ 16	R+ 1.90	0.64 / 0.21 — R — 9.00% — 0.40 — 0.85 — 0.80	R+ 1.90	0.64 / 0.21 — R — 9.00% — 0.40 — 0.85 — 0.80	18.05	28.5
2	2 Φ 20	5.99	0.50 — 5.63 — 9.00% — 0.40	5.37	0.45 — 5.01 — 9.00% — 0.40	11.36	28.0
3	2 Φ 20	4.80	0.40 — 4.45 — 9.00% — 0.40	4.37	0.36 / 0.04 — 4.01 — 9.00% — 0.40	9.16	22.6
4	2 Φ 32	4.53	0.37 / 0.08 — 4.12 — 9.00% — 0.45	3.82	0.30 / 0.15 — 3.42 — 9.00% — 0.45	8.35	52.7
11	2 Φ 16	Q	Q	Q	Q	12.70	20.0
22	2 Φ 8	Q-0.24	Q-0.24	Q-0.24	Q-0.24	12.22	4.8
24	33 Φ 8	1.62	0.14 / a / b / 0.22			55.82	22.0

	a(m)	b(m)	L(m)
EST. SUP	0.25	0.16	1.08
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	0.79	0.20	2.17

TOTAL 1 NERVIO 178.73
TOTAL 2 NERVIOS 357.45

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Los medidos indicados en los dibujos de las barras de la armadura principal (1,2.....10) son: de vértice a vértice, y del ramal largo, que está inclinado, su proyección horizontal. Al doblar las barras en vértices se curvan de acuerdo con la Norma EH 91. Las longitudes La y Lb indicadas corresponden al DESARROLLO REAL de la barra, es decir medida teniendo en cuenta el curvado de la barra y, por consiguiente, su valor es superior a la suma de las medidas parciales acotadas en el dibujo.
La longitud LT es el resultado de sumar La + Lb

REFER	H.MED	P
01CV1	7.290	6.350

EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

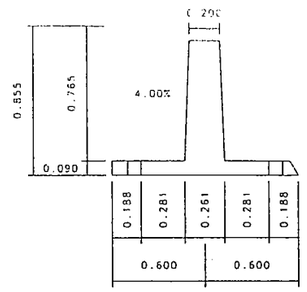
			L(m)		LT(m)	P(kg)
26	2	ø10	1.36	0.59 / 0.23 / 0.59	2.71	1.7
27	59	ø8	2.34	2.34	138.06	54.5
28	8	ø6	P-0.24	P-0.24	48.88	10.8
31	42	ø8	2.34	2.34	98.28	38.8
32	8	ø6	P	P	50.80	11.3
36		ø6	0.48	b=0.15 / 0.24 / 0.24	1.12m2	2.53
		ø5	2.34			
					TOTAL	119.58

KILOS DE ACERO POR PIEZA

REFER	6	8	10	12	16	20	25	32	M2.CAB	BARRAS
01CV1	22.12	146.95	1.67	0.00	97.08	101.23	0.00	105.44	1.12	474.49

INGENIERIA

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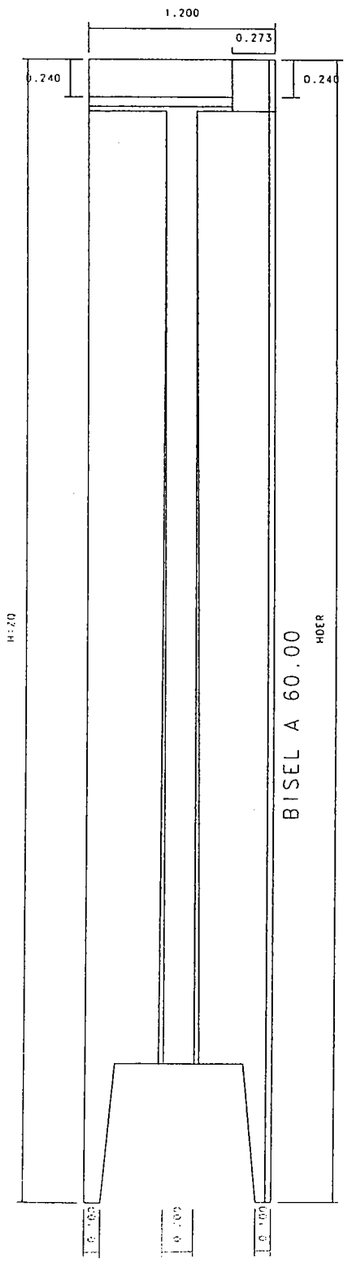


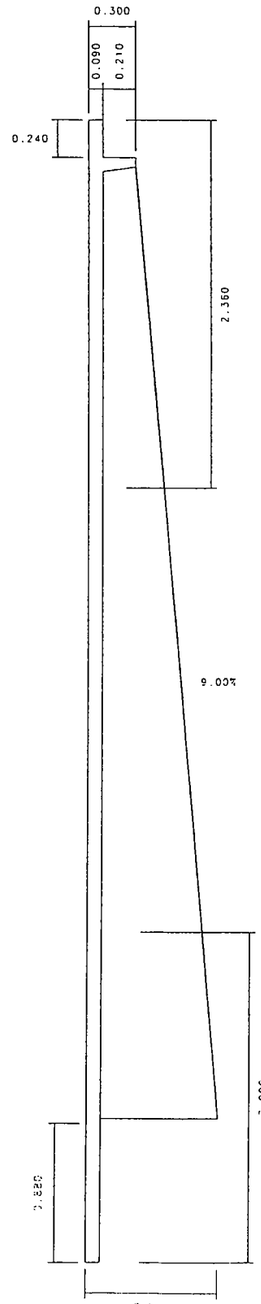
EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

PERFIL	10118 1 3 2	PEDIDO	10041
NUMERO DE PIEZAS	2	PESO PIEZA (T)	3.58
M3 HORMIGON	1.40	fck (Kp/cm2)	350
KG ACERO	228.49	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	9/9/20	

GOMA ESTANDAR EN JUNTAS

PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CV2	7.290	7.290	0.000	7.290
	01CV3	7.290	7.290	0.000	7.290



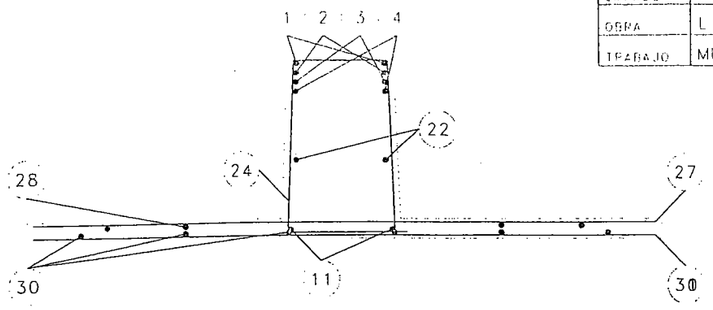


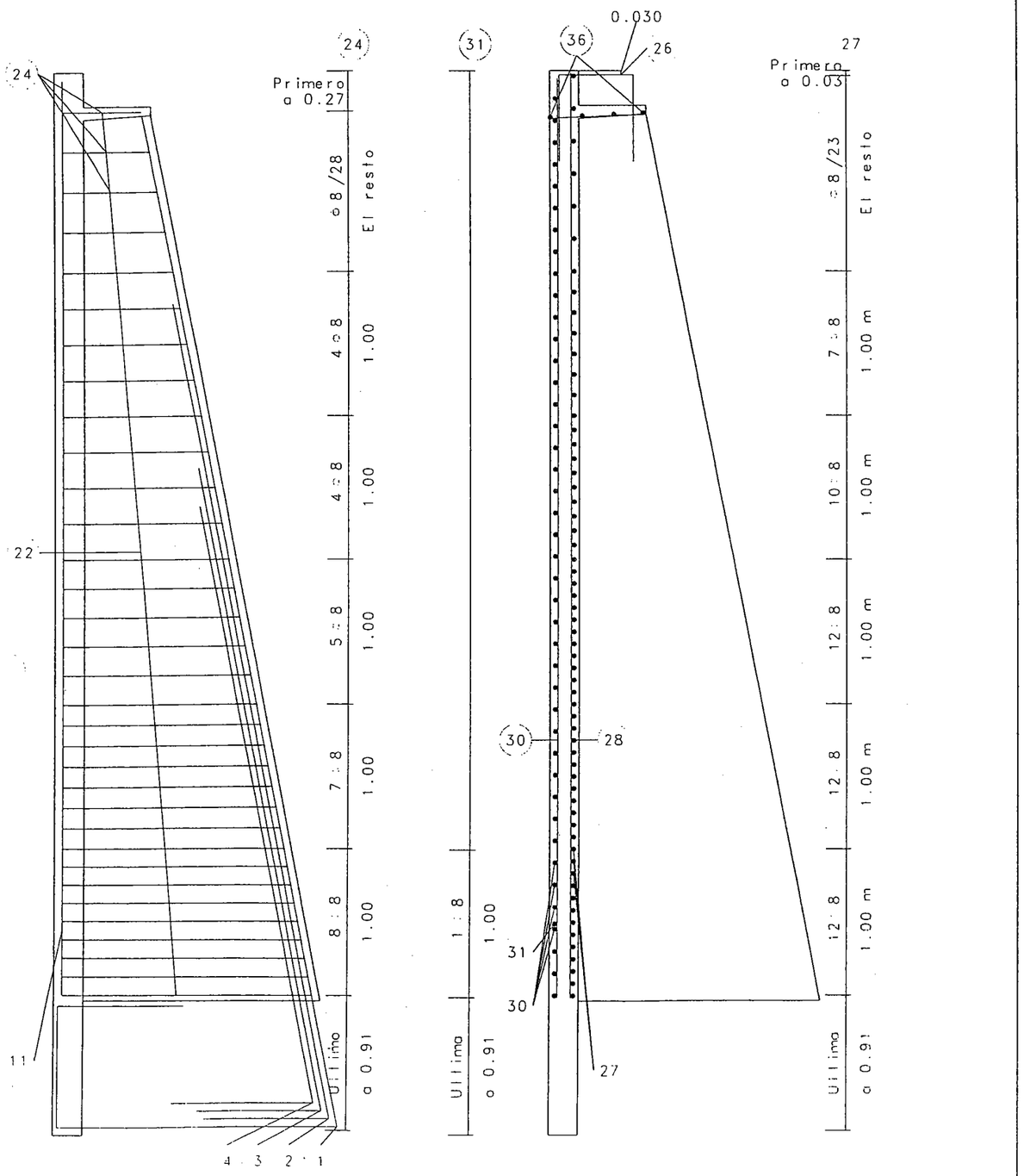
INGENIERIA

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Ingeniero de Caminos
Colegiado nº 16495

EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

REFER	H.MED
01CV2	7.290
01CV3	7.290





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REFER	.1	5	0
01CV2	8.887	6.990	6.350
01CV3	8.887	6.990	6.350

EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2ø16	R+1.90	0.62 / 0.23 — R — 9.00% — 0.40 — 0.85 / 0.80	R+1.90	0.62 / 0.23 — R — 9.00% — 0.40 — 0.85 / 0.80	17.77	28.1
2	2ø20	6.00	0.50 — 5.64 — 9.00% — 0.40	5.43	0.45 — 5.08 — 9.00% — 0.40	11.43	28.2
3	2ø20	4.80	0.40 — 4.45 — 9.00% — 0.40	4.43	0.36 / 0.04 — 4.08 — 9.00% — 0.40	9.23	22.8
4	2ø32	4.54	0.37 / 0.08 — 4.13 — 9.00% — 0.45	3.83	0.30 / 0.15 — 3.42 — 9.00% — 0.45	8.37	52.8
11	2ø16	Q	Q	0	Q	12.70	20.0
22	2ø8	Q-0.24	Q-0.24	Q-0.24	Q-0.24	12.22	4.8
24	33ø8	1.62	0.14 / a / b / 0.22			55.82	22.0

	a(m)	b(m)	L(m)
EST. SUP	0.25	0.16	1.08
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	0.79	0.20	2.17

TOTAL 1 NERVIO 178.74

NORTSEIH
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Los medidas indicados en los dibujos de las barras de la armadura principal (1,2,....10) son: de vertice a vertice, y del ramal largo, que esta inclinado, su proyeccion horizontal. Al doblar las barras los vertices se curvaran de acuerdo con la Norma EH 91. Las longitudes Lo y Lb indicados corresponden al DESARROLLO REAL de la barra (es lo medido a tener en cuenta al cortar la barra) y, por consiguiente, su valor es inferior a la suma de las medidas parciales acotadas en el dibujo.
En graficos [illegible] la suma de [illegible]

REFER	H.MED	P
01CV2	7.290	6.350
01CV3	7.290	6.350

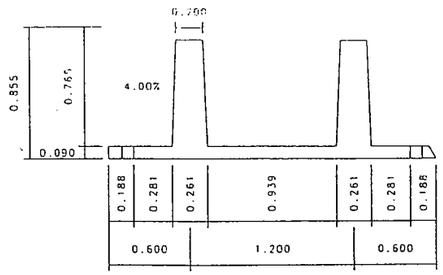
EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

		L(m)		Ll(m)	P(kg)
26	1 ⌀10	1.36	0.59 / 0.23 / 0.59	1.36	0.8
27	60 ⌀8	1.11	1.11	66.32	26.2
28	4 ⌀6	P	P	25.40	5.6
30	⌀6 ⌀5	1.12 P	P / 1.12 / 0.15 / 1.12 / 0.20	7.13m2	16.0
31	1 ⌀8	1.12	1.12	1.12	0.4
36	⌀6 ⌀5	0.24 1.14	b=0.15 / 0.24	0.27m2	0.62
				TOTAL	49.74

KILOS DE ACERO POR PIEZA

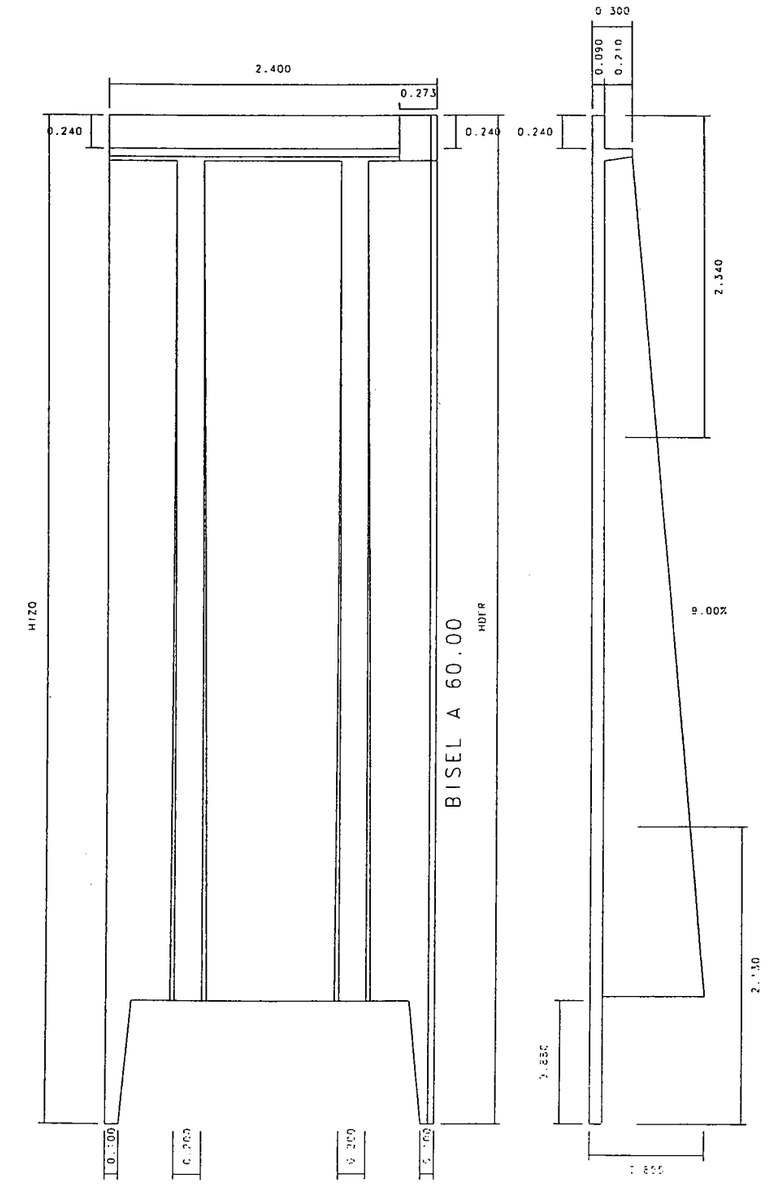
REFER	6	8	10	12	16	20	25	32	M2.ALA	M2.CAB	BARRAS
01CV2	5.64	53.46	0.84	0.00	48.10	50.97	0.00	52.83	7.13	0.27	211.84
01CV3	5.64	53.46	0.84	0.00	48.10	50.97	0.00	52.83	7.13	0.27	211.84

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Colegiado n.º 16495



EMPRESA	UTE ALT-CAMP		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-1		
PERFIL	10118 1 3 3	PEDIDO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	7.13
M3 HORMIGON	2.77	fck (Kp/cm2)	350
KG ACERO	475.12	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	9/9/20	
GOMA ESTANDAR EN JUNTAS			
BERENJENO			

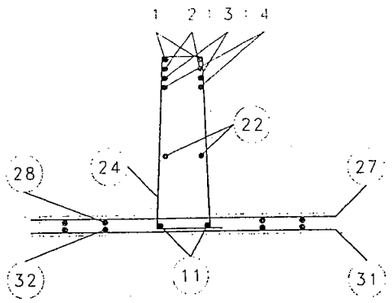
PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CV4	7.290	7.290	0.000	7.290

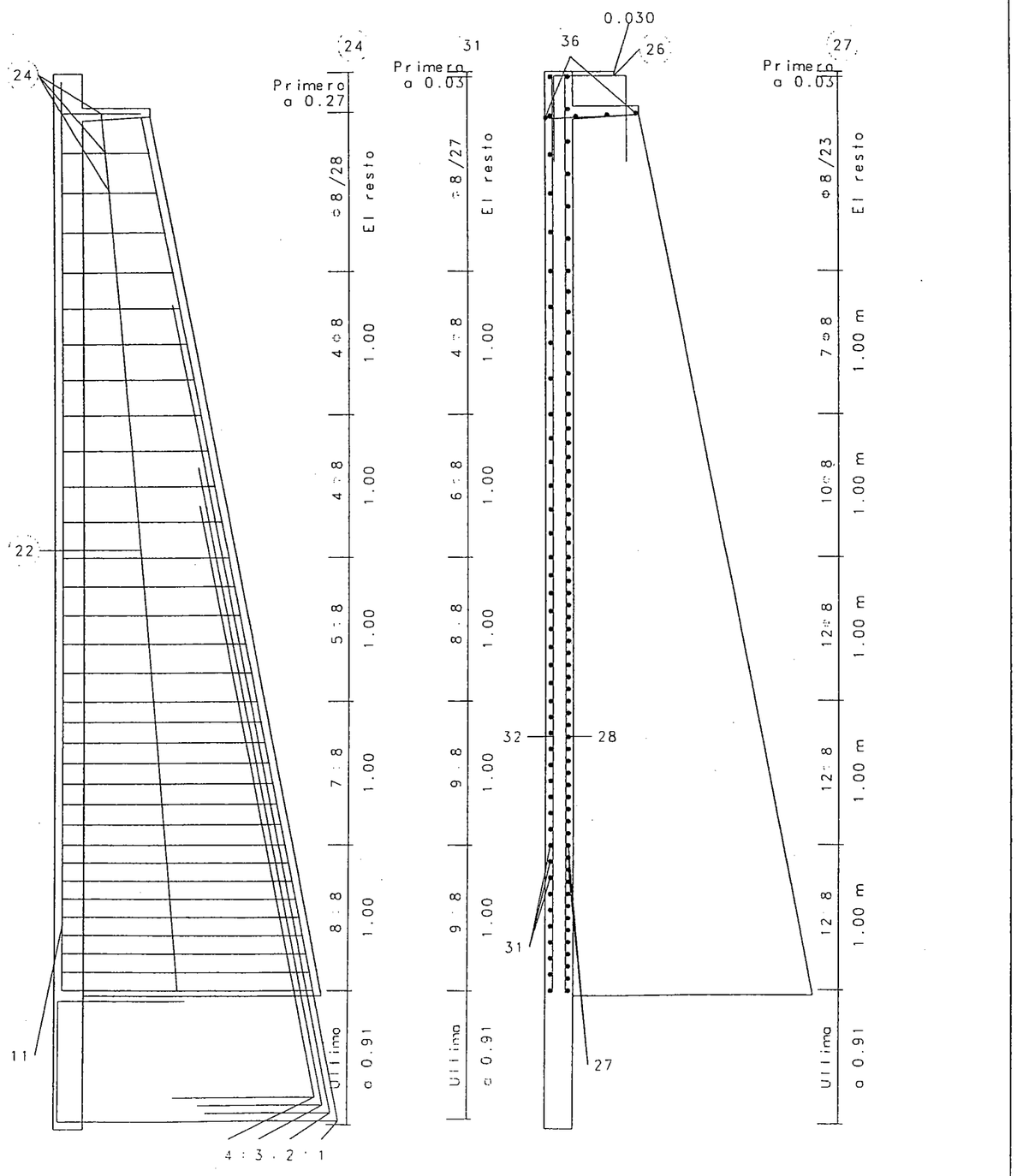


NORTEMPH
Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

REFER	H.MED
01CV4	7.290





MORYENPI
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Ingeniero de Caminos
Colegiado n º 16455

REFER	L1	R	Q
01CV4	8.887	6.990	5.350

EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

		Lo(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2 ⌀ 16	R+ 1.90	0.62 / 0.23 — R — 9.00% — 0.40 — 0.85 — 0.80	R+ 1.90	0.62 / 0.23 — R — 9.00% — 0.40 — 0.85 — 0.80	17.77	28.1
2	2 ⌀ 20	5.99	0.50 — 5.63 — 9.00% — 0.40	5.37	0.45 — 5.01 — 9.00% — 0.40	11.36	28.0
3	2 ⌀ 20	4.80	0.40 — 4.45 — 9.00% — 0.40	4.37	0.36 / 0.04 — 4.01 — 9.00% — 0.40	9.16	22.6
4	2 ⌀ 32	4.53	0.37 / 0.08 — 4.12 — 9.00% — 0.45	3.82	0.30 / 0.15 — 3.42 — 9.00% — 0.45	8.35	52.7
11	2 ⌀ 16	Q	Q	Q	Q	12.70	20.0
22	2 ⌀ 8	Q-0.24	Q-0.24	Q-0.24	Q-0.24	12.22	4.8
24	33 ⌀ 8	1.62	0.14 / a / b / 0.22			55.82	22.0

	a(m)	b(m)	L(m)
EST. SUP	0.25	0.16	1.08
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	0.79	0.20	2.17

TOTAL 1 NERVIO	178.28
TOTAL 2 NERVIOS	356.57

MORYENPI
Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n º 16455

Las medidas indicadas en los dibujos de las barras de la armadura principal (1,2,....10) son de vértice a vértice, y del ramal largo, que está inclinado. Su proyección horizontal. A los dobleces de las barras en los vértices se curvarán de acuerdo con la Norma EH-91. Las longitudes Lo y Lb indicadas corresponden al DESARROLLO REAL de la barra (es la medida a tener en cuenta al cortar la barra) y, por consiguiente, su valor es superior a la suma de las medidas parciales acotadas en el dibujo.
La cuantía total en el resguardo es igual a [illegible]

PERFIL	H.MED	P
01CV4	7.290	6.350

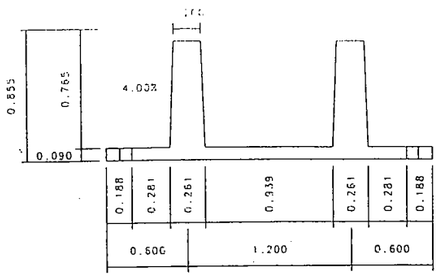
EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

		L(m)		LI(m)	P(kg)
26	2 ø10	1.36	0.59 / 0.23 / 0.59	2.71	1.7
27	60 ø8	2.31	2.31	138.32	54.6
28	8 ø6	P	P	50.80	11.3
31	42 ø8	2.32	2.32	97.55	38.5
32	8 ø6	P	P	50.80	11.3
36	ø6 ø5	0.24 2.34	b=0.15 / 0.24	0.56m2	1.26
				TOTAL	118.56

KILOS DE ACERO POR PIEZA

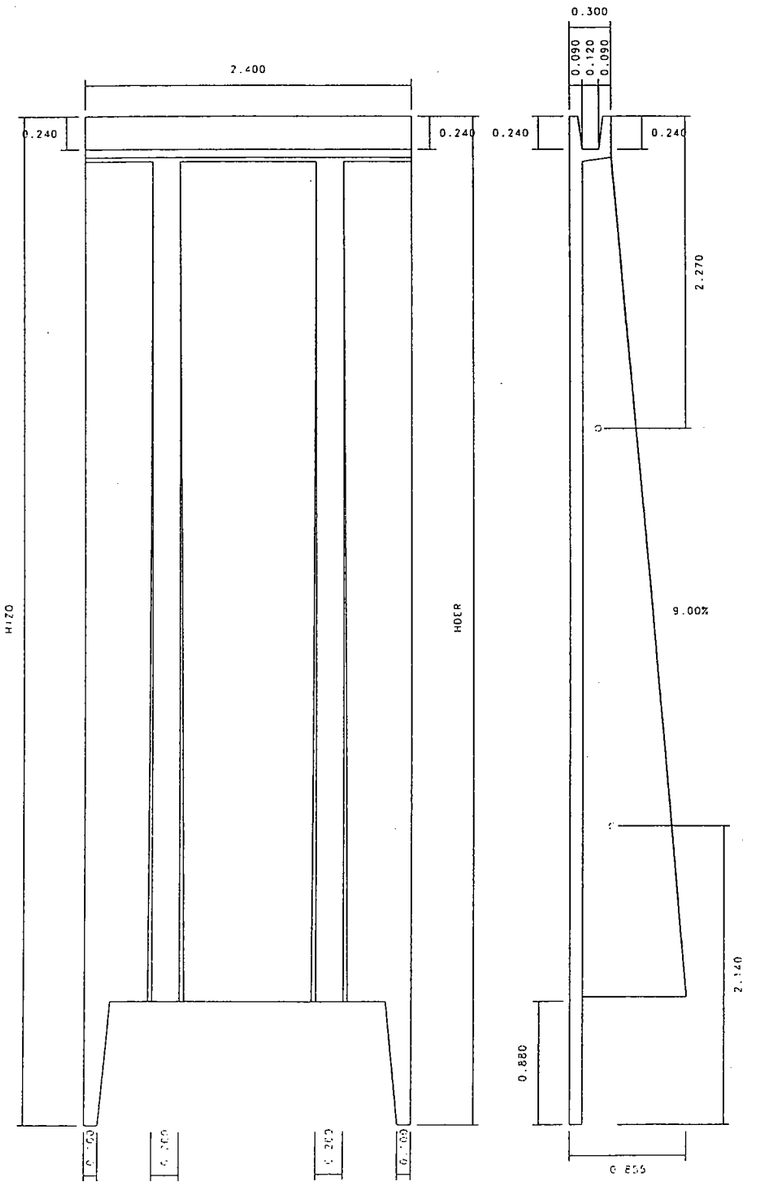
REFER	6	8	10	12	16	20	25	32	M2.CAB	BARRAS
01CV4	22.55	146.77	1.67	0.00	96.20	101.23	0.00	105.44	0.56	473.86

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EMPRESA	UTE ALT-CAMP		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-1		
PERFIL	10118 1 3 4	PLIEGO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	7.21
M3 HORMIGON	2.81	fck (Kp/cm2)	350
KG ACERO	477.01	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	9/9/20	
GOMA ESTANDAR EN JUNTAS			
BERENJENO			

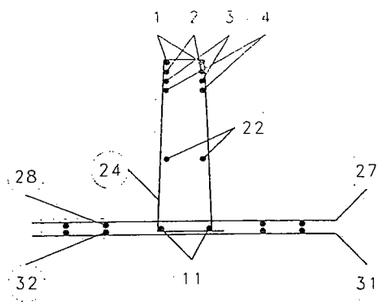
PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CV5	7.290	7.290	0.000	7.290

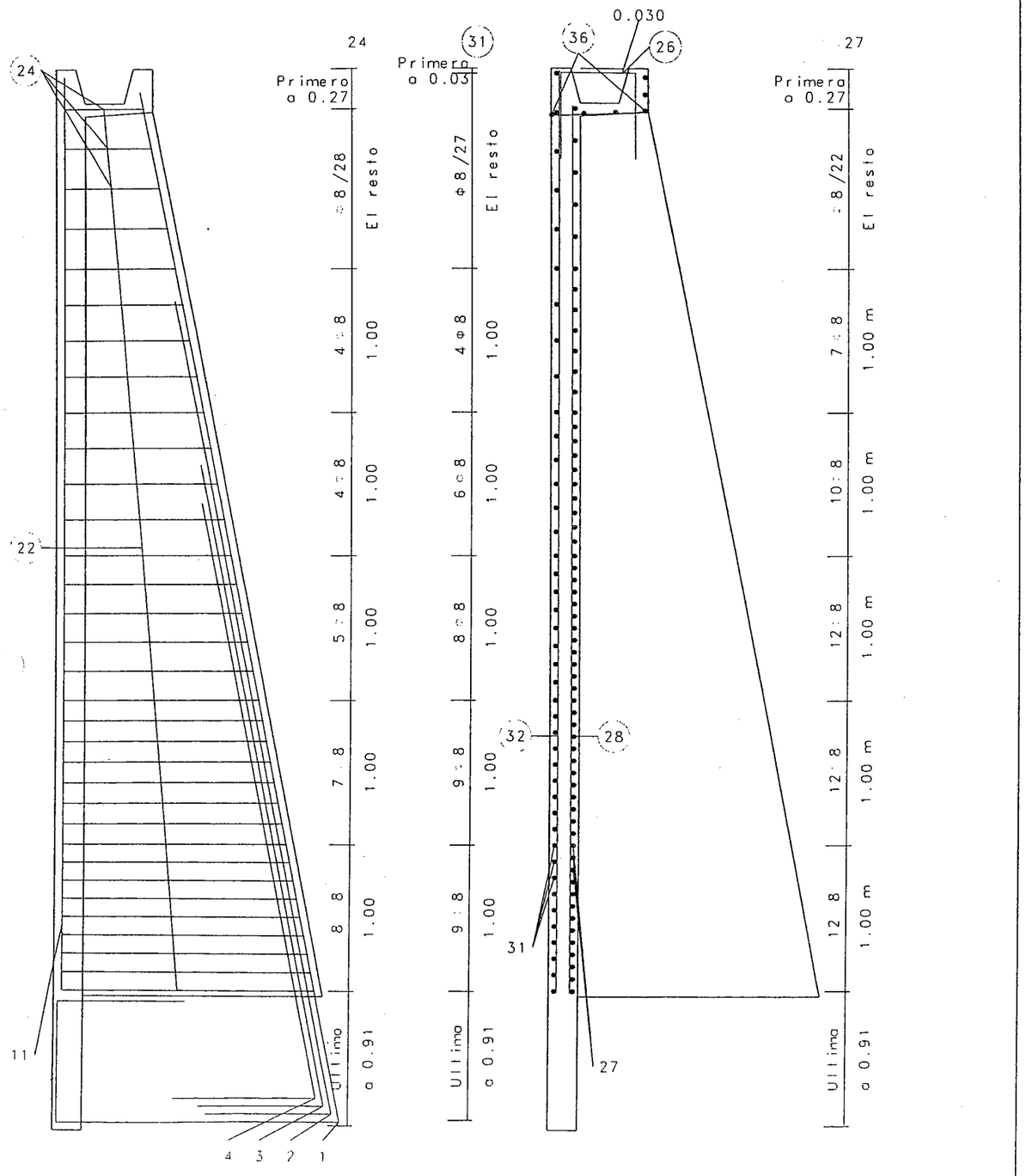


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Colegiado n.º 16495

EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

REFER	H.MED
01CV5	7.290





REFER	_1	P	Q
01CV5	9.027	7.130	6.350

EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

		Lo(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2:16	R+ 1.90	0.64 / 0.21 — R — 9.00% — 0.40 — 0.85 — 0.80	R+ 1.90	0.64 / 0.21 — R — 9.00% — 0.40 — 0.85 — 0.80	18.05	28.5
2	2:20	5.99	0.50 — 5.63 — 9.00% — 0.40	5.37	0.45 — 5.01 — 9.00% — 0.40	11.36	28.0
3	2:20	4.80	0.40 — 4.45 — 9.00% — 0.40	4.37	0.36 / 0.04 — 4.01 — 9.00% — 0.40	9.16	22.6
4	2:32	4.53	0.37 / 0.08 — 4.12 — 9.00% — 0.45	3.82	0.30 / 0.15 — 3.42 — 9.00% — 0.45	8.35	52.7
11	2:16	Q	Q	Q	Q	12.70	20.0
22	2:8	Q-0.24	Q-0.24	Q-0.24	Q-0.24	12.22	4.8
24	33:8	1.62	0.14 / a / b / 0.22			55.82	22.0

	a(m)	b(m)	L(m)
EST. SUP	0.25	0.16	1.08
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	0.79	0.20	2.17

TOTAL 1 NERVIO	178.73
TOTAL 2 NERVIOS	357.45

Director Técnico
NEKANE MUNDUATE ALTZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

Las medidas indicadas en los dibujos de las barras de la armadura principal (1,2,.....10) son: de vértice a vértice, y del ramal largo, que éste inclinado, su proyección horizontal. Al doblar las barras los vértices se curvarán de acuerdo con la Norma EH 91. Las longitudes Lo y Lb indicadas corresponden a: DESARROLLO REAL de la barra (es la medida a tener en cuenta al cortar la barra) y, por consiguiente, su valor es superior a la suma de las medidas parciales acotadas en el dibujo.
En capítulo II se ha tenido en cuenta la [illegible]

REFER	H.MED	P
01CV5	7.290	6.350

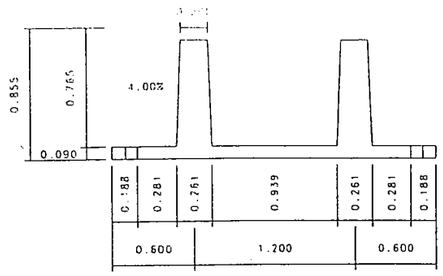
EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

		L(m)		LI(m)	P(kg)
26	2 Φ10	1.36	0.59 / 0.23 / 0.59	2.71	1.7
27	59 Φ8	2.34	2.34	138.06	54.5
28	8 Φ6	P-0.24	P-0.24	48.88	10.8
31	42 Φ8	2.34	2.34	98.28	38.8
32	8 Φ6	P	P	50.80	11.3
36	Φ6 / Φ5	0.48 / 2.34	b=0.15, 0.24 / 0.24	1.12m2	2.53
				TOTAL	119.58

KILOS DE ACERO POR PIEZA

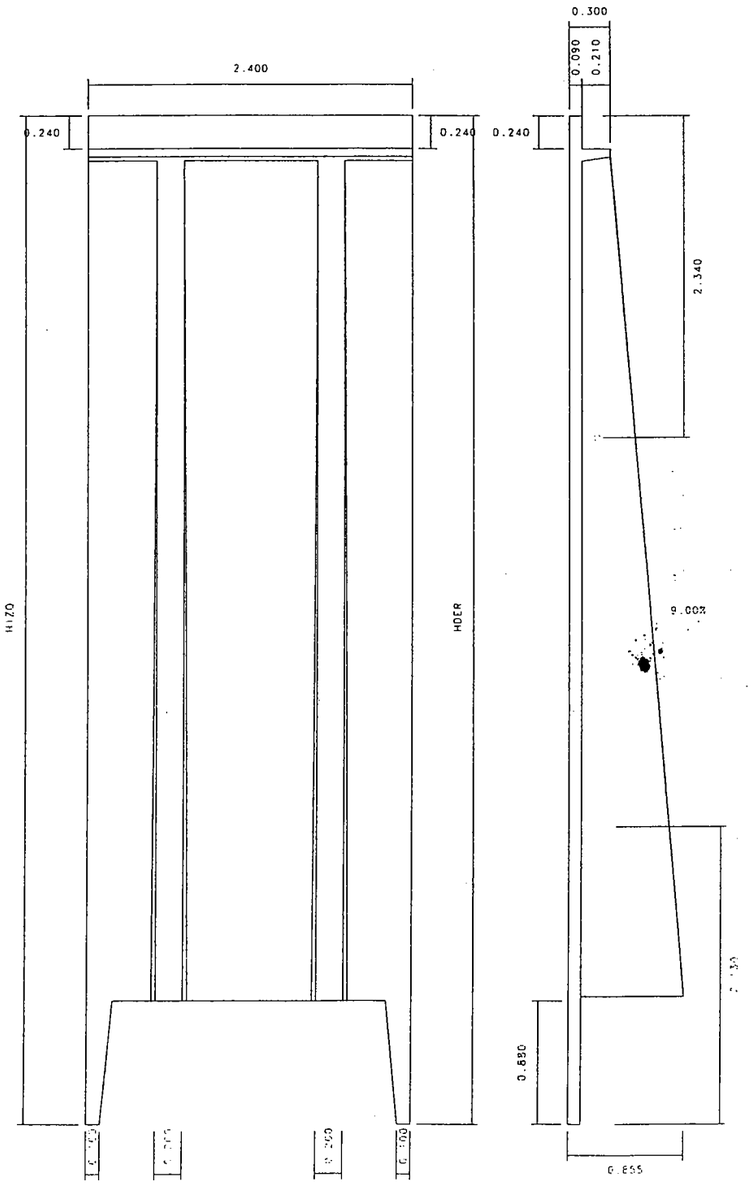
REFER	6	8	10	12	16	20	25	32	M2.CAB	BARRAS
01CV5	22.12	146.95	1.67	0.00	97.08	101.23	0.00	105.44	1.12	474.49

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Ingeniero de Caminos
Colegiado n.º 16496



EMPRESA	UTE ALT-CAMP		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-1		
PERFIL	10118 1 3 5	PED.DO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	7.31
M3 HORMIGON	2.77	fck (Kp/cm2)	350
KG ACERO	476.22	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	9/9/20	
MAMPOSTERIA CALIZA			

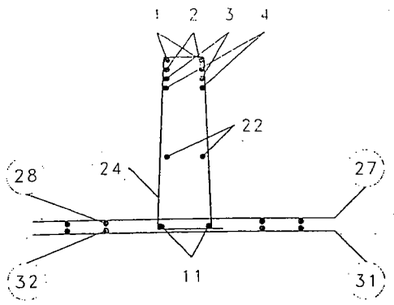
PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CV6	7.290	7.290	0.000	7.290

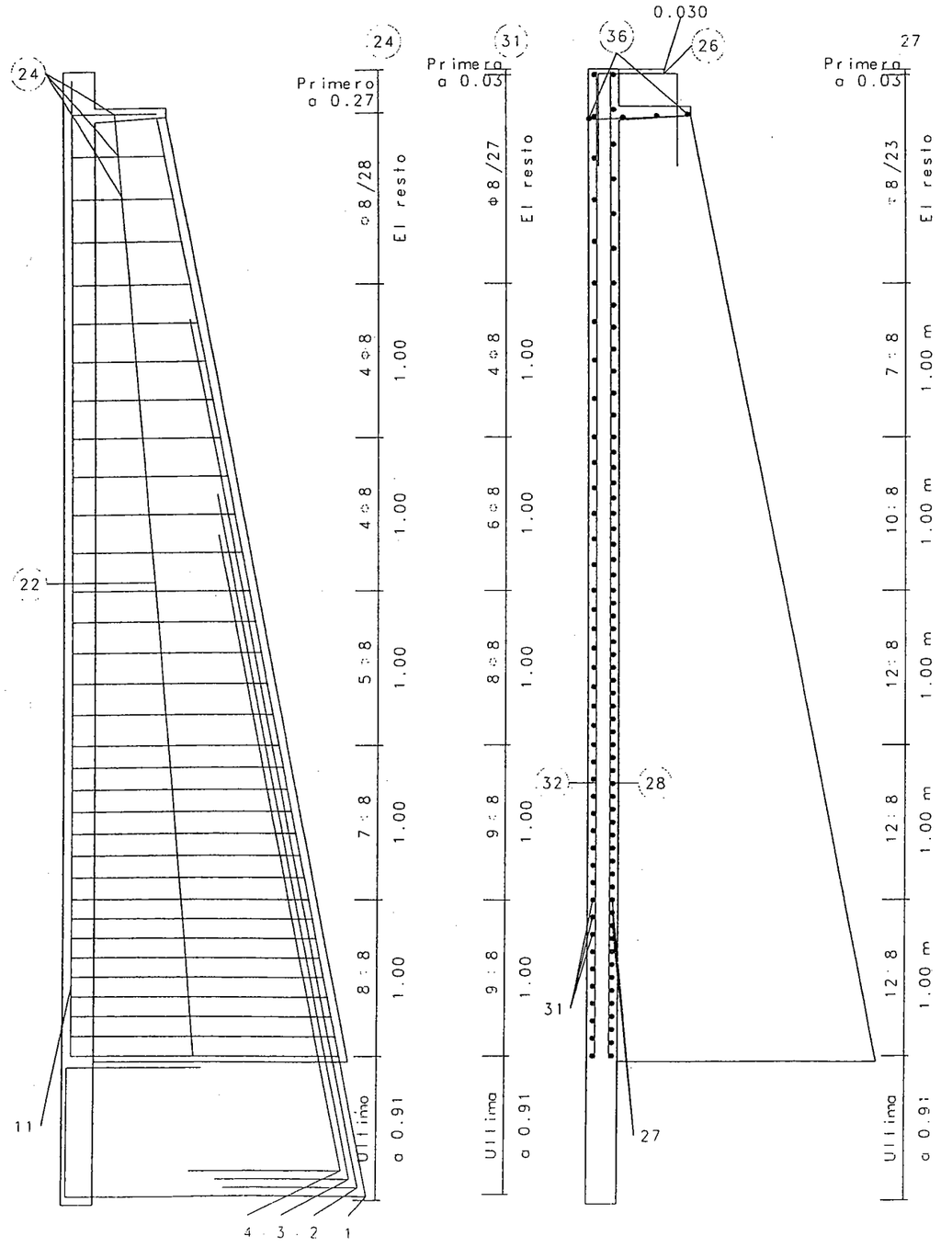


Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16496

EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

REFER	H.MED
01CV6	7.290





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Colegiado n.º 16495

REFER	L1	S	Q
01CV6	8.887	5.950	6.350

EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2 ⌀ 16	R+ 1.90	0.62 / 0.23 — R — 9.00% — 0.40 — 0.85 — 0.80	R+ 1.90	0.62 / 0.23 — R — 9.00% — 0.40 — 0.85 — 0.80	17.77	28.1
2	2 ⌀ 20	5.99	0.50 — 5.63 — 9.00% — 0.40	5.37	0.45 — 5.01 — 9.00% — 0.40	11.36	28.0
3	2 ⌀ 20	4.80	0.40 — 4.45 — 9.00% — 0.40	4.37	0.36 / 0.04 — 4.01 — 9.00% — 0.40	9.16	22.6
4	2 ⌀ 32	4.53	0.37 / 0.08 — 4.12 — 9.00% — 0.45	3.82	0.30 / 0.15 — 3.42 — 9.00% — 0.45	8.35	52.7
11	2 ⌀ 16	Q	Q	Q	Q	12.70	20.0
22	2 ⌀ 8	Q-0.24	Q-0.24	Q-0.24	Q-0.24	12.22	4.8
24	33 ⌀ 8	1.62	0.14 / a / b / 0.22			55.82	22.0

	a(m)	b(m)	L(m)
EST. SUP	0.25	0.16	1.08
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	0.79	0.20	2.17

TOTAL 1 NERVIO	178.28
TOTAL 2 NERVIOS	356.57

MOSTENPI
Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

Las medidas indicadas en los dibujos de las barras de la armadura principal (1,2,...,10) son: de vértice a vértice, y del ramal largo, que este inclinado, su proyección horizontal. Al doblar las barras los vértices se curvan de acuerdo con la Norma EH-91. Las longitudes La, Lb indicadas corresponden al DESARROLLO REAL de la barra (es la medida a tener en cuenta al cortar la barra) y, por consiguiente, su valor es superior a la suma de las medidas parciales acotadas en el dibujo.
La cantidad LT es el resultado de sumar La y Lb.

03/05/01 20:11 I. DESPIECE DE LA ARMADURA DEL ALA Y MEDICION PI 15032

REFER	P.MED	P
01CV6	7.290	6.350

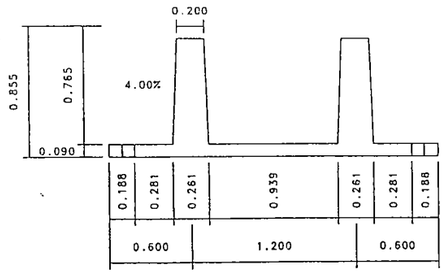
EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

		L(m)		LI(m)	P(kg)
26	2 ⌀10	1.36	0.59 / 0.23 / 0.59	2.71	1.7
27	60 ⌀8	2.34	2.34	140.40	55.4
28	8 ⌀6	P	P	50.80	11.3
31	42 ⌀8	2.34	2.34	98.28	38.8
32	8 ⌀6	P	P	50.80	11.3
36	⌀6 ⌀5	0.24 2.34	b=0.15 / 0.24	0.56m2	1.26
				TOTAL	119.67

KILOS DE ACERO POR PIEZA

REFER	6	8	10	12	16	20	25	32	M2.CAB	BARRAS
01CV6	22.55	147.87	1.67	0.00	96.20	101.23	0.00	105.44	0.56	474.96

HORTENPI
Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

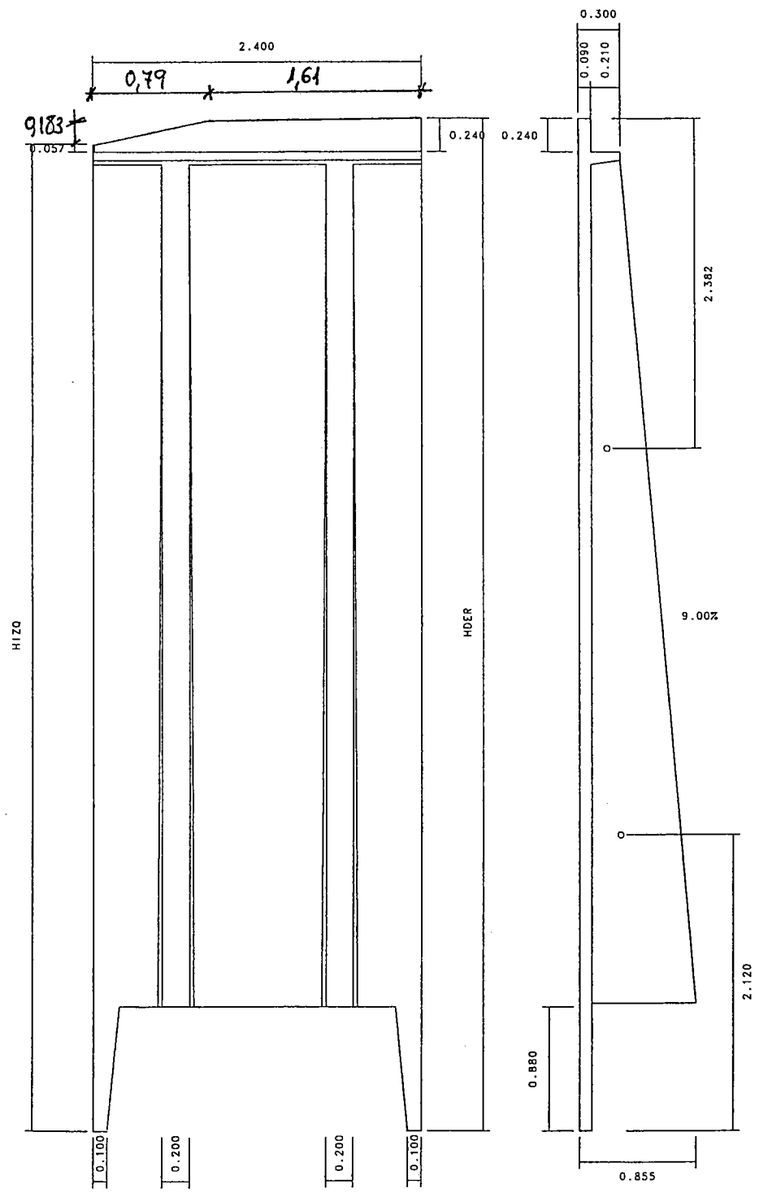


EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRANCESA
TRABAJO	MURO EST. E-1

PERFIL	10118 1 3 6	PEDIDO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	7.20
M3 HORMIGON	2.73	fck (Kp/cm2)	350
KG ACERO	467.01	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	9/9/20	

MAMPOSTERIA CALIZA

PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CV7	7.107	7.290	0.183	7.199

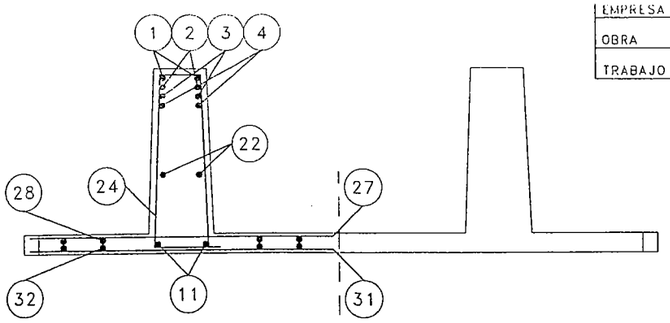


HORTENPI
Director Técnico
NEKANE MUNDUATE AUZMENDI
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Colegiado n.º 16495

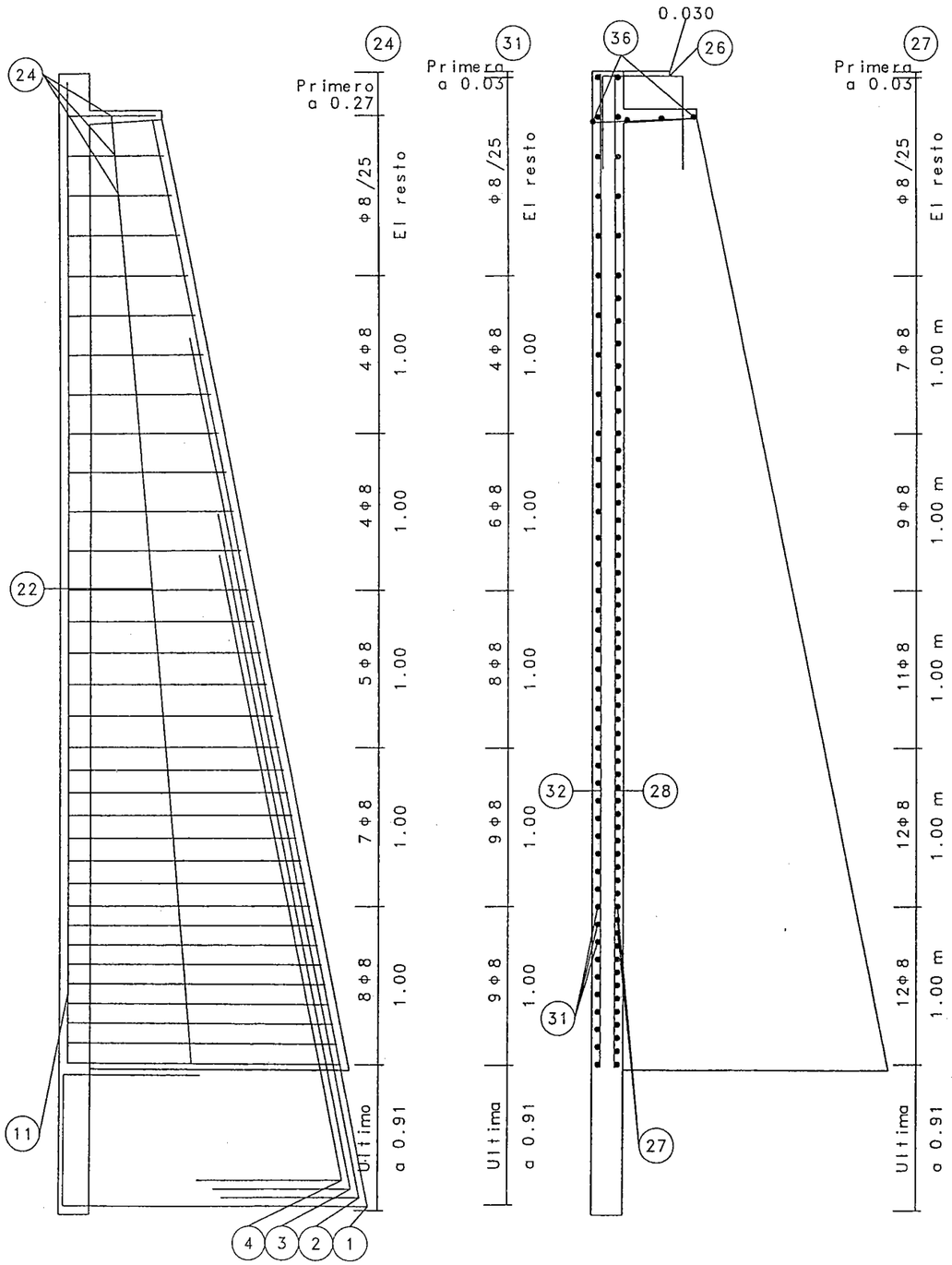
EMPRESA	UTE ALT-CAMI
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRANCESA
TRABAJO	MURO EST. E-1

REFER	H.MED
01CV7	7.199

REFER	L1	R	Q
01CV7	8.887	6.990	6.259



NORTEC[PH]
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		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2Φ16	R+ 1.90	0.62 / 0.23 — R — 9.00% — 0.40 — 0.85 — 0.80	R+ 1.90	0.62 / 0.23 — R — 9.00% — 0.40 — 0.85 — 0.80	17.77	28.1
2	2Φ20	5.89	0.49 — 5.53 — 9.00% — 0.40	5.27	0.44 — 4.92 — 9.00% — 0.40	11.16	27.5
3	2Φ20	4.70	0.39 / 0.01 — 4.35 — 9.00% — 0.40	4.27	0.35 / 0.05 — 3.92 — 9.00% — 0.40	8.97	22.1
4	2Φ32	4.40	0.36 / 0.06 — 4.03 — 9.00% — 0.42	3.69	0.29 / 0.13 — 3.32 — 9.00% — 0.42	8.10	51.1
11	2Φ16	Q	Q	Q	Q	12.52	19.8
22	2Φ8	Q-0.15	Q-0.15	Q-0.15	Q-0.15	12.22	4.8
24	33Φ8	1.62	0.14 / a / b / 0.22			55.33	21.8

	a(m)	b(m)	L(m)
EST. SUP	0.25	0.16	1.08
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	0.79	0.20	2.17

TOTAL 1 NERVIO 175.23
TOTAL 2 NERVIOS 350.45

NORTEC[PH]
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Ingeniero de Caminos
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Las medidas indicadas en los dibujos de las barras de la armadura principal (1,2,...,10) son: de vertice a vertice, y del ramal largo, que esta inclinado, su proyeccion horizontal. Al doblar las barras los vertices se curvaran de acuerdo con la Norma EH-91. Las longitudes La y Lb indicadas corresponden al DESARROLLO REAL de la barra (es la medida a tener en cuenta al cortar la barra) y, por consiguiente, su valor es inferior a la suma de las medidas parciales acotadas en el dibujo.
La longitud Lt es el resultado de sumar La y Lb.

REFER	H.MED	P
01CV7	7.199	6.259

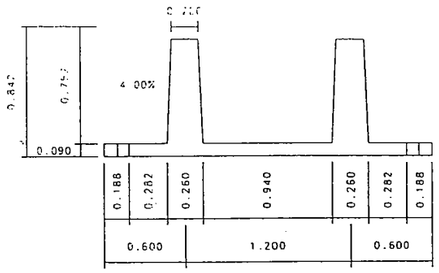
EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRANCESA
TRABAJO	MURO EST. E-1

		L(m)		Lt(m)	P(kg)
26	2 Φ10	1.36	0.59 / 0.23 / 0.59	2.71	1.7
27	57 Φ8	2.34	2.34	133.38	52.6
28	8 Φ6	P	P	50.07	11.1
31	42 Φ8	2.34	2.34	98.28	38.8
32	8 Φ6	P	P	50.07	11.1
36	Φ6 / Φ5	0.24 / 2.34	b=0.15 / 0.24	0.56m2	1.26
				TOTAL	116.57

KILOS DE ACERO POR PIEZA

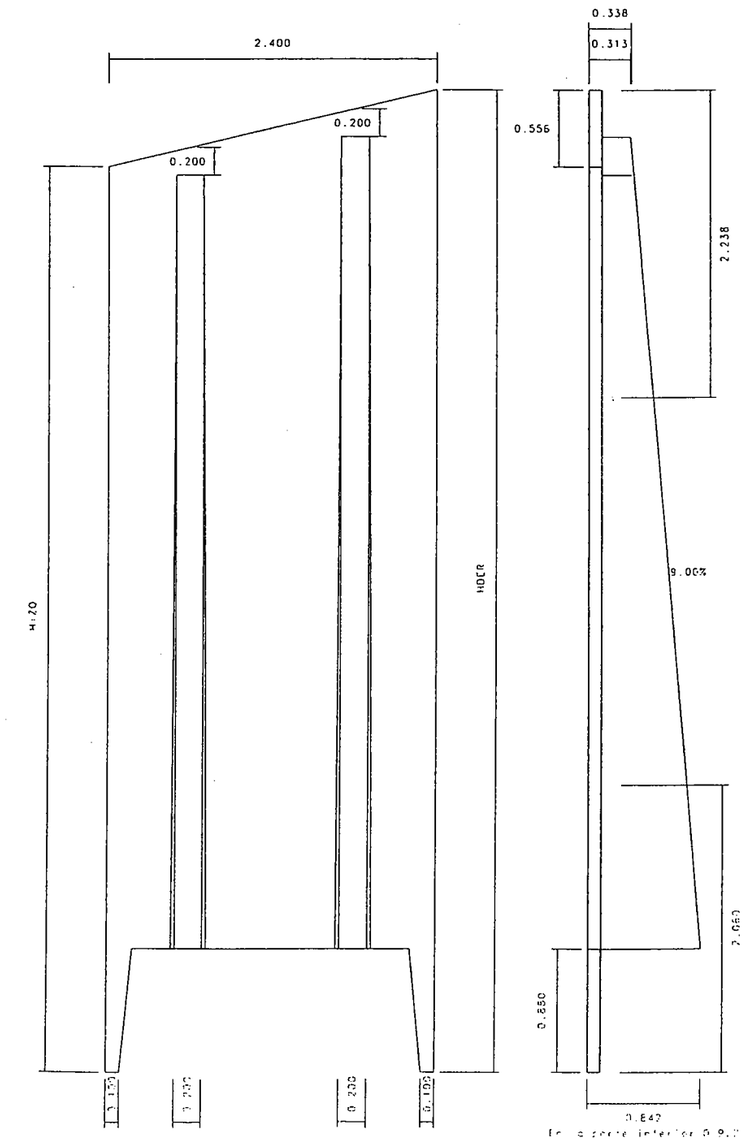
REFER	6	8	10	12	16	20	25	32	M2.CAB	BARRAS
01CV7	22.23	144.71	1.67	0.00	95.62	99.29	0.00	102.23	0.56	465.75

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EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1
PERFIL	10118 i 3 7 — PEDIDO 10041
NUMERO DE PIEZAS	1 — PESO PIEZA (T) 6.40
M3 HORMIGON	2.50 — fck (Kp/cm2) 350
KG ACERO	408.04 — fyk (Kp/cm2) 5100
RECUBRIMIENTO (M)	0.030 — 9/9/20
GOMA ESTANDAR EN JUNTAS	
BERENJENO	

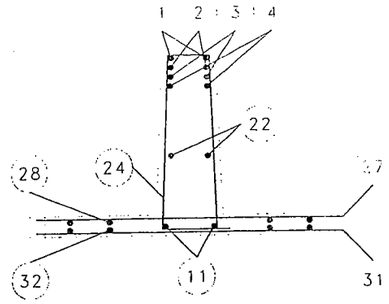
PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CV8	6.551	7.107	0.556	6.829

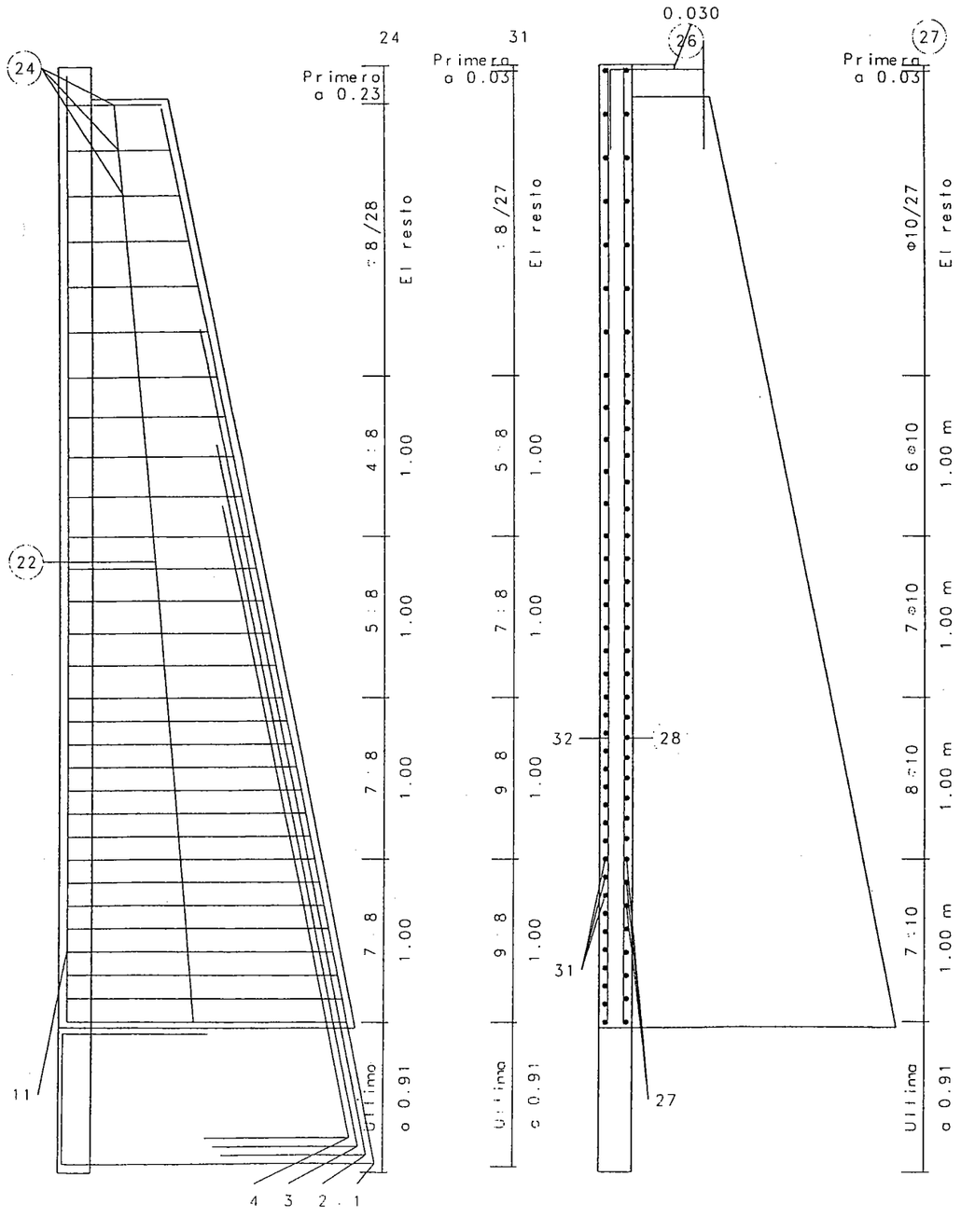


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EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

REFER	H.MED
01CV8	6.829





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REFER	X1	R	O	X2	R2	O1	O2
01CV8	8.427	6.569	5.869	P-0.139	R+0.139	0-0.139	0+0.139

EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2:16	R+1.86	0.59 / 0.23 — R — 9.00% — 0.40 — 0.82 / 0.80	R+1.86	0.59 / 0.23 — R — 9.00% — 0.40 — 0.82 / 0.80	16.85	26.6
2	2:16	5.51	0.46 — 5.15 — 9.00% — 0.40	5.15	0.43 — 4.80 — 9.00% — 0.40	10.66	16.8
3	2:20	4.73	0.39 / 0.01 — 4.38 — 9.00% — 0.40	4.29	0.35 / 0.05 — 3.94 — 9.00% — 0.40	9.03	22.3
4	2:32	4.29	0.35 / 0.05 — 3.94 — 9.00% — 0.40	3.54	0.28 / 0.12 — 3.19 — 9.00% — 0.40	7.83	49.4
11	2:12	0	0	0	0	11.78	10.5
22	2:8	0-0.20	0-0.20	0-0.20	0-0.20	11.38	4.5
24	30:8	1.63	0.14 / a / b / 0.22			48.80	19.3

	a(m)	b(m)	L(m)
EST. SUP	0.27	0.16	1.12
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	0.78	0.20	2.14

TOTAL 1 NERVIO 149.33
TOTAL 2 NERVIOS 298.65

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Las medidas indicadas en los dibujos de las barras de la armadura principal (1,2, ...10) son de vértice a vértice, y del ramal largo, que está inclinado, su proyección horizontal. Al doblar las barras los vértices se curvan de acuerdo con la Norma EH-91. Las longitudes La y Lb indicadas corresponden a DESARROLLO REAL de la barra (es decir medido a lo largo de la barra) y, por consiguiente, su valor es superior a la suma de las medidas parciales acotadas en el dibujo.

REFER	H.MED	P
01CV8	6.829	5.889

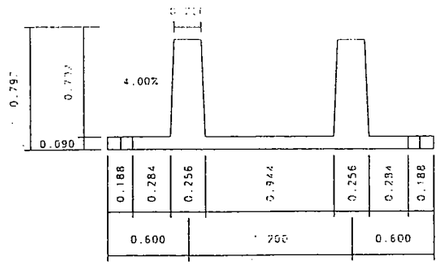
EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

		L(m)		LT(m)	P(kg)
26	2 ⌀10	1.18	0.50 / 0.26 / 0.50	2.36	1.5
27	36 ⌀10	2.34	2.34	84.24	51.9
28	8 ⌀6	P	P	47.11	10.5
31	38 ⌀8	2.34	2.34	88.92	35.1
32	8 ⌀6	P	P	47.11	10.5
				TOTAL	109.39

KILOS DE ACERO POR PIEZA

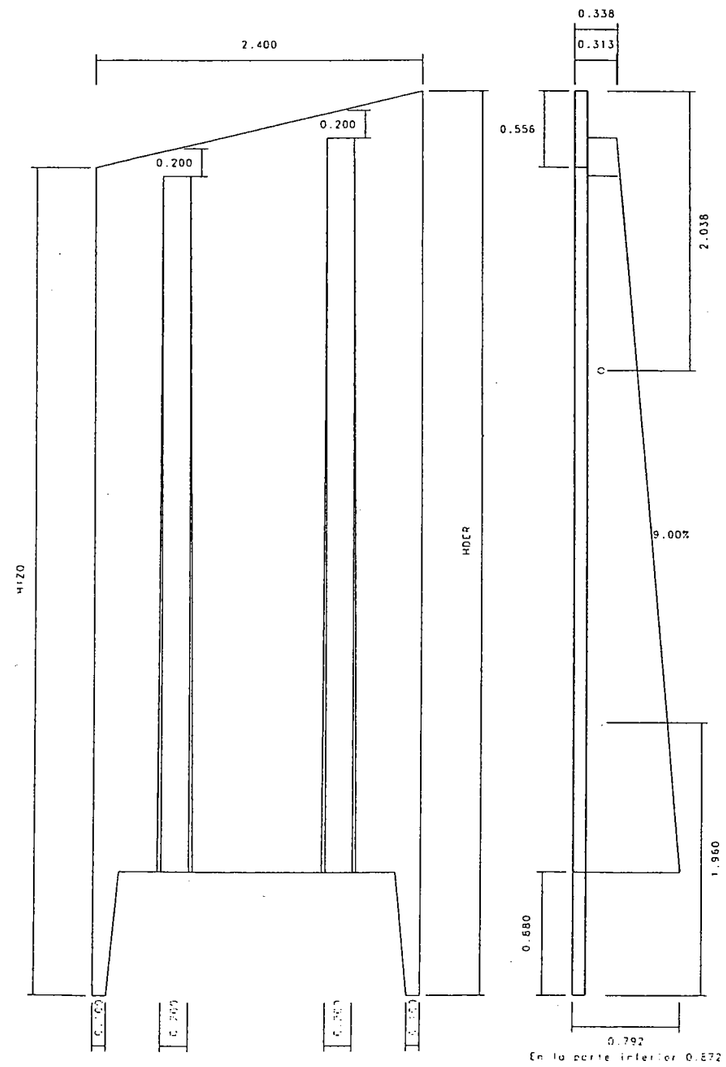
REFER	6	8	10	12	16	20	25	32	BARRAS
01CV8	20.91	82.58	53.39	20.91	86.85	44.52	0.00	98.88	408.04

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EMPRESA	UTE ALT-CAMP		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-1		
PERFIL	10118 1 3 8	PEDIDO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	5.58
M3 HORMIGON	2.20	fck (Kp/cm2)	350
KG ACERO	303.79	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	9/9/20	
GOMA ESTANDAR EN JUNTAS			
BERENJENO			

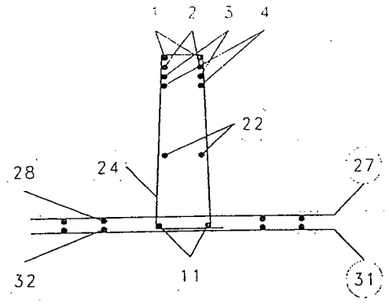
PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CV9	5.995	6.551	0.556	6.273

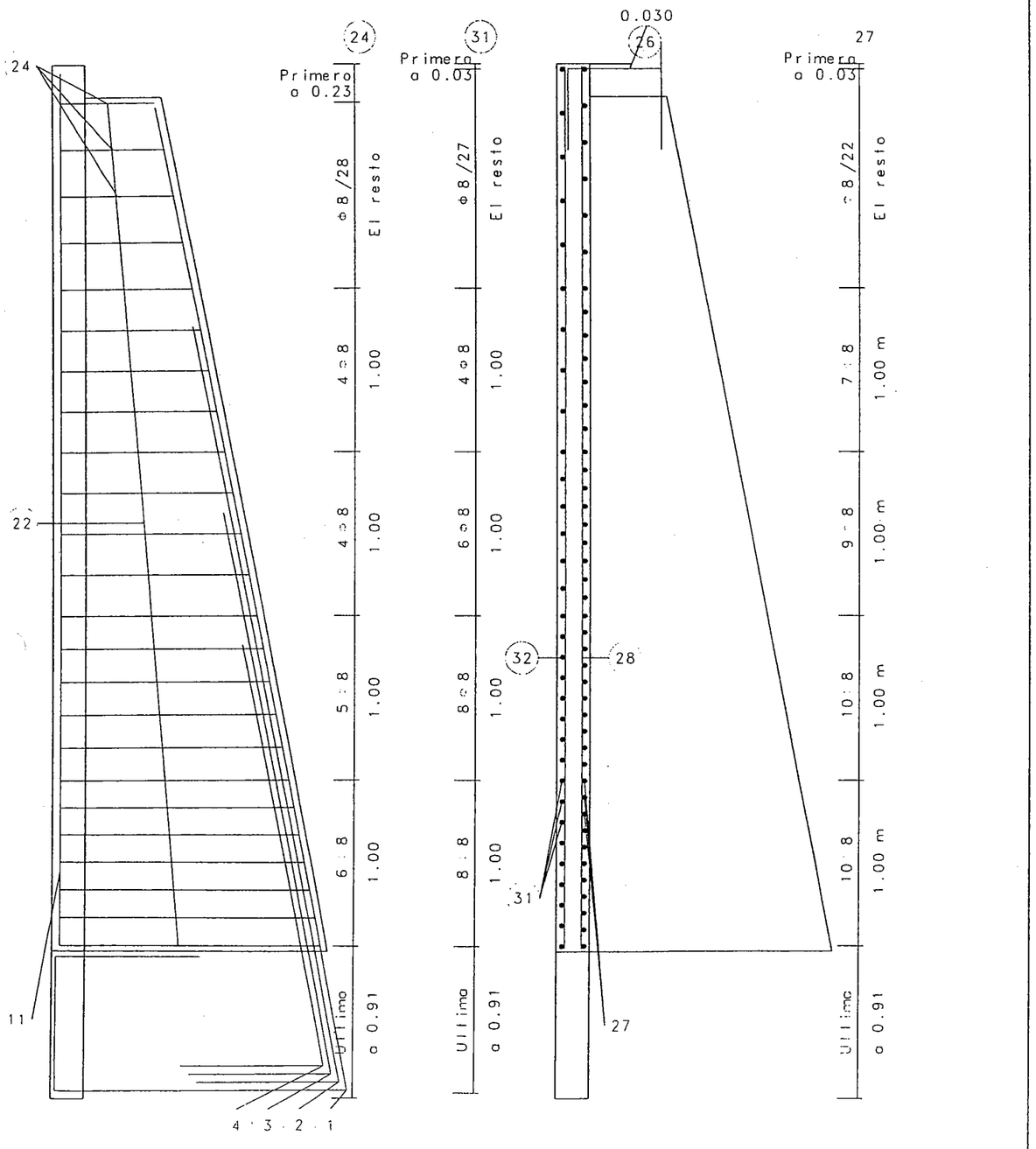


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Colegiado n.º 16495

EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

REFER	H.MED
01CV9	6.273





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Colegiado nº 16485

REFER	T	R	Q	R1	R2	Q1	Q2
01CV9	7.819	6.013	5.333	R-0.139	R+0.139	Q-0.139	Q+0.139

EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2Φ16	R+ 1.81	0.54 / 0.23 — R — 9.00% 0.40 — 0.77 — 0.80	R+ 1.81	0.54 / 0.23 — R — 9.00% 0.40 — 0.77 — 0.80	15.64	24.7
2	2Φ20	4.98	0.41 — 4.63 — 9.00% — 0.40	4.36	0.36 / 0.04 — 4.01 — 9.00% — 0.40	9.35	23.0
3	2Φ20	3.79	0.30 / 0.10 — 3.44 — 9.00% — 0.40	3.36	0.27 / 0.13 — 3.01 — 9.00% — 0.40	7.15	17.6
4	2Φ20	2.93	0.23 / 0.17 — 2.59 — 9.00% — 0.40	2.58	0.20 / 0.20 — 2.23 — 9.00% — 0.40	5.51	13.6
11	2Φ12	Q	Q	Q	Q	10.67	9.5
22	2Φ8	Q-0.20	Q-0.20	Q-0.20	Q-0.20	10.27	4.1
24	24Φ8	1.58	0.14 / a / b / 0.22			36.98	14.6

	a(m)	b(m)	L(m)
EST. SUP	0.27	0.16	1.12
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	0.73	0.20	2.04

TOTAL 1 NERVIO	107.07
TOTAL 2 NERVIOS	214.13

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Colegiado nº 16485

Las medidas indicadas en los dibujos de las barras de la armadura principal (1,2.....10) son: de vértice a vértice, y del tramal largo, que está inclinado, su proyección horizontal. A saber: las barras con vértices se curvaron de acuerdo con la Norma EH 91. Las longitudes La y Lb recortadas corresponden al DESARROLLO REAL de la barra (es lo medido a tener en cuenta al cortar la barra) y, por consiguiente, su valor es inferior a la suma de las medidas parciales acotadas en el cuadro.
La longitud LT es el resultado de sumar La y Lb.

02/03/01 10:54 DESPIECE DE LA ARMADURA DEL ALA Y MEDICION PG. 00002

REFER	H.MED	P
01CV9	6.273	5.333

EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

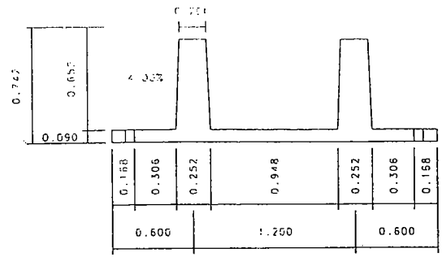
			L(m)		L1(m)	P(kg)
26	2	10	1.18	0.50 / 0.26 / 0.50	2.36	1.5
27	43	8	2.34	2.34	100.62	39.7
28	8	6	P	P	42.66	9.5
31	32	8	2.34	2.34	74.88	29.5
32	8	6	P	P	42.66	9.5
					TOTAL	89.64

KILOS DE ACERO POR PIEZA

REFER	6	8	10	12	16	20	25	32	BARRAS
01CV9	18.94	106.54	1.46	18.94	49.36	108.55	0.00	0.00	303.79

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02/03/01 10:40 1. DEFINICION GEOMETRICA PG. 00002



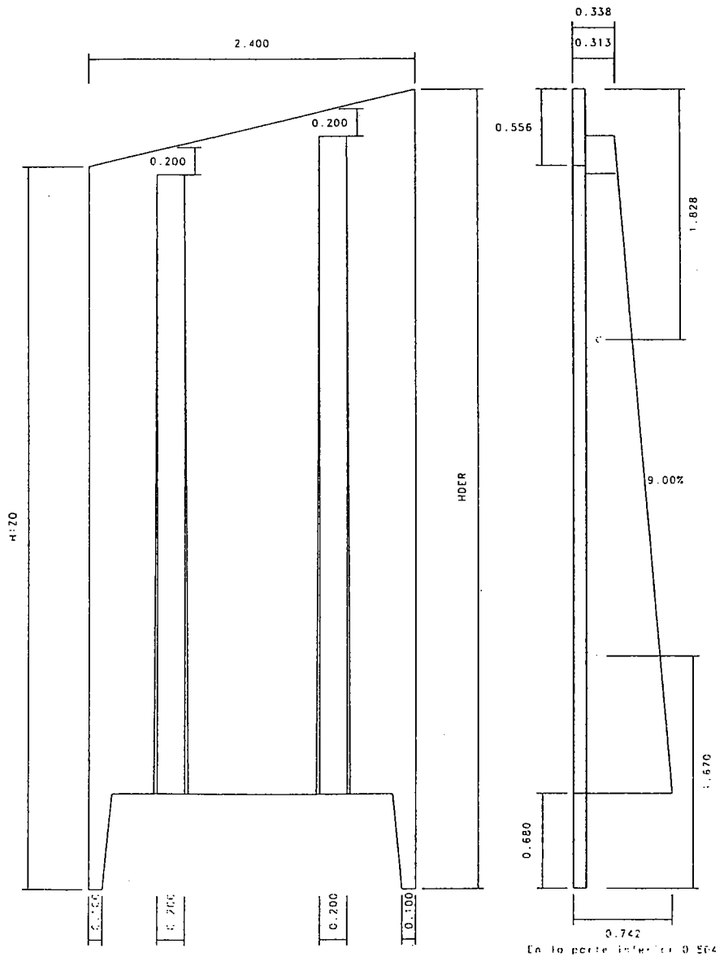
EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

PERFIL	10118 1 3 9	PEDIDO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	4.83
M3 HORMIGON	1.91	fck (Kp/cm2)	350
KG ACERO	245.50	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	9/9/20	

GOMA ESTANDAR EN JUNTAS

BERENJENO

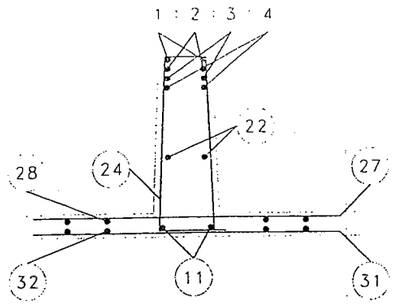
PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CV10	5.239	5.795	0.556	5.517

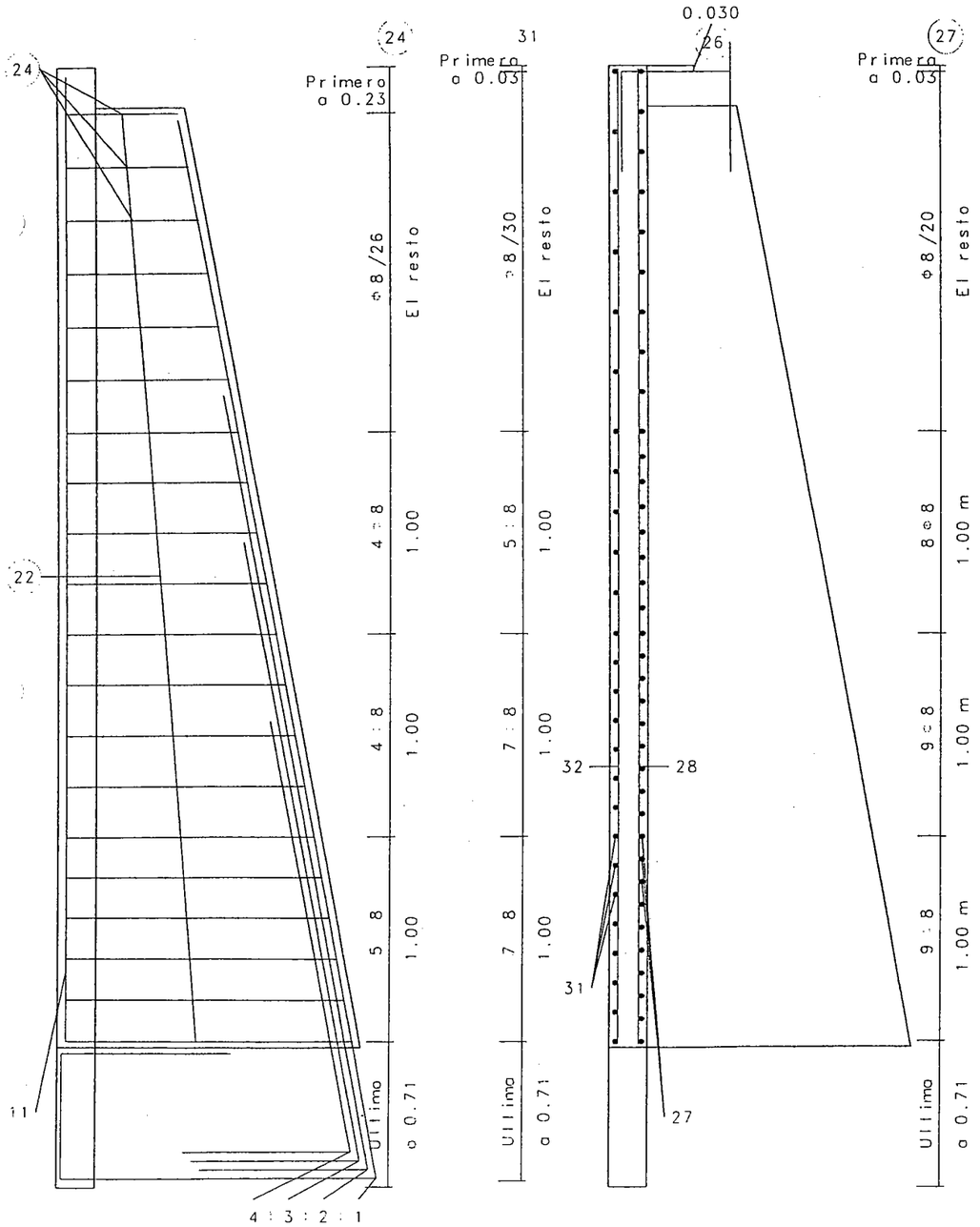


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Colegiado n.º 16495

EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

REFER	H.MED
01CV10	5.517





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REFER	C1	R	Q	R1	R2	Q1	Q2
01CV10	6.792	5.257	4.777	R-0.139	R+0.139	Q-0.139	Q+0.139

EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

		Lo(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2:16	R+ 1.54	0.47 R 0.70 / 0.23 9.00% 0.40 / 0.60	R+ 1.54	0.47 R 0.70 / 0.23 9.00% 0.40 / 0.60	13.58	21.4
2	2:16	4.20	0.34 3.85 0.40 / 0.06 9.00%	3.78	0.30 3.43 0.40 / 0.10 9.00%	7.98	12.6
3	2:20	3.42	0.27 3.08 0.40 / 0.13 9.00%	2.99	0.23 2.64 0.40 / 0.17 9.00%	6.41	15.8
4	2:20	2.50	0.19 2.35 0.40 / 0.21 9.00%	2.14	0.16 1.79 0.40 / 0.24 9.00%	4.63	11.4
11	2:12	Q	Q	Q	Q	9.55	8.5
22	2:8	Q-0.20	Q-0.20	Q-0.20	Q-0.20	9.15	3.6
24	20:8	1.53	0.14 / a / b / 0.22			29.28	11.6

	a(m)	b(m)	L(m)
EST. SUP	0.27	0.16	1.12
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	0.68	0.19	1.94

TOTAL 1 NERVIO 84.92
TOTAL 2 NERVIOS 169.84

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Los medidos indicados en los dibujos de las barras de la armadura principal (1,2,....10) son: de vértice a vértice, y del ramal largo, que este irá anclado, su proyección horizontal. A doblar las barras los vértices se curvarán de acuerdo con la Norma EH 91. Las longitudes Lo y Lb indicadas corresponden a DESARROLLO REAL de la barra (es decir medido a lo largo de la misma) y, por consiguiente, su valor es inferior a la suma de las medidas parciales acotadas en el dibujo.

REFER	H.MED	P
01CV10	5.517	4.777

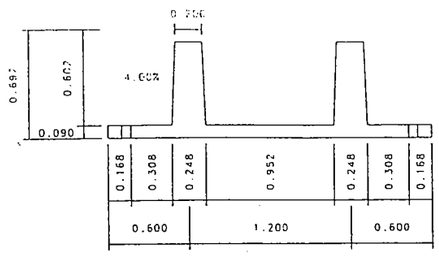
EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

			L(m)		Lt(m)	P(kg)
26	2	⌀10	1.18	0.50 / 0.26 / 0.50	2.36	1.5
27	36	⌀8	2.34	2.34	84.24	33.2
28	8	⌀6	P	P	38.22	8.5
31	26	⌀8	2.34	2.34	60.84	24.0
32	8	⌀6	P	P	38.22	8.5
					TOTAL	75.67

KILOS DE ACERO POR PIEZA

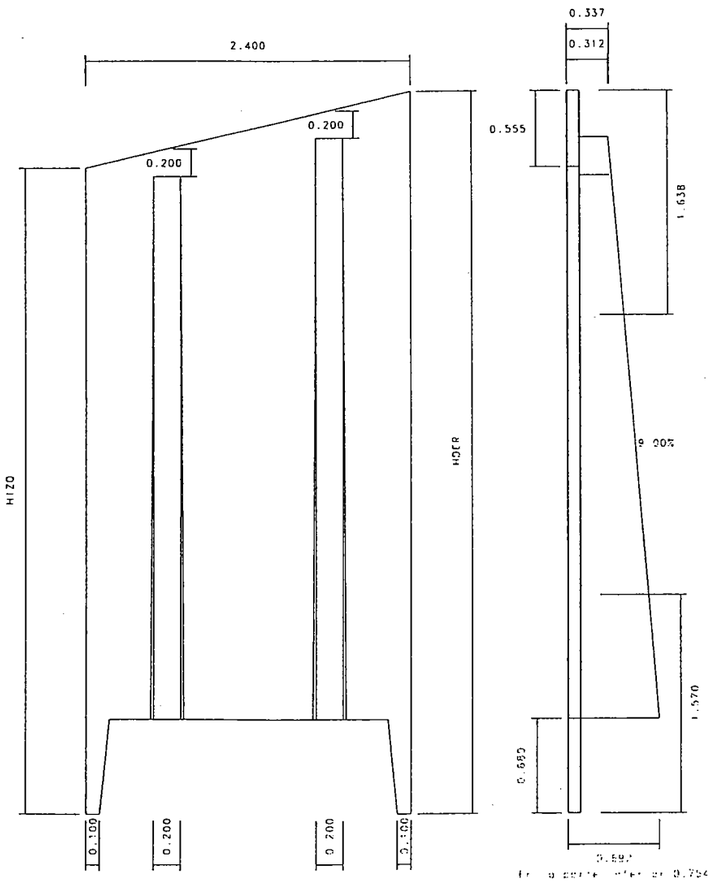
REFER	6	8	10	12	16	20	25	32	BARRAS
01CV10	16.96	87.58	1.46	16.96	68.07	54.47	0.00	0.00	245.50

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EMPRESA	UTE ALT-CAMP		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-1		
PERFIL	10118 1 3 10	PEDIDO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	4.12
M3 HORMIGON	1.64	fck (Kp/cm2)	350
KG ACERO	187.43	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	9/9/20	
GOMA ESTANDAR EN JUNTAS			
BERENJENO			

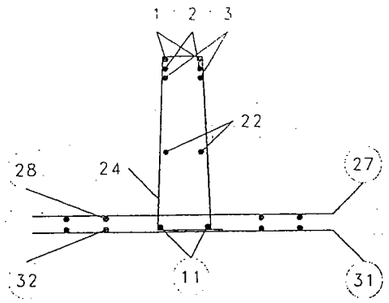
PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CV11	4.684	5.239	0.555	4.962



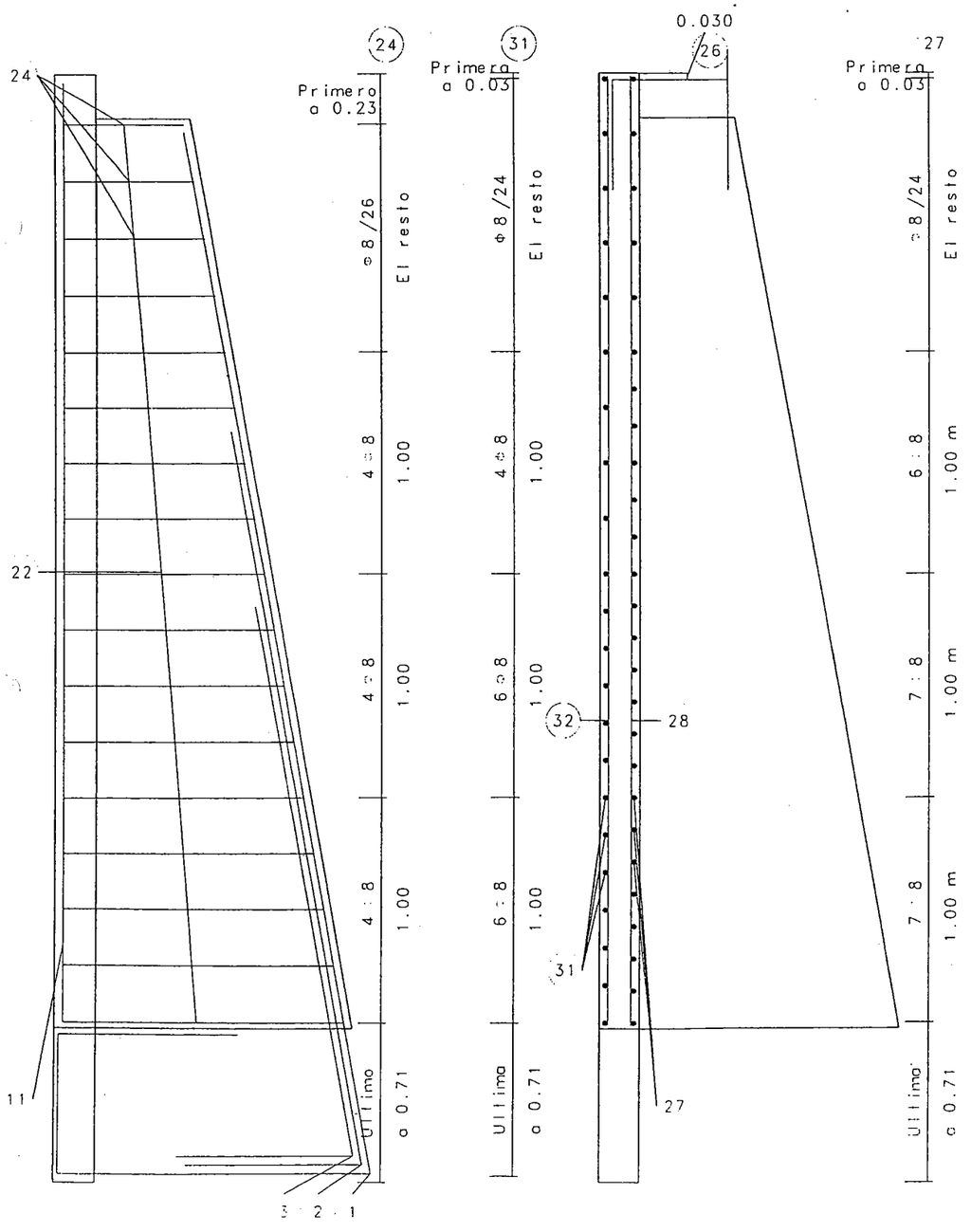
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EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

REFER	H.MED
01CV11	4.962



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REFER	L	R	O	R1	R2	O1	O2
01CV11	6.184	4.702	4.222	R-0.139	R+0.139	O-0.139	O+0.139

EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2Φ16	R+1.48	0.42 / 0.23 — R — 9.00% — 0.40 — 0.65 — 0.60	R+1.48	0.42 / 0.23 — R — 9.00% — 0.40 — 0.65 — 0.60	12.37	19.5
2	2Φ16	3.66	0.29 / 0.11 — 3.31 — 9.00% — 0.40	3.25	0.26 / 0.14 — 2.90 — 9.00% — 0.40	6.91	10.9
3	2Φ20	2.83	0.22 / 0.18 — 2.48 — 9.00% — 0.40	2.40	0.18 / 0.22 — 2.05 — 9.00% — 0.40	5.23	12.9
11	2Φ12	O	O	O	O	8.44	7.5
22	2Φ8	O-0.20	O-0.20	O-0.20	O-0.20	8.04	3.2
24	17Φ8	1.48	0.14 / a / b / 0.22			23.67	9.3

	a(m)	b(m)	L(m)
EST. SUP	0.27	0.16	1.12
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	0.63	0.19	1.84

TOTAL 1 NERVIO	63.33
TOTAL 2 NERVIOS	126.67

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Las medidas indicadas en los dibujos de las barras de la armadura principal (1,2.....10) son: de vértice a vértice, y del ramal largo, que está inclinado, su proyección horizontal. A doblar las barras los vértices se curvarán de acuerdo con la Norma EH 91. Las longitudes Lo y Lb indicadas corresponden al DESARROLLO REAL de la barra y es la medida a tener en cuenta al cortar la barra y, por consiguiente, su valor es superior a la suma de las medidas parciales acotadas en el dibujo.
La cantidad LT es el resultado de sumar Lo + Lb.

REFER	P.MED	P
01CV11	4.962	4.222

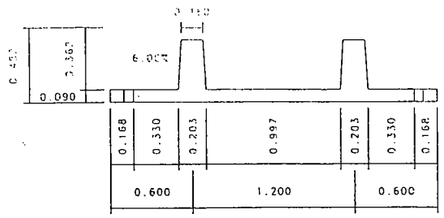
EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

		L(m)		Li(m)	P(kg)
26	2 : 10	1.18	0.50 / 0.26 / 0.50	2.36	1.5
27	26 : 8	2.34	2.34	60.84	24.0
28	8 : 6	P	P	33.77	7.5
31	22 : 8	2.34	2.34	51.48	20.3
32	8 : 6	P	P	33.77	7.5
				TOTAL	60.77

KILOS DE ACERO POR PIEZA

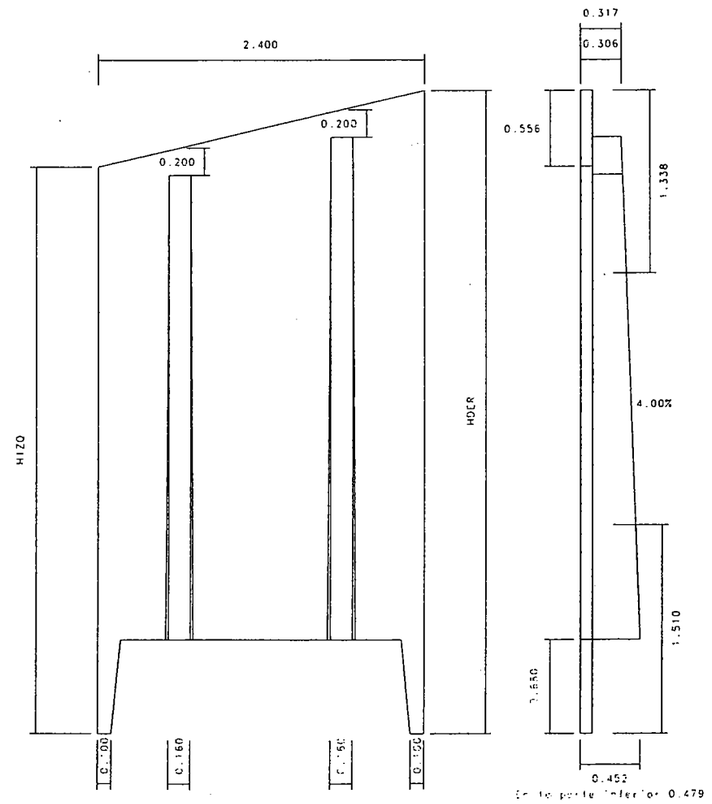
REFER	6	8	10	12	16	20	25	32	BARRAS
01CV11	14.99	69.34	1.46	14.99	60.87	25.78	0.00	0.00	187.43

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EMPRESA	UTE ALT-CAMP		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-1		
PERFIL	10118 1 3 11	PED:OO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	3.09
M3 HORMIGON	1.17	fck (Kp/cm2)	350
KG ACERO	172.97	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	9/4/16	
MAMPOSTERIA CALIZA			

PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CV12	4.128	4.684	0.556	4.406

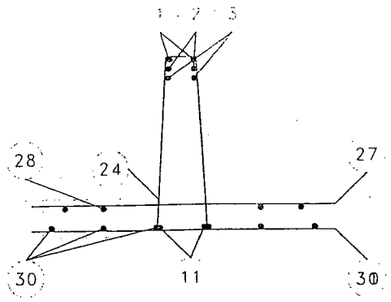


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02/04/01 10:02 ARMADURA DEL NERVIO Y ALA PG. 1

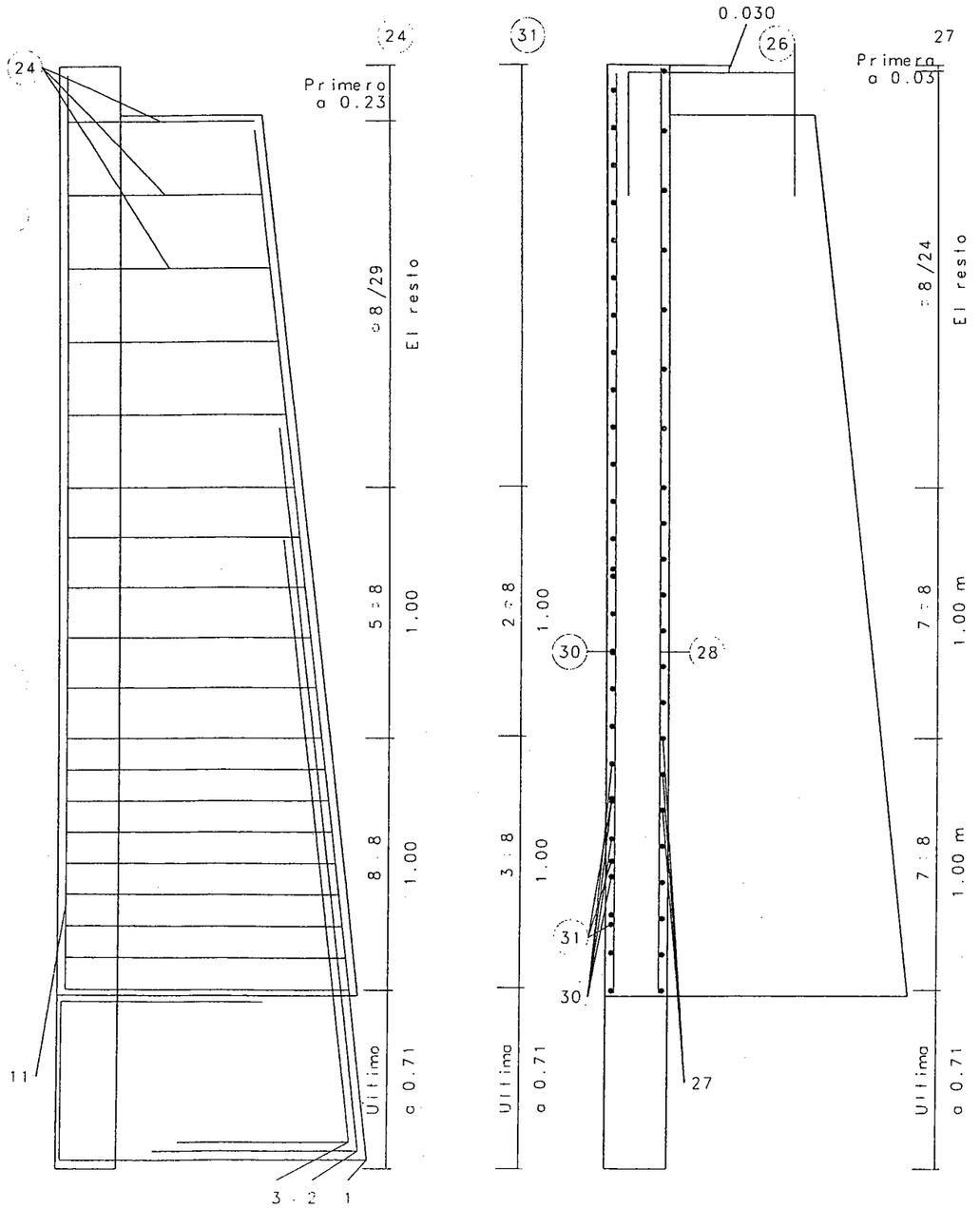
EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

REFER	H.MED
01CV12	4.406





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02/04/01 10:02 B. DESPIECE DE LA ARMADURA DEL NERVIO PG. 2

REFER	L1	R	α	R1	R2	Q1	Q2
01CV12	5.317	4.14E	3.66E	R-0.139	R+0.139	Q-0.139	Q+0.139

EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2:16	R+ 1.17	0.16 R 0.39 / 0.23 4.00% 0.30 0.60	R+ 1.17	0.16 R 0.39 / 0.23 4.00% 0.30 0.60	10.63	16.8
2	2:16	3.18	0.11 2.92 0.30 / 0.19 4.00%	2.84	0.10 2.58 0.30 / 0.20 4.00%	6.02	9.5
3	2:25	2.64	0.09 2.43 0.25 / 0.16 4.00%	2.24	0.08 2.03 0.25 / 0.17 4.00%	4.88	18.8
11	2:12	Q	Q	Q	Q	7.33	6.5
24	19:8	1.18	0.10 a b 0.22			22.34	8.8

	a(m)	b(m)	L(m)
EST. SUP	0.25	0.13	1.05
VARIACION	1cm/0.25	1cm/2.08	
EST. INF	0.39	0.15	1.32

TOTAL 1 NERVIO 60.39

TOTAL 2 NERVIOS 120.79

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Las medidas indicadas en los dibujos de las barras de la armadura principal (1,2, ...10) son: de vértice a vértice, y del ramal largo, que está inclinado, su proyección horizontal. Al doblar las barras los vértices se curvarán de acuerdo con la Norma EH-91. Las longitudes La y Lb indicadas corresponden a DESARROLLO REAL de la barra (es la medida a tener en cuenta al cortar la barra) y, por consiguiente, su valor es inferior a la suma de las medidas parciales acotadas en el dibujo.

La longitud LT es el resultado de sumar La y Lb.

REFER	H.MED	P
01CV12	4.406	3.666

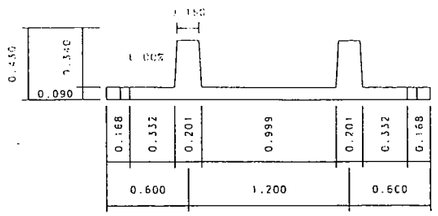
EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

		L(m)		Lt(m)	P(kg)
26	2 ⌀10	1.17	0.50 / 0.24 / 0.50	2.33	1.4
27	22 ⌀8	2.34	2.34	51.48	20.3
28	8 ⌀6	P	P	29.33	6.5
30	⌀6 ⌀5	2.34 P	P / 2.34 / 0.20 / 0.15	8.58m2	19.3
31	5 ⌀8	2.34	2.34	11.70	4.6
				TOTAL	52.18

KILOS DE ACERO POR PIEZA

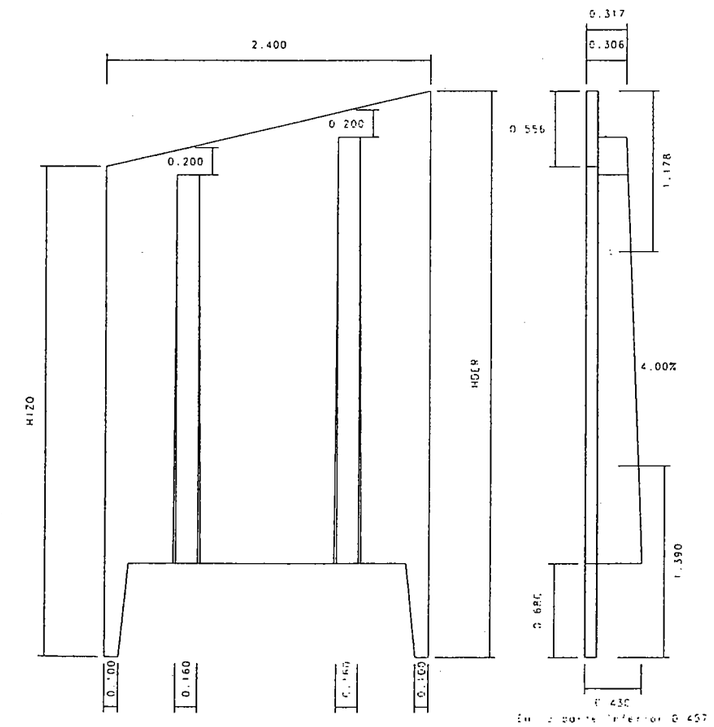
REFER	6	8	10	12	16	20	25	32	M2.ALA	BARRAS
01CV12	6.51	42.56	1.44	13.02	52.56	0.00	37.57	0.00	8.58	153.66

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EMPRESA	UTE ALT-CAMP		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-1		
PERFIL	10118 1 3 12	PEDIDO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	2.57
M3 HORMIGON	0.98	fck (Kp/cm2)	350
KG ACERO	116.92	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	9/4/16	
MAMPOSTERIA CALIZA			

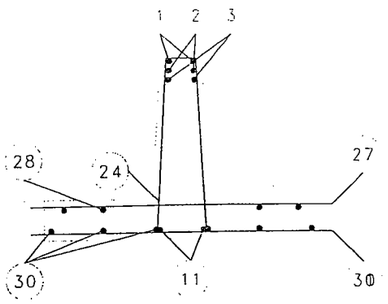
PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CV13	3.572	4.128	0.556	3.850

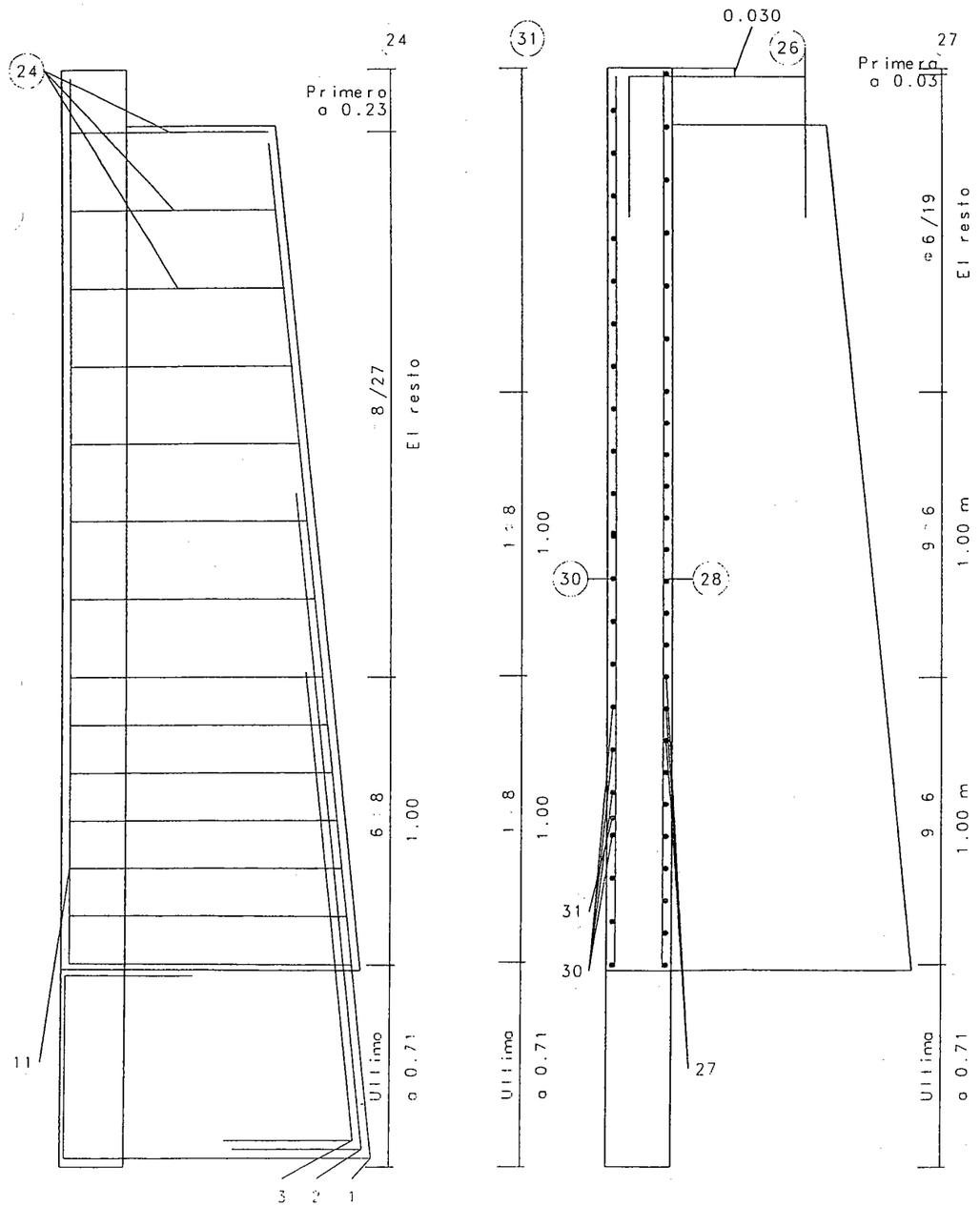


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Colegiado nº 16496

EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

REFER	H.MED
01CV13	3.850





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REFER	L	R	Q	R1	R2	Q1	Q2
01CV13	4.682	3.590	3.170	R-0.139	R+0.139	Q-0.139	Q+0.139

EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

			La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2	16	R+ 1.09	0.14 / 0.23 — R — 4.00% — 0.18 — 0.37 — 0.60	R+ 1.09	0.14 / 0.23 — R — 4.00% — 0.18 — 0.37 — 0.60	9.36	14.8
2	2	16	2.49	0.09 / 0.09 — 2.33 — 4.00% — 0.18	2.15	0.07 / 0.11 — 1.99 — 4.00% — 0.18	4.64	7.3
3	2	16	1.82	0.06 / 0.12 — 1.66 — 4.00% — 0.18	1.63	0.05 / 0.13 — 1.47 — 4.00% — 0.18	3.45	5.4
11	2	12	Q	Q	Q	Q	6.22	5.5
24	14	8	1.16	0.10 / a / b / 0.22		a(m) / b(m) / L(m)	15.98	6.3

	a(m)	b(m)	L(m)
EST. SUP	0.25	0.13	1.05
VARIACION	1cm/0.25	1cm/2.08	
EST. INF	0.37	0.14	1.28

TOTAL 1 NERVIO 39.37
TOTAL 2 NERVIOS 78.75

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Las medidas indicadas en los dibujos de las barras de la armadura principal (1,2,.....10) son de vertice a vertice, y del ramal largo, que esta inclinado, su proyeccion horizontal. A doblar las barras los vertices se curvaran de acuerdo con la Norma EH-91. Las longitudes Lo y Lb indicadas corresponden a DESARROLLO REAL de la barra (es la medida a tener en cuenta al cortar la barra) y, por consiguiente, su valor es superior a la suma de las medidas parciales acotadas en el dibujo.
El angulo R es el restante de sumar Q y 90.

REFER	H.MED	P
01CV13	3.850	3.116

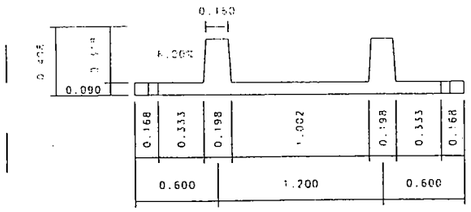
EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

		L(m)		Ll(m)	P(kg)
26	2 ⌀10	1.17	0.50 / 0.24 / 0.50	2.33	1.4
27	25 ⌀6	2.34	2.34	58.50	13.0
28	8 ⌀6	P	P	24.88	5.5
30	⌀6 ⌀5	2.34 P	P, 2.34, 0.20, 0.15, 2.34	7.28m2	16.4
31	2 ⌀8	2.34	2.34	4.68	1.8
				TOTAL	38.17

KILOS DE ACERO POR PIEZA

REFER	6	8	10	12	16	20	25	32	M2.ALA	BARRAS
01CV13	18.51	14.46	1.44	11.04	55.09	0.00	0.00	0.00	7.28	100.54

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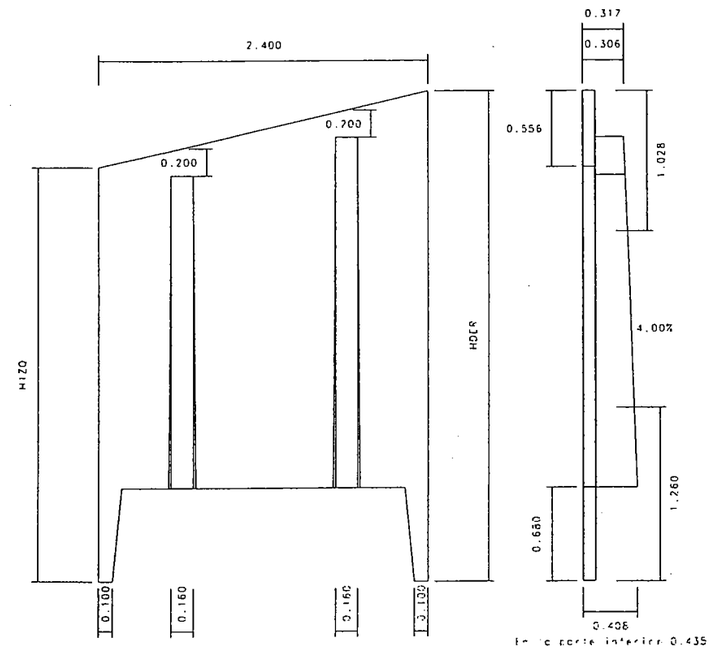
EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

PERFIL	10118 1 3 13	PEDIDO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	2.00
M3 HORMIGON	0.80	fck (Kp/cm2)	350
KG ACERO	84.24	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	9/4/16	

GOMA ESTANDAR EN JUNTAS

BERENJENO

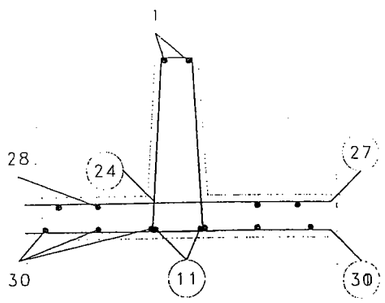
PISTA	REFER	H.IZO	H.DER	D.ALT	H.MED
	01CV14	3.016	3.572	0.556	3.294



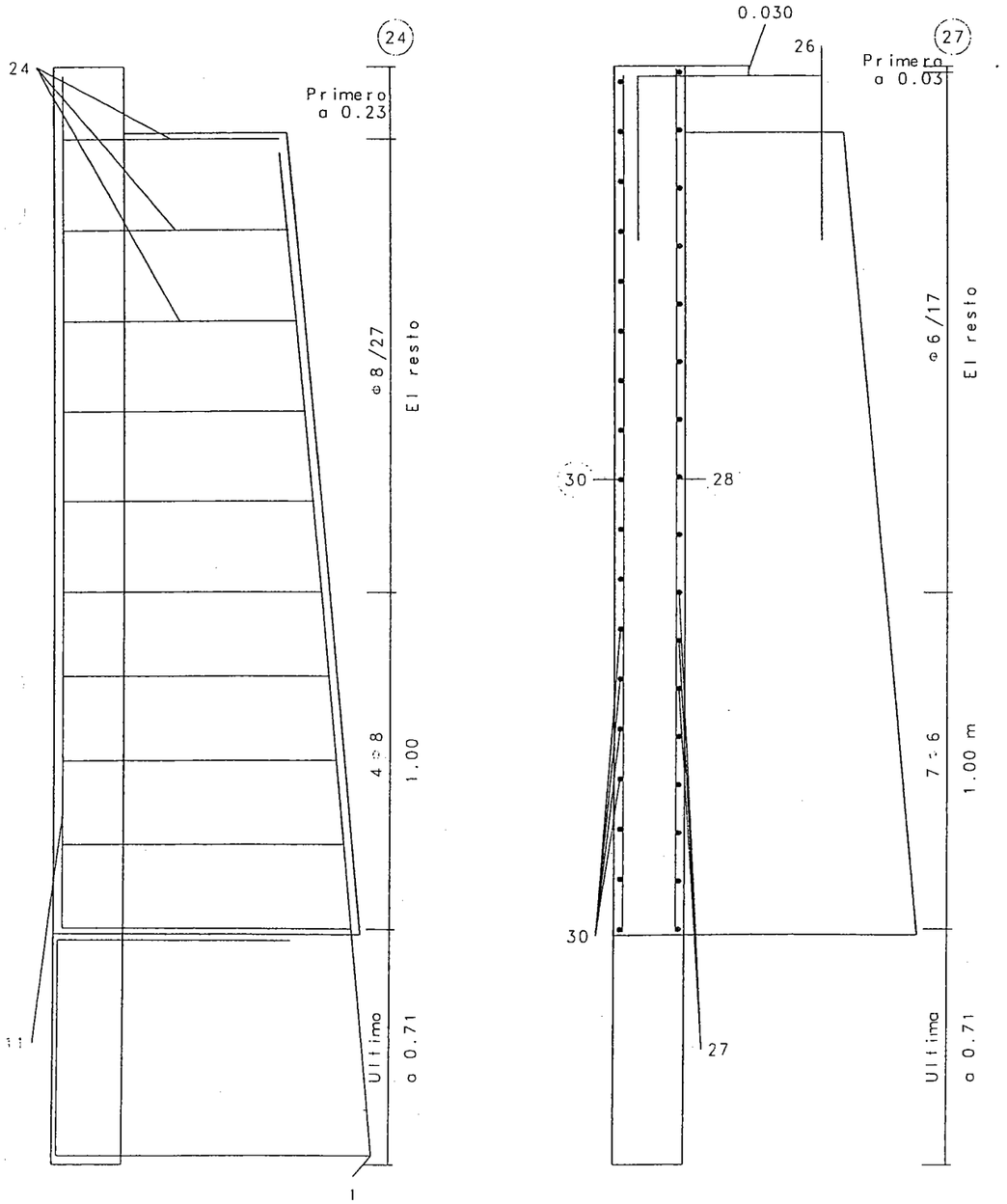
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EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

REFER	H.MED
01CV14	3.294



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REFER	L1	R	L	R1	R2	O1	O2
01CV14	4.151	3.034	7.554	R-0.139	R+0.139	0-0.139	0+0.139

EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2 : 20	R+ 1.12	0.12 / 0.22, R, 4.00% 0.30, 0.34, 0.60, Q	R+ 1.12	0.12 / 0.22, R, 4.00% 0.30, 0.34, 0.60, Q	8.30	20.5
11	2 : 10	0		0		5.11	3.1
24	10 : 8	1.14	0.10 / a / b / 0.22			11.06	4.4

	a(m)	b(m)	L(m)
EST. SUP	0.25	0.13	1.05
VARIACION	1cm/0.25	1cm/2.08	
EST. INF	0.35	0.14	1.23

TOTAL 1 NERVIO 27.99
TOTAL 2 NERVIOS 55.97

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Las medidas indicadas en los dibujos de las barras de la armadura principal (1,2,.....10) son de vértice a vértice, y del ramal largo, que está doblado, su proyección horizontal. Al doblar las barras los vértices se curvan de acuerdo con la Norma EH-91. Las longitudes Lo y Lb indicadas corresponden a DESARROLLO REAL de la barra (es la medida a tener en cuenta al cortar la barra) y, por consiguiente, su valor es inferior a la suma de las medidas parciales acotadas en el dibujo.

En cuanto al peso resultado se suma la ala.

REFER	H.MED	P
01CV14	3.294	2.554

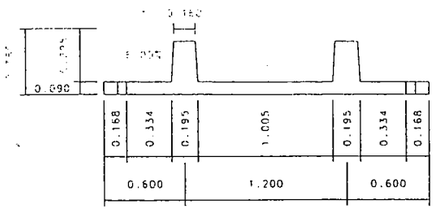
EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

		L(m)		Lt(m)	P(kg)
26	2 ø10	1.17	0.50 / 0.24 / 0.50	2.33	1.4
27	17 ø6	2.34	2.34	39.78	8.8
28	8 ø6	P	P	20.43	4.5
30	ø6	2.34	P / 2.34 / 0.20 / 0.15	5.98m2	13.4
	ø5	P			
				TOTAL	28.25

KILOS DE ACERO POR PIEZA

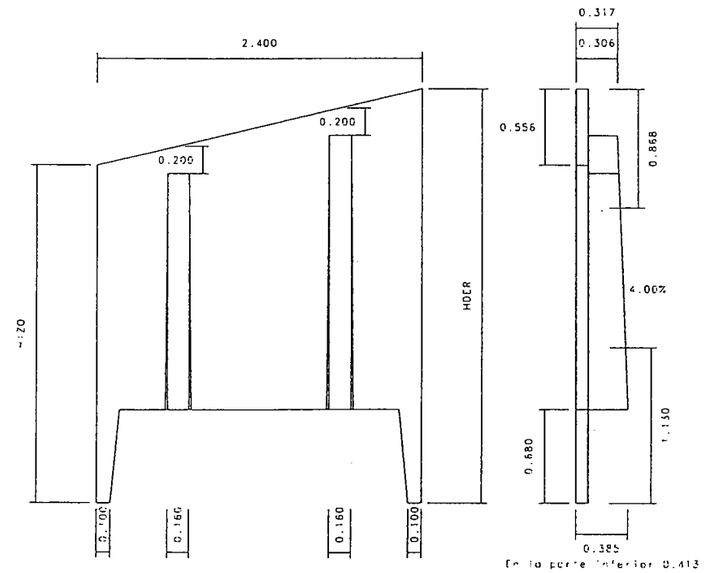
REFER	6	8	10	12	16	20	25	32	M2.ALA	BARRAS
01CV14	13.36	8.73	7.74	0.00	0.00	40.95	0.00	0.00	5.98	70.78

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EMPRESA	UTE ALT-CAMP		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-1		
PERFIL	10118 | 3 | 4	PED.DO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	1.55
M3 HORMIGON	0.62	fck (Kp/cm2)	350
KG ACERO	53.89	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	9/4/16	
GOMA ESTANDAR EN JUNTAS			
BERENJENO			

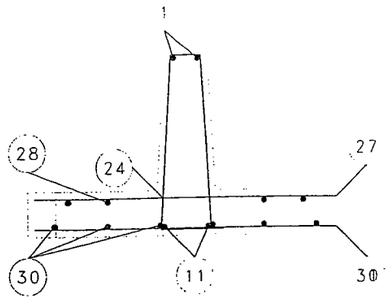
PISTA	REFER	H.IZO	H.DER	D.ALT	H.MED
	01CV15	2.460	3.016	0.556	2.738



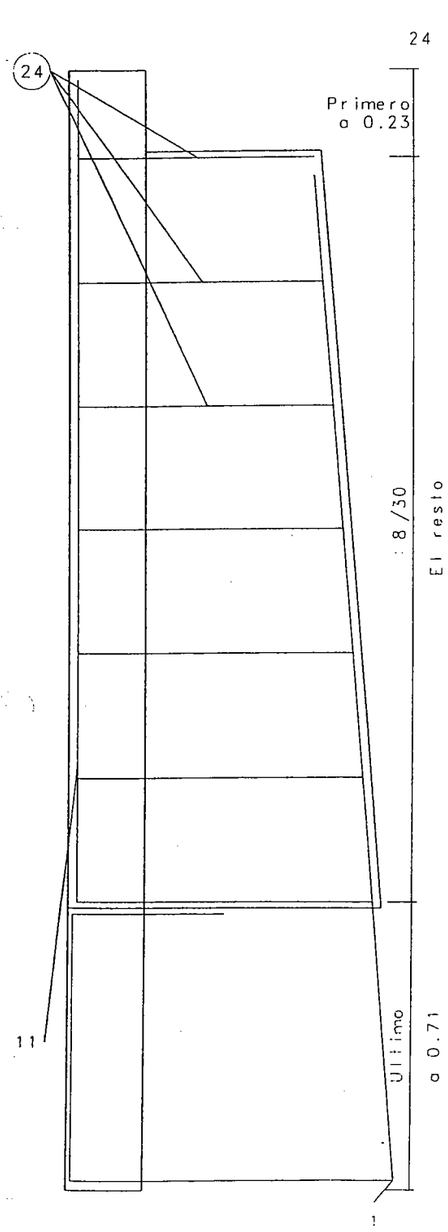
NORTEN(PH)
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Colegiado nº 16495

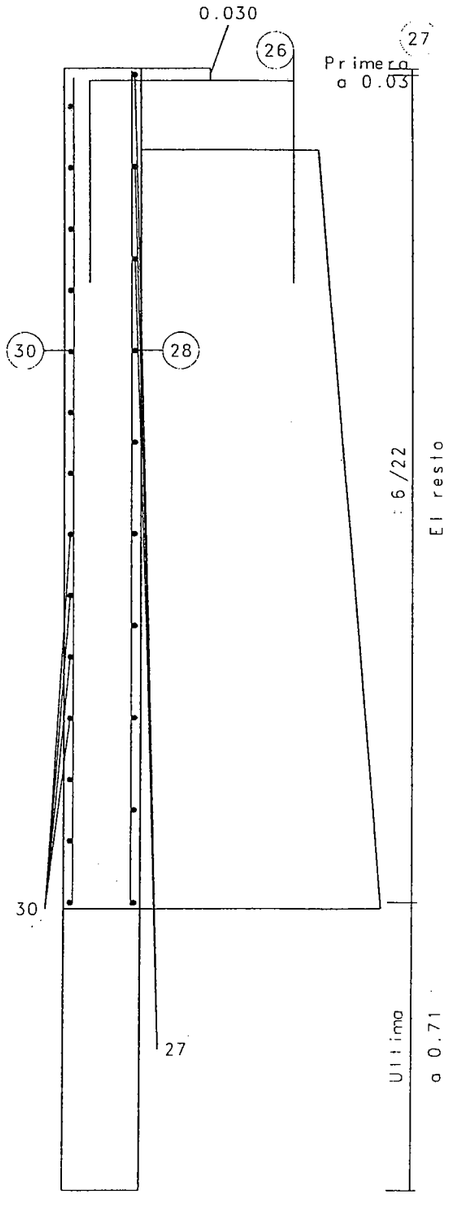
EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

REFER	H.MED
01CV15	2.738



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REFER	_1	R	Q	R1	R2	Q1	Q2
01CV15	3.525	2.478	1.995	R-0.139	R+0.139	Q-0.139	Q+0.139

EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

		Lo(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2:16	R+1.05	0.09 R 0.32 / 0.23 4.00% 0.18 0.60 / Q	R+1.05	0.09 R 0.32 / 0.23 4.00% 0.18 0.60 / Q	7.05	11.1
11	2:10	Q		Q		4.00	2.5
24	7:8	1.12	0.10 / a / b / 0.22			7.59	3.0

	a(m)	b(m)	L(m)
EST. SUP	0.25	0.13	1.05
VARIACION	1cm/0.25	1cm/2.08	
EST. INF	0.32	0.14	1.19

TOTAL 1 NERVIO 16.59
TOTAL 2 NERVIOS 33.18

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Las medidas indicadas en los dibujos de las barras de la armadura principal (1,2.....10) son de vertice a vertice, y del ramal largo, que esta inclinado, su proyeccion horizontal. Al doblar las barras los vertices se curvaran de acuerdo con la Norma EH 91. Las longitudes Lo y Lb indicadas corresponden al DESARROLLO REAL de la barra y es la medida a tener en cuenta al cortar la barra; y, por consiguiente, su valor es superior a la suma de las medidas parciales acotadas en el dibujo.
La anglitud 11 es el resultado de la suma 1a y 1b.

REFER	L.MED	P
01CV15	7.738	1.998

EMPRESA	UTE ALT-CAMP
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-1

		L(m)		Ut(m)	P(kg)
26	2 ø10	1.17	0.50 / 0.24 / 0.50	2.33	1.4
27	10 :6	2.34	2.34	23.40	5.2
28	8 :6	P	P	15.98	3.5
30	:6 :5	2.34 P	P; 2.34 / 0.20 / 0.15	4.68m2	10.5
				TOTAL	20.70

KILOS DE ACERO POR PIEZA

REFER	6	8	10	12	16	20	25	32	M2.ALA	BARRAS
01CV15	8.74	5.99	6.37	0.00	22.26	0.00	0.00	0.00	4.68	43.36

ACCIONA

Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado nº 16495

NORTEN PH

NEKANE MUNDUATE
Altsasu, 13 JUL. 2001

Ref. nº: 10215 / 0

DOCUMENTACION PROYECTO OBRA

L.A.V. MADRID-BARCELONA-FRONTERA FRANCESA

TRAMO: LLEIDA-MARTORELL V (II)

- ANEJOS DE CÁLCULO DE PIEZAS Y FICHAS DE FABRICACIÓN Estructura E-2

ENTRADA
Fecha 16 JUL. 2001
Núm.
☐ Gerente
☐ Jefe Obra
☒ Jefe Of. Técnica
☐ Jefe Ejecución
☐ Jefe Túneles
☐ Jefe Estructuras
☐ Jefe Topografía
☐ Jefe Administrat.
☒ Calidad / M. Ambiente
☐ Seguridad
☒ AFPO
☒ GIF
☐

NORTEN PREFABRICADOS DE HORMIGÓN S.L.
Bº Ugarriza, 1
E-48498 ARAKALDO (BIZKAIA)
Tel.: 946 727 726 - Fax: 946 728 683

Polígono Ibarrea s.n.
E-31800 ALSASUA (NAVARRA)
Tel.: 948 468 000 - Fax:948 468 443

NORTEN PH

ANEJOS DE CÁLCULO DE ENVOLVENTES

Y

FICHAS DE FABRICACIÓN

Estructura E-2

NORTEN PREFABRICADOS DE HORMIGÓN S.L.
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Tel.: 946 727 726 - Fax: 946 728 683
Apdo. de correos 64 - 01400 - LLODIO (ALAVA)

Polígono Ibarrea s.n.
E-31800 ALSASUA (NAVARRA)
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ISO 9001

LICENCIA OREKIN ®

ANEJO DE CÁLCULO DE ENVOLVENTE
CÓDIGO DEL PERFIL: 10118 1 4
GRUPO: 14

CARACTERÍSTICAS GEOMETRICAS Y DE LOS MATERIALES

ALTURA (m)	:	9.700
ANCHURA (m)	:	1.200
NERVIOS	:	1
CANTO TOTAL EN CORONACIÓN (m)	:	0.294
PENDIENTE LONGITUDINAL DEL NERVIO	:	9.000
ESPESOR MÍNIMO DEL NERVIO (m)	:	0.200
ESPESOR DE LAS ALAS (m)	:	0.120
LONGITUD DEL ALA IZQUIERDA (m)	:	0.600
LONGITUD DEL ALA DERECHA (m)	:	0.600
CODIGO DEL CABEZAL	:	0.55 X 0.3
HORMIGÓN (kg/cm2)	:	350
MINORACIÓN DEL HORMIGÓN	:	1.50
ACERO (kg/cm2)	:	5100
MINORACIÓN DEL ACERO	:	1.15
RECUBRIMIENTO (m)	:	0.030
COEFICIENTE DE ANCLAJE EN ZAPATA	:	15
COEFICIENTE DE ANCLAJE EN PIEZA ALA EMPOTRADA	:	12

NORTEN PH
Director Técnico
NEKANE MUNDUATE AUZMENDI
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ANEJO DE CÁLCULO DE ENVOLVENTE
CÓDIGO DEL PERFIL: 10118 1 4
GRUPO: 14
HIPÓTESIS : SERVICIO

ACCIONES Y RESISTENCIAS

COEFICIENTE DE MAYORACIÓN : 1.50

FISURACIÓN (mm) : 0.300

CARGAS REPARTIDAS

HORIZONTALES

Y(m)	Ph(T/m2)
0.000	1.116
5.600	5.282
9.700	7.321

VERTICALES

Y(m)	X(m)	Pv(T/n)

NORTENPH
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GRUPO: 14
HIPÓTESIS : SERVICIO

NORTENPH
Director Técnico:
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16494

x	h	d	ph	Nd/n	Ndrn/n	Vd/n	Vcu/n	Md/n	Fcc/n	ndrn	vcu	vda	md	delta
0.000	0.294	0.000	1.116	0.000	0.000	0.000	0.000	0.000	1.674	0.000	0.000	0.000	0.171	0.0397
0.100	0.303	0.000	1.190	0.000	0.000	0.241	0.000	0.000	1.786	0.000	0.000	0.100	0.364	0.0390
0.200	0.312	0.274	1.265	0.000	0.000	0.431	4.185	0.052	1.897	0.000	2.511	0.187	0.380	0.0383
0.300	0.321	0.283	1.339	0.000	0.000	0.639	4.323	0.110	2.009	0.000	2.594	0.281	0.395	0.0376
0.400	0.330	0.292	1.414	0.000	0.000	0.856	4.460	0.193	2.120	0.000	2.676	0.381	0.410	0.0368
0.500	0.339	0.301	1.488	0.000	0.000	1.082	4.598	0.301	2.232	0.000	2.759	0.489	0.426	0.0361
0.600	0.348	0.310	1.562	0.000	0.000	1.318	4.735	0.437	2.344	0.000	2.841	0.602	0.442	0.0354
0.700	0.357	0.319	1.637	0.000	0.000	1.563	4.873	0.601	2.455	0.000	2.924	0.722	0.459	0.0347
0.800	0.366	0.328	1.711	0.000	0.000	1.817	5.010	0.796	2.567	0.000	3.006	0.848	0.476	0.0340
0.900	0.375	0.337	1.786	0.000	0.000	2.081	5.148	1.021	2.678	0.000	3.089	0.981	0.495	0.0332
1.000	0.384	0.324	1.860	0.000	0.000	2.333	4.950	1.279	2.790	0.000	2.970	1.120	0.513	0.0325
1.100	0.393	0.333	1.934	0.000	0.000	2.612	5.088	1.571	2.901	0.000	3.053	1.265	0.532	0.0318
1.200	0.402	0.342	2.009	0.000	0.000	2.901	5.225	1.899	3.013	0.000	3.135	1.417	0.551	0.0311
1.300	0.411	0.351	2.083	0.000	0.000	3.199	5.363	2.263	3.125	0.000	3.218	1.575	0.570	0.0304
1.400	0.420	0.360	2.158	0.000	0.000	3.506	5.500	2.665	3.236	0.000	3.300	1.738	0.589	0.0297
1.500	0.429	0.369	2.232	0.000	0.000	3.822	5.638	3.107	3.348	0.000	3.383	1.908	0.608	0.0290
1.600	0.438	0.378	2.306	0.000	0.000	4.147	5.775	3.589	3.459	0.000	3.465	2.084	0.627	0.0283
1.700	0.447	0.387	2.381	0.000	0.000	4.481	5.913	4.114	3.571	0.000	3.548	2.265	0.647	0.0276
1.800	0.456	0.396	2.455	0.000	0.000	4.823	6.050	4.682	3.683	0.000	3.630	2.453	0.666	0.0269
1.900	0.465	0.405	2.529	0.000	0.000	5.174	6.188	5.295	3.794	0.000	3.713	2.646	0.685	0.0262
2.000	0.474	0.414	2.604	0.000	0.000	5.534	6.325	5.954	3.906	0.000	3.795	2.845	0.704	0.0255
2.100	0.483	0.423	2.678	0.000	0.000	5.902	6.463	6.660	4.017	0.000	3.878	3.049	0.723	0.0248
2.200	0.492	0.432	2.753	0.000	0.000	6.279	6.600	7.415	4.129	0.000	3.960	3.260	0.742	0.0241
2.300	0.501	0.441	2.827	0.000	0.000	6.664	6.737	8.221	4.241	0.000	4.042	3.476	0.761	0.0235
2.400	0.510	0.450	2.901	0.000	0.000	7.058	6.875	9.078	4.352	0.000	4.125	3.697	0.780	0.0228
2.500	0.519	0.459	2.976	0.000	0.000	7.460	7.012	9.988	4.464	0.000	4.207	3.924	0.799	0.0221
2.600	0.528	0.468	3.050	0.000	0.000	7.871	7.150	10.952	4.575	0.000	4.290	4.157	0.818	0.0215
2.700	0.537	0.477	3.125	0.000	0.000	8.291	7.287	11.972	4.687	0.000	4.372	4.396	0.837	0.0208
2.800	0.546	0.486	3.199	0.000	0.000	8.719	7.425	13.048	4.799	0.000	4.455	4.640	0.856	0.0202
2.900	0.555	0.495	3.273	0.000	0.000	9.155	7.562	14.183	4.910	0.000	4.537	4.889	0.875	0.0195
3.000	0.564	0.504	3.348	0.000	0.000	9.600	7.700	15.378	5.022	0.000	4.620	5.144	0.894	0.0189
3.100	0.573	0.505	3.422	0.000	0.000	10.004	7.707	16.633	5.133	0.000	4.624	5.405	0.912	0.0183
3.200	0.582	0.514	3.497	0.000	0.000	10.465	7.844	17.951	5.245	0.000	4.706	5.671	0.931	0.0177
3.300	0.591	0.523	3.571	0.000	0.000	10.933	7.982	19.332	5.356	0.000	4.789	5.943	0.950	0.0171
3.400	0.600	0.532	3.645	0.000	0.000	11.410	8.119	20.778	5.468	0.000	4.871	6.220	0.968	0.0165
3.500	0.609	0.541	3.720	0.000	0.000	11.896	8.256	22.291	5.580	0.000	4.954	6.503	0.987	0.0159
3.600	0.618	0.550	3.794	0.000	0.000	12.390	8.394	23.871	5.691	0.000	5.036	6.792	1.005	0.0153
3.700	0.627	0.559	3.869	0.000	0.000	12.893	8.531	25.520	5.803	0.000	5.119	7.086	1.024	0.0147
3.800	0.636	0.534	3.943	0.000	0.000	13.129	8.150	27.240	5.914	0.000	4.890	7.385	1.042	0.0142
3.900	0.645	0.543	4.017	0.000	0.000	13.640	8.287	29.031	6.026	0.000	4.972	7.690	1.060	0.0136
4.000	0.654	0.552	4.092	0.000	0.000	14.160	8.425	30.895	6.138	0.000	5.055	8.001	1.078	0.0130
4.100	0.663	0.561	4.166	0.000	0.000	14.688	8.562	32.833	6.249	0.000	5.137	8.317	1.096	0.0125
4.200	0.672	0.570	4.240	0.000	0.000	15.225	8.700	34.847	6.361	0.000	5.220	8.638	1.114	0.0120
4.300	0.681	0.579	4.315	0.000	0.000	15.771	8.837	36.939	6.472	0.000	5.302	8.965	1.131	0.0115
4.400	0.690	0.588	4.389	0.000	0.000	16.325	8.975	39.108	6.584	0.000	5.385	9.298	1.149	0.0109
4.500	0.699	0.597	4.464	0.000	0.000	16.888	9.112	41.357	6.696	0.000	5.467	9.636	1.166	0.0104
4.600	0.708	0.606	4.538	0.000	0.000	17.459	9.250	43.687	6.807	0.000	5.550	9.980	1.183	0.0100
4.700	0.717	0.615	4.612	0.000	0.000	18.039	9.387	46.100	6.919	0.000	5.632	10.329	1.200	0.0095
4.800	0.726	0.624	4.687	0.000	0.000	18.627	9.525	48.596	7.030	0.000	5.715	10.684	1.217	0.0090
4.900	0.735	0.619	4.761	0.000	0.000	19.069	9.459	51.178	7.142	0.000	5.676	11.044	1.234	0.0085
5.000	0.744	0.628	4.836	0.000	0.000	19.671	9.597	53.845	7.253	0.000	5.758	11.410	1.250	0.0081
5.100	0.753	0.637	4.910	0.000	0.000	20.282	9.734	56.601	7.365	0.000	5.841	11.781	1.265	0.0077
5.200	0.762	0.646	4.984	0.000	0.000	20.901	9.872	59.445	7.477	0.000	5.923	12.158	1.281	0.0072
5.300	0.771	0.655	5.059	0.000	0.000	21.529	10.009	62.380	7.588	0.000	6.006	12.540	1.295	0.0068
5.400	0.780	0.664	5.133	0.000	0.000	22.164	10.147	65.407	7.700	0.000	6.088	12.928	1.309	0.0064
5.500	0.789	0.673	5.208	0.000	0.000	22.807	10.284	68.527	7.811	0.000	6.171	13.320	1.322	0.0060
5.600	0.798	0.682	5.282	0.000	0.000	23.457	10.422	71.741	7.923	0.000	6.253	13.717	1.334	0.0056
5.700	0.807	0.691	5.332	0.000	0.000	24.113	10.559	75.051	7.998	0.000	6.336	14.118	1.345	0.0053
5.800	0.816	0.700	5.381	0.000	0.000	24.773	10.697	78.457	8.072	0.000	6.418	14.524	1.355	0.0049
5.900	0.825	0.687	5.431	0.000	0.000	25.105	10.498	81.961	8.147	0.000	6.299	14.933	1.364	0.0046
6.000	0.834	0.696	5.481	0.000	0.000	25.769	10.635	85.563	8.221	0.000	6.381	15.345	1.372	0.0041

ANEJO DE CÁLCULO DE ENVOLVENTE
CÓDIGO DEL PERFIL: 10118 1 4
GRUPO: 14
HIPÓTESIS : SERVICIO

x	h	d	ph	Nd/n	Ndrn/n	Vd/n	Vcu/n	Md/n	Fcc/n	ndrn	vcu	vda	md	delta
6.100	0.843	0.705	5.531	0.000	0.000	26.437	10.773	89.264	8.296	0.000	6.464	15.762	1.378	0.0039
6.200	0.852	0.714	5.580	0.000	0.000	27.109	10.910	93.065	8.371	0.000	6.546	16.182	1.384	0.0036
6.300	0.861	0.723	5.630	0.000	0.000	27.786	11.048	96.966	8.445	0.000	6.629	16.605	1.389	0.0033
6.400	0.870	0.732	5.680	0.000	0.000	28.468	11.185	100.970	8.520	0.000	6.711	17.032	1.392	0.0030
6.500	0.879	0.741	5.730	0.000	0.000	29.154	11.323	105.077	8.594	0.000	6.794	17.463	1.394	0.0027
6.600	0.888	0.750	5.779	0.000	0.000	29.844	11.460	109.287	8.669	0.000	6.876	17.898	1.394	0.0025
6.700	0.897	0.746	5.829	0.000	0.000	30.292	11.389	113.601	8.744	0.000	6.833	18.335	1.393	0.0022
6.800	0.906	0.755	5.879	0.000	0.000	30.988	11.526	118.021	8.818	0.000	6.916	18.777	1.390	0.0020
6.900	0.915	0.764	5.929	0.000	0.000	31.689	11.664	122.547	8.893	0.000	6.998	19.222	1.384	0.0018
7.000	0.924	0.773	5.978	0.000	0.000	32.395	11.801	127.181	8.967	0.000	7.081	19.671	1.376	0.0015
7.100	0.933	0.782	6.028	0.000	0.000	33.106	11.939	131.922	9.042	0.000	7.163	20.124	1.365	0.0013
7.200	0.942	0.791	6.078	0.000	0.000	33.823	12.076	136.772	9.117	0.000	7.246	20.581	1.350	0.0012
7.300	0.951	0.800	6.127	0.000	0.000	34.545	12.214	141.732	9.191	0.000	7.328	21.041	1.331	0.0000
7.400	0.960	0.789	6.177	0.000	0.000	34.868	12.053	146.803	9.266	0.000	7.232	21.505	1.307	0.0000
7.500	0.969	0.798	6.227	0.000	0.000	35.592	12.190	151.986	9.340	0.000	7.314	21.972	1.274	0.0000
7.600	0.978	0.807	6.277	0.000	0.000	36.312	12.328	157.282	9.415	0.000	7.397	22.438	1.231	0.0000
7.700	0.987	0.816	6.326	0.000	0.000	37.017	12.465	162.694	9.490	0.000	7.479	22.900	1.172	0.0000
7.800	0.996	0.825	6.376	0.000	0.000	37.687	12.603	168.224	9.564	0.000	7.562	23.349	1.092	0.0000
7.900	1.005	0.834	6.426	0.000	0.000	38.292	12.740	173.876	9.639	0.000	7.644	23.773	0.981	0.0000
8.000	1.014	0.829	6.476	0.000	0.000	38.460	12.662	179.656	9.713	0.000	7.597	24.153	0.832	0.0000
8.100	1.023	0.838	6.525	0.000	0.000	38.790	12.799	185.569	9.788	0.000	7.679	24.468	0.642	0.0000
8.200	1.032	0.847	6.575	0.000	0.000	38.911	12.937	191.621	9.863	0.000	7.762	24.698	0.416	0.0000
8.300	1.041	0.856	6.625	0.000	0.000	38.811	13.074	197.815	9.937	0.000	7.844	24.838	0.184	0.0000
8.400	1.050	0.865	6.674	0.000	0.000	38.562	13.212	204.144	10.012	0.000	7.927	24.919	0.000	0.0000
8.500	1.059	0.874	6.724	0.000	0.000	38.486	13.349	209.785	10.086	0.000	8.009	25.038	0.000	0.0000

NORTENPI
Director Técnico
NEKANE MUNDUATE AUZMENDI
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ANEJO DE CÁLCULO DE ENVOLVENTE
CÓDIGO DEL PERFIL: 10118 1 4
GRUPO: 14
HIPÓTESIS : SERVICIO

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Colegiado n.º 16495

x	d	Aa1	Aa2	Aa	Atn	Ain	Ars	Wk	aa	aft	afi	ata	aia	wk
0.000	0.256	2.22	0.40	2.62	0.00	0.00	0.00	0.0000	0.00	1.81	0.00	1.81	0.00	0.0000
0.100	0.265	2.22	0.43	2.65	0.00	0.00	0.00	0.0000	0.10	1.81	0.00	1.86	0.05	0.0000
0.200	0.274	2.22	0.45	2.67	3.71	0.00	0.00	0.0026	0.00	1.81	0.00	1.81	0.00	0.0000
0.300	0.283	2.22	0.48	2.70	3.75	0.00	0.00	0.0055	0.00	1.81	0.00	1.81	0.00	0.0000
0.400	0.292	2.22	0.50	2.73	3.79	0.00	0.00	0.0094	0.00	1.81	0.00	1.81	0.00	0.0000
0.500	0.301	2.22	0.53	2.75	3.83	0.00	0.00	0.0145	0.00	1.81	0.00	1.81	0.00	0.0000
0.600	0.310	2.22	0.56	2.78	3.87	0.00	0.00	0.0208	0.00	1.81	0.00	1.81	0.00	0.0000
0.700	0.319	2.22	0.58	2.81	3.91	0.00	0.00	0.0283	0.00	1.81	0.00	1.81	0.00	0.0000
0.800	0.328	2.22	0.61	2.83	3.96	0.00	0.00	0.0370	0.00	1.81	0.00	1.81	0.00	0.0000
0.900	0.337	2.22	0.64	2.86	4.00	0.00	0.00	0.0469	0.00	1.81	0.00	1.81	0.00	0.0000
1.000	0.324	2.22	0.66	2.89	3.95	0.00	0.00	0.0249	0.00	1.81	0.00	1.81	0.00	0.0000
1.100	0.333	2.22	0.69	2.91	3.99	0.00	0.00	0.0301	0.00	1.81	0.00	1.81	0.00	0.0000
1.200	0.342	2.22	0.72	2.94	4.03	0.00	0.00	0.0358	0.00	1.81	0.00	1.81	0.00	0.0000
1.300	0.351	2.22	0.74	2.97	4.07	0.00	0.00	0.0421	0.00	1.81	0.00	1.81	0.00	0.0000
1.400	0.360	2.22	0.77	2.99	4.11	0.00	0.00	0.0489	0.00	1.81	0.00	1.81	0.00	0.0000
1.500	0.369	2.22	0.80	3.02	4.16	0.00	0.00	0.0563	0.00	1.81	0.00	1.81	0.00	0.0000
1.600	0.378	2.22	0.82	3.05	4.20	0.00	0.00	0.0642	0.00	1.81	0.00	1.81	0.00	0.0000
1.700	0.387	2.22	0.85	3.07	4.24	0.00	0.00	0.0727	0.00	1.81	0.00	1.81	0.00	0.0000
1.800	0.396	2.22	0.88	3.10	4.28	0.00	0.00	0.0820	0.00	1.81	0.00	1.81	0.00	0.0000
1.900	0.405	2.22	0.90	3.13	4.33	0.00	0.00	0.1126	0.00	1.83	0.00	1.83	0.00	0.0000
2.000	0.414	2.22	0.93	3.15	4.37	0.00	0.00	0.0000	0.00	1.89	0.00	1.89	0.00	0.0000
2.100	0.423	2.22	0.96	3.18	4.41	0.00	0.00	0.0000	0.00	1.94	0.00	1.94	0.00	0.0000
2.200	0.432	2.22	0.98	3.21	4.46	0.00	0.00	0.0000	0.00	1.99	0.00	1.99	0.00	0.0000
2.300	0.441	2.22	1.01	3.23	4.50	0.00	0.00	0.0000	0.00	2.04	0.00	2.04	0.00	0.0000
2.400	0.450	2.22	1.04	3.26	4.54	0.00	0.00	0.0000	0.00	2.09	0.00	2.09	0.00	0.0000
2.500	0.459	2.22	1.06	3.29	4.84	0.00	0.00	0.0000	0.00	2.15	0.00	2.15	0.00	0.0000
2.600	0.468	2.22	1.09	3.31	5.21	0.00	0.00	0.0000	0.00	2.20	0.00	2.20	0.00	0.0000
2.700	0.477	2.22	1.12	3.34	5.59	0.00	0.00	0.0000	0.01	2.25	0.00	2.26	0.01	0.0000
2.800	0.486	2.22	1.14	3.36	5.99	0.00	0.00	0.0000	0.10	2.30	0.00	2.35	0.05	0.0000
2.900	0.495	2.22	1.17	3.39	6.40	0.00	0.00	0.0000	0.19	2.36	0.00	2.45	0.09	0.0000
3.000	0.504	2.22	1.20	3.42	6.82	0.00	0.00	0.0000	0.28	2.41	0.00	2.55	0.14	0.0000
3.100	0.505	2.22	1.22	3.44	7.38	0.00	0.00	0.0000	0.41	2.46	0.00	2.66	0.20	0.0000
3.200	0.514	2.22	1.25	3.47	7.83	0.00	0.00	0.0000	0.50	2.51	0.00	2.76	0.25	0.2016
3.300	0.523	2.22	1.28	3.50	8.30	0.00	0.00	0.0000	0.58	2.56	0.00	2.85	0.29	0.1676
3.400	0.532	2.22	1.30	3.52	8.78	0.00	0.00	0.0000	0.67	2.61	0.00	2.95	0.34	0.1768
3.500	0.541	2.22	1.33	3.55	9.27	0.00	0.00	0.0000	0.76	2.67	0.00	3.04	0.38	0.1859
3.600	0.550	2.22	1.36	3.58	9.77	0.00	0.00	0.0000	0.84	2.72	0.00	3.14	0.42	0.1948
3.700	0.559	2.22	1.38	3.60	10.29	0.00	0.00	0.0000	0.93	2.77	0.00	3.23	0.47	0.2036
3.800	0.534	2.47	1.41	3.88	11.55	0.00	0.00	0.0000	1.24	2.82	0.00	3.44	0.62	0.2122
3.900	0.543	2.61	1.43	4.04	12.12	0.00	0.00	0.0000	1.33	2.87	0.00	3.53	0.66	0.2207
4.000	0.552	2.75	1.46	4.21	12.70	0.00	0.00	0.0000	1.41	2.92	0.00	3.63	0.71	0.2291
4.100	0.561	2.89	1.49	4.38	13.29	0.00	0.00	0.0000	1.50	2.97	0.00	3.72	0.75	0.2374
4.200	0.570	3.03	1.51	4.55	13.90	0.00	0.00	0.0000	1.59	3.02	0.00	3.81	0.79	0.1989
4.300	0.579	3.17	1.54	4.71	14.52	0.00	0.00	0.0000	1.68	3.07	0.00	3.91	0.84	0.2054
4.400	0.588	3.31	1.57	4.88	15.15	0.00	0.00	0.0000	1.76	3.12	0.00	4.00	0.88	0.2118
4.500	0.597	3.45	1.59	5.04	15.79	0.00	0.00	0.0000	1.85	3.17	0.00	4.09	0.92	0.2180
4.600	0.606	3.59	1.62	5.21	16.45	0.00	0.00	0.0000	1.94	3.22	0.00	4.19	0.97	0.2242
4.700	0.615	3.72	1.65	5.37	17.12	0.00	0.00	0.0000	2.02	3.27	0.00	4.28	1.01	0.2302
4.800	0.624	3.86	1.67	5.54	17.81	0.00	0.00	0.0000	2.11	3.31	0.00	4.37	1.05	0.2362
4.900	0.619	4.11	1.70	5.81	18.94	0.00	0.00	0.0000	2.29	3.36	0.00	4.51	1.15	0.2419
5.000	0.628	4.24	1.73	5.97	19.66	0.00	0.00	0.0000	2.38	3.40	0.00	4.59	1.19	0.2476
5.100	0.637	4.38	1.75	6.13	20.39	0.00	0.00	0.0000	2.47	3.45	0.00	4.68	1.23	0.2530
5.200	0.646	4.51	1.78	6.30	21.14	0.00	0.00	0.0000	2.55	3.49	0.00	4.77	1.28	0.2583
5.300	0.655	4.65	1.81	6.46	21.90	0.00	0.00	0.0000	2.64	3.53	0.00	4.85	1.32	0.2157
5.400	0.664	4.79	1.83	6.62	22.68	0.00	0.00	0.0000	2.72	3.57	0.00	4.94	1.36	0.2196
5.500	0.673	4.92	1.86	6.78	23.46	0.00	0.00	0.0000	2.81	3.61	0.00	5.02	1.40	0.2233
5.600	0.682	5.05	1.89	6.94	24.27	0.00	0.00	0.0000	2.89	3.65	0.00	5.09	1.45	0.2266
5.700	0.691	5.19	1.90	7.09	25.08	0.00	0.00	0.0000	2.98	3.68	0.00	5.17	1.49	0.2296
5.800	0.700	5.32	1.92	7.24	25.91	0.00	0.00	0.0000	3.06	3.70	0.00	5.24	1.53	0.2324
5.900	0.687	5.62	1.94	7.56	27.70	0.00	0.00	0.0000	3.32	3.73	0.00	5.39	1.66	0.2348
6.000	0.696	5.75	1.96	7.71	28.57	0.00	0.00	0.0000	3.41	3.75	0.00	5.45	1.70	0.2370

ANEJO DE CÁLCULO DE ENVOLVENTE
CÓDIGO DEL PERFIL: 10118 1 4
GRUPO: 14
HIPÓTESIS : SERVICIO

x	d	Aa1	Aa2	Aa	Atn	Ain	Ars	Wk	aa	aft	afi	ata	aia	wk
6.100	0.705	5.88	1.98	7.85	29.46	0.00	0.00	0.0000	3.49	3.77	0.00	5.52	1.74	0.2388
6.200	0.714	6.00	1.99	7.99	30.36	0.00	0.00	0.0000	3.57	3.79	0.00	5.57	1.78	0.2404
6.300	0.723	6.12	2.01	8.13	31.27	0.00	0.00	0.0000	3.65	3.80	0.00	5.63	1.82	0.2417
6.400	0.732	6.24	2.03	8.27	32.19	0.00	0.00	0.0000	3.73	3.81	0.00	5.67	1.86	0.2426
6.500	0.741	6.36	2.05	8.41	33.12	0.00	0.00	0.0000	3.81	3.82	0.00	5.72	1.90	0.2431
6.600	0.750	6.48	2.06	8.55	34.07	0.00	0.00	0.0000	3.89	3.82	0.00	5.76	1.94	0.2432
6.700	0.746	6.71	2.08	8.79	35.76	0.00	0.00	0.0000	4.08	3.81	0.00	5.85	2.04	0.2429
6.800	0.755	6.82	2.10	8.92	36.74	0.00	0.00	0.0000	4.16	3.80	0.00	5.88	2.08	0.2419
6.900	0.764	6.94	2.12	9.06	37.74	0.00	0.00	0.0000	4.24	3.79	0.00	5.91	2.12	0.2404
7.000	0.773	7.05	2.14	9.19	38.75	0.00	0.00	0.0000	4.31	3.76	0.00	5.92	2.16	0.2382
7.100	0.782	7.16	2.15	9.32	39.77	0.00	0.00	0.0000	4.39	3.73	0.00	5.93	2.19	0.2351
7.200	0.791	7.28	2.17	9.45	40.80	0.00	0.00	0.0000	4.46	3.69	0.00	5.92	2.23	0.2311
7.300	0.800	7.39	2.19	9.58	41.84	0.00	0.00	0.0000	4.54	3.64	0.00	5.91	2.27	0.2258
7.400	0.789	7.65	2.21	9.86	44.12	0.00	0.00	0.0000	4.79	3.57	0.00	5.96	2.39	0.2189
7.500	0.798	7.76	2.22	9.98	45.21	0.00	0.00	0.0000	4.86	3.47	0.00	5.90	2.43	0.2562
7.600	0.807	7.86	2.24	10.10	46.30	0.00	0.00	0.0000	4.93	3.35	0.00	5.82	2.47	0.2411
7.700	0.816	7.96	2.26	10.22	47.41	0.00	0.00	0.0000	5.00	3.19	0.00	5.69	2.50	0.2202
7.800	0.825	8.04	2.28	10.32	48.53	0.00	0.00	0.0000	5.06	2.96	0.00	5.49	2.53	0.2354
7.900	0.834	8.10	2.29	10.40	49.67	0.00	0.00	0.0000	5.12	2.65	0.00	5.21	2.56	0.1831
8.000	0.829	8.23	2.31	10.55	51.83	0.00	0.00	0.0000	5.28	2.24	0.00	4.88	2.64	0.0000
8.100	0.838	8.21	2.33	10.54	53.01	0.00	0.00	0.0000	5.30	1.81	0.00	4.46	2.65	0.0000
8.200	0.847	8.11	2.35	10.46	54.21	0.00	0.00	0.0000	5.29	1.81	0.00	4.46	2.65	0.0000
8.300	0.856	7.95	2.37	10.32	55.43	0.00	0.00	0.0000	5.25	1.81	0.00	4.44	2.63	0.0000
8.400	0.865	7.75	2.38	10.14	56.66	0.00	0.00	0.0000	5.20	0.00	0.00	2.60	2.60	0.0000
8.500	0.874	7.61	2.40	10.01	57.66	0.00	0.00	0.0000	5.15	0.00	0.00	2.58	2.58	0.0000

HORTENPH
Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

ANEJO DE CÁLCULO DE ENVOLVENTE
CÓDIGO DEL PERFIL: 10118 1 4
GRUPO: 14
ENVOLVENTE DE ARMADOS

x	Aa1	Aa2	Aa	Atn	Ain	Ars	aa	aft	afi	ata	aia
0.000	2.22	0.40	2.62	0.00	0.00	0.00	0.00	1.81	0.00	1.81	0.00
0.100	2.22	0.43	2.65	0.00	0.00	0.00	0.10	1.81	0.00	1.86	0.05
0.200	2.22	0.45	2.67	3.71	0.00	0.00	0.00	1.81	0.00	1.81	0.00
0.300	2.22	0.48	2.70	3.75	0.00	0.00	0.00	1.81	0.00	1.81	0.00
0.400	2.22	0.50	2.73	3.79	0.00	0.00	0.00	1.81	0.00	1.81	0.00
0.500	2.22	0.53	2.75	3.83	0.00	0.00	0.00	1.81	0.00	1.81	0.00
0.600	2.22	0.56	2.78	3.87	0.00	0.00	0.00	1.81	0.00	1.81	0.00
0.700	2.22	0.58	2.81	3.91	0.00	0.00	0.00	1.81	0.00	1.81	0.00
0.800	2.22	0.61	2.83	3.96	0.00	0.00	0.00	1.81	0.00	1.81	0.00
0.900	2.22	0.64	2.86	4.00	0.00	0.00	0.00	1.81	0.00	1.81	0.00
1.000	2.22	0.66	2.89	3.95	0.00	0.00	0.00	1.81	0.00	1.81	0.00
1.100	2.22	0.69	2.91	3.99	0.00	0.00	0.00	1.81	0.00	1.81	0.00
1.200	2.22	0.72	2.94	4.03	0.00	0.00	0.00	1.81	0.00	1.81	0.00
1.300	2.22	0.74	2.97	4.07	0.00	0.00	0.00	1.81	0.00	1.81	0.00
1.400	2.22	0.77	2.99	4.11	0.00	0.00	0.00	1.81	0.00	1.81	0.00
1.500	2.22	0.80	3.02	4.16	0.00	0.00	0.00	1.81	0.00	1.81	0.00
1.600	2.22	0.82	3.05	4.20	0.00	0.00	0.00	1.81	0.00	1.81	0.00
1.700	2.22	0.85	3.07	4.24	0.00	0.00	0.00	1.81	0.00	1.81	0.00
1.800	2.22	0.88	3.10	4.28	0.00	0.00	0.00	1.81	0.00	1.81	0.00
1.900	2.22	0.90	3.13	4.33	0.00	0.00	0.00	1.83	0.00	1.83	0.00
2.000	2.22	0.93	3.15	4.37	0.00	0.00	0.00	1.89	0.00	1.89	0.00
2.100	2.22	0.96	3.18	4.41	0.00	0.00	0.00	1.94	0.00	1.94	0.00
2.200	2.22	0.98	3.21	4.46	0.00	0.00	0.00	1.99	0.00	1.99	0.00
2.300	2.22	1.01	3.23	4.50	0.00	0.00	0.00	2.04	0.00	2.04	0.00
2.400	2.22	1.04	3.26	4.54	0.00	0.00	0.00	2.09	0.00	2.09	0.00
2.500	2.22	1.06	3.29	4.84	0.00	0.00	0.00	2.15	0.00	2.15	0.00
2.600	2.22	1.09	3.31	5.21	0.00	0.00	0.00	2.20	0.00	2.20	0.00
2.700	2.22	1.12	3.34	5.59	0.00	0.00	0.01	2.25	0.00	2.26	0.01
2.800	2.22	1.14	3.36	5.99	0.00	0.00	0.10	2.30	0.00	2.35	0.05
2.900	2.22	1.17	3.39	6.40	0.00	0.00	0.19	2.36	0.00	2.45	0.09
3.000	2.22	1.20	3.42	6.82	0.00	0.00	0.28	2.41	0.00	2.55	0.14
3.100	2.22	1.22	3.44	7.38	0.00	0.00	0.41	2.46	0.00	2.66	0.20
3.200	2.22	1.25	3.47	7.83	0.00	0.00	0.50	2.51	0.00	2.76	0.25
3.300	2.22	1.28	3.50	8.30	0.00	0.00	0.58	2.56	0.00	2.85	0.29
3.400	2.22	1.30	3.52	8.78	0.00	0.00	0.67	2.61	0.00	2.95	0.34
3.500	2.22	1.33	3.55	9.27	0.00	0.00	0.76	2.67	0.00	3.04	0.38
3.600	2.22	1.36	3.58	9.77	0.00	0.00	0.84	2.72	0.00	3.14	0.42
3.700	2.22	1.38	3.60	10.29	0.00	0.00	0.93	2.77	0.00	3.23	0.47
3.800	2.47	1.41	3.88	11.55	0.00	0.00	1.24	2.82	0.00	3.44	0.62
3.900	2.61	1.43	4.04	12.12	0.00	0.00	1.33	2.87	0.00	3.53	0.66
4.000	2.75	1.46	4.21	12.70	0.00	0.00	1.41	2.92	0.00	3.63	0.71
4.100	2.89	1.49	4.38	13.29	0.00	0.00	1.50	2.97	0.00	3.72	0.75
4.200	3.03	1.51	4.55	13.90	0.00	0.00	1.59	3.02	0.00	3.81	0.79
4.300	3.17	1.54	4.71	14.52	0.00	0.00	1.68	3.07	0.00	3.91	0.84
4.400	3.31	1.57	4.88	15.15	0.00	0.00	1.76	3.12	0.00	4.00	0.88
4.500	3.45	1.59	5.04	15.79	0.00	0.00	1.85	3.17	0.00	4.09	0.92
4.600	3.59	1.62	5.21	16.45	0.00	0.00	1.94	3.22	0.00	4.19	0.97
4.700	3.72	1.65	5.37	17.12	0.00	0.00	2.02	3.27	0.00	4.28	1.01
4.800	3.86	1.67	5.54	17.81	0.00	0.00	2.11	3.31	0.00	4.37	1.05
4.900	4.11	1.70	5.81	18.94	0.00	0.00	2.29	3.36	0.00	4.51	1.15
5.000	4.24	1.73	5.97	19.66	0.00	0.00	2.38	3.40	0.00	4.59	1.19
5.100	4.38	1.75	6.13	20.39	0.00	0.00	2.47	3.45	0.00	4.68	1.23
5.200	4.51	1.78	6.30	21.14	0.00	0.00	2.55	3.49	0.00	4.77	1.28
5.300	4.65	1.81	6.46	21.90	0.00	0.00	2.64	3.53	0.00	4.85	1.32
5.400	4.79	1.83	6.62	22.68	0.00	0.00	2.72	3.57	0.00	4.94	1.36
5.500	4.92	1.86	6.78	23.46	0.00	0.00	2.81	3.61	0.00	5.02	1.40
5.600	5.05	1.89	6.94	24.27	0.00	0.00	2.89	3.65	0.00	5.09	1.45
5.700	5.19	1.90	7.09	25.08	0.00	0.00	2.98	3.68	0.00	5.17	1.49
5.800	5.32	1.92	7.24	25.91	0.00	0.00	3.06	3.70	0.00	5.24	1.53
5.900	5.62	1.94	7.56	27.70	0.00	0.00	3.32	3.73	0.00	5.39	1.66
6.000	5.75	1.96	7.71	28.57	0.00	0.00	3.41	3.75	0.00	5.45	1.70

HORTENPH
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ANEJO DE CÁLCULO DE ENVOLVENTE
CÓDIGO DEL PERFIL: 10118 1 4
GRUPO: 14

ENVOLVENTE DE ARMADOS

x	Aa1	Aa2	Aa	Atn	Ain	Ars	aa	aft	afi	ata	aia
6.100	5.88	1.98	7.85	29.46	0.00	0.00	3.49	3.77	0.00	5.52	1.74
6.200	6.00	1.99	7.99	30.36	0.00	0.00	3.57	3.79	0.00	5.57	1.78
6.300	6.12	2.01	8.13	31.27	0.00	0.00	3.65	3.80	0.00	5.63	1.82
6.400	6.24	2.03	8.27	32.19	0.00	0.00	3.73	3.81	0.00	5.67	1.86
6.500	6.36	2.05	8.41	33.12	0.00	0.00	3.81	3.82	0.00	5.72	1.90
6.600	6.48	2.06	8.55	34.07	0.00	0.00	3.89	3.82	0.00	5.76	1.94
6.700	6.71	2.08	8.79	35.76	0.00	0.00	4.08	3.81	0.00	5.85	2.04
6.800	6.82	2.10	8.92	36.74	0.00	0.00	4.16	3.80	0.00	5.88	2.08
6.900	6.94	2.12	9.06	37.74	0.00	0.00	4.24	3.79	0.00	5.91	2.12
7.000	7.05	2.14	9.19	38.75	0.00	0.00	4.31	3.76	0.00	5.92	2.16
7.100	7.16	2.15	9.32	39.77	0.00	0.00	4.39	3.73	0.00	5.93	2.19
7.200	7.28	2.17	9.45	40.80	0.00	0.00	4.46	3.69	0.00	5.92	2.23
7.300	7.39	2.19	9.58	41.84	0.00	0.00	4.54	3.64	0.00	5.91	2.27
7.400	7.65	2.21	9.86	44.12	0.00	0.00	4.79	3.57	0.00	5.96	2.39
7.500	7.76	2.22	9.98	45.21	0.00	0.00	4.86	3.47	0.00	5.90	2.43
7.600	7.86	2.24	10.10	46.30	0.00	0.00	4.93	3.35	0.00	5.82	2.47
7.700	7.96	2.26	10.22	47.41	0.00	0.00	5.00	3.19	0.00	5.69	2.50
7.800	8.04	2.28	10.32	48.53	0.00	0.00	5.06	2.96	0.00	5.49	2.53
7.900	8.10	2.29	10.40	49.67	0.00	0.00	5.12	2.65	0.00	5.21	2.56
8.000	8.23	2.31	10.55	51.83	0.00	0.00	5.28	2.24	0.00	4.88	2.64
8.100	8.21	2.33	10.54	53.01	0.00	0.00	5.30	1.81	0.00	4.46	2.65
8.200	8.11	2.35	10.46	54.21	0.00	0.00	5.29	1.81	0.00	4.46	2.65
8.300	7.95	2.37	10.32	55.43	0.00	0.00	5.25	1.81	0.00	4.44	2.63
8.400	7.75	2.38	10.14	56.66	0.00	0.00	5.20	0.00	0.00	2.60	2.60
8.500	7.61	2.40	10.01	57.66	0.00	0.00	5.15	0.00	0.00	2.58	2.58

NORTEN PH
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ANEJO DE CÁLCULO DE ENVOLVENTE
CÓDIGO DEL PERFIL: 10118 1 4
GRUPO: 1

CARACTERÍSTICAS GEOMETRICAS Y DE LOS MATERIALES

ALTURA	(m)	: 8.192
ANCHURA	(m)	: 1.200
NERVIOS		: 1
CANTO TOTAL EN CORONACIÓN	(m)	: 0.214
PENDIENTE LONGITUDINAL DEL NERVIO		: 9.000
ESPESOR MÍNIMO DEL NERVIO	(m)	: 0.200
ESPESOR DE LAS ALAS	(m)	: 0.120
LONGITUD DEL ALA IZQUIERDA	(m)	: 0.600
LONGITUD DEL ALA DERECHA	(m)	: 0.600
CODIGO DEL CABEZAL		: 0.55 X 0.3
HORMIGÓN	(kg/cm2)	: 350
MINORACIÓN DEL HORMIGÓN		: 1.50
ACERO	(kg/cm2)	: 5100
MINORACIÓN DEL ACERO		: 1.15
RECUBRIMIENTO	(m)	: 0.030
COEFICIENTE DE ANCLAJE EN ZAPATA		: 15
COEFICIENTE DE ANCLAJE EN PIEZA		: 12
ALA EMPOTRADA		

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ANEJO DE CÁLCULO DE ENVOLVENTE
CÓDIGO DEL PERFIL: 10118 1 4
GRUPO: 1
HIPÓTESIS : SERVICIO

ACCIONES Y RESISTENCIAS

COEFICIENTE DE MAYORACIÓN : 1.50

FISURACIÓN (mm) : 0.300

CARGAS REPARTIDAS

HORIZONTALES

Y(m)	Ph(T/m2)
0.000	1.116
11.500	9.672

VERTICALES

Y(m)	X(m)	Pv(T/n)

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CÓDIGO DEL PERFIL: 10118 1 4
GRUPO: 1
HIPÓTESIS : SERVICIO

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x	h	d	ph	Nd/n	Ndrn/n	Vd/n	Vcu/n	Md/n	Fcc/n	ndrn	vcu	vda	md	delta
0.000	0.214	0.000	1.116	0.000	0.000	0.000	0.000	0.000	1.674	0.000	0.000	0.000	0.271	0.0297
0.193	0.231	0.000	1.259	0.000	0.000	0.217	0.000	0.000	1.889	0.000	0.000	0.090	0.329	0.0284
0.293	0.240	0.198	1.334	0.000	0.000	0.373	3.022	0.072	2.000	0.000	1.813	0.169	0.351	0.0277
0.393	0.249	0.207	1.408	0.000	0.000	0.559	3.159	0.135	2.112	0.000	1.896	0.258	0.371	0.0270
0.493	0.258	0.216	1.482	0.000	0.000	0.758	3.297	0.224	2.224	0.000	1.978	0.355	0.392	0.0263
0.593	0.267	0.225	1.557	0.000	0.000	0.969	3.434	0.340	2.335	0.000	2.061	0.460	0.412	0.0257
0.693	0.276	0.234	1.631	0.000	0.000	1.191	3.572	0.484	2.447	0.000	2.143	0.574	0.434	0.0250
0.793	0.285	0.243	1.706	0.000	0.000	1.426	3.709	0.657	2.558	0.000	2.226	0.696	0.455	0.0243
0.893	0.294	0.252	1.780	0.000	0.000	1.673	3.847	0.861	2.670	0.000	2.308	0.825	0.477	0.0236
0.993	0.303	0.261	1.854	0.000	0.000	1.931	3.984	1.097	2.782	0.000	2.391	0.962	0.499	0.0229
1.093	0.312	0.270	1.929	0.000	0.000	2.200	4.122	1.367	2.893	0.000	2.473	1.107	0.521	0.0223
1.193	0.321	0.279	2.003	0.000	0.000	2.479	4.259	1.672	3.005	0.000	2.555	1.258	0.543	0.0216
1.293	0.330	0.288	2.078	0.000	0.000	2.769	4.397	2.014	3.116	0.000	2.638	1.416	0.564	0.0209
1.393	0.339	0.297	2.152	0.000	0.000	3.069	4.534	2.393	3.228	0.000	2.720	1.581	0.585	0.0203
1.493	0.348	0.306	2.226	0.000	0.000	3.377	4.672	2.811	3.340	0.000	2.803	1.752	0.606	0.0196
1.593	0.357	0.315	2.301	0.000	0.000	3.696	4.809	3.270	3.451	0.000	2.885	1.929	0.626	0.0190
1.693	0.366	0.324	2.375	0.000	0.000	4.023	4.947	3.771	3.563	0.000	2.968	2.113	0.646	0.0183
1.793	0.375	0.333	2.450	0.000	0.000	4.358	5.084	4.316	3.674	0.000	3.050	2.302	0.666	0.0177
1.893	0.384	0.342	2.524	0.000	0.000	4.703	5.221	4.905	3.786	0.000	3.133	2.498	0.686	0.0170
1.993	0.393	0.351	2.598	0.000	0.000	5.056	5.359	5.540	3.898	0.000	3.215	2.699	0.705	0.0164
2.093	0.402	0.360	2.673	0.000	0.000	5.417	5.496	6.222	4.009	0.000	3.298	2.906	0.725	0.0158
2.193	0.411	0.369	2.747	0.000	0.000	5.786	5.634	6.953	4.121	0.000	3.380	3.118	0.744	0.0152
2.293	0.420	0.378	2.822	0.000	0.000	6.164	5.771	7.735	4.232	0.000	3.463	3.336	0.763	0.0146
2.393	0.429	0.387	2.896	0.000	0.000	6.550	5.909	8.568	4.344	0.000	3.545	3.560	0.781	0.0140
2.493	0.438	0.396	2.970	0.000	0.000	6.944	6.046	9.453	4.456	0.000	3.628	3.789	0.800	0.0134
2.593	0.447	0.405	3.045	0.000	0.000	7.346	6.184	10.393	4.567	0.000	3.710	4.024	0.818	0.0128
2.693	0.456	0.414	3.119	0.000	0.000	7.757	6.321	11.388	4.679	0.000	3.793	4.264	0.836	0.0122
2.793	0.465	0.423	3.194	0.000	0.000	8.175	6.459	12.440	4.790	0.000	3.875	4.510	0.854	0.0117
2.893	0.474	0.432	3.268	0.000	0.000	8.602	6.596	13.550	4.902	0.000	3.958	4.761	0.872	0.0111
2.993	0.483	0.441	3.342	0.000	0.000	9.037	6.734	14.720	5.014	0.000	4.040	5.018	0.890	0.0106
3.093	0.492	0.450	3.417	0.000	0.000	9.480	6.871	15.951	5.125	0.000	4.123	5.280	0.907	0.0100
3.193	0.501	0.459	3.491	0.000	0.000	9.931	7.009	17.244	5.237	0.000	4.205	5.547	0.924	0.0095
3.293	0.510	0.468	3.566	0.000	0.000	10.390	7.146	18.600	5.348	0.000	4.288	5.820	0.941	0.0090
3.393	0.519	0.477	3.640	0.000	0.000	10.858	7.284	20.021	5.460	0.000	4.370	6.099	0.958	0.0085
3.493	0.528	0.467	3.714	0.000	0.000	11.171	7.131	21.509	5.572	0.000	4.279	6.382	0.974	0.0080
3.593	0.537	0.476	3.789	0.000	0.000	11.650	7.268	23.064	5.683	0.000	4.361	6.672	0.990	0.0076
3.693	0.546	0.485	3.863	0.000	0.000	12.136	7.406	24.688	5.795	0.000	4.443	6.966	1.006	0.0071
3.793	0.555	0.494	3.938	0.000	0.000	12.631	7.543	26.382	5.906	0.000	4.526	7.267	1.022	0.0067
3.893	0.564	0.503	4.012	0.000	0.000	13.135	7.681	28.148	6.018	0.000	4.608	7.572	1.036	0.0062
3.993	0.573	0.512	4.086	0.000	0.000	13.646	7.818	29.987	6.130	0.000	4.691	7.883	1.051	0.0058
4.093	0.582	0.521	4.161	0.000	0.000	14.166	7.956	31.900	6.241	0.000	4.773	8.199	1.065	0.0054
4.193	0.591	0.530	4.235	0.000	0.000	14.694	8.093	33.888	6.353	0.000	4.856	8.521	1.078	0.0050
4.293	0.600	0.529	4.310	0.000	0.000	15.123	8.086	35.954	6.464	0.000	4.851	8.848	1.090	0.0046
4.393	0.609	0.538	4.384	0.000	0.000	15.665	8.223	38.098	6.576	0.000	4.934	9.181	1.102	0.0043
4.493	0.618	0.547	4.458	0.000	0.000	16.215	8.361	40.321	6.688	0.000	5.016	9.519	1.113	0.0039
4.593	0.627	0.556	4.533	0.000	0.000	16.773	8.498	42.626	6.799	0.000	5.099	9.862	1.123	0.0036
4.693	0.636	0.565	4.607	0.000	0.000	17.340	8.635	45.012	6.911	0.000	5.181	10.211	1.131	0.0032
4.793	0.645	0.574	4.682	0.000	0.000	17.915	8.773	47.483	7.022	0.000	5.264	10.565	1.138	0.0029
4.893	0.654	0.566	4.756	0.000	0.000	18.265	8.649	50.038	7.134	0.000	5.190	10.924	1.144	0.0026
4.993	0.663	0.575	4.830	0.000	0.000	18.852	8.787	52.680	7.246	0.000	5.272	11.289	1.147	0.0024
5.093	0.672	0.584	4.905	0.000	0.000	19.447	8.924	55.409	7.357	0.000	5.355	11.659	1.149	0.0021
5.193	0.681	0.593	4.979	0.000	0.000	20.051	9.062	58.228	7.469	0.000	5.437	12.035	1.149	0.0018
5.293	0.690	0.602	5.054	0.000	0.000	20.663	9.199	61.136	7.580	0.000	5.519	12.417	1.146	0.0016
5.393	0.699	0.611	5.128	0.000	0.000	21.285	9.337	64.136	7.692	0.000	5.602	12.804	1.139	0.0014
5.493	0.708	0.609	5.202	0.000	0.000	21.734	9.300	67.229	7.804	0.000	5.580	13.197	1.129	0.0012
5.593	0.717	0.618	5.277	0.000	0.000	22.370	9.437	70.417	7.915	0.000	5.662	13.595	1.114	0.0010
5.693	0.726	0.627	5.351	0.000	0.000	23.013	9.575	73.700	8.027	0.000	5.745	13.998	1.092	0.0000
5.793	0.735	0.636	5.426	0.000	0.000	23.658	9.712	77.081	8.138	0.000	5.827	14.404	1.061	0.0000
5.893	0.744	0.645	5.500	0.000	0.000	24.294	9.850	80.562	8.250	0.000	5.910	14.808	1.016	0.0000
5.993	0.753	0.638	5.574	0.000	0.000	24.609	9.739	84.147	8.362	0.000	5.843	15.203	0.952	0.0000
6.093	0.762	0.647	5.649	0.000	0.000	25.162	9.876	87.838	8.473	0.000	5.926	15.579	0.861	0.0000

ANEJO DE CÁLCULO DE ENVOLVENTE
CÓDIGO DEL PERFIL: 10118 1 4
GRUPO: 1
HIPÓTESIS : SERVICIO

x	h	d	ph	Nd	Ndrn/n	Vd/n	Vcu/n	Md/n	Fcc/n	ndrn	vcu	vda	md	delta
6.193	0.771	0.656	5.723	0.000	0.000	25.620	10.014	91.642	8.585	0.000	6.008	15.918	0.736	0.0000
6.293	0.780	0.665	5.798	0.000	0.000	25.936	10.151	95.564	8.696	0.000	6.091	16.199	0.572	0.0000
6.393	0.789	0.661	5.872	0.000	0.000	25.816	10.102	99.611	8.808	0.000	6.061	16.405	0.375	0.0000
6.493	0.798	0.670	5.946	0.000	0.000	25.733	10.239	103.786	8.920	0.000	6.144	16.528	0.169	0.0000
6.593	0.807	0.679	6.021	0.000	0.000	25.506	10.377	108.083	9.031	0.000	6.226	16.594	0.000	0.0000
6.692	0.816	0.688	6.095	0.000	0.000	25.455	10.514	111.759	9.143	0.000	6.309	16.695	0.000	0.0000

NORYSNPH
Director Técnico
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ANEJO DE CÁLCULO DE ENVOLVENTE
CÓDIGO DEL PERFIL: 10118 1 4
GRUPO: 1
HIPÓTESIS : SERVICIO

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x	d	Aa1	Aa2	Aa	Atn	Ain	Ars	Wk	aa	aft	afi	ata	aia	wk
0.000	0.176	2.22	0.40	2.62	0.00	0.00	0.00	0.0000	0.00	1.81	0.00	1.81	0.00	0.0000
0.193	0.193	2.22	0.45	2.67	0.00	0.00	0.00	0.0000	0.12	1.81	0.00	1.87	0.06	0.0000
0.293	0.198	2.22	0.48	2.70	3.37	0.00	0.00	0.0011	0.00	1.81	0.00	1.81	0.00	0.0000
0.393	0.207	2.22	0.50	2.73	3.41	0.00	0.00	0.0021	0.00	1.81	0.00	1.81	0.00	0.0000
0.493	0.216	2.22	0.53	2.75	3.45	0.00	0.00	0.0033	0.00	1.81	0.00	1.81	0.00	0.0000
0.593	0.225	2.22	0.56	2.78	3.49	0.00	0.00	0.0049	0.00	1.81	0.00	1.81	0.00	0.0000
0.693	0.234	2.22	0.58	2.80	3.53	0.00	0.00	0.0067	0.00	1.81	0.00	1.81	0.00	0.0000
0.793	0.243	2.22	0.61	2.83	3.57	0.00	0.00	0.0089	0.00	1.81	0.00	1.81	0.00	0.0000
0.893	0.252	2.22	0.64	2.86	3.61	0.00	0.00	0.0113	0.00	1.81	0.00	1.81	0.00	0.0000
0.993	0.261	2.22	0.66	2.88	3.65	0.00	0.00	0.0141	0.00	1.81	0.00	1.81	0.00	0.0000
1.093	0.270	2.22	0.69	2.91	3.69	0.00	0.00	0.0171	0.00	1.81	0.00	1.81	0.00	0.0000
1.193	0.279	2.22	0.72	2.94	3.73	0.00	0.00	0.0204	0.00	1.81	0.00	1.81	0.00	0.0000
1.293	0.288	2.22	0.74	2.96	3.77	0.00	0.00	0.0240	0.00	1.81	0.00	1.81	0.00	0.0000
1.393	0.297	2.22	0.77	2.99	3.81	0.00	0.00	0.0280	0.00	1.81	0.00	1.81	0.00	0.0000
1.493	0.306	2.22	0.80	3.02	3.86	0.00	0.00	0.0353	0.00	1.81	0.00	1.81	0.00	0.0000
1.593	0.315	2.22	0.82	3.04	3.90	0.00	0.00	0.0000	0.00	1.81	0.00	1.81	0.00	0.0000
1.693	0.324	2.22	0.85	3.07	3.94	0.00	0.00	0.0000	0.00	1.81	0.00	1.81	0.00	0.0000
1.793	0.333	2.22	0.87	3.10	3.98	0.00	0.00	0.0000	0.00	1.81	0.00	1.81	0.00	0.0000
1.893	0.342	2.22	0.90	3.12	4.02	0.00	0.00	0.0000	0.00	1.84	0.00	1.84	0.00	0.0000
1.993	0.351	2.22	0.93	3.15	4.06	0.00	0.00	0.0000	0.00	1.89	0.00	1.89	0.00	0.0000
2.093	0.360	2.22	0.95	3.18	4.11	0.00	0.00	0.0000	0.00	1.94	0.00	1.94	0.00	0.0000
2.193	0.369	2.22	0.98	3.20	4.20	0.00	0.00	0.0000	0.00	1.99	0.00	1.99	0.00	0.0000
2.293	0.378	2.22	1.01	3.23	4.56	0.00	0.00	0.0000	0.00	2.05	0.00	2.05	0.00	0.0000
2.393	0.387	2.22	1.03	3.26	4.94	0.00	0.00	0.0000	0.01	2.10	0.00	2.10	0.00	0.0000
2.493	0.396	2.22	1.06	3.28	5.34	0.00	0.00	0.0000	0.11	2.15	0.00	2.20	0.05	0.0000
2.593	0.405	2.22	1.09	3.31	5.74	0.00	0.00	0.0000	0.20	2.20	0.00	2.30	0.10	0.0000
2.693	0.414	2.22	1.11	3.34	6.16	0.00	0.00	0.0000	0.30	2.25	0.00	2.40	0.15	0.0000
2.793	0.423	2.22	1.14	3.36	6.60	0.00	0.00	0.0000	0.40	2.30	0.00	2.50	0.20	0.0000
2.893	0.432	2.22	1.17	3.39	7.04	0.00	0.00	0.0000	0.49	2.35	0.00	2.59	0.25	0.0000
2.993	0.441	2.22	1.19	3.42	7.50	0.00	0.00	0.0000	0.59	2.40	0.00	2.69	0.29	0.0000
3.093	0.450	2.22	1.22	3.44	7.97	0.00	0.00	0.0000	0.68	2.44	0.00	2.78	0.34	0.0000
3.193	0.459	2.22	1.25	3.47	8.46	0.00	0.00	0.0000	0.77	2.49	0.00	2.88	0.39	0.0000
3.293	0.468	2.22	1.27	3.50	8.96	0.00	0.00	0.0000	0.87	2.54	0.00	2.97	0.43	0.1634
3.393	0.477	2.22	1.30	3.52	9.47	0.00	0.00	0.0000	0.96	2.59	0.00	3.07	0.48	0.1717
3.493	0.467	2.29	1.33	3.62	10.43	0.00	0.00	0.0000	1.19	2.63	0.00	3.23	0.60	0.1798
3.593	0.476	2.44	1.35	3.79	10.99	0.00	0.00	0.0000	1.28	2.68	0.00	3.32	0.64	0.1877
3.693	0.485	2.58	1.38	3.96	11.56	0.00	0.00	0.0000	1.38	2.72	0.00	3.41	0.69	0.1953
3.793	0.494	2.73	1.41	4.13	12.14	0.00	0.00	0.0000	1.47	2.76	0.00	3.50	0.73	0.2026
3.893	0.503	2.87	1.43	4.30	12.73	0.00	0.00	0.0000	1.56	2.80	0.00	3.58	0.78	0.2097
3.993	0.512	3.01	1.46	4.47	13.34	0.00	0.00	0.0000	1.65	2.84	0.00	3.67	0.82	0.2165
4.093	0.521	3.15	1.49	4.64	13.96	0.00	0.00	0.0000	1.74	2.88	0.00	3.75	0.87	0.2230
4.193	0.530	3.30	1.51	4.81	14.59	0.00	0.00	0.0000	1.83	2.92	0.00	3.84	0.92	0.2291
4.293	0.529	3.52	1.54	5.06	15.54	0.00	0.00	0.0000	2.00	2.96	0.00	3.95	1.00	0.2349
4.393	0.538	3.66	1.57	5.22	16.21	0.00	0.00	0.0000	2.09	2.99	0.00	4.03	1.04	0.2402
4.493	0.547	3.80	1.59	5.39	16.89	0.00	0.00	0.0000	2.18	3.02	0.00	4.11	1.09	0.1986
4.593	0.556	3.94	1.62	5.55	17.58	0.00	0.00	0.0000	2.27	3.05	0.00	4.18	1.13	0.2021
4.693	0.565	4.07	1.65	5.72	18.29	0.00	0.00	0.0000	2.35	3.07	0.00	4.25	1.18	0.2052
4.793	0.574	4.21	1.67	5.88	19.01	0.00	0.00	0.0000	2.44	3.09	0.00	4.31	1.22	0.2078
4.893	0.566	4.49	1.70	6.19	20.41	0.00	0.00	0.0000	2.68	3.11	0.00	4.44	1.34	0.2098
4.993	0.575	4.63	1.73	6.35	21.17	0.00	0.00	0.0000	2.77	3.12	0.00	4.50	1.38	0.2112
5.093	0.584	4.76	1.75	6.52	21.95	0.00	0.00	0.0000	2.85	3.12	0.00	4.55	1.43	0.2119
5.193	0.593	4.90	1.78	6.68	22.74	0.00	0.00	0.0000	2.94	3.12	0.00	4.59	1.47	0.2117
5.293	0.602	5.04	1.80	6.84	23.54	0.00	0.00	0.0000	3.03	3.11	0.00	4.63	1.51	0.2106
5.393	0.611	5.17	1.83	7.00	24.36	0.00	0.00	0.0000	3.12	3.09	0.00	4.65	1.56	0.2083
5.493	0.609	5.40	1.86	7.26	25.72	0.00	0.00	0.0000	3.31	3.06	0.00	4.72	1.65	0.2046
5.593	0.618	5.54	1.88	7.42	26.57	0.00	0.00	0.0000	3.40	3.02	0.00	4.72	1.70	0.1990
5.693	0.627	5.67	1.91	7.58	27.44	0.00	0.00	0.0000	3.48	2.96	0.00	4.70	1.74	0.2357
5.793	0.636	5.80	1.94	7.74	28.32	0.00	0.00	0.0000	3.57	2.87	0.00	4.66	1.78	0.2212
5.893	0.645	5.93	1.96	7.89	29.22	0.00	0.00	0.0000	3.65	2.75	0.00	4.57	1.83	0.2000
5.993	0.638	6.17	1.99	8.16	31.00	0.00	0.00	0.0000	3.88	2.57	0.00	4.51	1.94	0.1687
6.093	0.647	6.25	2.02	8.27	31.95	0.00	0.00	0.0000	3.95	2.32	0.00	4.29	1.97	0.0000

ANEJO DE CÁLCULO DE ENVOLVENTE
CÓDIGO DEL PERFIL: 10118 1 4
GRUPO: 1
HIPÓTESIS : SERVICIO

x	d	Aa1	Aa2	Aa	Atn	Ain	Ars	Wk	aa	aft	afi	ata	aia	wk
6.193	0.656	6.30	2.04	8.34	32.91	0.00	0.00	0.0000	4.00	1.97	0.00	3.97	2.00	0.0000
6.293	0.665	6.28	2.07	8.35	33.88	0.00	0.00	0.0000	4.02	1.81	0.00	3.82	2.01	0.0000
6.393	0.661	6.29	2.10	8.38	35.63	0.00	0.00	0.0000	4.14	1.81	0.00	3.88	2.07	0.0000
6.493	0.670	6.11	2.12	8.24	36.66	0.00	0.00	0.0000	4.10	1.81	0.00	3.86	2.05	0.0000
6.593	0.679	5.89	2.15	8.04	37.71	0.00	0.00	0.0000	4.04	0.00	0.00	2.02	2.02	0.0000
6.692	0.688	5.74	2.18	7.92	38.50	0.00	0.00	0.0000	3.99	0.00	0.00	2.00	2.00	0.0000

Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

ANEJO DE CÁLCULO DE ENVOLVENTE
CÓDIGO DEL PERFIL: 10118 1 4
GRUPO: 1

ENVOLVENTE DE ARMADOS

Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

x	Aa1	Aa2	Aa	Atn	Ain	Ars	aa	aft	afi	ata	aia
0.000	2.22	0.40	2.62	0.00	0.00	0.00	0.00	1.81	0.00	1.81	0.00
0.193	2.22	0.45	2.67	0.00	0.00	0.00	0.12	1.81	0.00	1.87	0.06
0.293	2.22	0.48	2.70	3.37	0.00	0.00	0.00	1.81	0.00	1.81	0.00
0.393	2.22	0.50	2.73	3.41	0.00	0.00	0.00	1.81	0.00	1.81	0.00
0.493	2.22	0.53	2.75	3.45	0.00	0.00	0.00	1.81	0.00	1.81	0.00
0.593	2.22	0.56	2.78	3.49	0.00	0.00	0.00	1.81	0.00	1.81	0.00
0.693	2.22	0.58	2.80	3.53	0.00	0.00	0.00	1.81	0.00	1.81	0.00
0.793	2.22	0.61	2.83	3.57	0.00	0.00	0.00	1.81	0.00	1.81	0.00
0.893	2.22	0.64	2.86	3.61	0.00	0.00	0.00	1.81	0.00	1.81	0.00
0.993	2.22	0.66	2.88	3.65	0.00	0.00	0.00	1.81	0.00	1.81	0.00
1.093	2.22	0.69	2.91	3.69	0.00	0.00	0.00	1.81	0.00	1.81	0.00
1.193	2.22	0.72	2.94	3.73	0.00	0.00	0.00	1.81	0.00	1.81	0.00
1.293	2.22	0.74	2.96	3.77	0.00	0.00	0.00	1.81	0.00	1.81	0.00
1.393	2.22	0.77	2.99	3.81	0.00	0.00	0.00	1.81	0.00	1.81	0.00
1.493	2.22	0.80	3.02	3.86	0.00	0.00	0.00	1.81	0.00	1.81	0.00
1.593	2.22	0.82	3.04	3.90	0.00	0.00	0.00	1.81	0.00	1.81	0.00
1.693	2.22	0.85	3.07	3.94	0.00	0.00	0.00	1.81	0.00	1.81	0.00
1.793	2.22	0.87	3.10	3.98	0.00	0.00	0.00	1.81	0.00	1.81	0.00
1.893	2.22	0.90	3.12	4.02	0.00	0.00	0.00	1.84	0.00	1.84	0.00
1.993	2.22	0.93	3.15	4.06	0.00	0.00	0.00	1.89	0.00	1.89	0.00
2.093	2.22	0.95	3.18	4.11	0.00	0.00	0.00	1.94	0.00	1.94	0.00
2.193	2.22	0.98	3.20	4.20	0.00	0.00	0.00	1.99	0.00	1.99	0.00
2.293	2.22	1.01	3.23	4.56	0.00	0.00	0.00	2.05	0.00	2.05	0.00
2.393	2.22	1.03	3.26	4.94	0.00	0.00	0.01	2.10	0.00	2.10	0.00
2.493	2.22	1.06	3.28	5.34	0.00	0.00	0.11	2.15	0.00	2.20	0.05
2.593	2.22	1.09	3.31	5.74	0.00	0.00	0.20	2.20	0.00	2.30	0.10
2.693	2.22	1.11	3.34	6.16	0.00	0.00	0.30	2.25	0.00	2.40	0.15
2.793	2.22	1.14	3.36	6.60	0.00	0.00	0.40	2.30	0.00	2.50	0.20
2.893	2.22	1.17	3.39	7.04	0.00	0.00	0.49	2.35	0.00	2.59	0.25
2.993	2.22	1.19	3.42	7.50	0.00	0.00	0.59	2.40	0.00	2.69	0.29
3.093	2.22	1.22	3.44	7.97	0.00	0.00	0.68	2.44	0.00	2.78	0.34
3.193	2.22	1.25	3.47	8.46	0.00	0.00	0.77	2.49	0.00	2.88	0.39
3.293	2.22	1.27	3.50	8.96	0.00	0.00	0.87	2.54	0.00	2.97	0.43
3.393	2.22	1.30	3.52	9.47	0.00	0.00	0.96	2.59	0.00	3.07	0.48
3.493	2.29	1.33	3.62	10.43	0.00	0.00	1.19	2.63	0.00	3.23	0.60
3.593	2.44	1.35	3.79	10.99	0.00	0.00	1.28	2.68	0.00	3.32	0.64
3.693	2.58	1.38	3.96	11.56	0.00	0.00	1.38	2.72	0.00	3.41	0.69
3.793	2.73	1.41	4.13	12.14	0.00	0.00	1.47	2.76	0.00	3.50	0.73
3.893	2.87	1.43	4.30	12.73	0.00	0.00	1.56	2.80	0.00	3.58	0.78
3.993	3.01	1.46	4.47	13.34	0.00	0.00	1.65	2.84	0.00	3.67	0.82
4.093	3.15	1.49	4.64	13.96	0.00	0.00	1.74	2.88	0.00	3.75	0.87
4.193	3.30	1.51	4.81	14.59	0.00	0.00	1.83	2.92	0.00	3.84	0.92
4.293	3.52	1.54	5.06	15.54	0.00	0.00	2.00	2.96	0.00	3.95	1.00
4.393	3.66	1.57	5.22	16.21	0.00	0.00	2.09	2.99	0.00	4.03	1.04
4.493	3.80	1.59	5.39	16.89	0.00	0.00	2.18	3.02	0.00	4.11	1.09
4.593	3.94	1.62	5.55	17.58	0.00	0.00	2.27	3.05	0.00	4.18	1.13
4.693	4.07	1.65	5.72	18.29	0.00	0.00	2.35	3.07	0.00	4.25	1.18
4.793	4.21	1.67	5.88	19.01	0.00	0.00	2.44	3.09	0.00	4.31	1.22
4.893	4.49	1.70	6.19	20.41	0.00	0.00	2.68	3.11	0.00	4.44	1.34
4.993	4.63	1.73	6.35	21.17	0.00	0.00	2.77	3.12	0.00	4.50	1.38
5.093	4.76	1.75	6.52	21.95	0.00	0.00	2.85	3.12	0.00	4.55	1.43
5.193	4.90	1.78	6.68	22.74	0.00	0.00	2.94	3.12	0.00	4.59	1.47
5.293	5.04	1.80	6.84	23.54	0.00	0.00	3.03	3.11	0.00	4.63	1.51
5.393	5.17	1.83	7.00	24.36	0.00	0.00	3.12	3.09	0.00	4.65	1.56
5.493	5.40	1.86	7.26	25.72	0.00	0.00	3.31	3.06	0.00	4.72	1.65
5.593	5.54	1.88	7.42	26.57	0.00	0.00	3.40	3.02	0.00	4.72	1.70
5.693	5.67	1.91	7.58	27.44	0.00	0.00	3.48	2.96	0.00	4.70	1.74
5.793	5.80	1.94	7.74	28.32	0.00	0.00	3.57	2.87	0.00	4.66	1.78
5.893	5.93	1.96	7.89	29.22	0.00	0.00	3.65	2.75	0.00	4.57	1.83
5.993	6.17	1.99	8.16	31.00	0.00	0.00	3.88	2.57	0.00	4.51	1.94
6.093	6.25	2.02	8.27	31.95	0.00	0.00	3.95	2.32	0.00	4.29	1.97

ANEJO DE CÁLCULO DE ENVOLVENTE
CÓDIGO DEL PERFIL: 10118 1 4
GRUPO: 1

ENVOLVENTE DE ARMADOS

x	Aa1	Aa2	Aa	Atn	Ain	Ars	aa	aft	afi	ata	aia
6.193	6.30	2.04	8.34	32.91	0.00	0.00	4.00	1.97	0.00	3.97	2.00
6.293	6.28	2.07	8.35	33.88	0.00	0.00	4.02	1.81	0.00	3.82	2.01
6.393	6.29	2.10	8.38	35.63	0.00	0.00	4.14	1.81	0.00	3.88	2.07
6.493	6.11	2.12	8.24	36.66	0.00	0.00	4.10	1.81	0.00	3.86	2.05
6.593	5.89	2.15	8.04	37.71	0.00	0.00	4.04	0.00	0.00	2.02	2.02
6.692	5.74	2.18	7.92	38.50	0.00	0.00	3.99	0.00	0.00	2.00	2.00

Director Técnico
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Colegiado n.º 16495

ANEJO DE CÁLCULO DE ENVOLVENTE
CÓDIGO DEL PERFIL: 10118 1 4
GRUPO: 30

CARACTERÍSTICAS GEOMETRICAS Y DE LOS MATERIALES

ALTURA	(m)	: 3.809
ANCHURA	(m)	: 2.400
NERVIOS		: 2
CANTO TOTAL EN CORONACIÓN	(m)	: 0.292
PENDIENTE LONGITUDINAL DEL NERVIO		: 4.000
ESPESOR MÍNIMO DEL NERVIO	(m)	: 0.160
ESPESOR DE LAS ALAS	(m)	: 0.090
LONGITUD DEL ALA IZQUIERDA	(m)	: 0.600
LONGITUD DEL ALA DERECHA	(m)	: 0.600
DISTANCIA ENTRE NERVIOS	(m)	: 1.200
CODIGO DEL CABEZAL		: SIN CABEZAL
HORMIGÓN	(kg/cm2)	: 350
MINORACIÓN DEL HORMIGÓN		: 1.50
ACERO	(kg/cm2)	: 5100
MINORACIÓN DEL ACERO		: 1.15
RECUBRIMIENTO	(m)	: 0.030
COEFICIENTE DE ANCLAJE EN ZAPATA		: 15
COEFICIENTE DE ANCLAJE EN PIEZA		: 12
ALA EMPOTRADA		

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ANEJO DE CÁLCULO DE ENVOLVENTE
CÓDIGO DEL PERFIL: 10118 1 4
GRUPO: 30
HIPÓTESIS : SERVICIO

ACCIONES Y RESISTENCIAS

COEFICIENTE DE MAYORACIÓN : 1.50

FISURACIÓN (mm) : 0.300

CARGAS REPARTIDAS

HORIZONTALES		VERTICALES		
Y(m)	Ph(T/m2)	Y(m)	X(m)	Pv(T/n)
0.000	1.116			
7.350	6.584			

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ANEJO DE CÁLCULO DE ENVOLVENTE
CÓDIGO DEL PERFIL: 10118 1 4
GRUPO: 30
HIPÓTESIS : SERVICIO

x	h	d	ph	Nd/n	Ndrn/n	Vd/n	Vcu/n	Md/n	Fcc/n	ndrn	vcu	vda	md	delta
0.000	0.292	0.000	1.116	0.000	0.000	0.000	0.000	0.000	1.741	0.000	0.000	0.000	0.159	0.0048
0.109	0.296	0.000	1.197	0.000	0.000	0.279	0.000	0.000	1.868	0.000	0.000	0.121	0.319	0.0046
0.209	0.300	0.000	1.272	0.000	0.000	0.493	0.000	0.000	1.984	0.000	0.000	0.213	0.325	0.0044
0.309	0.304	0.266	1.346	0.000	0.000	0.705	3.255	0.096	2.100	0.000	1.831	0.312	0.332	0.0041
0.409	0.308	0.270	1.421	0.000	0.000	0.932	3.304	0.174	2.216	0.000	1.859	0.415	0.342	0.0039
0.509	0.312	0.274	1.495	0.000	0.000	1.170	3.353	0.276	2.332	0.000	1.886	0.525	0.352	0.0037
0.609	0.316	0.278	1.569	0.000	0.000	1.419	3.402	0.406	2.448	0.000	1.914	0.640	0.362	0.0034
0.709	0.320	0.282	1.644	0.000	0.000	1.678	3.451	0.562	2.564	0.000	1.941	0.762	0.373	0.0032
0.809	0.324	0.286	1.718	0.000	0.000	1.947	3.500	0.748	2.680	0.000	1.969	0.889	0.384	0.0030
0.909	0.328	0.290	1.793	0.000	0.000	2.228	3.549	0.965	2.796	0.000	1.996	1.023	0.395	0.0028
1.009	0.332	0.294	1.867	0.000	0.000	2.520	3.597	1.214	2.913	0.000	2.024	1.163	0.406	0.0026
1.109	0.336	0.298	1.941	0.000	0.000	2.822	3.646	1.495	3.029	0.000	2.051	1.310	0.415	0.0024
1.209	0.340	0.302	2.016	0.000	0.000	3.136	3.695	1.812	3.145	0.000	2.079	1.463	0.425	0.0021
1.309	0.344	0.306	2.090	0.000	0.000	3.461	3.744	2.165	3.261	0.000	2.106	1.622	0.433	0.0019
1.409	0.348	0.310	2.165	0.000	0.000	3.797	3.793	2.555	3.377	0.000	2.134	1.788	0.441	0.0017
1.509	0.352	0.314	2.239	0.000	0.000	4.144	3.842	2.984	3.493	0.000	2.161	1.960	0.447	0.0016
1.609	0.356	0.318	2.313	0.000	0.000	4.502	3.891	3.453	3.609	0.000	2.189	2.139	0.452	0.0014
1.709	0.360	0.322	2.388	0.000	0.000	4.870	3.940	3.965	3.725	0.000	2.216	2.324	0.455	0.0012
1.809	0.364	0.326	2.462	0.000	0.000	5.248	3.988	4.520	3.841	0.000	2.243	2.514	0.457	0.0010
1.909	0.368	0.330	2.537	0.000	0.000	5.634	4.037	5.119	3.957	0.000	2.271	2.710	0.458	0.0000
2.009	0.372	0.334	2.611	0.000	0.000	6.024	4.086	5.766	4.073	0.000	2.298	2.909	0.457	0.0000
2.109	0.376	0.316	2.685	0.000	0.000	6.360	3.867	6.462	4.189	0.000	2.175	3.110	0.448	0.0000
2.209	0.380	0.320	2.760	0.000	0.000	6.734	3.916	7.208	4.305	0.000	2.203	3.308	0.428	0.0000
2.309	0.384	0.324	2.834	0.000	0.000	7.085	3.965	8.006	4.421	0.000	2.230	3.498	0.394	0.0000
2.409	0.388	0.328	2.909	0.000	0.000	7.394	4.014	8.858	4.537	0.000	2.258	3.672	0.344	0.0000
2.509	0.392	0.332	2.983	0.000	0.000	7.639	4.063	9.762	4.653	0.000	2.285	3.819	0.277	0.0000
2.609	0.396	0.328	3.057	0.000	0.000	7.764	4.007	10.717	4.769	0.000	2.254	3.931	0.196	0.0000
2.709	0.400	0.332	3.132	0.000	0.000	7.822	4.056	11.717	4.885	0.000	2.281	4.002	0.109	0.0000
2.809	0.404	0.336	3.206	0.000	0.000	7.805	4.105	12.754	5.002	0.000	2.309	4.040	0.000	0.0000
2.910	0.408	0.340	3.281	0.000	0.000	7.827	4.154	13.591	5.118	0.000	2.336	4.085	0.000	0.0000

Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

LICENCIA

OREKIN

ANEJO DE CÁLCULO DE ENVOLVENTE
CÓDIGO DEL PERFIL: 10118 1 4
GRUPO: 30
HIPÓTESIS : SERVICIO

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0.109	0.258	1.78	0.44	2.22	0.00	0.00	0.00	0.0000	0.12	1.31	1.18	1.37	1.24	0.0000
0.209	0.262	1.78	0.47	2.25	0.00	0.00	0.00	0.0000	0.22	1.34	1.18	1.44	1.29	0.0000
0.309	0.266	1.78	0.50	2.28	2.92	0.00	0.00	0.0033	0.00	1.37	1.18	1.37	1.18	0.0000
0.409	0.270	1.78	0.53	2.31	2.94	0.00	0.00	0.0059	0.00	1.41	1.18	1.41	1.18	0.0000
0.509	0.274	1.78	0.56	2.33	2.95	0.00	0.00	0.0093	0.00	1.45	1.18	1.45	1.18	0.0000
0.609	0.278	1.78	0.58	2.36	2.97	0.00	0.00	0.0136	0.00	1.50	1.18	1.50	1.18	0.0000
0.709	0.282	1.78	0.61	2.39	2.99	0.00	0.00	0.0187	0.00	1.54	1.18	1.54	1.18	0.0000
0.809	0.286	1.78	0.64	2.42	3.00	0.00	0.00	0.0246	0.00	1.59	1.18	1.59	1.18	0.0000
0.909	0.290	1.78	0.67	2.44	3.02	0.00	0.00	0.0315	0.00	1.64	1.18	1.64	1.18	0.0000
1.009	0.294	1.78	0.69	2.47	3.03	0.00	0.00	0.0393	0.00	1.68	1.18	1.68	1.18	0.0000
1.109	0.298	1.78	0.72	2.50	3.05	0.00	0.00	0.0481	0.00	1.72	1.18	1.72	1.18	0.0000
1.209	0.302	1.78	0.75	2.53	3.07	0.00	0.00	0.0578	0.00	1.76	1.24	1.76	1.24	0.0000
1.309	0.306	1.78	0.78	2.55	3.08	0.00	0.00	0.0685	0.00	1.80	1.30	1.80	1.30	0.0000
1.409	0.310	1.78	0.80	2.58	3.10	0.00	0.00	0.0932	0.00	1.83	1.36	1.83	1.36	0.0000
1.509	0.314	1.78	0.83	2.61	3.11	0.00	0.00	0.0000	0.00	1.86	1.42	1.86	1.42	0.0000
1.609	0.318	1.78	0.86	2.64	3.13	0.00	0.00	0.0000	0.00	1.88	1.47	1.88	1.47	0.0000
1.709	0.322	1.78	0.89	2.66	3.15	0.00	0.00	0.0000	0.09	1.90	1.52	1.94	1.56	0.0000
1.809	0.326	1.78	0.91	2.69	3.16	0.00	0.00	0.0000	0.22	1.90	1.54	2.01	1.65	0.0000
1.909	0.330	1.78	0.94	2.72	3.45	0.00	0.00	0.0000	0.35	1.90	1.56	2.08	1.73	0.0000
2.009	0.334	1.78	0.97	2.75	3.84	0.00	0.00	0.0000	0.48	1.90	1.54	2.14	1.78	0.0000
2.109	0.316	2.08	1.00	3.08	4.57	0.00	0.00	0.0000	0.78	1.86	1.50	2.25	1.89	0.0000
2.209	0.320	2.33	1.03	3.35	5.04	0.00	0.00	0.0000	0.91	1.78	1.41	2.23	1.87	0.0000
2.309	0.324	2.54	1.05	3.60	5.54	0.00	0.00	0.0000	1.03	1.63	1.29	2.15	1.81	0.0000
2.409	0.328	2.72	1.08	3.80	6.07	0.00	0.00	0.0000	1.14	1.42	1.18	1.99	1.75	0.0000
2.509	0.332	2.85	1.11	3.95	6.63	0.00	0.00	0.0000	1.22	1.18	1.18	1.79	1.79	0.0000
2.609	0.328	3.03	1.14	4.17	7.40	0.00	0.00	0.0000	1.35	1.18	1.18	1.86	1.86	0.0000
2.709	0.332	3.00	1.16	4.17	8.02	0.00	0.00	0.0000	1.37	1.18	1.18	1.86	1.86	0.0000
2.809	0.336	2.91	1.19	4.11	8.64	0.00	0.00	0.0000	1.36	0.00	1.18	0.68	1.86	0.0000
2.910	0.340	2.86	1.22	4.08	9.11	0.00	0.00	0.0000	1.36	0.00	0.00	0.68	0.68	0.0000

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Ingeniero de Caminos
Colegiado n.º 16495

LICENCIA

OREKIN

ANEJO DE CÁLCULO DE ENVOLVENTE
CÓDIGO DEL PERFIL: 10118 1 4
GRUPO: 30
ENVOLVENTE DE ARMADOS

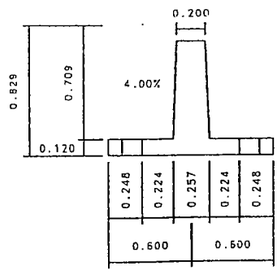
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0.109	1.78	0.44	2.22	0.00	0.00	0.00	0.12	1.31	1.18	1.37	1.24
0.209	1.78	0.47	2.25	0.00	0.00	0.00	0.22	1.34	1.18	1.44	1.29
0.309	1.78	0.50	2.28	2.92	0.00	0.00	0.00	1.37	1.18	1.37	1.18
0.409	1.78	0.53	2.31	2.94	0.00	0.00	0.00	1.41	1.18	1.41	1.18
0.509	1.78	0.56	2.33	2.95	0.00	0.00	0.00	1.45	1.18	1.45	1.18
0.609	1.78	0.58	2.36	2.97	0.00	0.00	0.00	1.50	1.18	1.50	1.18
0.709	1.78	0.61	2.39	2.99	0.00	0.00	0.00	1.54	1.18	1.54	1.18
0.809	1.78	0.64	2.42	3.00	0.00	0.00	0.00	1.59	1.18	1.59	1.18
0.909	1.78	0.67	2.44	3.02	0.00	0.00	0.00	1.64	1.18	1.64	1.18
1.009	1.78	0.69	2.47	3.03	0.00	0.00	0.00	1.68	1.18	1.68	1.18
1.109	1.78	0.72	2.50	3.05	0.00	0.00	0.00	1.72	1.18	1.72	1.18
1.209	1.78	0.75	2.53	3.07	0.00	0.00	0.00	1.76	1.24	1.76	1.24
1.309	1.78	0.78	2.55	3.08	0.00	0.00	0.00	1.80	1.30	1.80	1.30
1.409	1.78	0.80	2.58	3.10	0.00	0.00	0.00	1.83	1.36	1.83	1.36
1.509	1.78	0.83	2.61	3.11	0.00	0.00	0.00	1.86	1.42	1.86	1.42
1.609	1.78	0.86	2.64	3.13	0.00	0.00	0.00	1.88	1.47	1.88	1.47
1.709	1.78	0.89	2.66	3.15	0.00	0.00	0.09	1.90	1.52	1.94	1.56
1.809	1.78	0.91	2.69	3.16	0.00	0.00	0.22	1.90	1.54	2.01	1.65
1.909	1.78	0.94	2.72	3.45	0.00	0.00	0.35	1.90	1.56	2.08	1.73
2.009	1.78	0.97	2.75	3.84	0.00	0.00	0.48	1.90	1.54	2.14	1.78
2.109	2.08	1.00	3.08	4.57	0.00	0.00	0.78	1.86	1.50	2.25	1.89
2.209	2.33	1.03	3.35	5.04	0.00	0.00	0.91	1.78	1.41	2.23	1.87
2.309	2.54	1.05	3.60	5.54	0.00	0.00	1.03	1.63	1.29	2.15	1.81
2.409	2.72	1.08	3.80	6.07	0.00	0.00	1.14	1.42	1.18	1.99	1.75
2.509	2.85	1.11	3.95	6.63	0.00	0.00	1.22	1.18	1.18	1.79	1.79
2.609	3.03	1.14	4.17	7.40	0.00	0.00	1.35	1.18	1.18	1.86	1.86
2.709	3.00	1.16	4.17	8.02	0.00	0.00	1.37	1.18	1.18	1.86	1.86
2.809	2.91	1.19	4.11	8.64	0.00	0.00	1.36	0.00	1.18	0.68	1.86
2.910	2.86	1.22	4.08	9.11	0.00	0.00	1.36	0.00	0.00	0.68	0.68

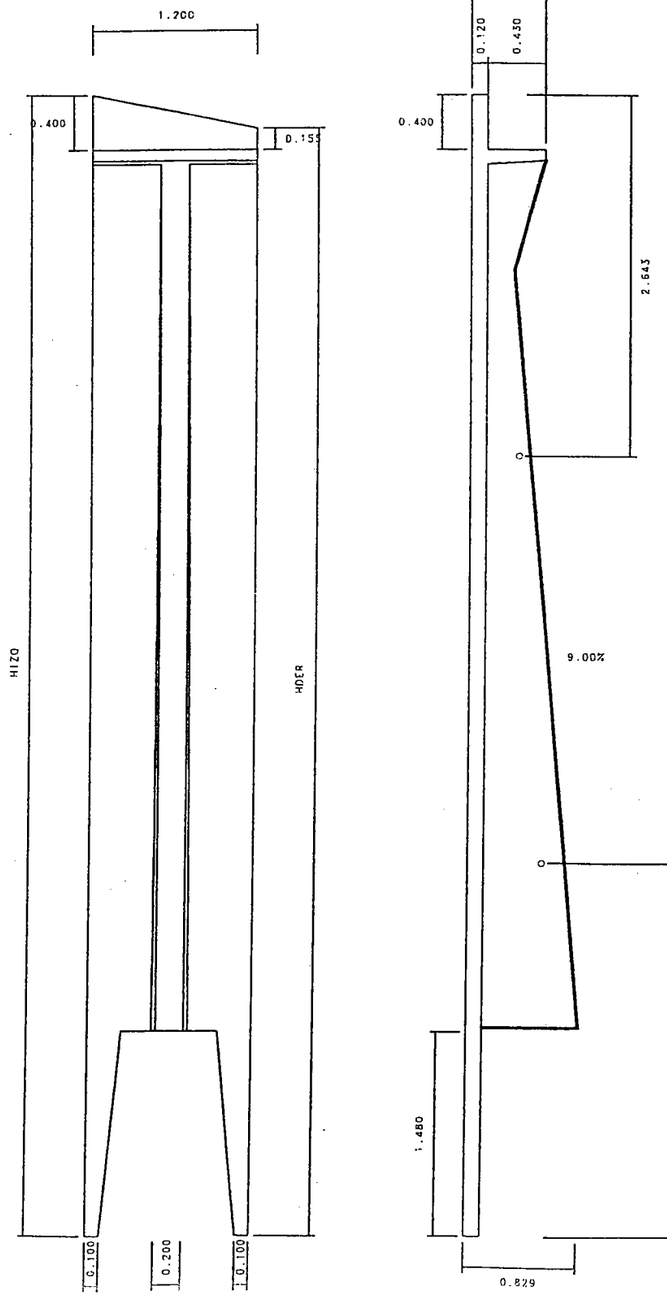
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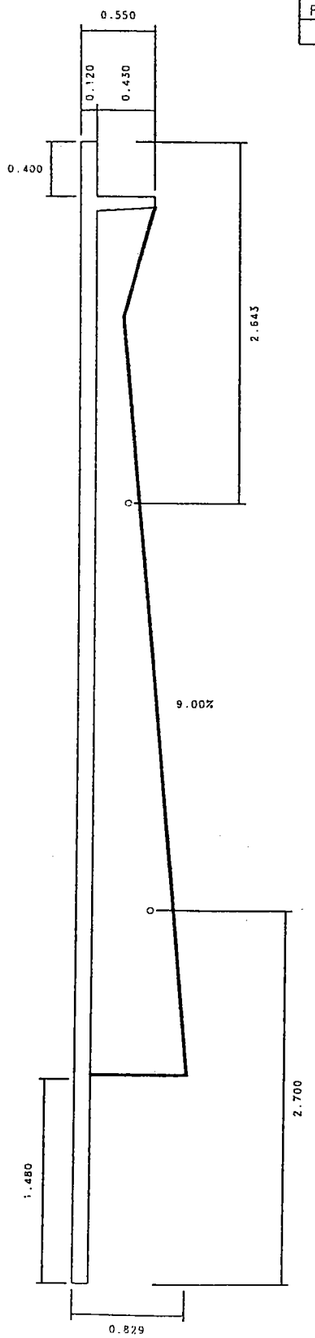
Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-2		
PERFIL	10118 1 4 1	PEDIDO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	4.25
M3 HORMIGON	1.65	fck (Kp/cm2)	350
KG ACERO	286.33	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	12/9/20 Verduguillo	
GOMA ESTANDAR EN JUNTAS			

PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CW1	8.315	8.070	0.245	8.192



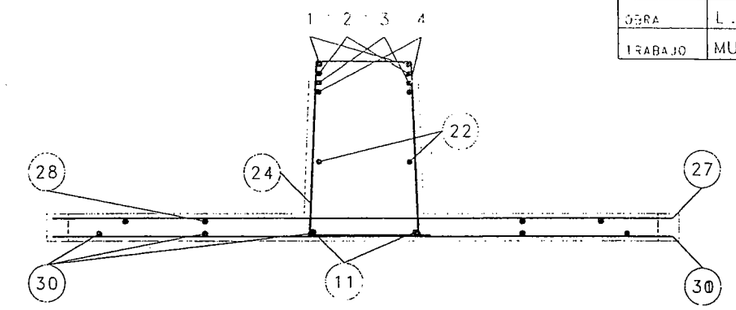




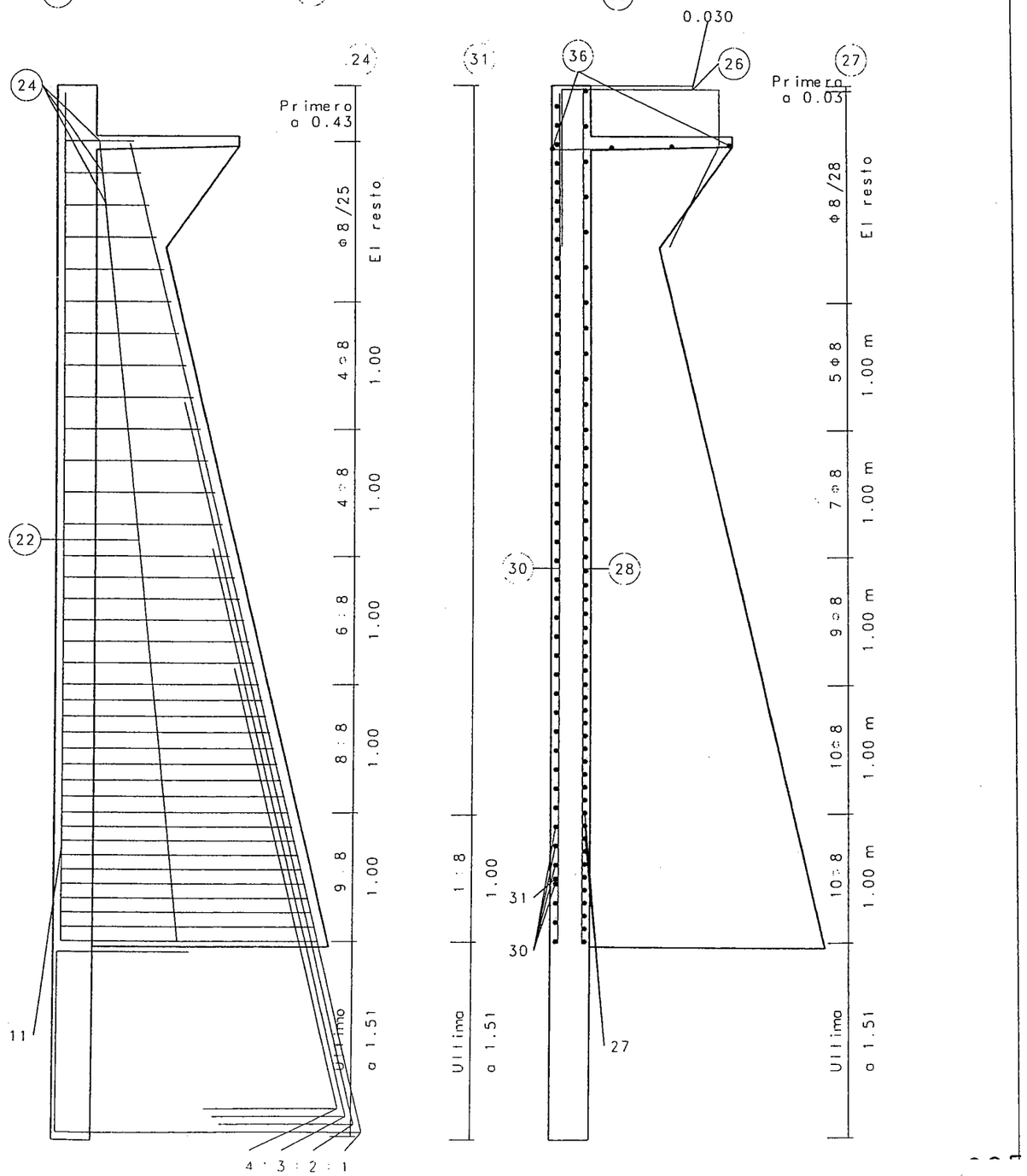
Director Técnico
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Ingeniero de Caminos
Colegiado n.º 16495

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

REFER	H.MED
01CW1	8.192



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Colegiado n.º 16495



REFER	L1	R	Q
01CW1	10.366	7.855	6.653

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2 ⌀25	R+ 2.51	0.70 / 0.17 — R — 9.00% — 0.40 — 0.87 — 1.40	R+ 2.51	0.70 / 0.17 — R — 9.00% — 0.40 — 0.87 — 1.40	20.73	79.9
2	2 ⌀25	6.11	0.51 — 5.75 — 9.00% — 0.40	5.47	0.46 — 5.12 — 9.00% — 0.40	11.58	44.6
3	2 ⌀25	4.88	0.40 — 4.53 — 9.00% — 0.40	4.37	0.36 / 0.04 — 4.02 — 9.00% — 0.40	9.25	35.6
4	2 ⌀25	3.87	0.31 / 0.09 — 3.52 — 9.00% — 0.40	3.50	0.28 / 0.12 — 3.15 — 9.00% — 0.40	7.36	28.4
11	2 ⌀16	Q	Q	Q	Q	13.31	21.0
22	2 ⌀8	Q-0.28	Q-0.28	Q-0.28	Q-0.28	12.75	5.0
24	37 ⌀8	1.55	0.14 / a / b / 0.22			60.06	23.7

	a(m)	b(m)	L(m)
EST. SUP	0.20	0.16	0.98
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	0.77	0.20	2.11

TOTAL 1 NERVIO 238.26

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Ingeniero de Caminos
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Las medidas indicadas en los dibujos de las barras de la armadura principal (1,2,.....10) son: de vertice a vertice, y del ramal largo, que esta inclinado, su proyeccion horizontal. Al doblar las barras los vertices se curvaran de acuerdo con la Norma EH-91. Las longitudes La y Lb indicadas corresponden al DESARROLLO REAL de la barra (es la medida a tener en cuenta al cortar la barra) y, por consiguiente, su valor es inferior a la suma de las medidas parciales acotadas en el dibujo.
La longitud total es el resultado de sumar La y Lb.

REFER	P.MED	P
01CW1	8.192	6.652

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		L(m)		LI(m)	P(kg)
26	1 ⌀10	2.93	0.44 0.80 / 0.48 — 0.22 — 1.24	2.93	1.8
27	48 ⌀8	1.14	1.14	54.72	21.6
28	4 ⌀6	P	P	26.61	5.9
30	⌀6 ⌀5	1.14 P	P — 1.14 — 0.20 — 0.15	7.58m2	17.1
31	1 ⌀8	1.14	1.14	1.14	0.4
36	⌀6 ⌀5	0.49 1.14	b=0.15 — 0.49	0.56m2	1.26

TOTAL 48.08

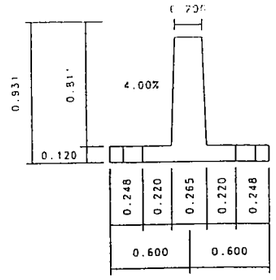
KILOS DE ACERO POR PIEZA

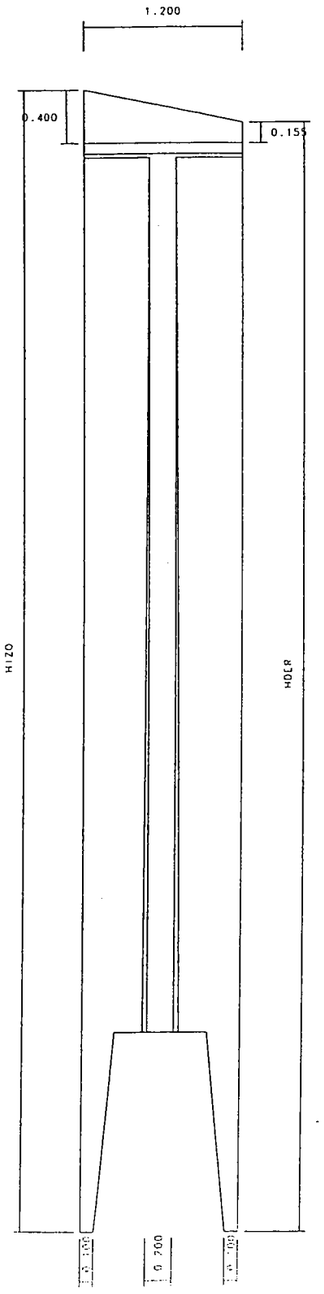
REFER	6	8	10	12	16	20	25	32	M2.ALA	M2.CAB	BARRAS
01CW1	5.91	50.77	1.80	0.00	21.00	0.00	188.53	0.00	7.58	0.56	268.01

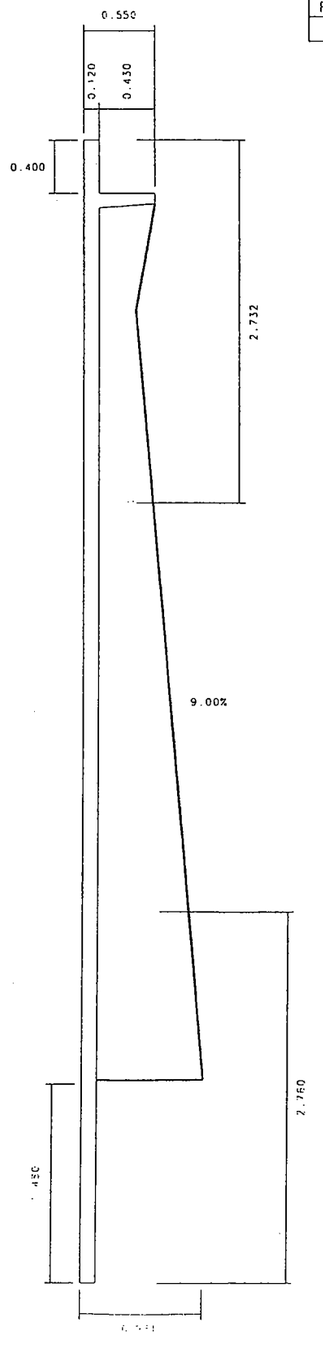
NORTENPH
Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-2		
PERFIL	10118 1 4 13	PEDIDO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	4.74
M3 HORMIGON	1.85	fck (Kp/cm2)	350
KG ACERO	294.17	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	12/9/20 Verduguillo	
BERENJENO			
GOMA ESTANDAR EN JUNTAS			

PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CW2	8.560	8.315	0.245	8.438



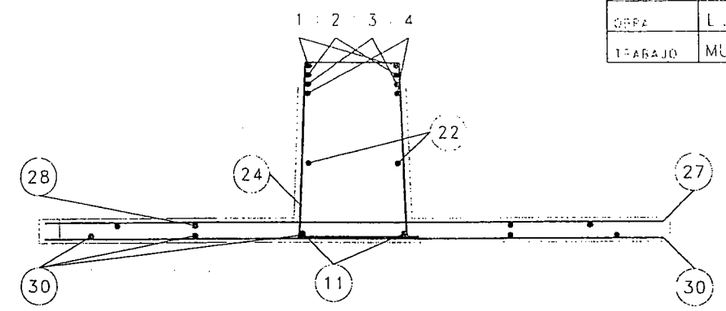




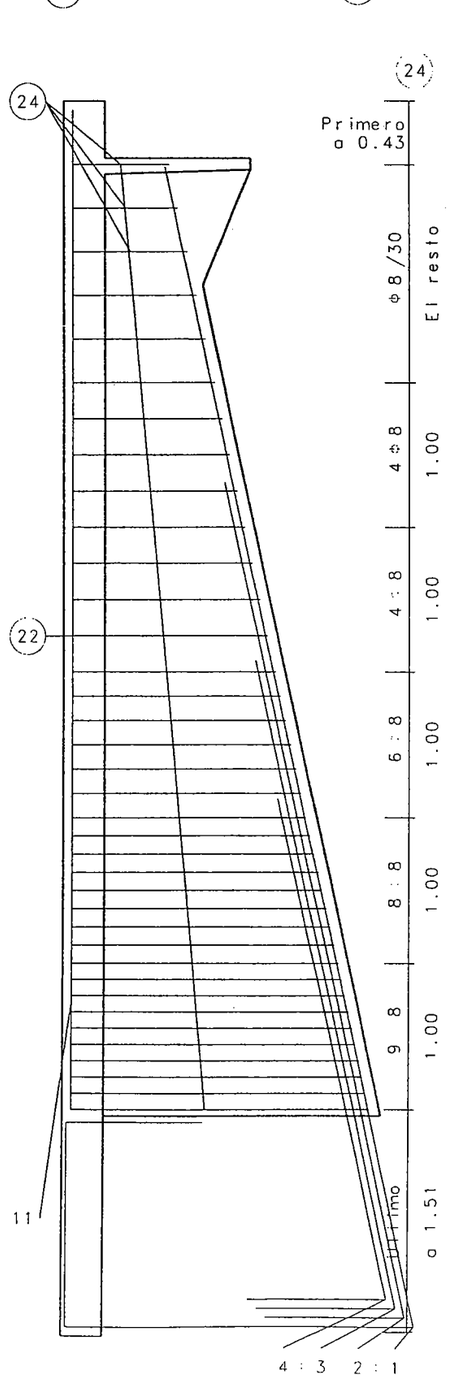
NORTEC PH
Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

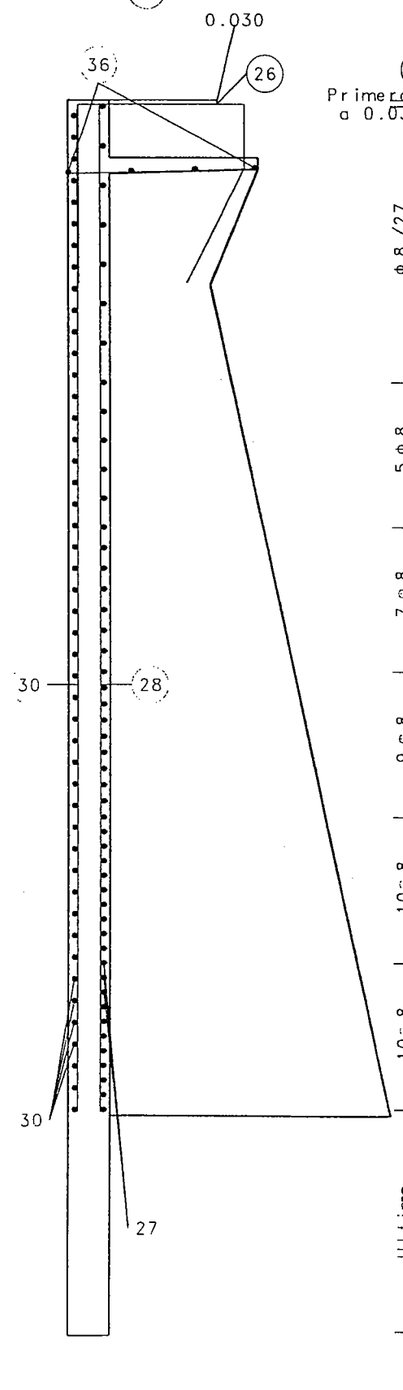
EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-2		

REFER	H.MED
01CW2	8.438



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Colegiado n.º 16495





REFER	L1	E	O
01CW2	8.714	8.100	6.898

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2⌀25	R+ 2.61	0.72 / 0.25 — R — 9.00% — 0.40 — 0.97 — 1.40	R+ 2.61	0.72 / 0.25 — R — 9.00% — 0.40 — 0.97 — 1.40	21.43	82.6
2	2⌀25	6.20	0.52 — 5.84 — 9.00% — 0.40	5.55	0.46 — 5.19 — 9.00% — 0.40	11.75	45.3
3	2⌀25	4.89	0.40 — 4.54 — 9.00% — 0.40	4.38	0.36 / 0.04 — 4.02 — 9.00% — 0.40	9.27	35.7
4	2⌀25	3.86	0.31 / 0.09 — 3.51 — 9.00% — 0.40	3.43	0.27 / 0.13 — 3.08 — 9.00% — 0.40	7.29	28.1
11	2Φ16	Q	Q	Q	Q	13.80	21.8
22	2Φ8	Q-0.28	Q-0.28	Q-0.28	Q-0.28	13.24	5.2
24	37Φ8	1.73	0.14 / a / b / 0.22			67.46	26.6

	a(m)	b(m)	L(m)
EST. SUP	0.28	0.16	1.14
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	0.87	0.21	2.32

TOTAL 1 NERVIO 245.28

Los medidos indicados en los dibujos de las barras de la armadura principal (1,2.....10) son: de vertice a vertice, y del ramal largo, que esta inclinado, su proyeccion horizontal. Al doblar las barras los vertices se curvaran de acuerdo con la Norma EH-91. Las longitudes Lo y Lb indicadas corresponden al DESARROLLO REAL de la barra (es lo medido o tener en cuenta al cortar la barra) y, por consiguiente, su valor es inferior a la suma de las medidas parciales acotadas en el dibujo.
La magnitud LT es el resultado de sumar Lo + Lb

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REFER	E MED	P
01CW2	8.438	6.898

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		L(m)		Li(m)	P(kg)
26	1 ⌀10	2.91	0.44 0.80 / 0.48 — 0.14 — 1.24	2.91	1.8
27	49 ⌀8	1.14	1.14	55.86	22.0
28	4 ⌀6	P	P	27.59	6.1
30	⌀6 ⌀5	1.14 P	P — 1.14 — 0.20 — 0.15	7.86m2	17.7
36	⌀6 ⌀5	0.49 1.14	b=0.15 — 0.49	0.56m2	1.26

TOTAL 48.91

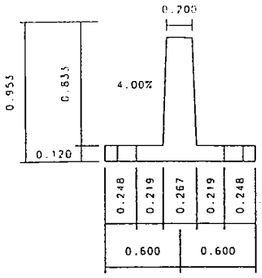
KILOS DE ACERO POR PIEZA

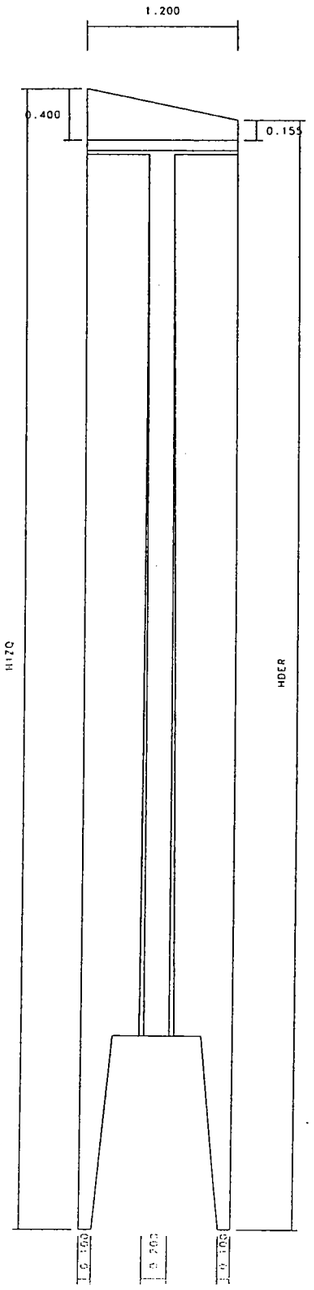
REFER	6	8	10	12	16	20	25	32	M2.ALA	M2.CAB	BARRAS
01CW2	6.12	53.88	1.79	0.00	21.77	0.00	191.66	0.00	7.86	0.56	275.22

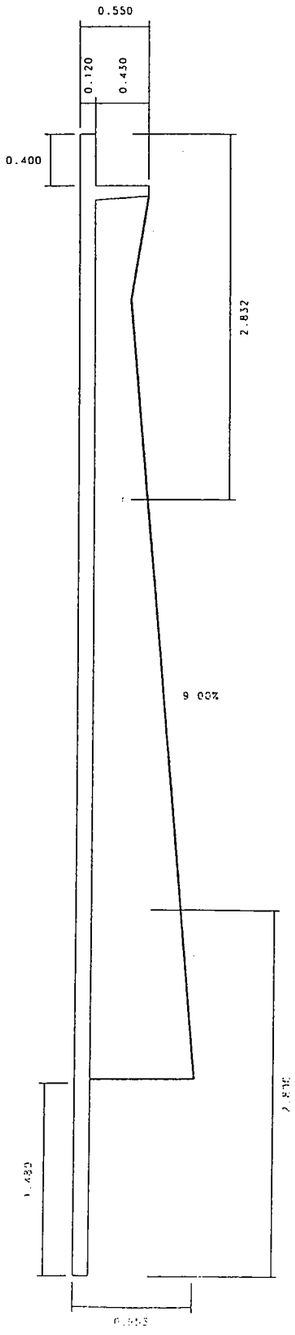
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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-2		
PERFIL	10118 1 4 12	PEDIDO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (t)	4.95
M3 HORMIGON	1.93	fck (Kp/cm2)	350
KG ACERO	306.78	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	12/9/20 Verduguillo	
GOMA ESTANDAR EN JUNTAS			

PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CW3	8.805	8.560	0.245	8.683





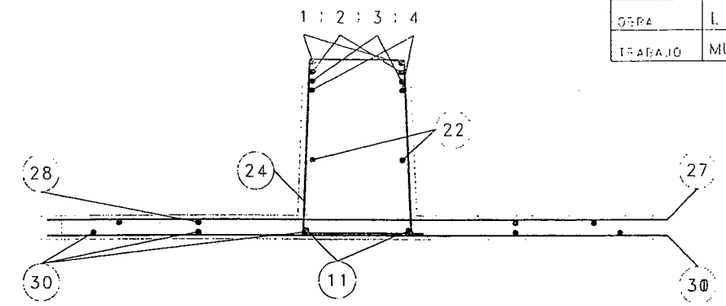


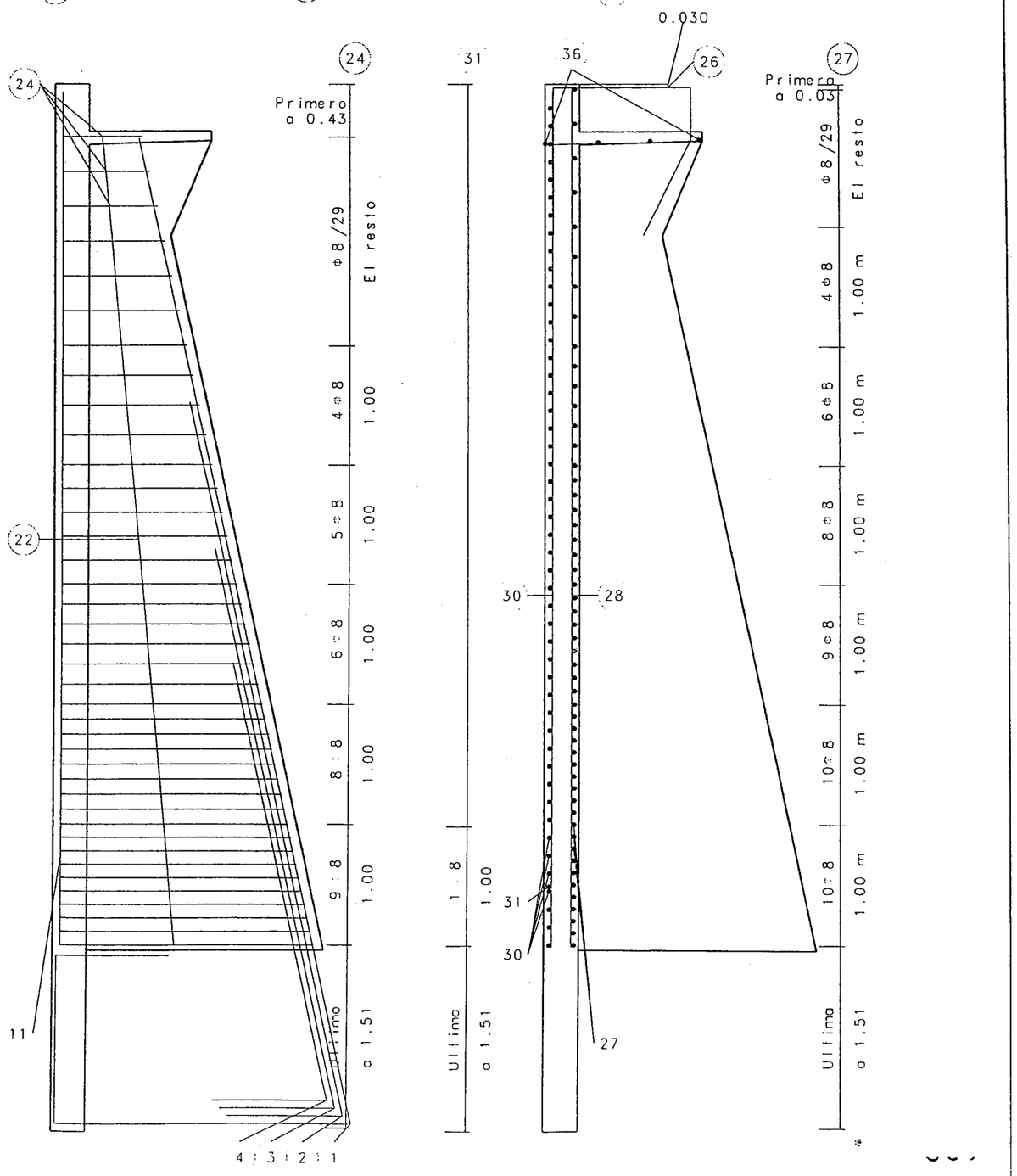
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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

REFER	H.MED
01CW3	8.683

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REFER	C1	R	Q
01CW3	10.982	8.345	7.143

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		a(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2Φ25	R+ 2.64	0.75 / 0.25 — R — 9.00% 0.40 — 1.00 / 1.40	R+ 2.64	0.75 / 0.25 — R — 9.00% 0.40 — 1.00 / 1.40	21.96	84.6
2	2Φ25	6.42	0.54 — 6.05 — 9.00% — 0.40	5.76	0.48 — 5.41 — 9.00% — 0.40	12.18	46.9
3	2Φ25	5.10	0.42 — 4.75 — 9.00% — 0.40	4.59	0.38 / 0.02 — 4.24 — 9.00% — 0.40	9.69	37.3
4	2Φ25	4.07	0.33 / 0.07 — 3.72 — 9.00% — 0.40	3.70	0.30 / 0.10 — 3.35 — 9.00% — 0.40	7.78	30.0
11	2Φ16	Q	Q	Q	Q	14.29	22.5
22	2Φ8	Q-0.28	Q-0.28	Q-0.28	Q-0.28	13.73	5.4
24	39Φ8	1.75	0.14 / b / a / 0.22			71.97	28.4

	a(m)	b(m)	L(m)
EST. SUP	0.28	0.16	1.14
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	0.89	0.21	2.36

TOTAL 1 NERVIO 255.22

Los medidas indicadas en los dibujos de las barras de la armadura principal (1,2.....10) son: de vertice a vertice, y del ramal largo, que esta inclinado, su proyeccion horizontal. Al doblar las barras los vertices se curvaran de acuerdo con la Norma EH 91. Las longitudes Lo y Lb indicadas corresponden al DESARROLLO REAL de la barra (es decir medido a lo largo de la misma) y, por consiguiente, su valor es inferior o la suma de las medidas parciales acotadas en el dibujo.
La longitud LT es el resultado de sumar Lo y Lb.

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REFER	C.MED	F
01CW3	9.685	7.143

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		L(m)		Lt(m)	P(kg)
26	1 Φ10	2.91	0.44 0.80 / 0.48 — 0.14 / 1.24	2.91	1.8
27	52 Φ8	1.14	1.14	59.28	23.4
28	4 Φ6	P	P	28.57	6.3
30	Φ6 / Φ5	1.14 / P	P — 1.14 — 0.20 — 0.15 — 1.14	8.14m2	18.3
31	1 Φ8	1.14	1.14	1.14	0.4
36	Φ6 / Φ5	0.49 / 1.14	b=0.15 / 0.49	0.56m2	1.26

TOTAL 51.56

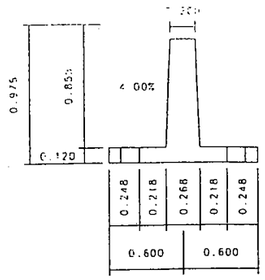
KILOS DE ACERO POR PIEZA

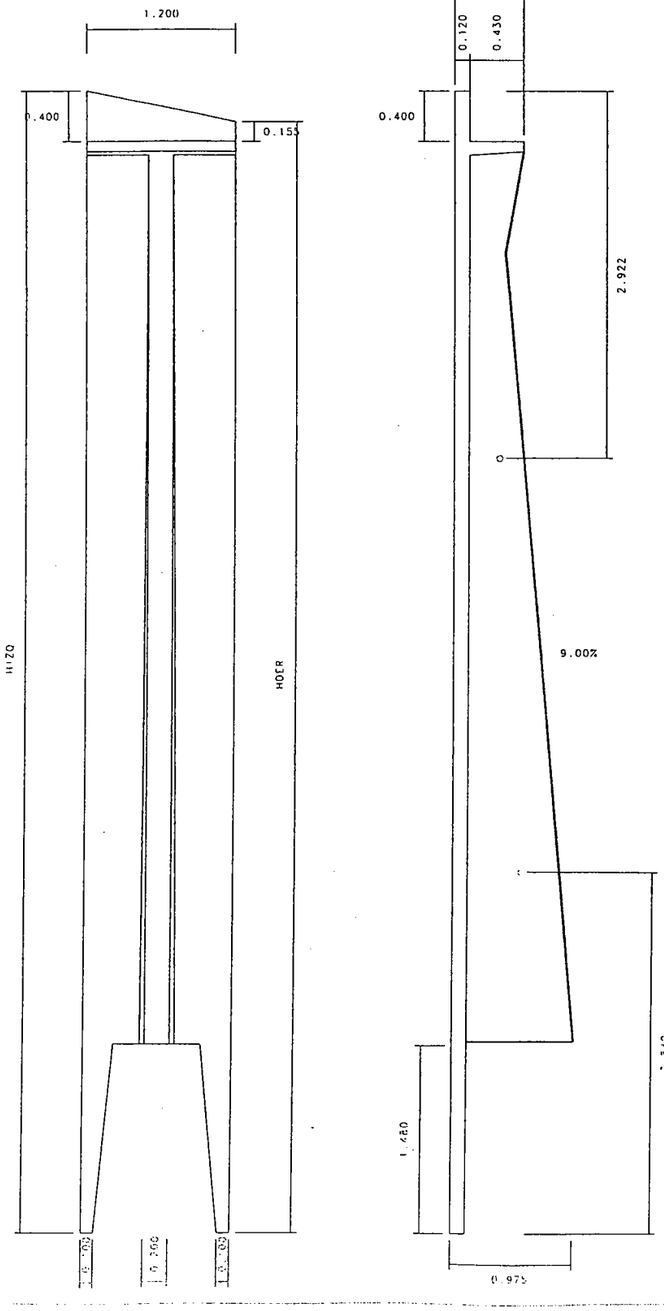
REFER	6	8	10	12	16	20	25	32	M2.ALA	M2.CAB	BARRAS
01CW3	6.34	57.66	1.79	0.00	22.55	0.00	198.86	0.00	8.14	0.56	287.20

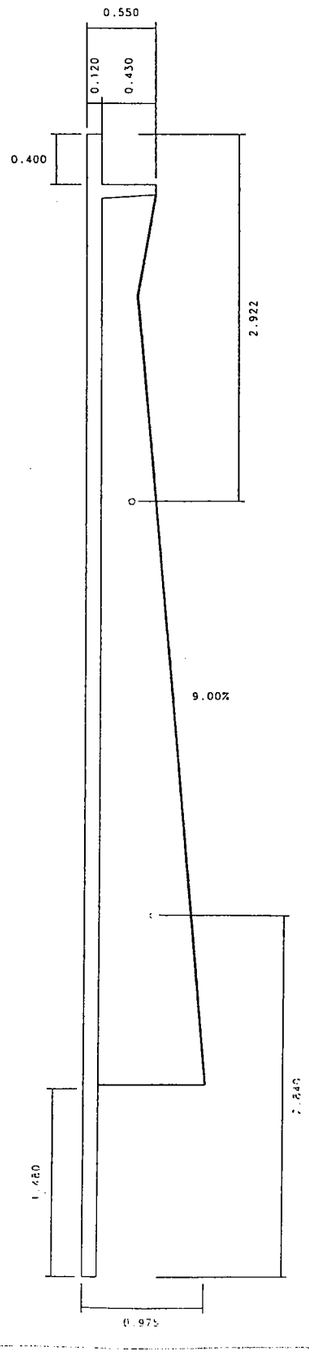
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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-2		
PERFIL	10118 1 4 11	PESO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	5.18
M3 HORMIGON	2.02	fck (Kp/cm2)	350
KG ACERO	343.64	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	12/9/20 Verduguillo	
GOMA ESTANDAR EN JUNTAS			

PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CW4	9.050	8.805	0.245	8.928





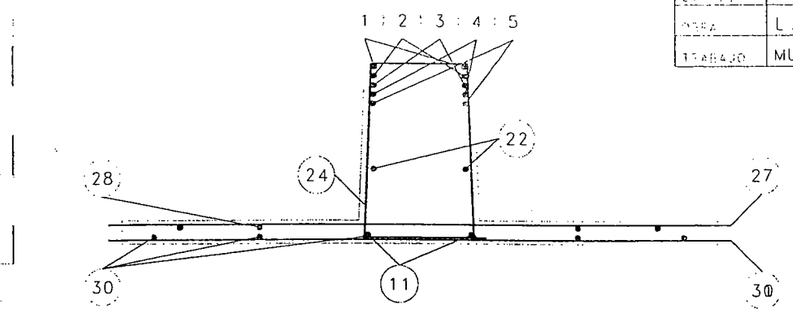


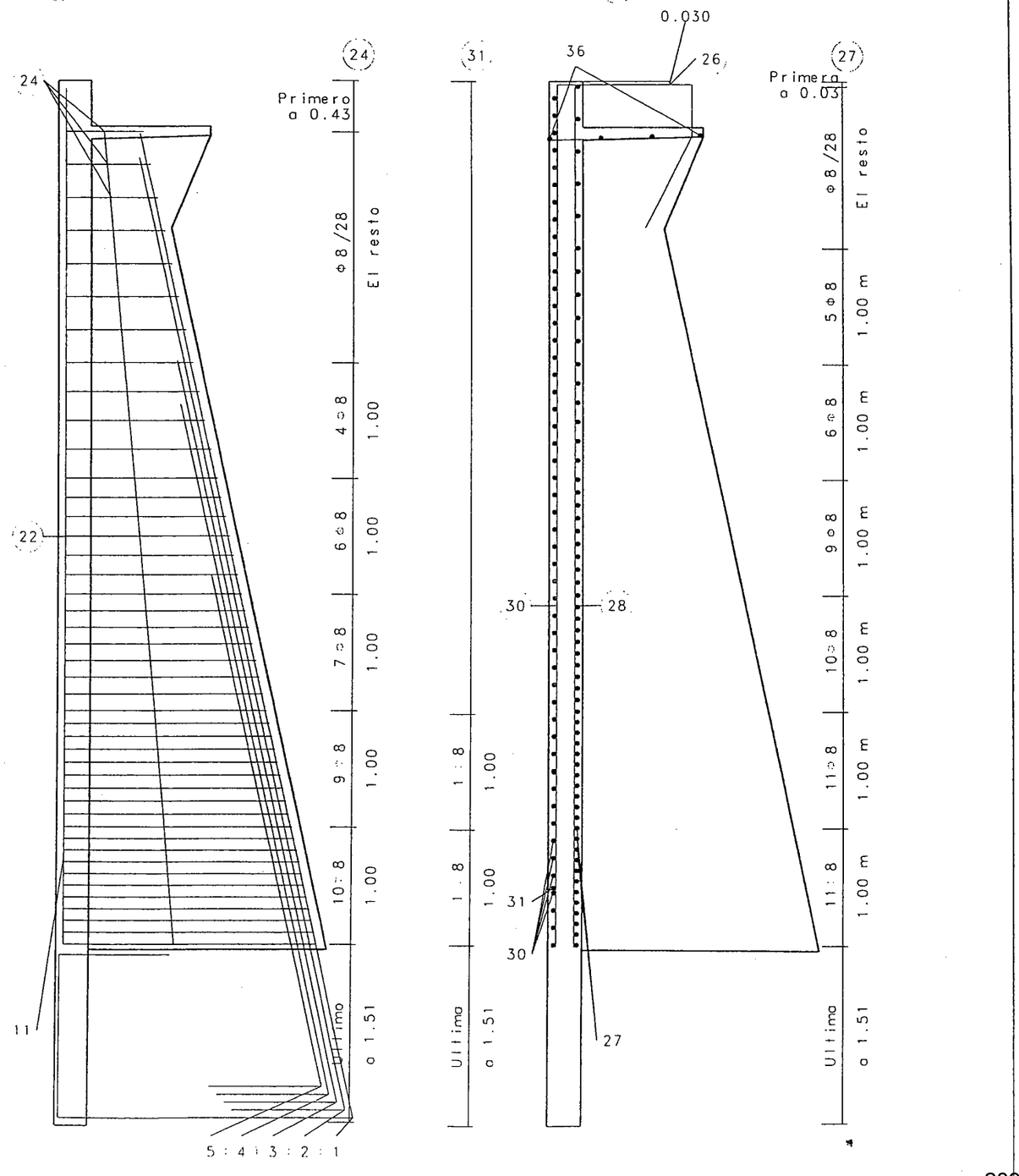
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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

REFER	H.MED
01CW4	8.928

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REFER	L1	P	Q
01CW4	1.268	8.592	7.388

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2Φ16	R+2.68	0.77 / 0.26 R 9.00% 0.40 1.03 / 1.40	R+2.68	0.77 / 0.26 R 9.00% 0.40 1.03 / 1.40	22.54	35.6
2	2Φ16	8.68	0.74 8.31 9.00% 0.40	7.20	0.61 6.84 9.00% 0.40	15.88	25.1
3	2Φ20	6.84	0.58 6.48 9.00% 0.40	6.34	0.53 5.98 9.00% 0.40	13.19	32.5
4	2Φ32	6.40	0.54 6.04 9.00% 0.40	5.63	0.47 5.28 9.00% 0.40	12.03	75.9
5	2Φ32	4.83	0.40 4.48 9.00% 0.40	4.24	0.35 / 0.05 3.89 9.00% 0.40	9.08	57.3
11	2Φ16	Q	Q	Q	Q	14.78	23.3
22	2Φ8	Q-0.28	Q-0.28	Q-0.28	Q-0.28	14.22	5.6
24	44Φ8	1.77	0.14 / a / b / 0.22			83.02	32.8

	a(m)	b(m)	L(m)
EST. SUP	0.28	0.16	1.14
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	0.91	0.21	2.41

TOTAL 1 NERVIO 288.09

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Los medidos indicados en los dibujos de las barras de la armadura principal (1,2.....10) son: de vertice a vertice, y del ramal largo, que esta inclinado, su proyeccion horizontal. Al doblar las barras los vértices se curvaron de acuerdo con la Norma EH 91. Las longitudes Lo y Lb indicados corresponden al DESARROLLO REAL de la barra (es lo medido a tener en cuenta al cortar la barra) y, por consiguiente, su valor es inferior a la suma de las medidas parciales acotadas en el dibujo.
La longitud LT es el resultado de sumar La y Lb.

REFER	P.MED	P
01CW4	5.928	7.388

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

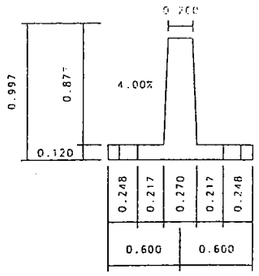
		L(m)		Lt(m)	P(kg)
26	1 Φ10	2.91	0.44 0.80 / 0.48 / 0.14 / 1.24	2.91	1.8
27	58 Φ8	1.14	1.14	66.12	26.1
28	4 Φ6	P	P	29.55	6.6
30	Φ6 / Φ5	1.14 / P	P; 1.14 / 0.20 / 0.15 / 1.14	8.42m2	19.0
31	2 Φ8	1.14	1.14	2.28	0.9
36	Φ6 / Φ5	0.49 / 1.14	b=0.15 / 0.49	0.56m2	1.26

TOTAL 55.55

KILOS DE ACERO POR PIEZA

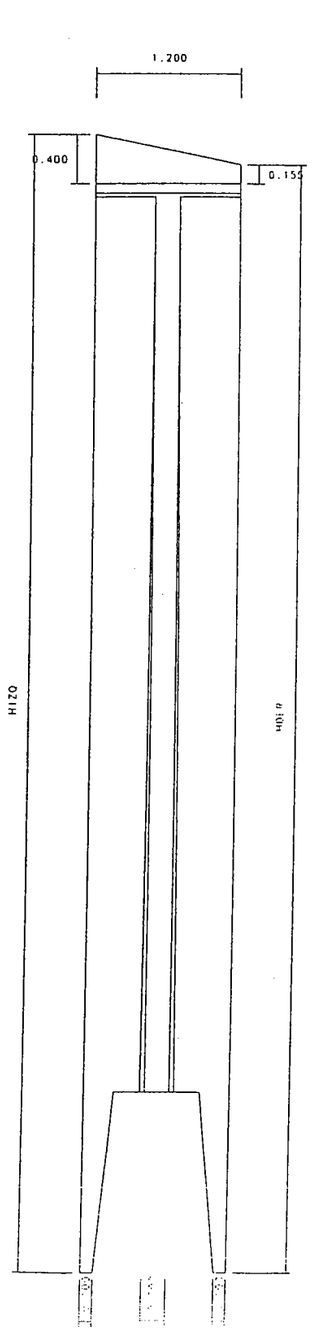
REFER	6	8	10	12	16	20	25	32	M2.ALA	M2.CAB	BARRAS
01CW4	6.56	65.36	1.79	0.00	83.96	32.52	0.00	133.24	8.42	0.56	323.43

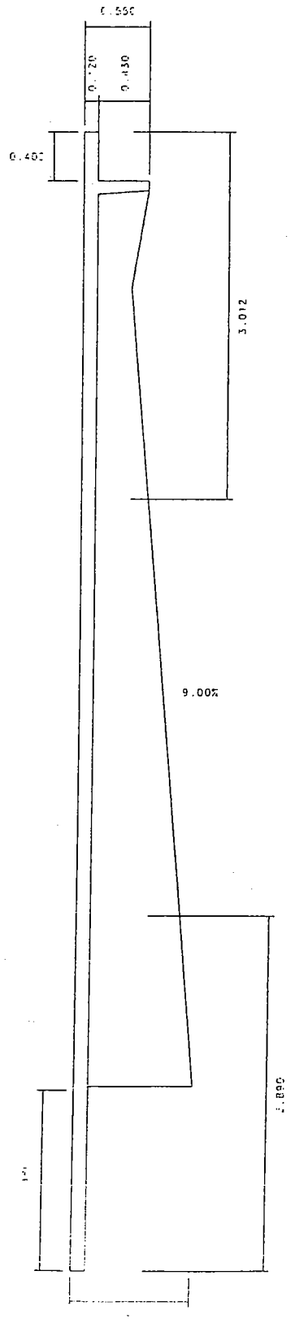
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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)			
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN			
TRABAJO	MURO EST. E-2			
PERFIL	10118 1 4 12		PEDIDO	10041
NUMERO DE PIEZAS	1		PESO PIEZA (T)	5.41
M3 HORMIGON	2.10		fck (Kp/cm2)	350
KG ACERO	365.82		fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030		12/9/20	Verduguillo
GOMA ESTANDAR EN JUNTAS				

PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CW5	9.295	9.050	0.245	9.172

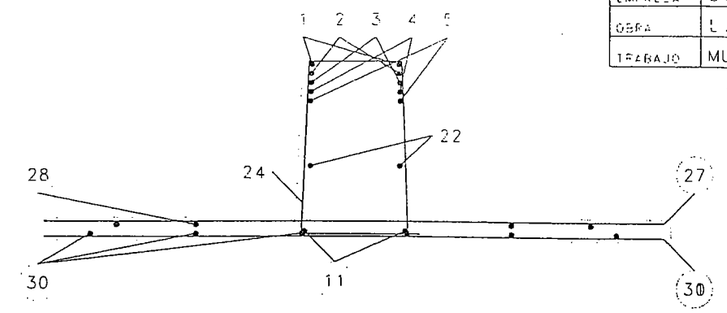




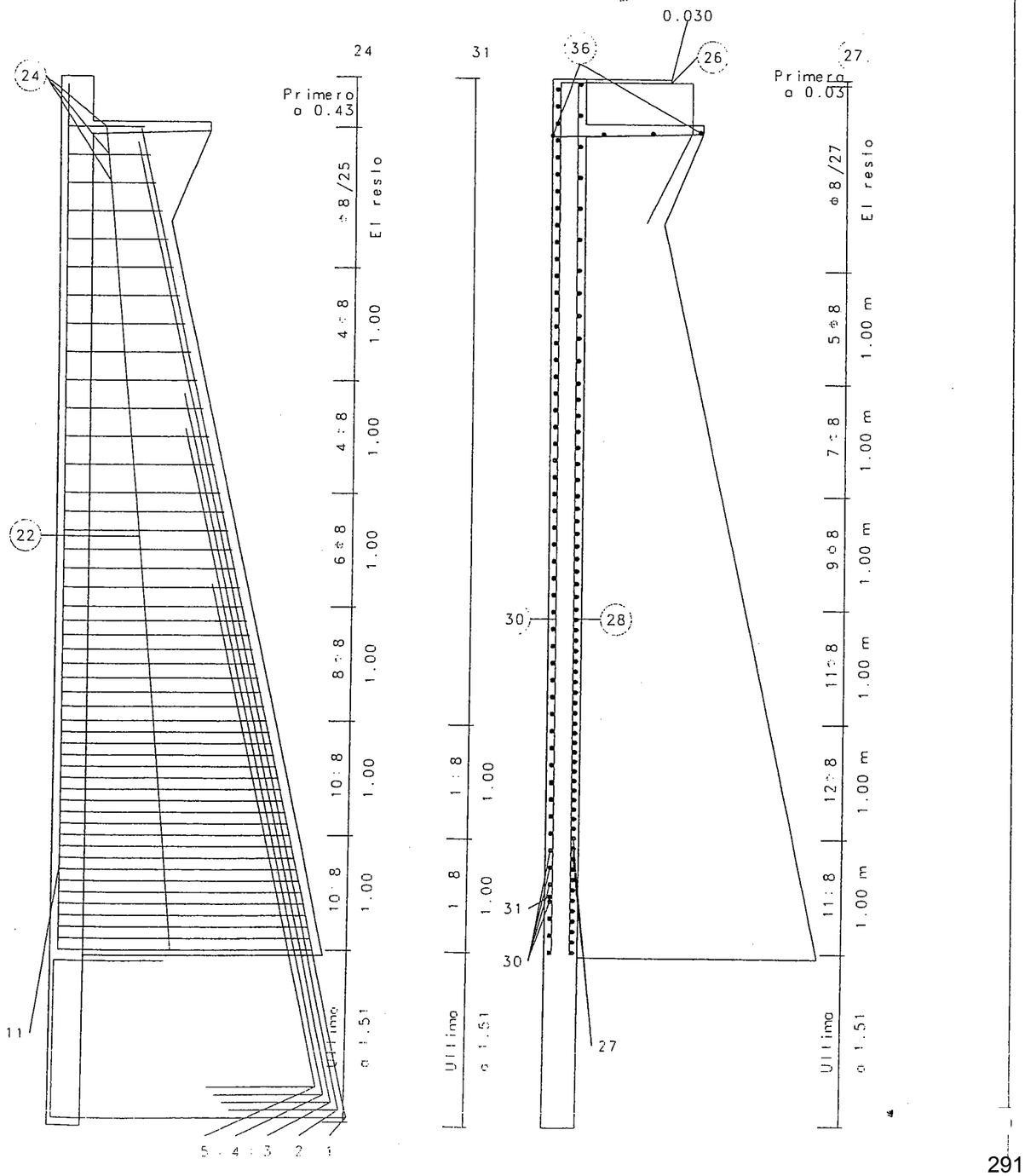
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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

REFER	H.MED
01CW5	9.172



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REFER	L	R	Q
01CW5	1.536	8.835	7.653

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		Lr(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2 16	R+ 2.70	0.79 R 1.05 / 0.26 9.00% 0.40 / 1.40	R+ 2.70	0.79 R 1.05 / 0.26 9.00% 0.40 / 1.40	23.07	36.4
2	2:20	9.02	0.77 8.65 0.40 / 9.00%	7.28	0.62 6.91 0.40 / 9.00%	16.29	40.2
3	2:20	6.71	0.57 6.34 0.40 / 9.00%	6.27	0.53 5.91 0.40 / 9.00%	12.98	32.0
4	2:32	6.32	0.53 5.96 0.40 / 9.00%	5.61	0.47 5.25 0.40 / 9.00%	11.93	75.3
5	2:32	4.86	0.40 4.51 0.40 / 9.00%	4.27	0.35 3.92 0.40 / 0.05 9.00%	9.14	57.7
11	2:16	Q	Q	Q	Q	15.27	24.1
22	2 8	Q-0.28	Q-0.28	Q-0.28	Q-0.28	14.71	5.8
24	48:8	1.80	0.14 / a / b / 0.22			91.53	36.1

	a(m)	b(m)	L(m)
EST. SUP	0.28	0.16	1.14
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	0.93	0.21	2.45

TOTAL 1 NERVIO 307.62

Las medidas indicadas en los dibujos de las barras de la armadura principal corresponden a la distancia de vértice a vértice, y del ramal largo, que está inclinado, su proyección horizontal. A doblar las barras se verifican se cumplen de acuerdo con la Norma EH-91. Las longitudes y los indicados corresponden a DESARROLLO REAL de la barra (es lo mecánico a tener en cuenta al cortar la barra) y, por consiguiente, su valor es inferior a la suma de los tramos que aparecen en el dibujo.

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REFER	H.MED	P
01CW5	9.172	7.632

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

			L(m)		Lt(m)	P(kg)
26	1 ø 10	2.91	0.44 0.80 / 0.48 0.14 / 1.24		2.91	1.8
27	62 ø8	1.14	1.14		70.68	27.9
28	4 ø6	P	P		30.53	6.8
30	ø6 ø5	1.14 P	P / 1.14 / 0.15 / 1.14	0.20	8.70m2	19.6
31	2 ø8	1.14	1.14		2.28	0.9
36	ø6 ø5	0.49 1.14	b=0.15 / 0.49		0.56m2	1.26

TOTAL 58.20

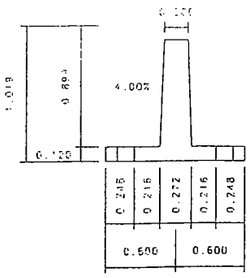
KILOS DE ACERO POR PIEZA

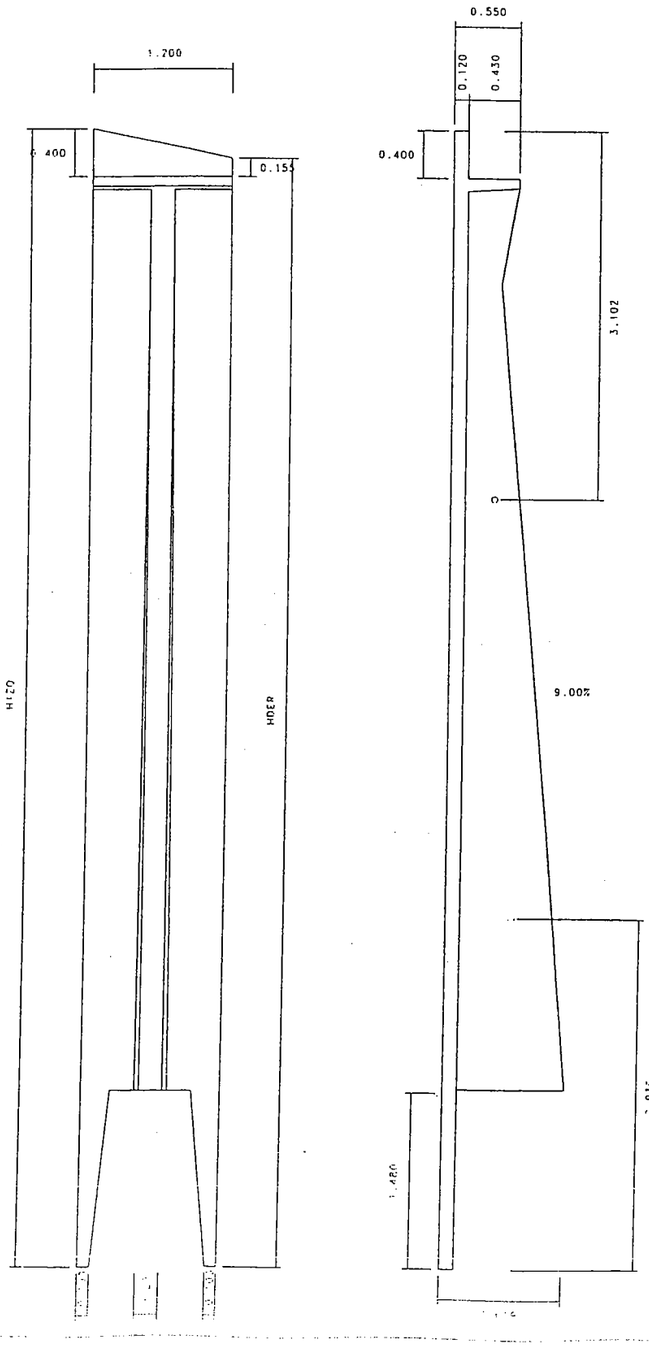
REFER	6	8	10	12	16	20	25	32	M2.ALA	M2.CAB	BARRAS
01CW5	6.78	70.71	1.79	0.00	60.51	72.19	0.00	133.00	8.70	0.56	344.98

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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-2		
PERFIL	10118 1 4 11	FECHA	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	5.63
M3 HORMIGON	2.19	fck (Kp/cm2)	350
KG ACERO	379.65	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	12/9/20 Verduguillo	
GOMA ESTANDAR EN JUNTAS			

PISTA	REFER	H.IZO	H.DER	D.ALT	H.MED
	01CW6	9.540	9.295	0.245	9.418



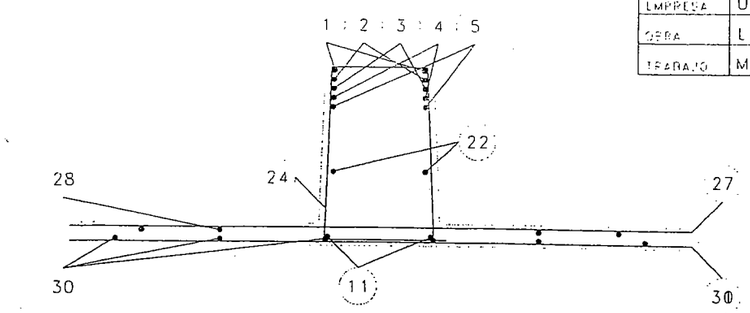


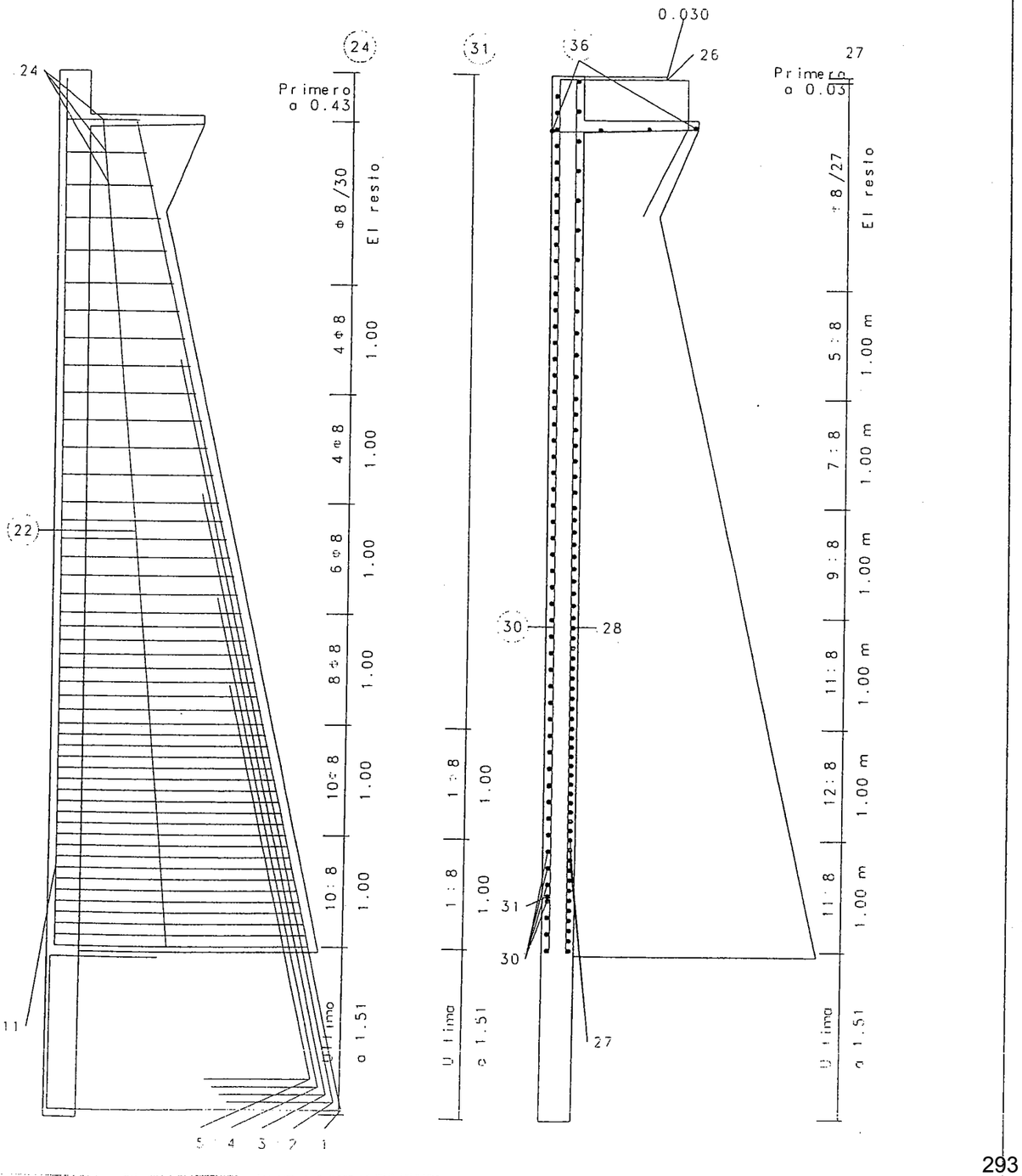
HORTENPH
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Colegiado n.º 16495

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

REFER	H.MED
01CW6	9.418

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Colegiado n.º 16495





REFER	A	B	D
01CW6	11.736	9.080	7.878

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		Lo(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2Φ25	R+2.71	0.81 / 0.25 — R — 9.00% 0.40 — 1.06 / 1.40	R+2.71	0.81 / 0.25 — R — 9.00% 0.40 — 1.06 / 1.40	23.57	90.8
2	2Φ25	7.20	0.61 — 6.84 — 9.00% — 0.40	6.55	0.55 — 6.19 — 9.00% — 0.40	13.75	53.0
3	2Φ25	5.89	0.49 — 5.53 — 9.00% — 0.40	5.38	0.45 — 5.02 — 9.00% — 0.40	11.27	43.4
4	2Φ25	4.86	0.40 — 4.51 — 9.00% — 0.40	4.42	0.36 / 0.04 — 4.07 — 9.00% — 0.40	9.29	35.8
5	2Φ25	3.99	0.32 / 0.08 — 3.64 — 9.00% — 0.40	3.63	0.29 / 0.11 — 3.28 — 9.00% — 0.40	7.62	29.4
11	2Φ16	Q	Q	Q	Q	15.76	24.9
22	2Φ8	Q-0.28	Q-0.28	Q-0.28	Q-0.28	15.20	6.0
24	48Φ8	1.82	0.14 / b / a / 0.22			93.50	36.9

	a(m)	b(m)	L(m)
EST. SUP	0.28	0.16	1.14
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	0.96	0.22	2.49

TOTAL 1 NERVIO 320.15

HORTENPH

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Las medidas indicadas en los dibujos de las barras de la armadura principal (1,.....10) son de vértice a vértice, y del canal longe. que esta incluido, su proyección horizontal. En doblar las barras en los vértices se cumplirán de acuerdo con la Norma EH 91. Los longitudes teóricas y las indicadas corresponden a DESARROLLO REAL de la barra (es decir incluyendo a tener en cuenta al cortar la barra) y, por consiguiente, su valor es superior a la suma de las dos partes indicadas en el dibujo.

REFER	A.MED	P
01CW6	9.418	7.878

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

			L(m)		LT(m)	P(kg)
26	1	10	2.91	0.44 0.80 / 0.48 — 0.14 / 1.24	2.91	1.8
27	63	8	1.14	1.14	71.82	28.3
28	4	6	P	P	31.51	7.0
30	6 / 5		1.14 / P	P / 1.14 — 0.20 / 0.15 / 1.14	8.98m2	20.2
31	2	8	1.14		2.28	0.9
36	6 / 5		0.49 / 1.14	b=0.15 / 0.49	0.56m2	1.26

TOTAL 59.49

KILOS DE ACERO POR PIEZA

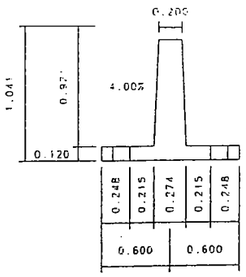
REFER	6	8	10	12	16	20	25	32	M2.ALA	M2.CAB	BARRAS
01CW6	6.99	72.13	1.79	0.00	24.87	0.00	252.40	0.00	8.98	0.56	358.18

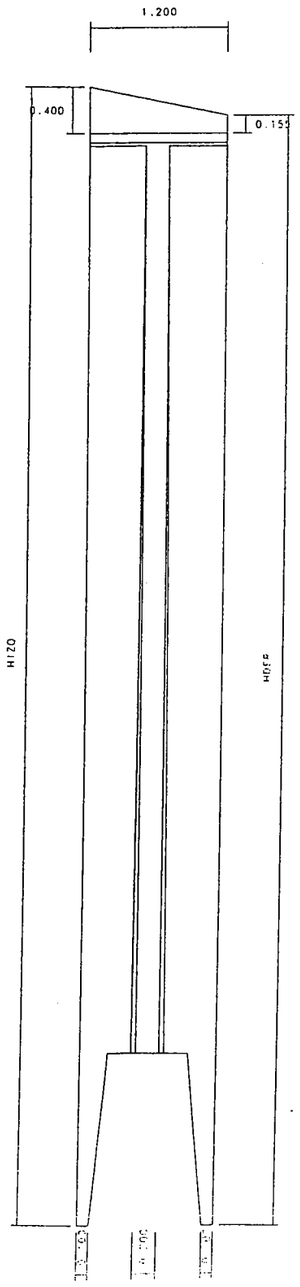
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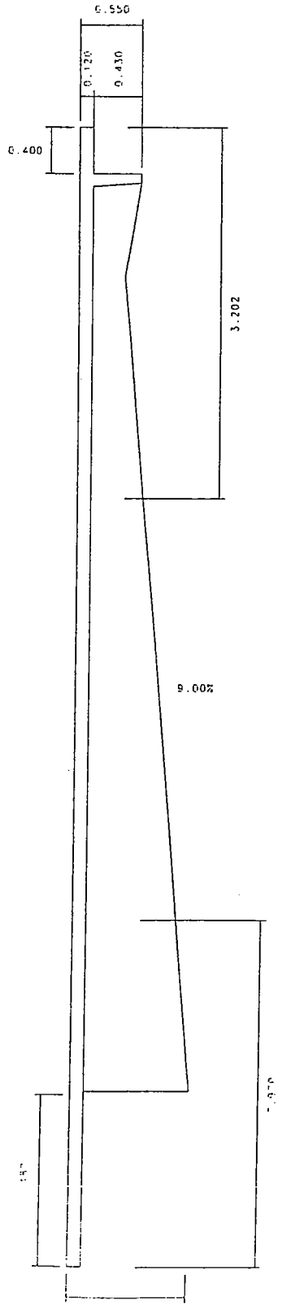
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Colegiado n.º 16495

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)			
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN			
TRABAJO	MURO EST. E-2			
PERFIL	10118 1 4 10		PEDIDO	10041
NUMERO DE PIEZAS	1		PESO PIEZA (T)	5.88
M3 HORMIGON	2.27		fck (Kp/cm2)	350
KG ACERO	420.65		fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030		12/9/20 Verduguillo	
GOMA ESTANDAR EN JUNTAS				

PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CW	9.785	9.540	0.245	9.663



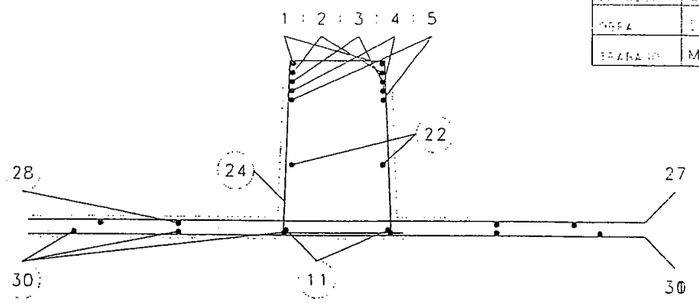




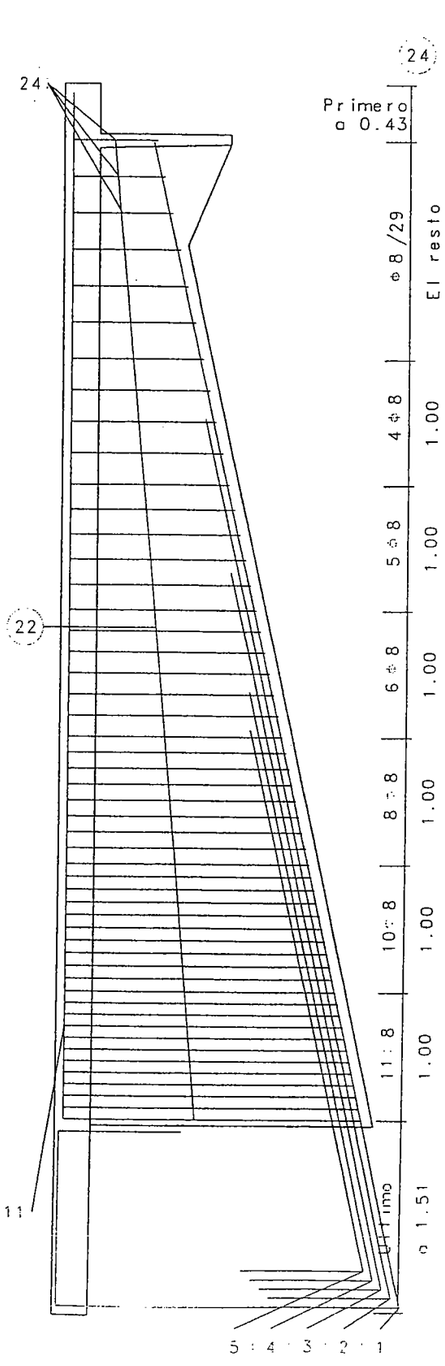
NORTSA PH
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NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

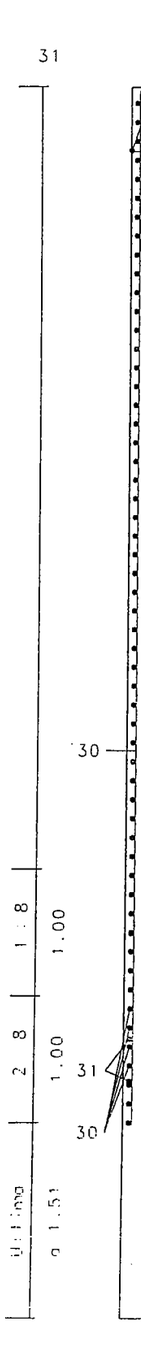
EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

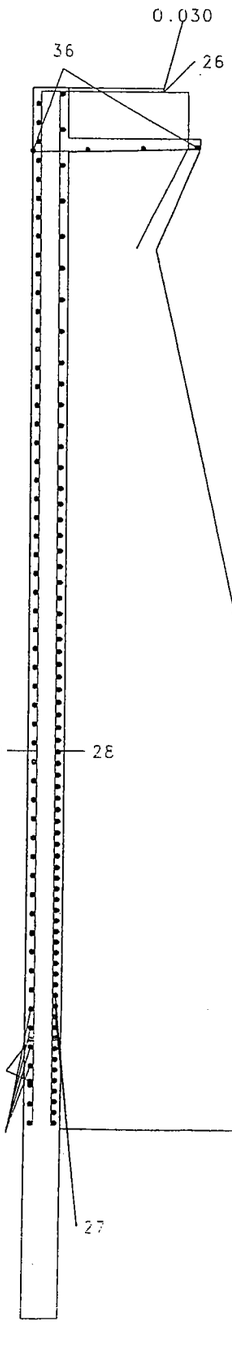
REFER	H.MED
01CW	9.663

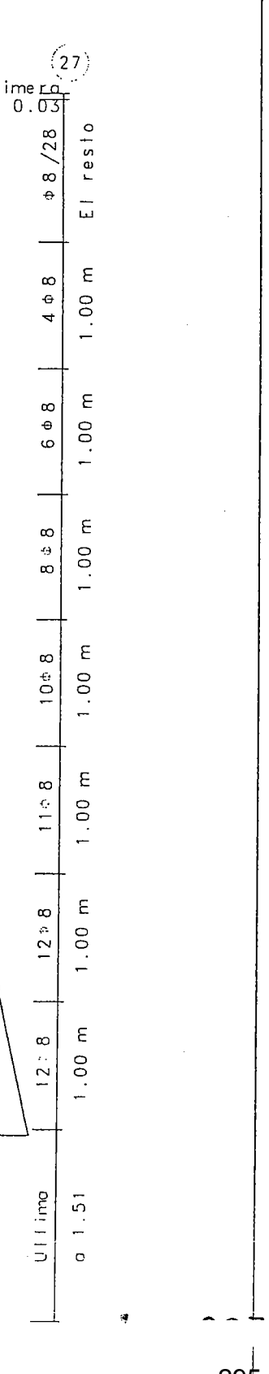


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Colegiado n.º 16495









REFER	E1	R	Q
01CW7	12.054	9.325	8.123

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2⌀25	R+ 2.73	0.83 R 0.26 9.00% 0.40 1.09 1.40	R+ 2.73	0.83 R 0.26 9.00% 0.40 1.09 1.40	24.11	92.9
2	2⌀25	7.41	0.63 7.05 9.00% 0.40	6.76	0.57 6.40 9.00% 0.40	14.18	54.6
3	2⌀25	6.10	0.51 5.74 9.00% 0.40	5.59	0.47 5.23 9.00% 0.40	11.69	45.0
4	2⌀25	5.07	0.42 4.72 9.00% 0.40	4.64	0.38 4.28 0.02 9.00% 0.40	9.71	37.4
5	2⌀32	4.70	0.39 4.34 0.01 9.00% 0.40	4.17	0.34 3.82 0.06 9.00% 0.40	8.87	56.0
11	2⌀16	Q	0	0	0	16.25	25.6
22	2⌀8	Q-0.28	Q-0.28	Q-0.28	Q-0.28	15.69	6.2
24	51⌀8	1.84	0.14 a b 0.22			100.94	39.8

	a(m)	b(m)	L(m)
EST. SUP	0.28	0.16	1.14
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	0.98	0.22	2.54

TOTAL 1 NERVIO 357.61

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Los medidas indicadas en los dibujos de las barras de la armadura principal (1,2.....16) son de vértice a vértice, y del ramal largo que está inclinado, su proyección horizontal. A doblar las barras en vértices se curvarán de acuerdo con la Norma EHE, los tramos rectos y los inclinados corresponden al DESARROLLO REAL de la barra, es necesario tener en cuenta al cortar la barra y, en consecuencia, su valor es inferior a la suma de los dos perfiles extremos en el plano.
Se dispone [illegible]

REFER	E.MED	E
01CW7	9.653	8.123

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		L(m)		Lt(m)	P(kg)
26	1 c 10	2.91	0.44 0.80 0.48 0.14 1.24	2.91	1.8
27	68 ⌀8	1.14	1.14	77.52	30.6
28	4 ⌀6	P	P	32.49	7.2
30	⌀6 ⌀5	1.14 P	P 1.14 0.20 0.15 1.14	9.26m2	20.8
31	3 ⌀8	1.14	1.14	3.42	1.3
36	⌀6 ⌀5	0.49 1.14	b=0.15 0.49	0.56m2	1.26

TOTAL 63.04

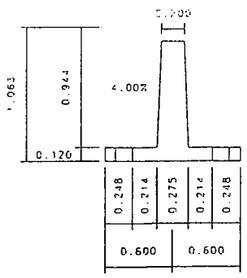
KILOS DE ACERO POR PIEZA

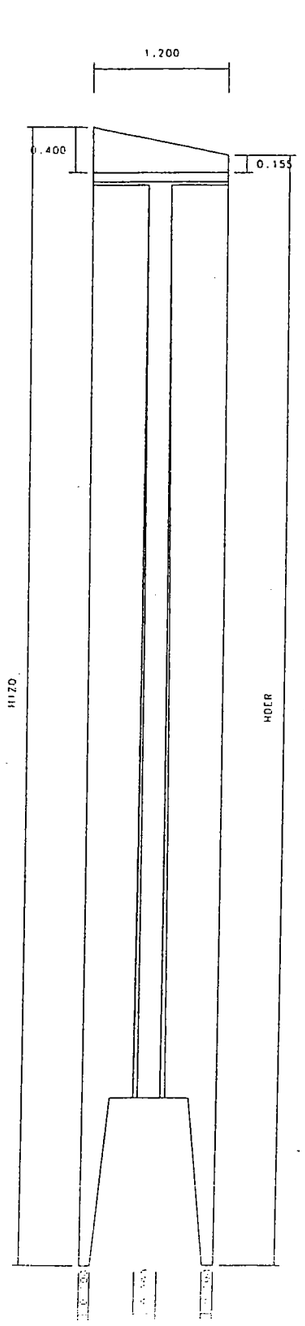
REFER	6	8	10	12	16	20	25	32	M2.ALA	M2.CAB	BARRAS
01CW7	7.21	77.96	1.79	0.00	25.64	0.00	229.97	55.98	9.26	0.56	398.55

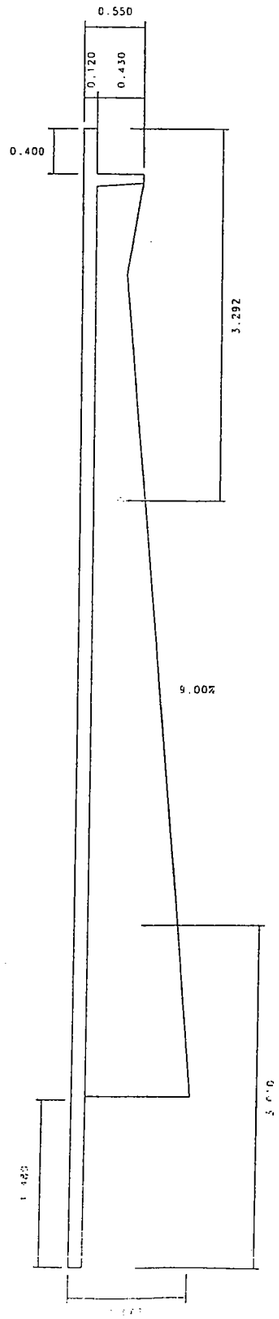
Director Técnico
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Colegiado n.º 16495

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-2		
PERFIL	10118 1 4 9	PEDIDO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	6.12
M3 HORMIGON	2.36	fck (Kp/cm2)	350
KG ACERO	450.48	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	12/9/20 Verduguillo	
GOMA ESTANDAR EN JUNTAS			

PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CW8	10.030	9.785	0.245	9.907





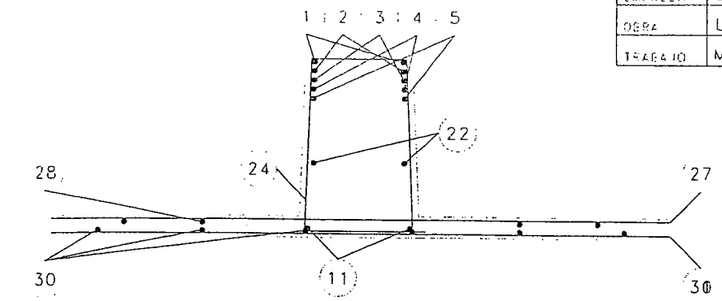


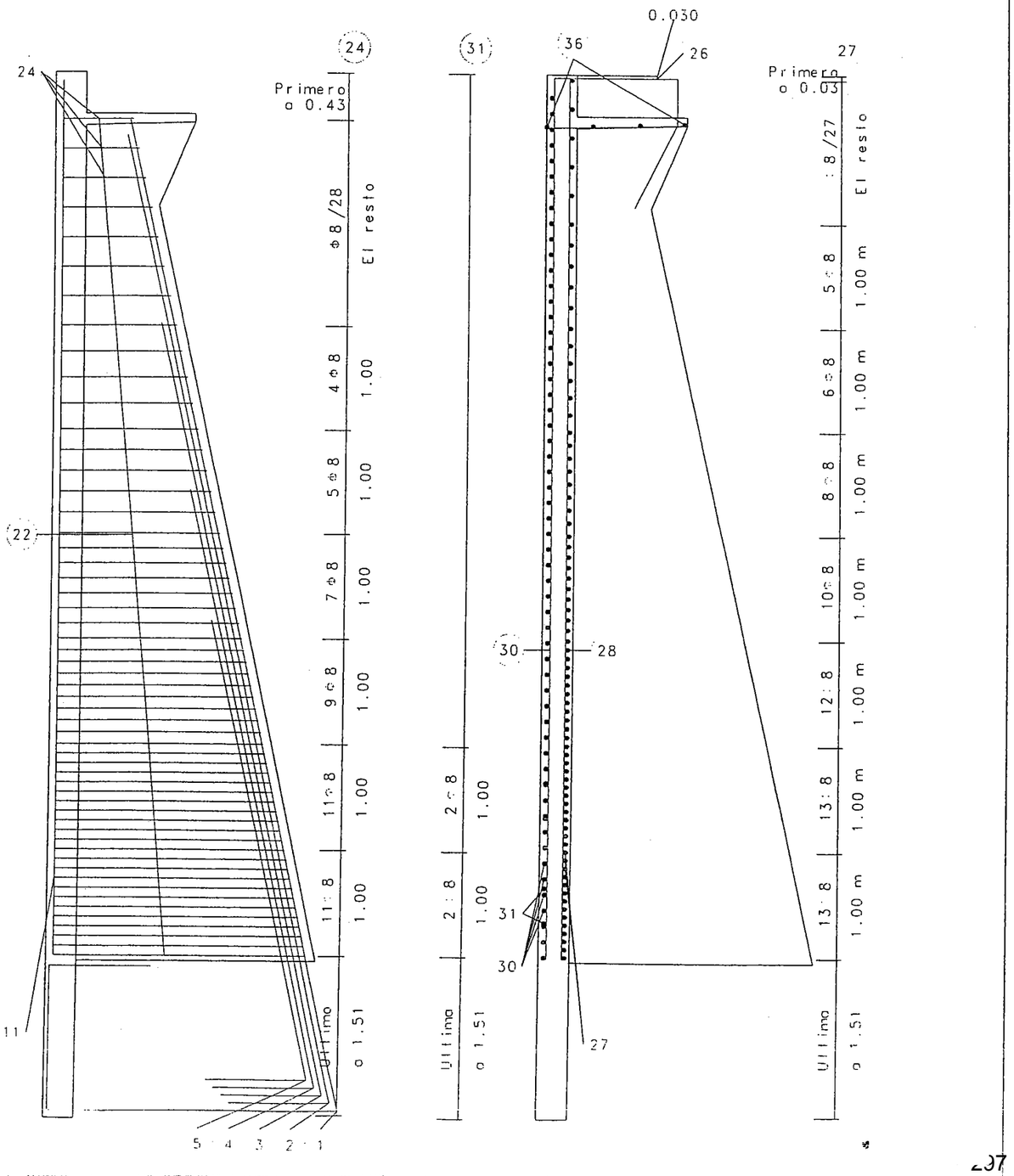
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Colegiado n.º 16495

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

REFER	H.MED
01CW8	9.907

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Colegiado n.º 16495





REFER	L	R	Q
01CW8	12.340	9.570	8.368

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		La(m)	Barra (a)	Lb(m)	Barra (b)	Lt(m)	P(kg)
1	2Φ16	R+ 2.77	0.86 / 0.26 R 9.00% 0.40 1.12 / 1.40	R+ 2.77	0.86 / 0.26 R 9.00% 0.40 1.12 / 1.40	24.68	39.0
2	2Φ20	9.72	0.84 9.35 9.00% 0.40	8.07	0.69 7.70 9.00% 0.40	17.79	43.9
3	2Φ32	7.84	0.67 7.47 9.00% 0.40	7.01	0.59 6.65 9.00% 0.40	14.85	93.8
4	2Φ32	6.15	0.52 5.79 9.00% 0.40	5.49	0.46 5.13 9.00% 0.40	11.63	73.4
5	2Φ32	4.81	0.40 4.45 9.00% 0.40	4.28	0.35 / 0.05 3.93 9.00% 0.40	9.09	57.4
11	2Φ16	Q	Q	Q	Q	16.74	26.4
22	2Φ8	Q-0.28	Q-0.28	Q-0.28	Q-0.28	16.18	6.4
24	55Φ8	1.86	0.14 / a / b / 0.22			10.72	43.7

	a(m)	b(m)	L(m)
EST. SUP	0.28	0.16	1.14
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	1.00	0.22	2.58

TOTAL 1 NERVIO 383.90

Director Técnico
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Las medidas indicadas en los dibujos de las barras de la armadura principal (1,2,...,10) son: de vértice a vértice, y del ramal largo, que está inclinado, su proyección horizontal. A doblar las barras más verticales se curvarán de acuerdo con la Norma EA 95. Las longitudes así y las indicadas corresponden a DESARROLLO REAL de la barra (es decir a tener en cuenta al cortar la barra) y, por consiguiente, su valor es inferior a la suma de las medidas parciales medidas en el dibujo.

REFER	H.MED	P
01CW8	9.907	8.367

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

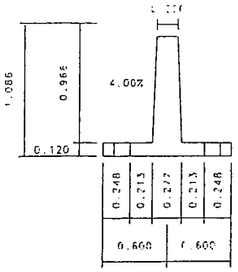
			L(m)		Lt(m)	P(kg)
26	1	10	2.91	0.44 0.80 / 0.48 / 0.14 / 1.24	2.91	1.8
27	73	8	1.14	1.14	83.22	32.8
28	4	6	P	P	33.47	7.4
30	6	5	1.14 P	P 1.14 / 0.15 / 0.20	9.54m2	21.5
31	4	8	1.14	1.14	4.56	1.8
36	6	5	0.49 1.14	b=0.15 / 0.49	0.56m2	1.26

TOTAL 66.58

KILOS DE ACERO POR PIEZA

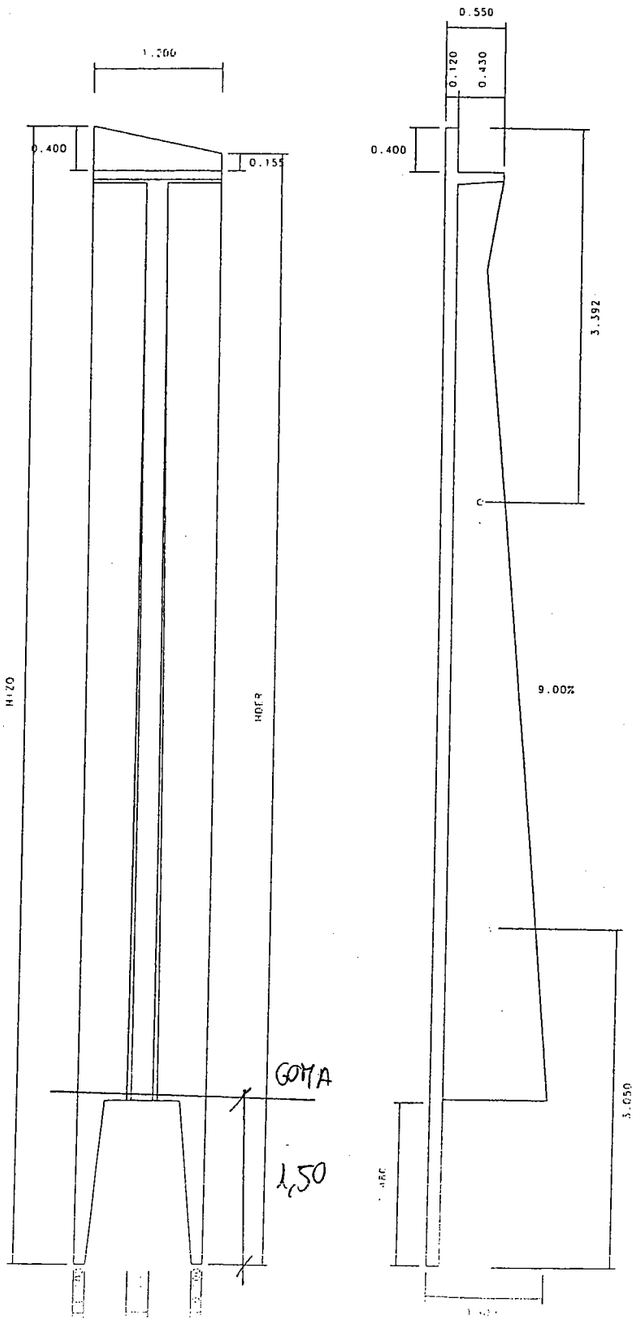
REFER	6	8	10	12	16	20	25	32	M2.ALA	M2.CAB	BARRAS
01CW8	7.43	84.71	1.79	0.00	65.37	43.87	0.00	224.58	9.54	0.56	427.75

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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-2		
PERFIL	10118 1 4 8	PEDIDO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	6.49
M3 HORMIGON	2.45	fck (Kp/cm2)	350
KG ACERO	477.26	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	12/9/20 Verduguillo	
MAMPOSTERIA CALIZA			

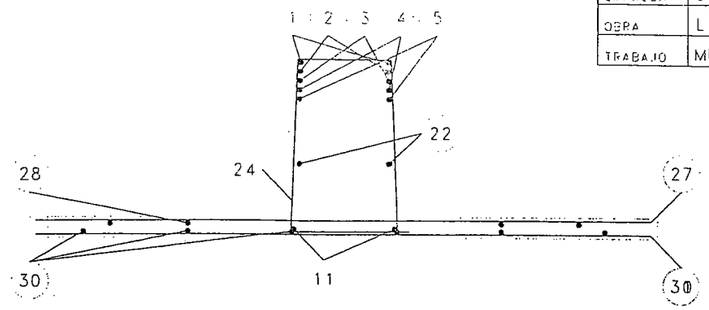
PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CW9	10.275	10.030	0.245	10.153



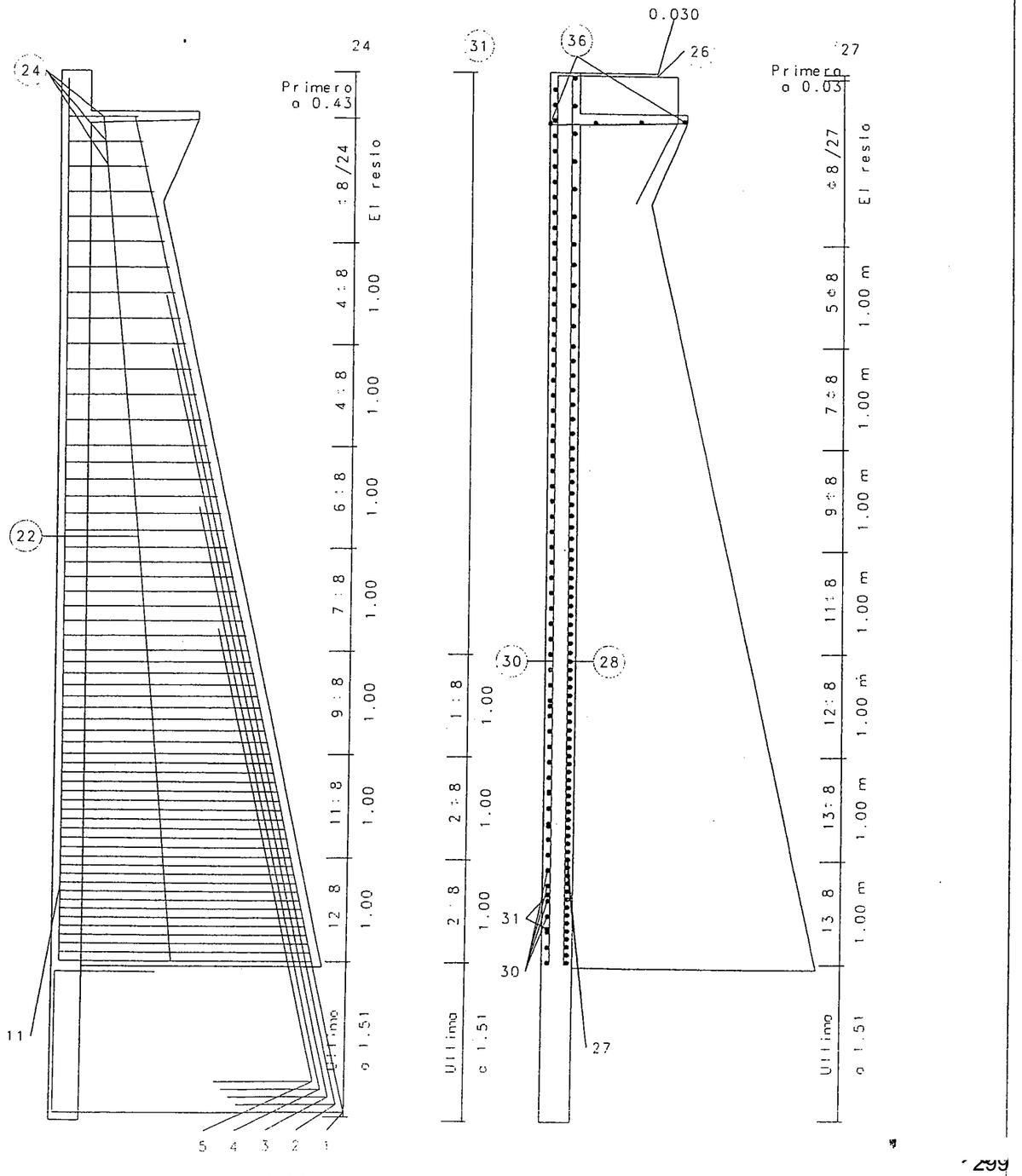
NORTEN PH
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NEKANE MUNDUATE AUZMENDI
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Colegiado n.º 16495

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

REFER	H.MED
01CW9	10.153



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REFER	L1	R	Q
01CW9	12.600	9.815	8.612

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2:20	R+ 2.79	0.88 R 0.25 9.00% 0.40 1.13 1.40	R+ 2.79	0.88 R 0.25 9.00% 0.40 1.13 1.40	25.20	62.1
2	2:20	8.37	0.72 8.00 9.00% 0.40	7.86	0.67 7.50 9.00% 0.40	16.23	40.0
3	2:32	7.76	0.66 7.40 9.00% 0.40	6.98	0.59 6.62 9.00% 0.40	14.74	93.1
4	2:32	6.12	0.51 5.76 9.00% 0.40	5.51	0.46 5.16 9.00% 0.40	11.63	73.4
5	2:32	4.84	0.40 4.49 9.00% 0.40	4.32	0.35 3.97 0.05 9.00% 0.40	9.16	57.8
11	2:16	Q	Q	Q	Q	17.23	27.2
22	2:8	Q-0.28	Q-0.28	Q-0.28	Q-0.28	16.67	6.6
24	59:8	1.88	0.14 a b 0.22			19.89	47.3

	a(m)	b(m)	L(m)
EST. SUP	0.28	0.16	1.14
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	1.02	0.22	2.63

TOTAL 1 NERVIO 407.57

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Las medidas indicadas en los dibujos de las barras de la armadura principal (1,2.....10) son: de vértice a vértice, y del ramal largo, que está inclinado, su proyección horizontal. Al doblar las barras en vértices se curvarán de acuerdo con la Norma EH 91. Las longitudes Lo y Lb indicadas corresponden a "DESARROLLO REAL" de la barra (es la medida a tener en cuenta al cortar la barra) y, por tanto quiere, su valor es inferior a la suma de las dos partes en que es dividida en el dibujo.
Se emplea el acero [illegible] y II.

REFER	H.MED	P
01CW9	10.153	8.612

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

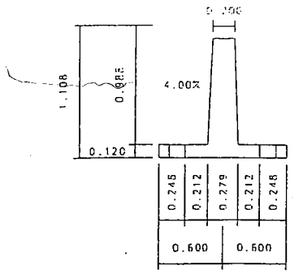
		L(m)		LI(m)	P(kg)
26	1 :10	2.91	0.44 0.80 0.48 0.14 1.24	2.91	1.8
27	77 :8	1.14	1.14	87.78	34.6
28	4 :6	P	P	34.45	7.6
30	:6 :5	1.14 P	P 1.14 0.20 0.15 1.14	9.82m2	22.1
31	5 :8	1.14	1.14	5.70	2.2
36	:6 :5	0.49 1.14	b=0.15 0.49	0.56m2	1.26

TOTAL 69.68

KILOS DE ACERO POR PIEZA

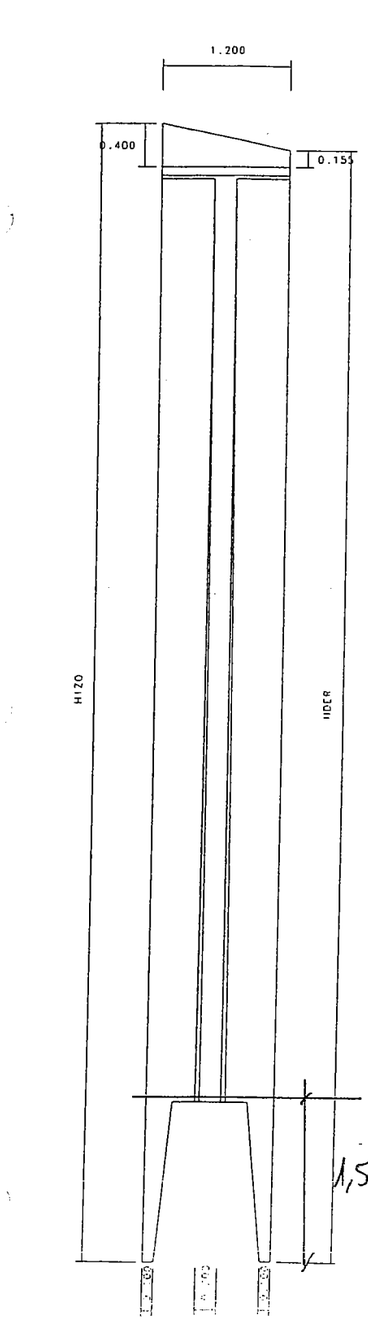
REFER	6	8	10	12	16	20	25	32	M2.ALA	M2.CAB	BARRAS
01CW9	7.65	90.77	1.79	0.00	27.19	102.18	0.00	224.32	9.82	0.56	453.90

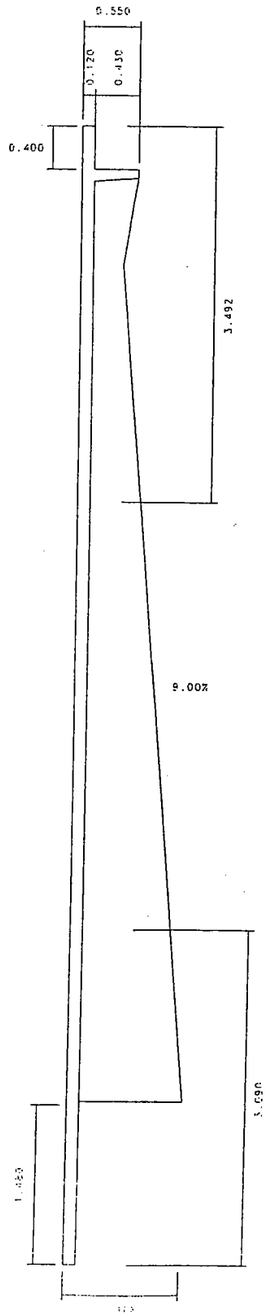
Director Técnico
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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-2		
PERFIL	10118 1 4 7	PEDIDO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	6.76
M3 HORMIGON	2.54	fck (Kp/cm2)	350
KG ACERO	523.26	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	12/9/20 Verduguillo	
MAMPOSTERIA CALIZA			

PISTA	REFER	H.IZO	H.DER	D.ALT	H.MED
	01CW40	10.520	10.275	0.245	10.398

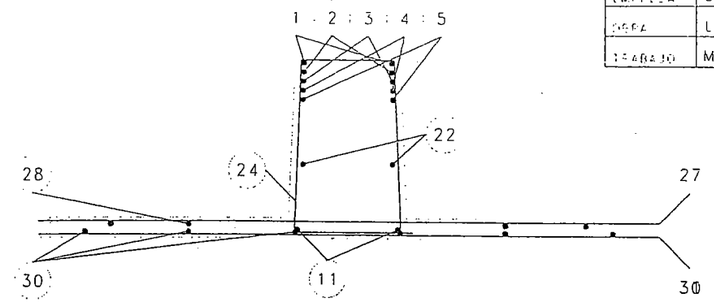




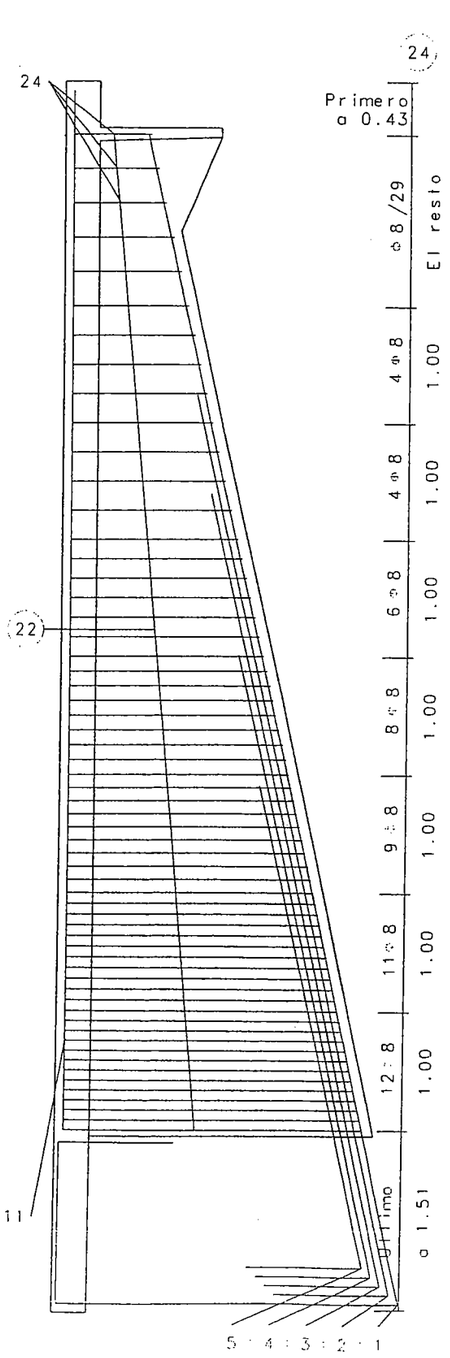
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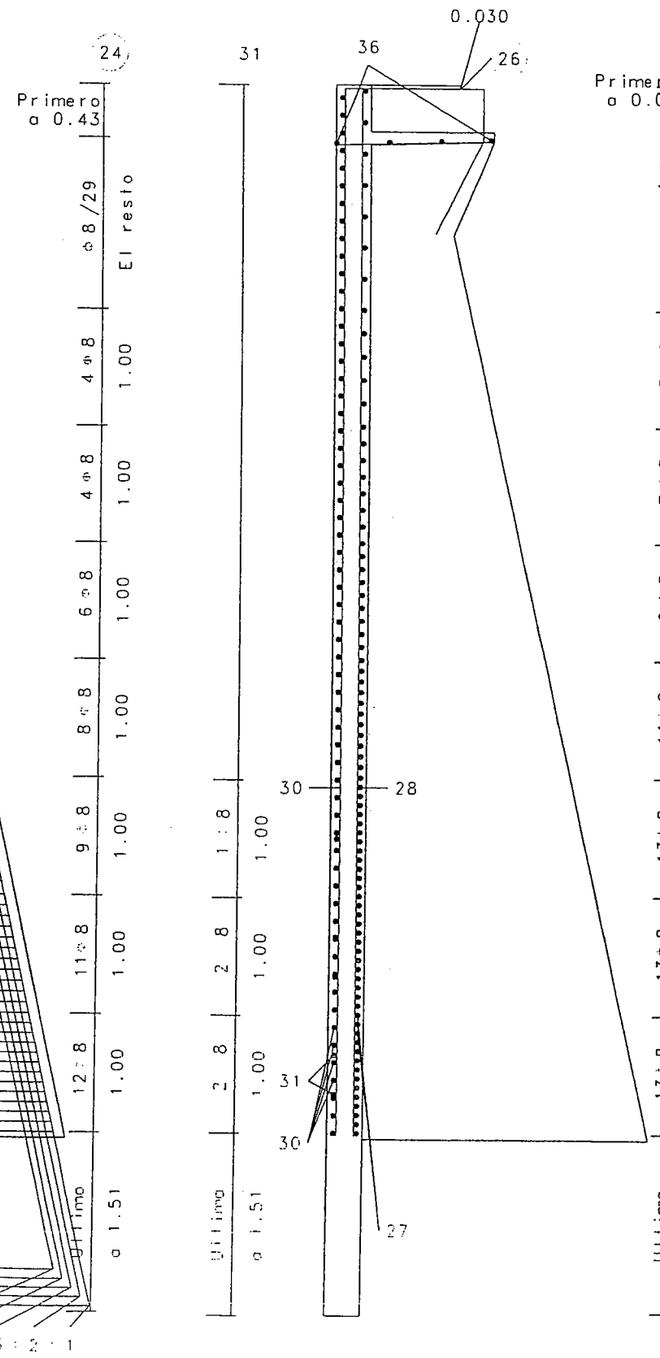
EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

REFER	H.MED
01CW40	10.398



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REFER	L1	R	Q
01CW10	2.858	10.060	8.858

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2⌀25	R+ 2.80	0.90 / 0.25 — R — 9.00% — 0.40 — 1.40 — 1.15	R+ 2.80	0.90 / 0.25 — R — 9.00% — 0.40 — 1.40 — 1.15	25.72	99.1
2	2⌀25	8.13	0.69 — 7.76 — 9.00% — 0.40	7.47	0.63 — 7.11 — 9.00% — 0.40	15.60	60.1
3	2⌀32	7.19	0.61 — 6.83 — 9.00% — 0.40	6.46	0.54 — 6.10 — 9.00% — 0.40	13.65	86.2
4	2⌀32	5.72	0.48 — 5.36 — 9.00% — 0.40	5.12	0.42 — 4.77 — 9.00% — 0.40	10.84	68.4
5	2⌀32	4.52	0.37 / 0.03 — 4.17 — 9.00% — 0.40	4.06	0.33 / 0.07 — 3.71 — 9.00% — 0.40	8.58	54.2
11	2Φ16	Q	Q	0	Q	17.72	28.0
22	2Φ8	Q-0.28	Q-0.28	Q-0.28	Q-0.28	17.16	6.8
24	60Φ8	1.91	0.14 / a / b / 0.22			124.38	49.1

	a(m)	b(m)	L(m)
EST. SUP	0.28	0.16	1.14
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	1.04	0.22	2.67

TOTAL 1 NERVIO 451.84

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Las medidas indicadas en los dibujos de las barras de la armadura principal (1,2,....10) son de vértice a vértice, y del ramal largo, que está inclinado, su proyección horizontal. A doblar las barras en vértices se curvarán de acuerdo con la Norma EH 91. Las longitudes leídas y las indicadas corresponden a DESARROLLO REAL de la barra (es lo medido o tener en cuenta al cortar la barra) y, por consiguiente, su valor es superior a la suma de las medidas parciales indicadas en el dibujo.
Se añadirá [illegible] por cada codo o patilla.

REFER	L.MED	P
01CW10	10.398	8.857

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		L(m)		Lt(m)	P(kg)
26	1 ⌀10	2.91	0.44 0.80 / 0.48 — 0.14 / 1.24	2.91	1.8
27	79 ⌀8	1.14	1.14	90.06	35.5
28	4 ⌀6	P	P	35.43	7.9
30	⌀6 ⌀5	1.14 P	P; 1.14 — 0.20 / 0.15 / 1.14	10.10m2	22.7
31	5 ⌀8	1.14	1.14	5.70	2.2
36	⌀6 ⌀5	0.49 1.14	b=0.15 / 0.49	0.56m2	1.26

TOTAL 71.42

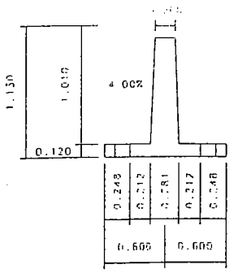
KILOS DE ACERO POR PIEZA

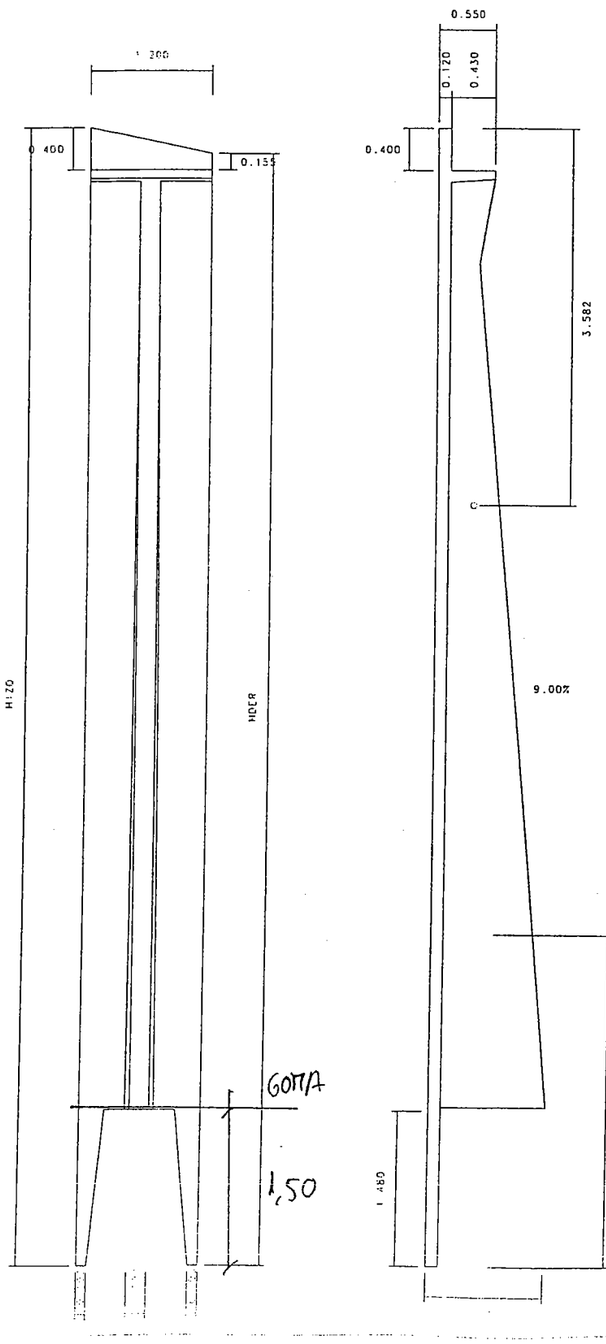
REFER	6	8	10	12	16	20	25	32	M2.ALA	M2.CAB	BARRAS
01CW10	7.86	93.63	1.79	0.00	27.96	0.00	159.20	208.83	10.10	0.56	499.27

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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)			
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN			
TRABAJO	MURO EST. E-2			
PERFIL	10118 1 4 6		PEDIDO	10041
NUMERO DE PIEZAS	1		PESO PIEZA (T)	7.01
M3 HORMIGON	2.64		fck (Kp/cm2)	350
KG ACERO	552.13		fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030		12/9/20 Verduguillo	
MAMPOSTERIA CALIZA				

PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CW11	10.765	10.520	0.245	10.643

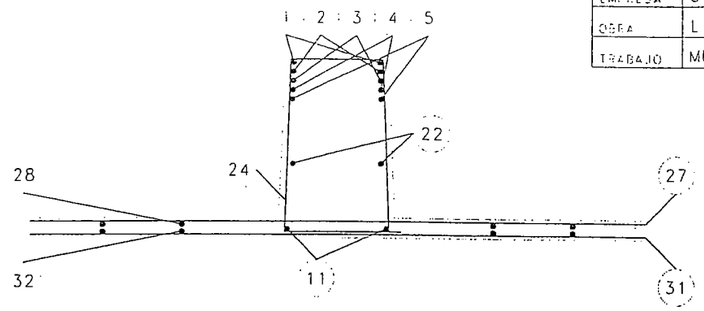




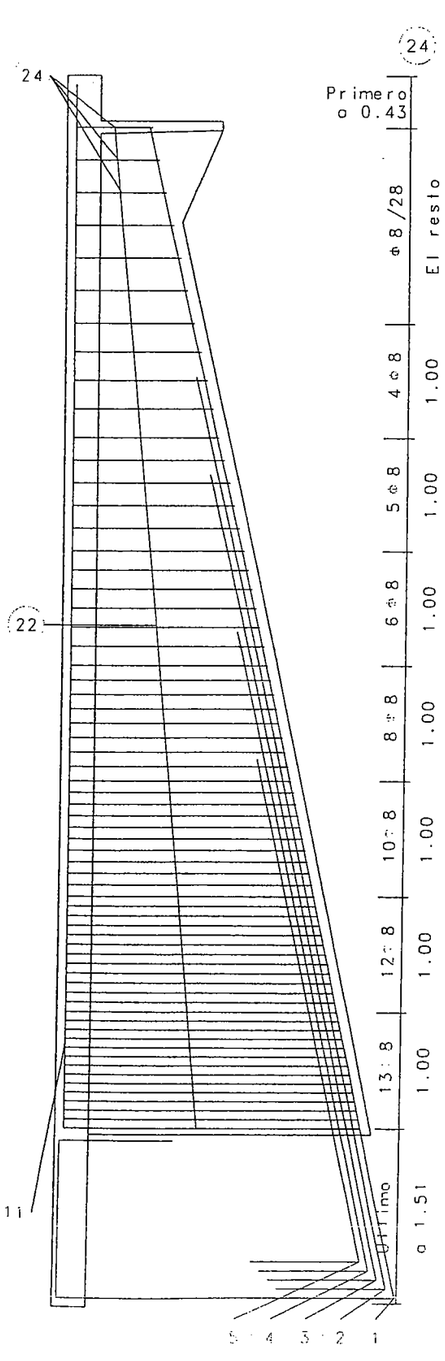
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Colegiado n.º 16495

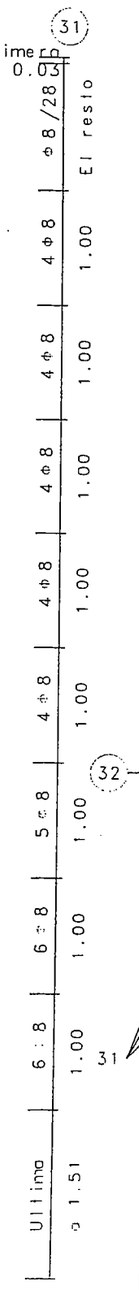
EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

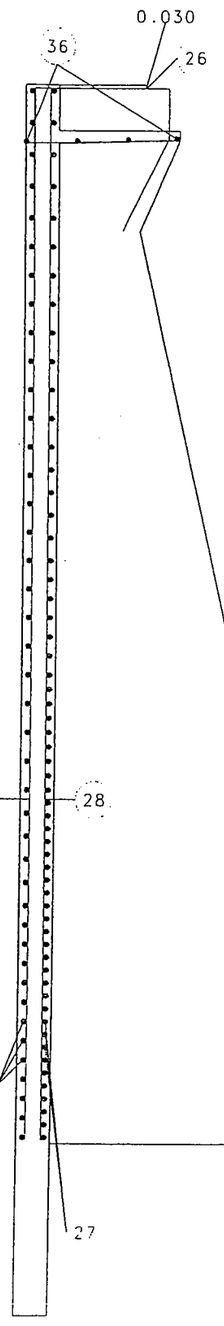
REFER	H.MED
01CW11	10.643

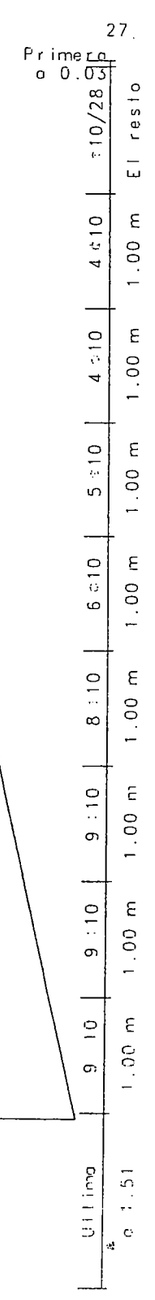


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REFER	A	B	C
01CW##	13.326	10.305	9.102

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2:25	R+ 2.82	0.92 / 0.25 R 9.00% 0.40 1.17 / 1.40	R+ 2.82	0.92 / 0.25 R 9.00% 0.40 1.17 / 1.40	26.25	101.2
2	2:25	8.41	0.72 8.04 9.00% 0.40	7.76	0.66 7.40 9.00% 0.40	16.17	62.3
3	2:32	7.47	0.63 7.11 9.00% 0.40	6.75	0.57 6.39 9.00% 0.40	14.22	89.8
4	2:32	6.00	0.50 5.64 9.00% 0.40	5.41	0.45 5.05 9.00% 0.40	11.41	72.0
5	2:32	4.80	0.40 4.45 9.00% 0.40	4.29	0.35 3.94 0.05 9.00% 0.40	9.09	57.4
11	2:16	0	0	0	0	18.21	28.7
22	2:8	0-0.28	0-0.28	0-0.28	0-0.28	17.65	7.0
24	65:8	1.93	0.14 / a / b / 0.22			37.22	54.1

	a(m)	b(m)	L(m)
EST. SUP	0.28	0.16	1.14
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	1.07	0.23	2.72

TOTAL 1 NERVIO 472.58



Las medidas indicadas en los dibujos de los barros de la armadura principal (1,2,...10) son de cara a cara. y del ramal largo, que esta inclinado. su proyección horizontal. A doblar los barros en vértices se curvarán de acuerdo con la Norma EH-91. Las longitudes Lo y Lb indicadas corresponden a DESARROLLO REAL de la barra (es la medida a tener en cuenta al cortar la barra) y, por consiguiente, su valor es superior a la suma de las medidas parciales acotadas en el dibujo.
El coeficiente de [illegible]

REFER	H.MED	P
01CW##	10.643	9.102

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		L(m)		LI(m)	P(kg)
26	1:10	2.91	0.44 0.80 / 0.48 / 0.14 / 1.24	2.91	1.8
27	59:10	1.14	1.14	67.26	41.5
28	4:6	P	P	36.41	8.1
31	42:8	1.14	1.14	47.88	18.9
32	4:6	P	P	36.41	8.1
36	:6 :5	0.49 1.14	b=0.15 / 0.49	0.56m2	1.26

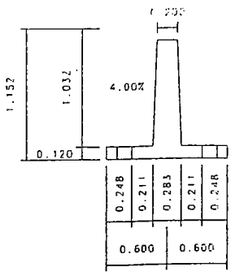
TOTAL 79.57

KILOS DE ACERO POR PIEZA

REFER	6	8	10	12	16	20	25	32	M2.CAB	BARRAS
01CW##	16.16	80.00	43.26	0.00	28.73	0.00	163.48	219.24	0.56	550.87

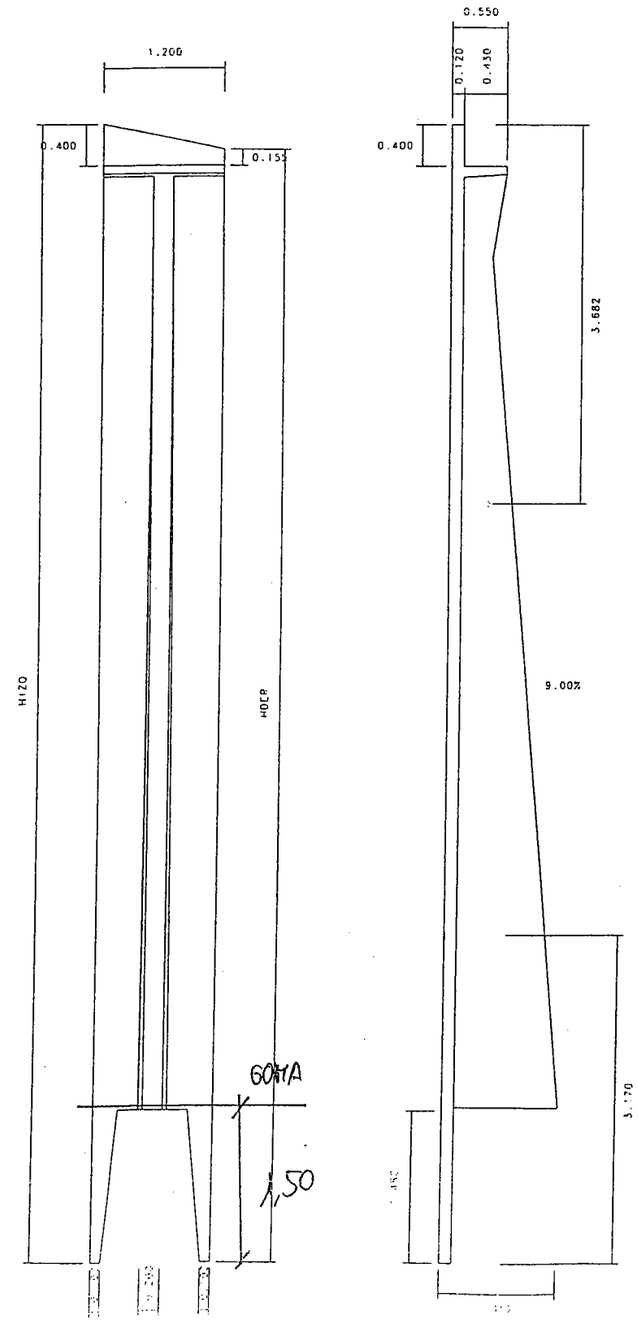


11/01/01 09:19 — DEFINICION GEOMETRICA — PL 10041



EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-2		
PERFIL	10118 1 4 5	PEDIDO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	7.27
M3 HORMIGON	2.73	fck (Kp/cm2)	350
KG ACERO	574.69	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	12/9/20 Verduguillo	
MAMPOSTERIA CALIZA			

PISTA	REFER	H.IZO	H.DER	D.ALT	H.MED
	01CW12	11.010	10.765	0.245	10.887



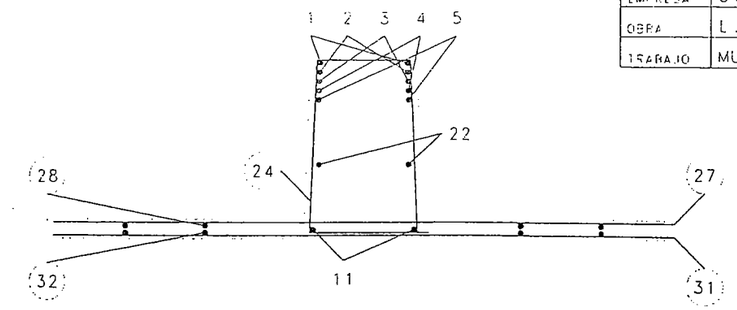
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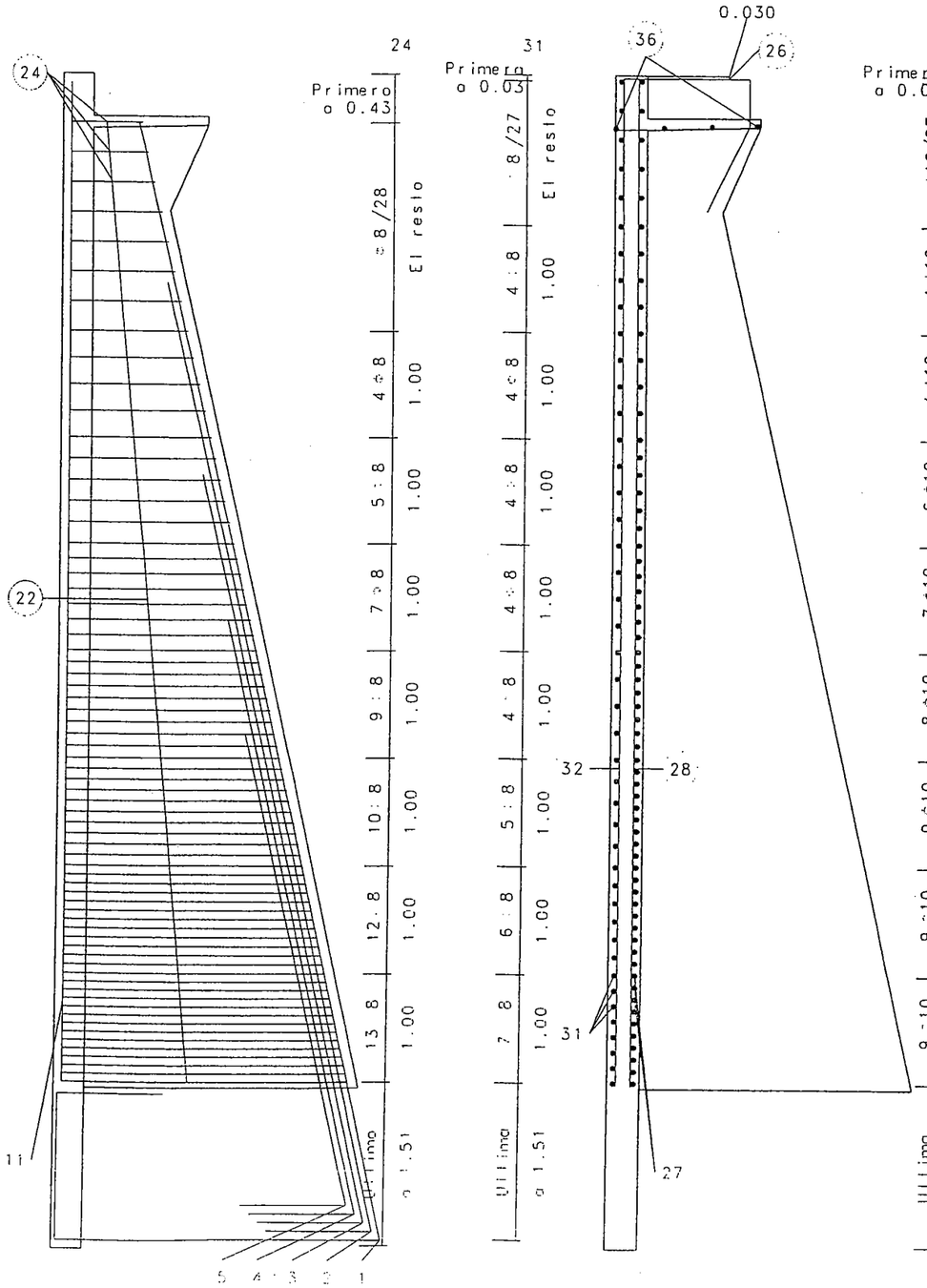
11/01/01 09:19 — ARMADURA DEL NARIZ Y ALA — PL 10041

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-2		

REFER	H.MED
01CW12	10.887

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REFER	L1	R	O
01CW12	13.404	10.550	9.348

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2⌀20	R+ 2.85	0.94 / 0.26 R 9.00% 0.40 1.20 / 1.40	R+ 2.85	0.94 / 0.26 R 9.00% 0.40 1.20 / 1.40	26.81	66.1
2	2⌀32	9.35	0.80 8.97 9.00% 0.40	8.38	0.72 8.01 9.00% 0.40	17.72	111.9
3	2⌀32	7.44	0.63 7.08 9.00% 0.40	6.72	0.57 6.36 9.00% 0.40	14.16	89.4
4	2⌀32	5.97	0.50 5.62 9.00% 0.40	5.44	0.45 5.08 9.00% 0.40	11.41	72.0
5	2⌀32	4.84	0.40 4.48 9.00% 0.40	4.38	0.36 / 0.04 4.03 9.00% 0.40	9.22	58.2
11	2⌀16	Q	Q	Q	Q	18.70	29.5
22	2⌀8	Q-0.28	Q-0.28	Q-0.28	Q-0.28	18.14	7.2
24	68⌀8	1.95	0.14 / a / b / 0.22			45.31	57.3

	a(m)	b(m)	L(m)
EST. SUP	0.28	0.16	1.14
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	1.09	0.23	2.76

TOTAL 1 NERVIO 491.65

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Las medidas indicadas en los dibujos de las barras de la armadura principal (1,2,....10) son de vértice a vértice, y del ramal largo, que este inclinado, su proyección horizontal. Al doblar las barras los vértices se curvarán de acuerdo con la Norma EH 91. Las longitudes Lo y Lo indicadas corresponden a DESARROLLO REAL de la barra (es lo medido a tener en cuenta al pedir la barra) y, por consiguiente, su valor es inferior a la suma de las rectas que aparecen en el dibujo.

REFER	P.MED	P
01CW12	10.887	9.347

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		L(m)		Ll(m)	P(kg)
26	1⌀10	2.91	0.44 0.80 / 0.48 / 0.14 / 1.24	2.91	1.8
27	62⌀10	1.14	1.14	70.68	43.6
28	4⌀6	P	P	37.39	8.3
31	44⌀8	1.14	1.14	50.16	19.8
32	4⌀6	P	P	37.39	8.3
36	⌀6 ⌀5	0.49 1.14	b=0.15 / 0.49	0.56m2	1.26

TOTAL 83.02

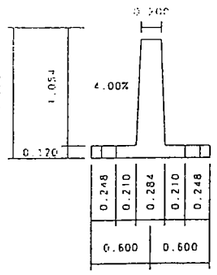
KILOS DE ACERO POR PIEZA

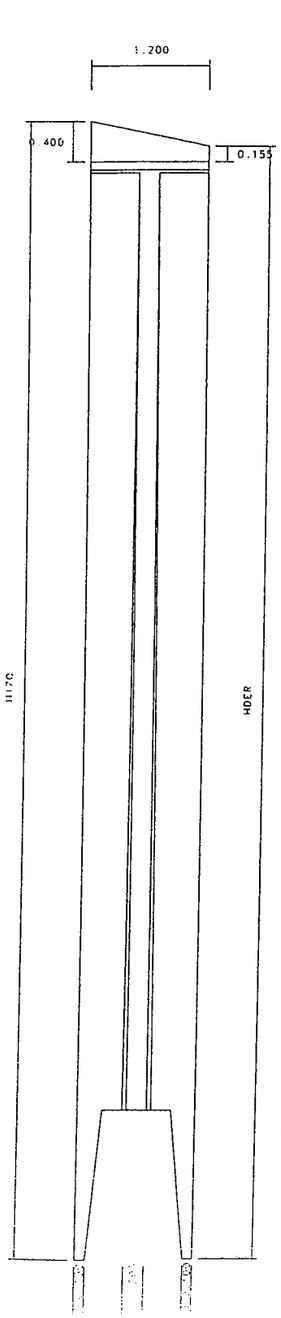
REFER	6	8	10	12	16	20	25	32	M2.CAB	BARRAS
01CW12	16.60	84.29	45.37	0.00	29.51	66.11	0.00	331.55	0.56	573.43

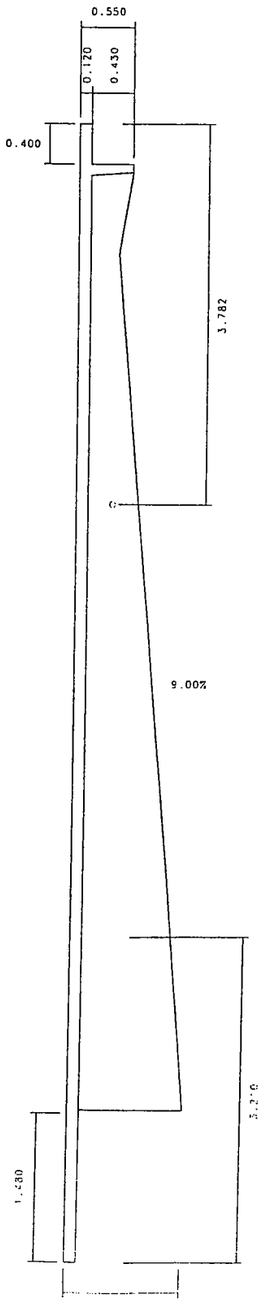
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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)				
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN				
TRABAJO	MURO EST. E-2				
PERFIL	IQ118 1 4 4		PEDIDO	10041	
NUMERO DE PIEZAS	1		PESO PIEZA (T)	7.41	
M3 HORMIGON	2.83		fck (Kp/cm2)	350	
KG ACERO	625.34		fyk (Kp/cm2)	5100	
RECUBRIMIENTO (M)	0.030		12/9/20 Verduguillo		
GOMA ESTANDAR EN JUNTAS					

PISTA	REFER	H.IZO	H.DER	D.ALT	H.MED
	01CW13	11.255	11.010	0.245	11.133



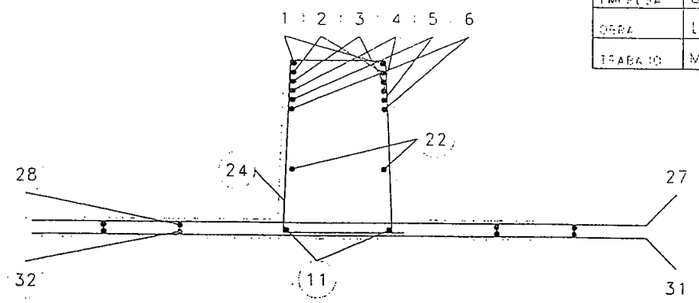




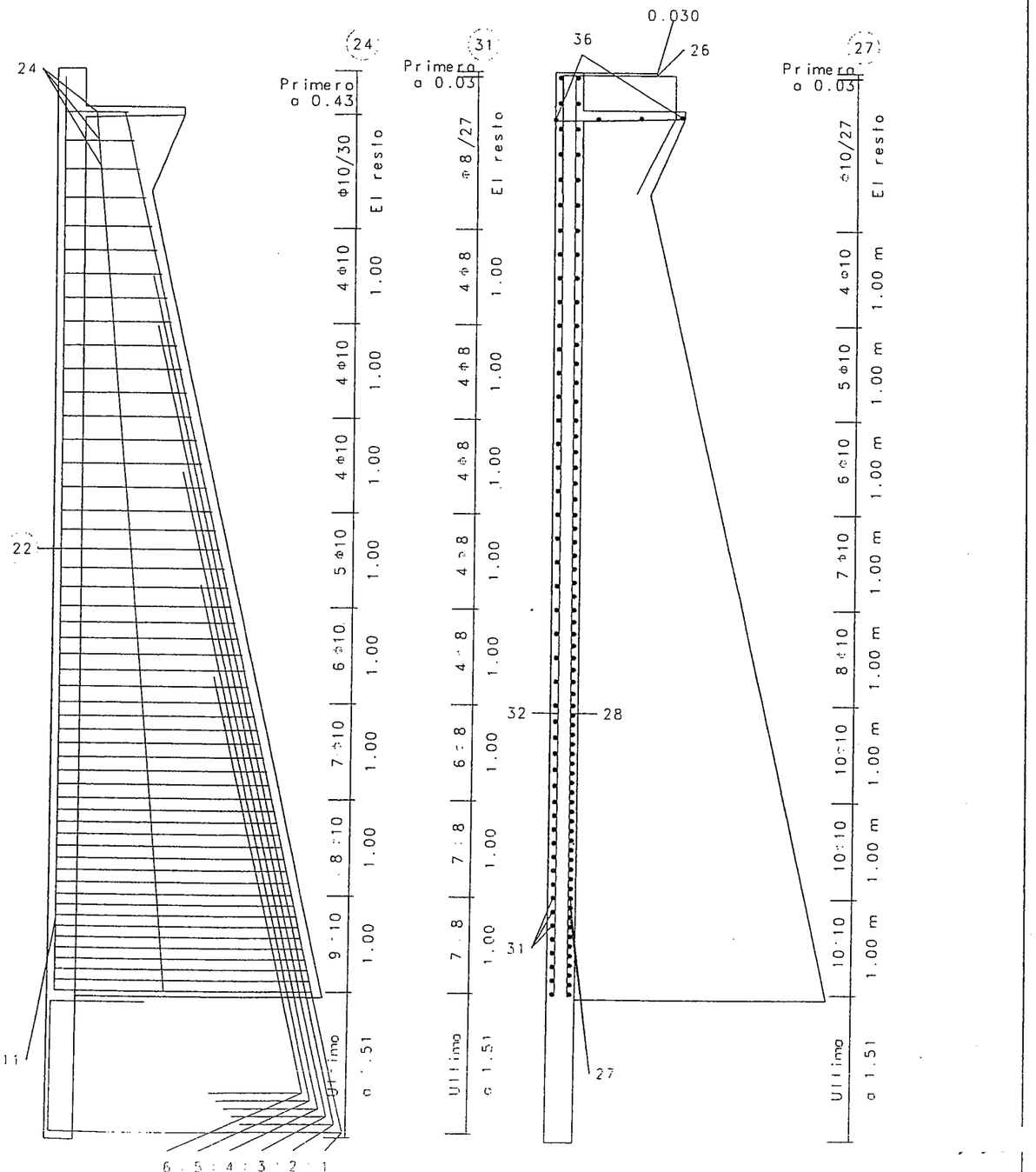
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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

REFER	H.MED
01CW13	11.133



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REFER	L1	R	Q
01CW13	13.672	10.795	9.593

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2⌀20	R+ 2.88	0.97 R 0.25 9.00% 0.40 1.22 1.40	R+ 2.88	0.97 R 0.25 9.00% 0.40 1.22 1.40	27.34	67.4
2	2⌀20	9.37	0.80 9.00 9.00% 0.40	8.86	0.76 8.49 9.00% 0.40	18.23	45.0
3	2⌀32	8.76	0.75 8.39 9.00% 0.40	7.98	0.68 7.61 9.00% 0.40	16.74	105.7
4	2⌀32	7.12	0.60 6.75 9.00% 0.40	6.51	0.55 6.15 9.00% 0.40	13.63	86.0
5	2⌀32	5.84	0.49 5.48 9.00% 0.40	5.32	0.44 4.96 9.00% 0.40	11.16	70.4
6	2⌀32	4.78	0.39 4.43 0.01 9.00% 0.40	4.34	0.35 3.99 0.05 9.00% 0.40	9.12	57.6
11	2⌀16	Q	Q	0	Q	19.19	30.3
22	2⌀8	Q-0.28	Q-0.28	Q-0.28	Q-0.28	18.63	7.4
24	52⌀10	1.97	0.14 a b 0.22			109.10	67.3

	a(m)	b(m)	L(m)
EST. SUP	0.28	0.16	1.14
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	1.11	0.23	2.80

TOTAL 1 NERVIO 537.02

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Los medidas indicadas en [illegible] de las barras de la armadura principal (1,2,.....10) son de cálculo de vértices y del ramal largo, que está inclinado, su proyección horizontal. A deducir los cortes en los vértices se curvarán de acuerdo con la línea EH Nº. Las longitudes L1 y L2 indicados corresponden a DESARROLLO REAL de la barra y es necesario tener en cuenta el cortar o doblar y, por lo siguiente, su valor es inferior a la suma de las dos partes [illegible]

REFER	P.MED	P
01CW13	1.133	9.592

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		L(m)		LI(m)	P(kg)
26	1 ⌀10	2.91	0.44 0.80 0.48 0.14 1.24	2.91	1.8
27	67 ⌀10	1.14	1.14	76.38	47.1
28	4 ⌀6	P	P	38.37	8.5
31	47 ⌀8	1.14	1.14	53.58	21.1
32	4 ⌀6	P	P	38.37	8.5
36	⌀6 ⌀5	0.49 1.14	b=0.15 0.49	0.56m2	1.26

TOTAL 88.32

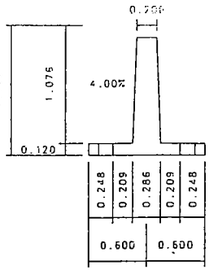
KILOS DE ACERO POR PIEZA

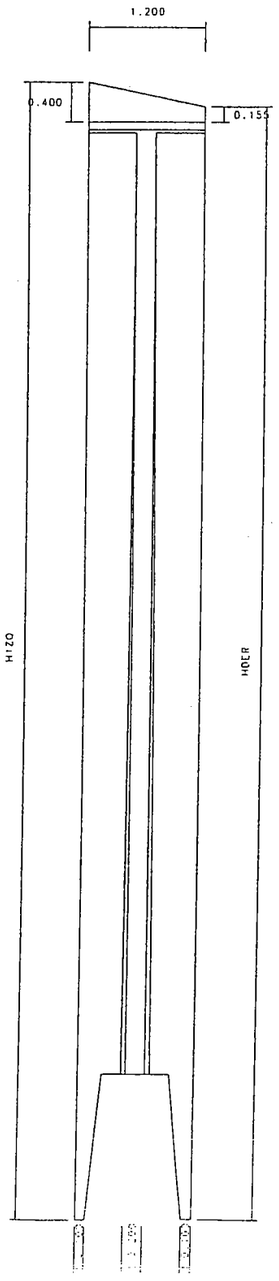
REFER	6	8	10	12	16	20	25	32	M2.CAB	BARRAS
01CW13	17.03	28.49	116.15	0.00	30.28	112.40	0.00	319.73	0.56	624.08

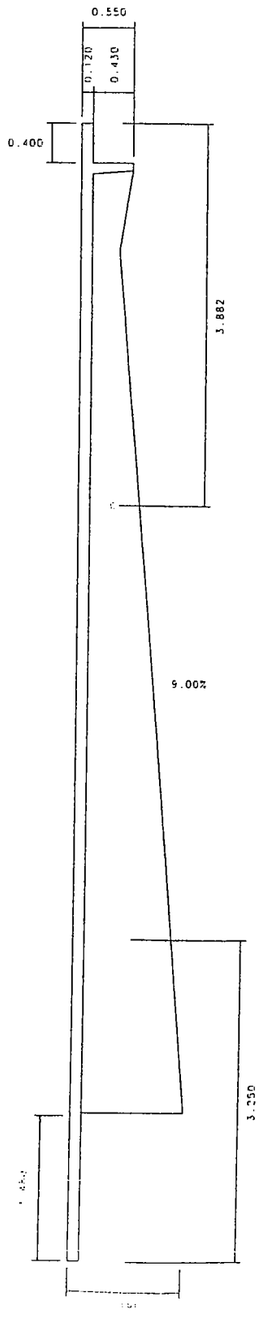
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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-2		
PERFIL	10118 1 4 3	PEDIDO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	7.70
M3 HORMIGON	2.93	fck (Kp/cm2)	350
KG ACERO	676.11	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	12/9/20 Verduguillo	
GOMA ESTANDAR EN JUNTAS			

PISTA	REFER	H.IZO	H.DER	D.ALT	H.MED
	01CW14	11.500	11.255	0.245	11.378



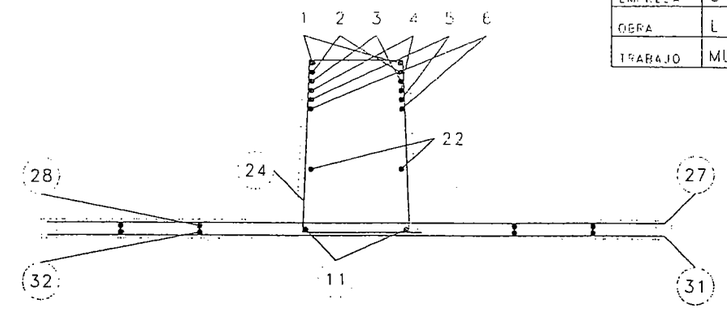




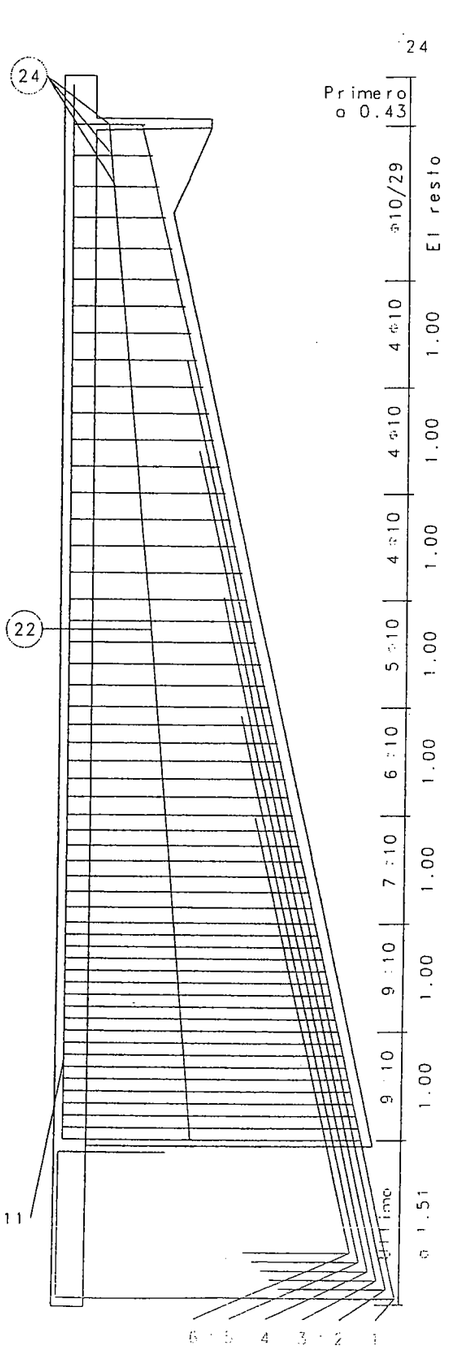
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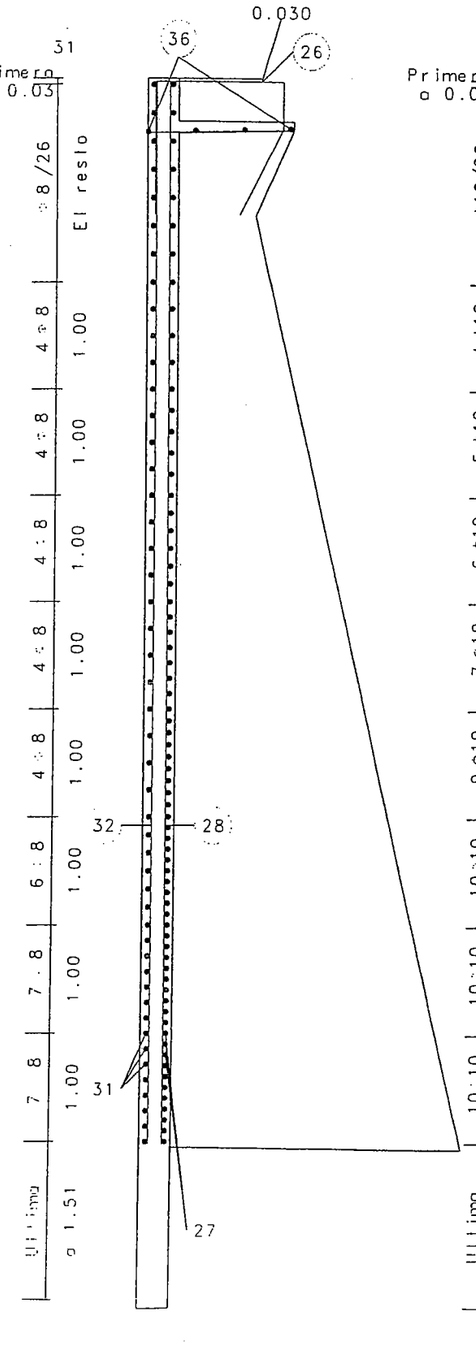
EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

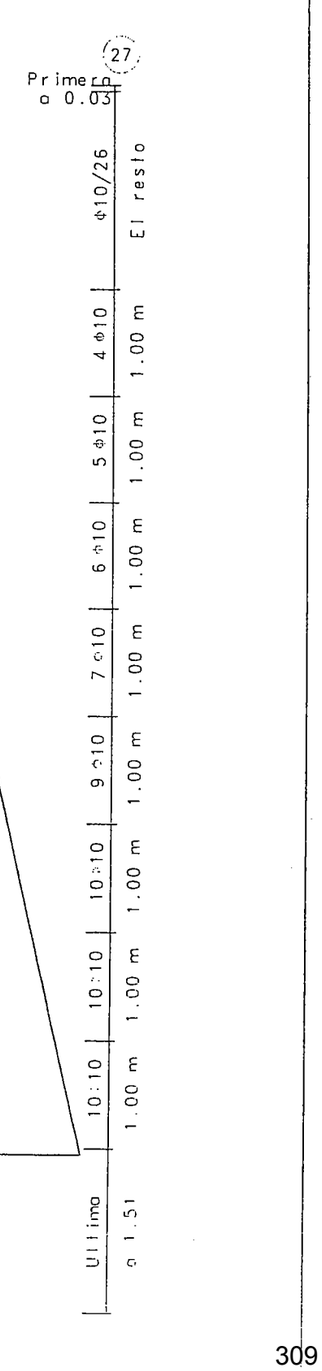
REFER	H.MED
01CW14	11.378

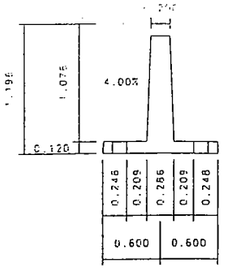


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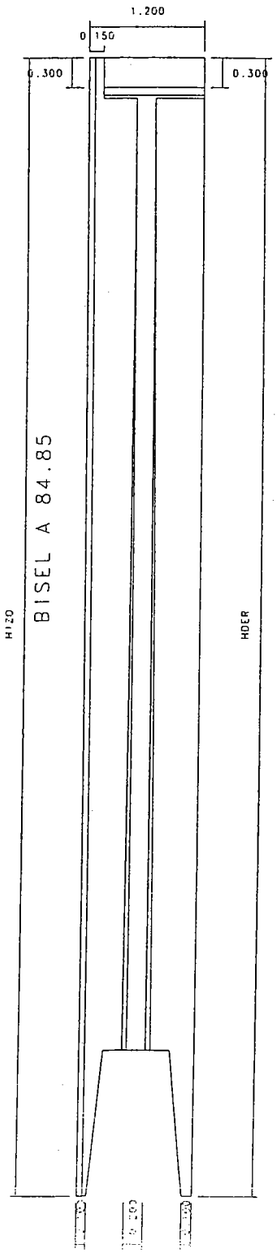


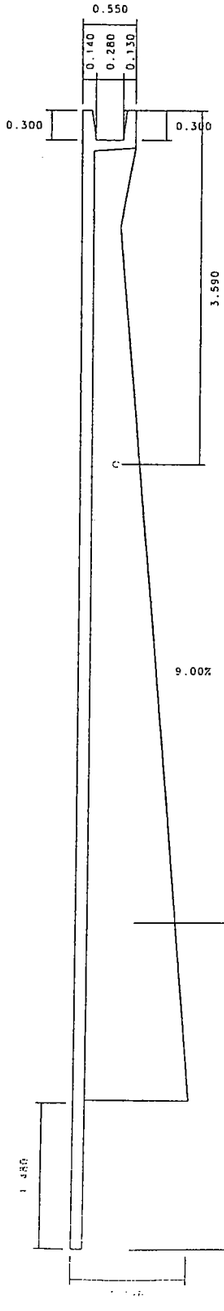


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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)			
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN			
TRABAJO	MURO EST. E-2			
PERFIL	10118 1 4 2		PEDIDO	10041
NUMERO DE PIEZAS	2		PESO PIEZA (T)	7.92
M3 HORMIGON	3.01		fck (Kp/cm2)	350
KG ACERO	688.97		fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030		12/9/20 Verduguillo	
GOMA ESTANDAR EN JUNTAS				

PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CW15	11.500	11.500	0.000	11.500
	01CW16	11.500	11.500	0.000	11.500

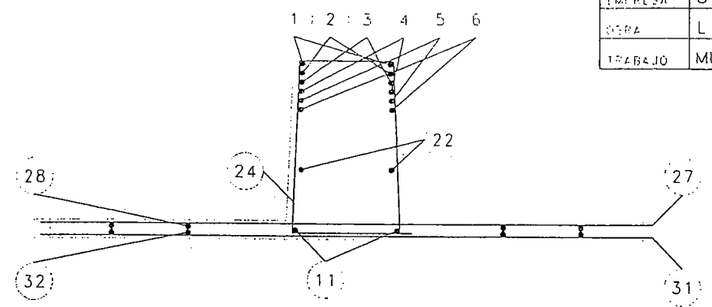




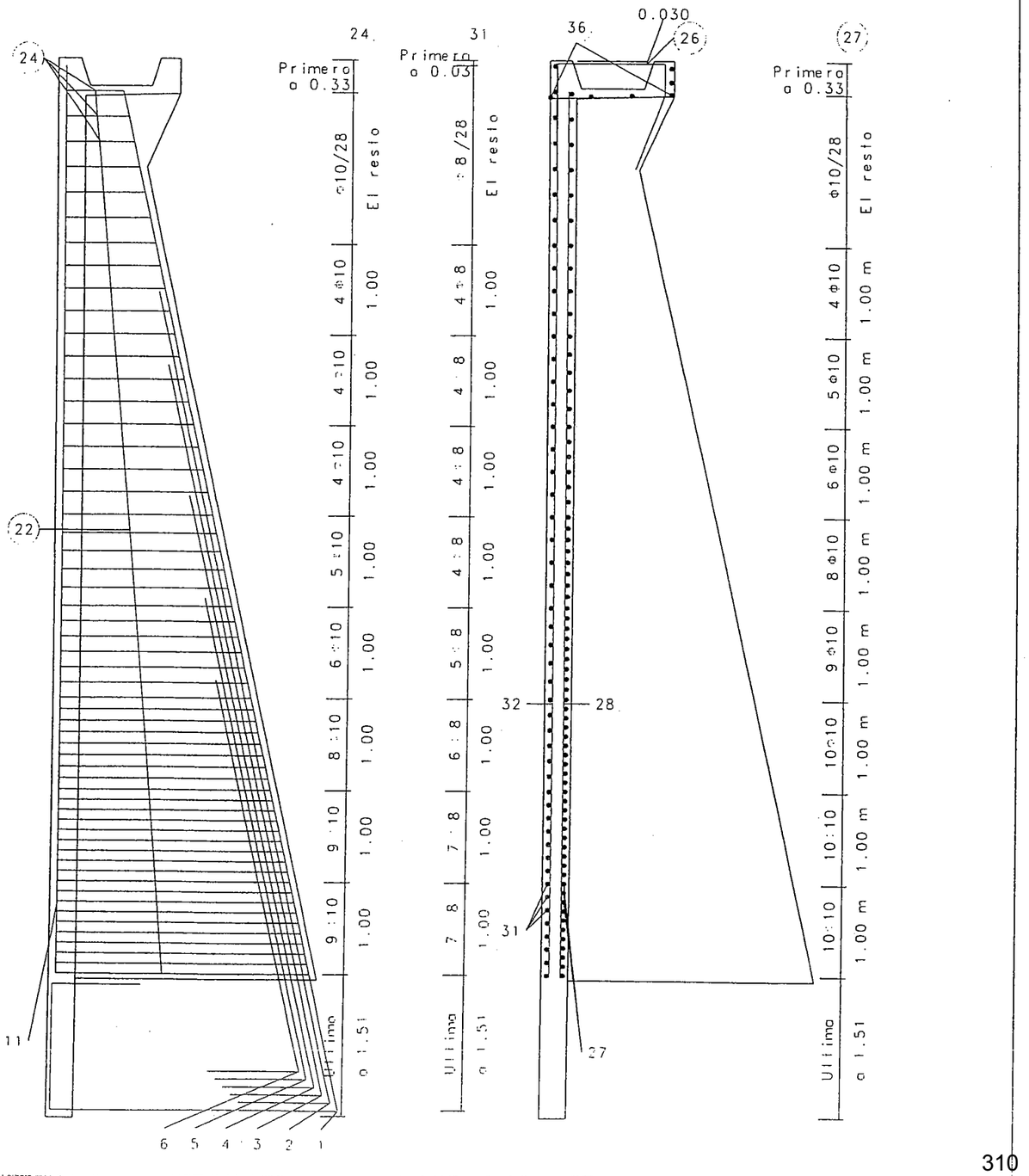
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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

REFER	H.MED
01CW15	11.500
01CW16	11.500



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11/01/01 10:10 — DESPIECE DE LA ARMADURA DEL NERVIO — P1

REFER	L1	R	Q
01CW15	14.031	11.140	9.960
01CW16	14.031	11.140	9.960

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		Lo(m)	Borra (a)	Lb(m)	Borra (b)	LT(m)	P(kg)
1	2:25	R+ 2.89	1.00 R 0.24 9.00% 0.40 1.24 1.40	R+ 2.89	1.00 R 0.24 9.00% 0.40 1.24 1.40	28.06	108.1
2	2:25	9.25	0.79 8.88 9.00% 0.40	8.60	0.74 8.23 9.00% 0.40	17.85	68.8
3	2:32	8.37	0.71 8.00 9.00% 0.40	7.59	0.65 7.23 9.00% 0.40	15.96	100.7
4	2:32	6.84	0.58 6.48 9.00% 0.40	6.30	0.53 5.94 9.00% 0.40	13.14	83.0
5	2:32	5.64	0.47 5.28 9.00% 0.40	5.18	0.43 4.83 9.00% 0.40	10.82	68.3
6	2:32	4.66	0.38 4.30 0.02 9.00% 0.40	4.19	0.34 3.84 0.06 9.00% 0.40	8.85	55.9
11	2:16	Q	Q	Q	Q	19.92	31.4
22	2:8	Q-0.30	Q-0.30	Q-0.30	Q-0.30	19.32	7.6
24	56:10	1.99	0.14 a b 0.22			19.86	73.9

	a(m)	b(m)	L(m)
EST. SUP	0.27	0.16	1.12
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	1.13	0.23	2.85

TOTAL 1 NERVIO 597.72

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Las medidas indicadas en los dibujos de las barras de la armadura principal [illegible] serán de vértice a vértice, y del ramal largo, que este inclinado, su proyección horizontal. Al doblar las barras los vértices se curvarán de acuerdo con la Norma EH 91. Las longitudes Lo y Lb indicadas corresponden a DESARROLLO REAL de la barra y es la medida a tener en cuenta al cortar la barra y, por consiguiente, su valor es superior a [illegible] suma de las [illegible] que resultan en el dibujo.

11/01/01 10:10 — DESPIECE DE LA ARMADURA DEL ALA Y MEDICION — P2

REFER	P.MED	L
01CW15	11.500	9.960
01CW16	11.500	9.960

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		L(m)		LT(m)	P(kg)
26	1:10	2.71	0.34 0.80 0.48 0.15 1.14	2.71	1.7
27	69:10	1.13	1.13	78.09	48.1
28	4:6	P-0.30	P-0.30	38.64	8.6
31	49:8	1.14	1.14	55.72	22.0
32	4:6	P	P	39.84	8.8
36	6:5	0.79 1.14	b=0.15 0.30 0.49	0.90m2	2.03

TOTAL 91.25

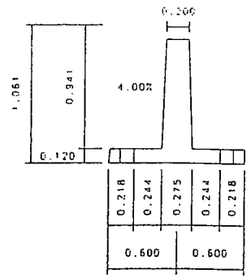
KILOS DE ACERO POR PIEZA

REFER	6	8	10	12	16	20	25	32	M2.CAB	BARRAS
01CW15	17.42	29.61	123.71	0.00	31.44	0.00	176.91	307.85	0.90	686.94
01CW16	17.42	29.61	123.71	0.00	31.44	0.00	176.91	307.85	0.90	686.94

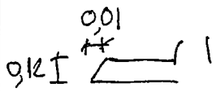
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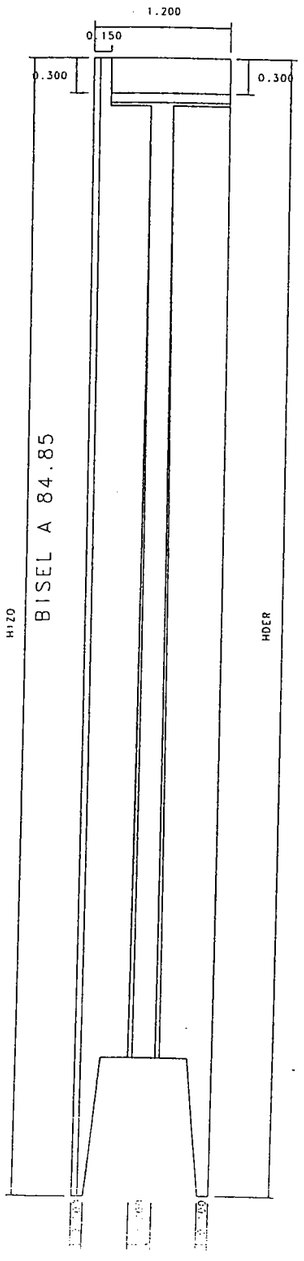
EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-2		
PERFIL	10118 1 4 14	PEDIDO	10041
NUMERO DE PIEZAS	5	PESO PIEZA (T)	6.24
M3 HORMIGON	2.42	fck (Kp/cm2)	350
KG ACERO	441.49	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	12/9/20 Verduguillo	
GOMA ESTANDAR EN JUNTAS			

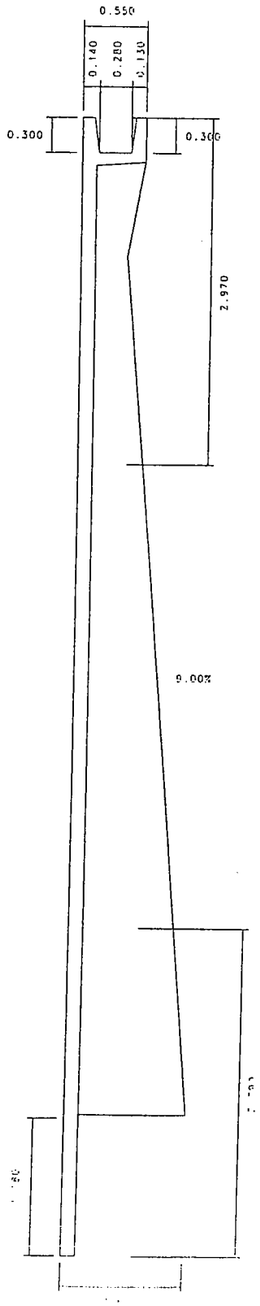
PISTA	REFER	H.IZO	H.DER	D.ALT	H.MED
	01CW17	9.700	9.700	0.000	9.700
	01CW18	9.700	9.700	0.000	9.700
	01CW19	9.700	9.700	0.000	9.700
	01CW20	9.700	9.700	0.000	9.700
	01CW25	9.700	9.700	0.000	9.700



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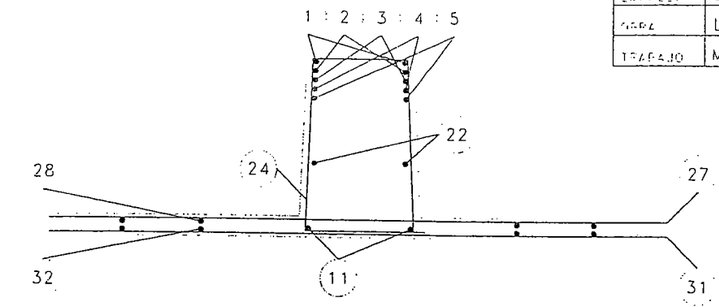






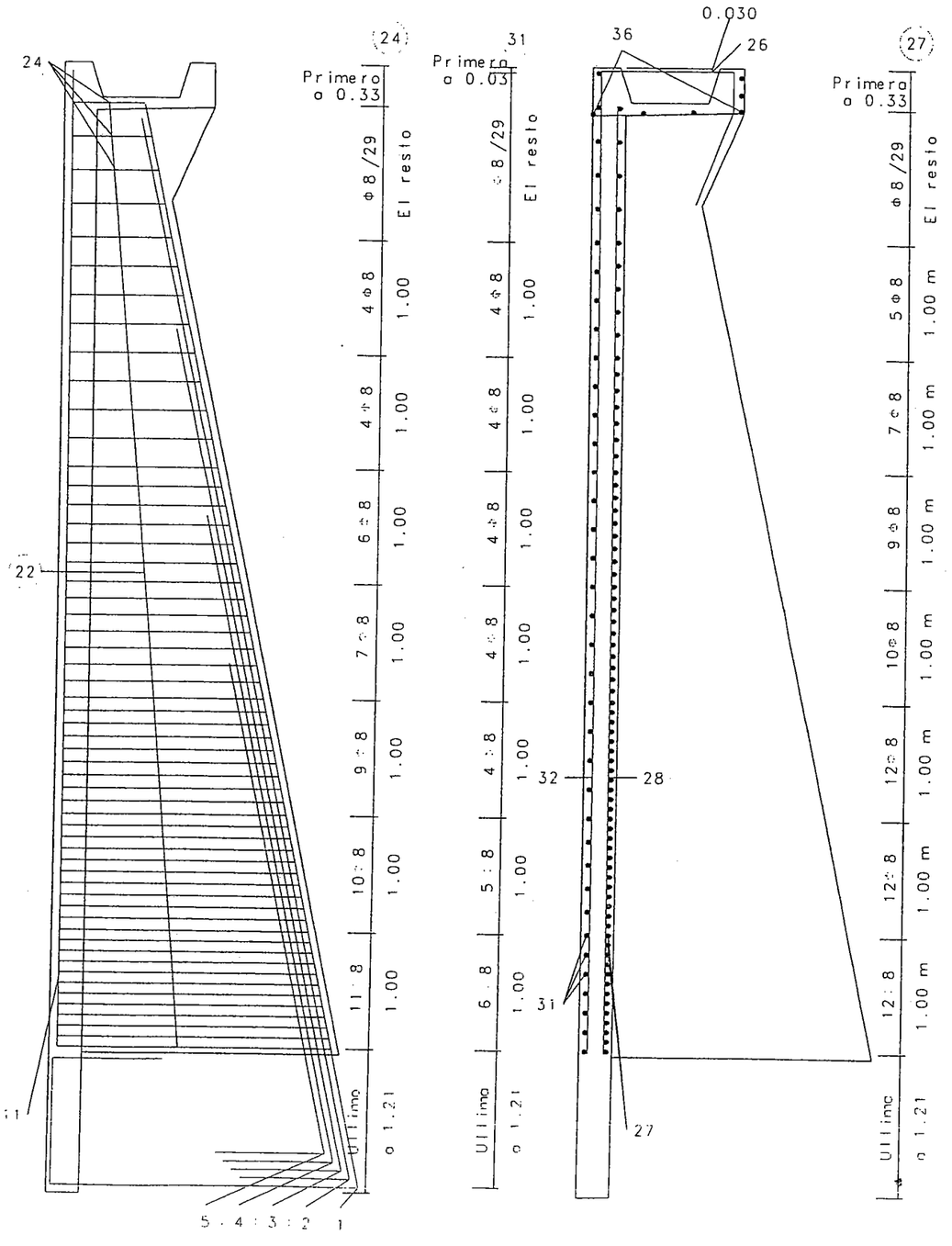
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Colegiado n.º 16495

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2



HORTENPH
Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

REFER	H.MED
01CW17	9.700
01CW18	9.700
01CW19	9.700
01CW20	9.700
01CW25	9.700



REFER	L1	R	Q
01CW17	11.780	9.340	8.460
01CW18	11.780	9.340	8.460
01CW19	11.780	9.340	8.460
01CW20	11.780	9.340	8.460
01CW25	11.780	9.340	8.460

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2 ø16	R+ 2.44	0.84 / 0.25 R 9.00% 0.40 1.09 / 1.10	R+ 2.44	0.84 / 0.25 R 9.00% 0.40 1.09 / 1.10	23.56	37.2
2	2 ø20	9.52	0.82 9.15 9.00% 0.40	7.87	0.67 7.50 9.00% 0.40	17.39	42.9
3	2 ø32	7.64	0.65 7.27 9.00% 0.40	6.81	0.58 6.45 9.00% 0.40	14.45	91.2
4	2 ø32	5.94	0.50 5.58 9.00% 0.40	5.28	0.44 4.92 9.00% 0.40	11.22	70.8
5	2 ø32	4.60	0.38 / 0.02 4.25 9.00% 0.40	4.07	0.33 / 0.07 3.72 9.00% 0.40	8.67	54.7
11	2 ø16	Q	Q	Q	Q	16.92	26.7
22	2 ø8	Q-0.30	Q-0.30	Q-0.30	Q-0.30	16.32	6.4
24	56 ø8	1.85	0.14 / a / b / 0.22			12.23	44.3

	a(m)	b(m)	L(m)
EST. SUP	0.27	0.16	1.12
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	1.00	0.22	2.58

TOTAL 1 NERVIO 374.28

Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

Los medidas indicadas en los detalles de las barras de la armadura principal (1,2.....10) son de vértice a vértice, y del ramal largo, que este inclinado, su proyección hasta cortar. Al doblar las barras los vértices se curvaron de acuerdo con la Norma EH 91. Las longitudes La y Lb indicadas corresponden a "DESARROLLO REAL" de la barra (es la medida a tener en cuenta al cortar la barra) y, por consiguiente, su valor es inferior a la suma de las medidas parciales acotadas en el dibujo.

REFER	H.MED	P
01CW17	9.700	8.460
01CW18	9.700	8.460
01CW19	9.700	8.460
01CW20	9.700	8.460
01CW25	9.700	8.460

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		L(m)		LI(m)	P(kg)
26	1 ø10	2.71	0.34 0.80 / 0.48 / 0.15 / 1.14	2.71	1.7
27	72 ø8	1.13	1.13	81.48	32.2
28	4 ø6	P-0.30	P-0.30	32.64	7.2
31	37 ø8	1.14	1.14	42.08	16.6
32	4 ø6	P	P	33.84	7.5
36	ø6 / ø5	0.79 / 1.14	b=0.15 0.30 / 0.49	0.90m2	2.03

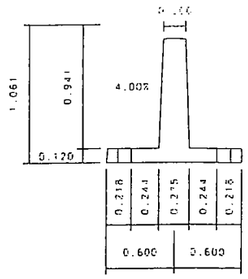
TOTAL 67.21

KILOS DE ACERO POR PIEZA

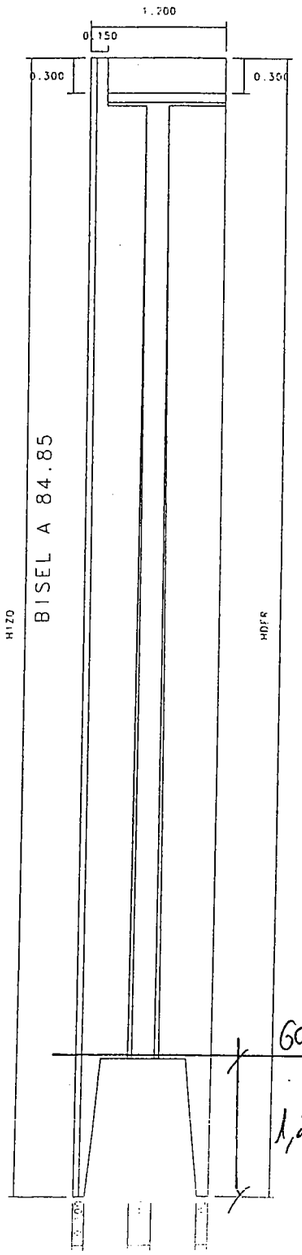
REFER	6	8	10	12	16	20	25	32	M2.CAB	BARRAS
01CW17	14.76	99.48	1.67	0.00	63.89	42.88	0.00	216.78	0.90	439.46
01CW18	14.76	99.48	1.67	0.00	63.89	42.88	0.00	216.78	0.90	439.46
01CW19	14.76	99.48	1.67	0.00	63.89	42.88	0.00	216.78	0.90	439.46
01CW20	14.76	99.48	1.67	0.00	63.89	42.88	0.00	216.78	0.90	439.46
01CW25	14.76	99.48	1.67	0.00	63.89	42.88	0.00	216.78	0.90	439.46

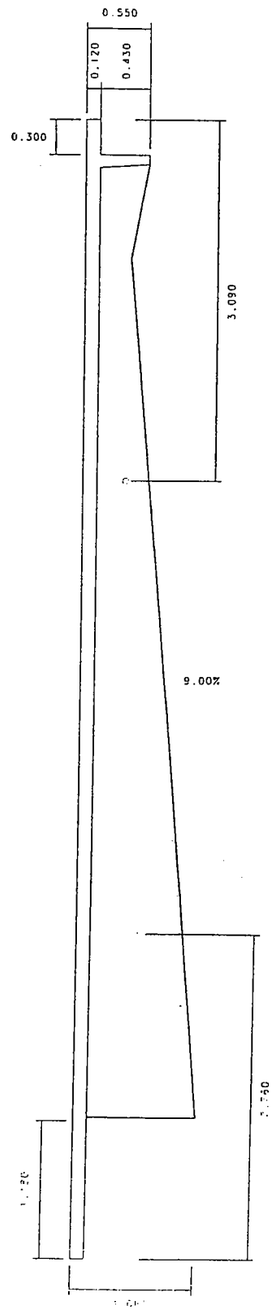
Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-2		
PERFIL	10118 1 4 15	PESO	10041
NUMERO DE PIEZAS	4	PESO PIEZA (T)	6.27
M3 HORMIGON	2.38	fck (Kp/cm2)	350
KG ACERO	441.43	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	12/9/20 Verduguillo	
MAMPOSTERIA CALIZA			



0,12 ... 1

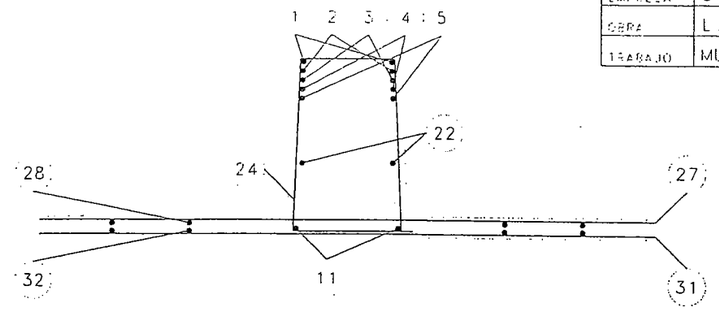




PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CW21	9.700	9.700	0.000	9.700
	01CW22	9.700	9.700	0.000	9.700
	01CW23	9.700	9.700	0.000	9.700
	01CW24	9.700	9.700	0.000	9.700

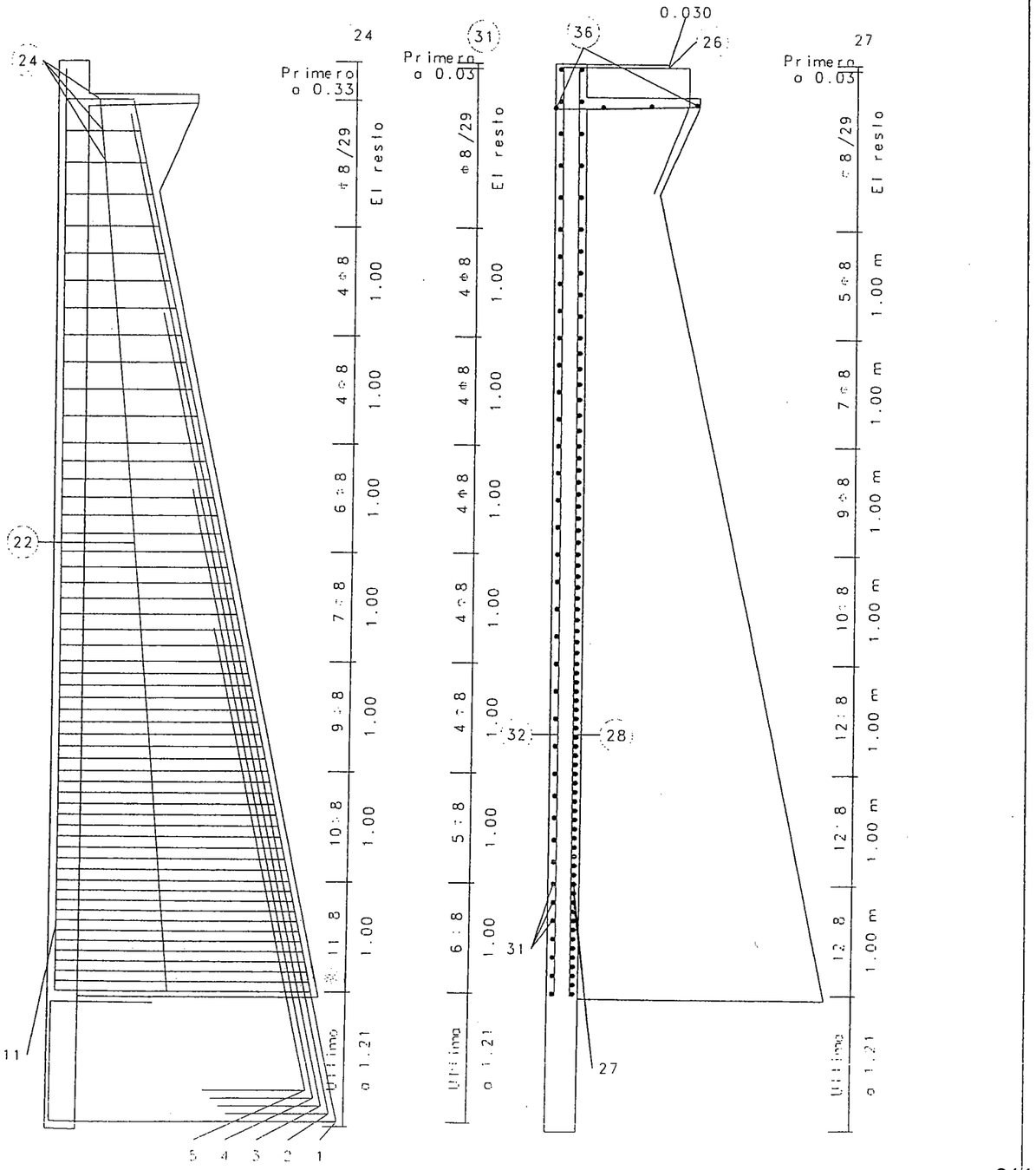
NORTEMPI
Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2



REFER	H.MED
01CW21	9.700
01CW22	9.700
01CW23	9.700
01CW24	9.700

NORTEMPI
Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495



REFER	_1	S	Q
01CW21	11.780	9.340	8.460
01CW22	11.780	9.340	8.460
01CW23	11.780	9.340	8.460
01CW24	11.780	9.340	8.460

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2:16	R+2.44	0.84 / 0.25 R 9.00% 0.40 1.09 / 1.10	R+2.44	0.84 / 0.25 R 9.00% 0.40 1.09 / 1.10	23.56	37.2
2	2:20	9.52	0.82 9.15 9.00% 0.40	7.87	0.67 7.50 9.00% 0.40	17.39	42.9
3	2:32	7.64	0.65 7.27 9.00% 0.40	6.81	0.58 6.45 9.00% 0.40	14.45	91.2
4	2:32	5.94	0.50 5.58 9.00% 0.40	5.28	0.44 4.92 9.00% 0.40	11.22	70.8
5	2:32	4.60	0.38 / 0.02 4.25 9.00% 0.40	4.07	0.33 / 0.07 3.72 9.00% 0.40	8.67	54.7
11	2:16	0	0	0	0	16.92	26.7
22	2:8	0-0.30	0-0.30	0-0.30	0-0.30	16.32	6.4
24	56:8	1.85	0.14 / a / b / 0.22			12.23	44.3

	a(m)	b(m)	L(m)
EST. SUP	0.27	0.16	1.12
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	1.00	0.22	2.58

TOTAL 1 NERVIO 374.28

Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

Las medidas indicadas en los dibujos de las barras de la armadura principal (1,2,...,10) son de vértice a vértice, y del ramal largo, que está inclinado, su proyección horizontal. Al doblar las barras los vértices se curvan de acuerdo con la Norma EH-91. Las longitudes L y la indicadas corresponden a DESARROLLO REAL de la barra (es la medida a tener en cuenta al cortar la barra) y, por consiguiente, su valor es superior a la suma de las medidas parciales acotadas en el dibujo.

REFER	H.MED	P
01CW21	9.700	8.460
01CW22	9.700	8.460
01CW23	9.700	8.460
01CW24	9.700	8.460

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		L(m)		LI(m)	P(kg)
26	1:10	2.71	0.34 0.80 / 0.48 / 0.15 / 1.14	2.71	1.7
27	73:8	1.13	1.13	82.61	32.6
28	4:6	P	P	33.84	7.5
31	37:8	1.14	1.14	42.08	16.6
32	4:6	P	P	33.84	7.5
36	:6 :5	0.49 1.14	b=0.15 / 0.49	0.56m2	1.26

TOTAL 67.15

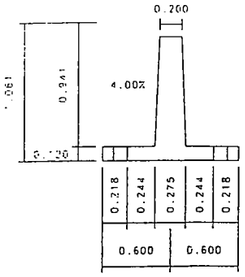
KILOS DE ACERO POR PIEZA

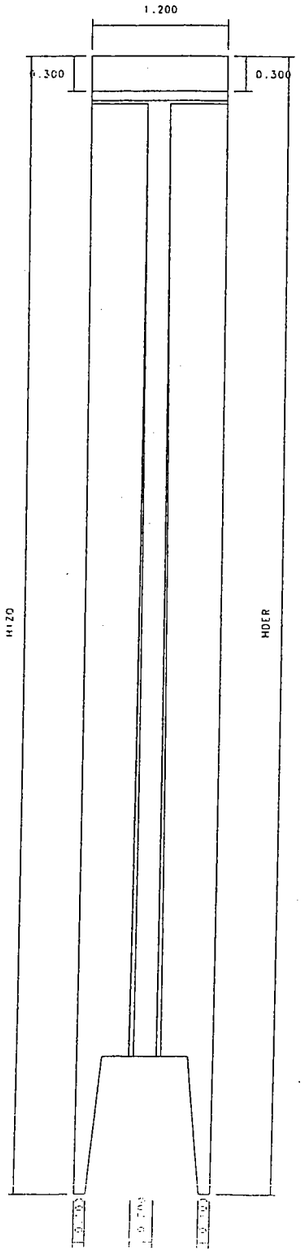
REFER	6	8	10	12	16	20	25	32	M2.CAB	BARRAS
01CW21	15.02	99.93	1.67	0.00	63.89	42.88	0.00	216.78	0.56	440.17
01CW22	15.02	99.93	1.67	0.00	63.89	42.88	0.00	216.78	0.56	440.17
01CW23	15.02	99.93	1.67	0.00	63.89	42.88	0.00	216.78	0.56	440.17
01CW24	15.02	99.93	1.67	0.00	63.89	42.88	0.00	216.78	0.56	440.17

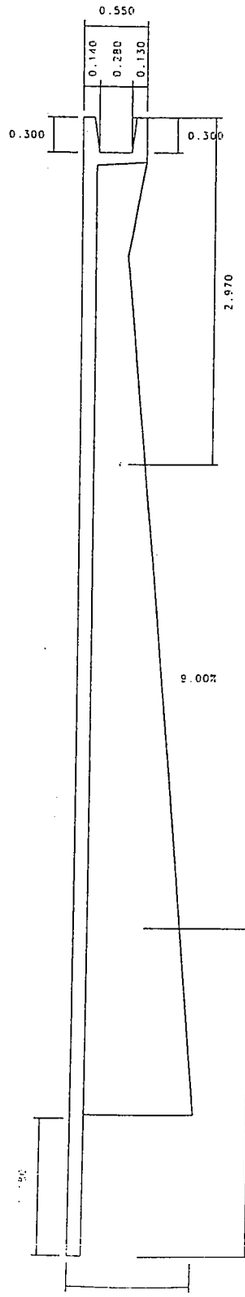
Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-2		
PERFIL	10118 1 4 16	PEDIDO	10041
NUMERO DE PIEZAS	7	PESO PIEZA (T)	6.24
M3 HORMIGON	2.42	fck (Kp/cm2)	350
KG ACERO	441.77	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	12/9/20 Verduguillo	
GOMA ESTANDAR EN JUNTAS			

PISTA	REFER	H.IZO	H.DER	D.ALT	H.MED
	01CW26	9.700	9.700	0.000	9.700
	01CW27	9.700	9.700	0.000	9.700
	01CW28	9.700	9.700	0.000	9.700
	01CW29	9.700	9.700	0.000	9.700
	01CW30	9.700	9.700	0.000	9.700
	01CW31	9.700	9.700	0.000	9.700
	01CW32	9.700	9.700	0.000	9.700

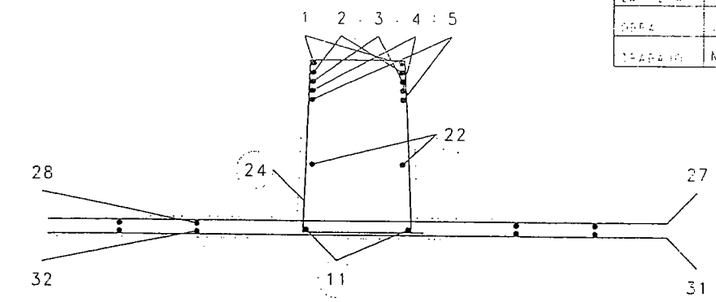






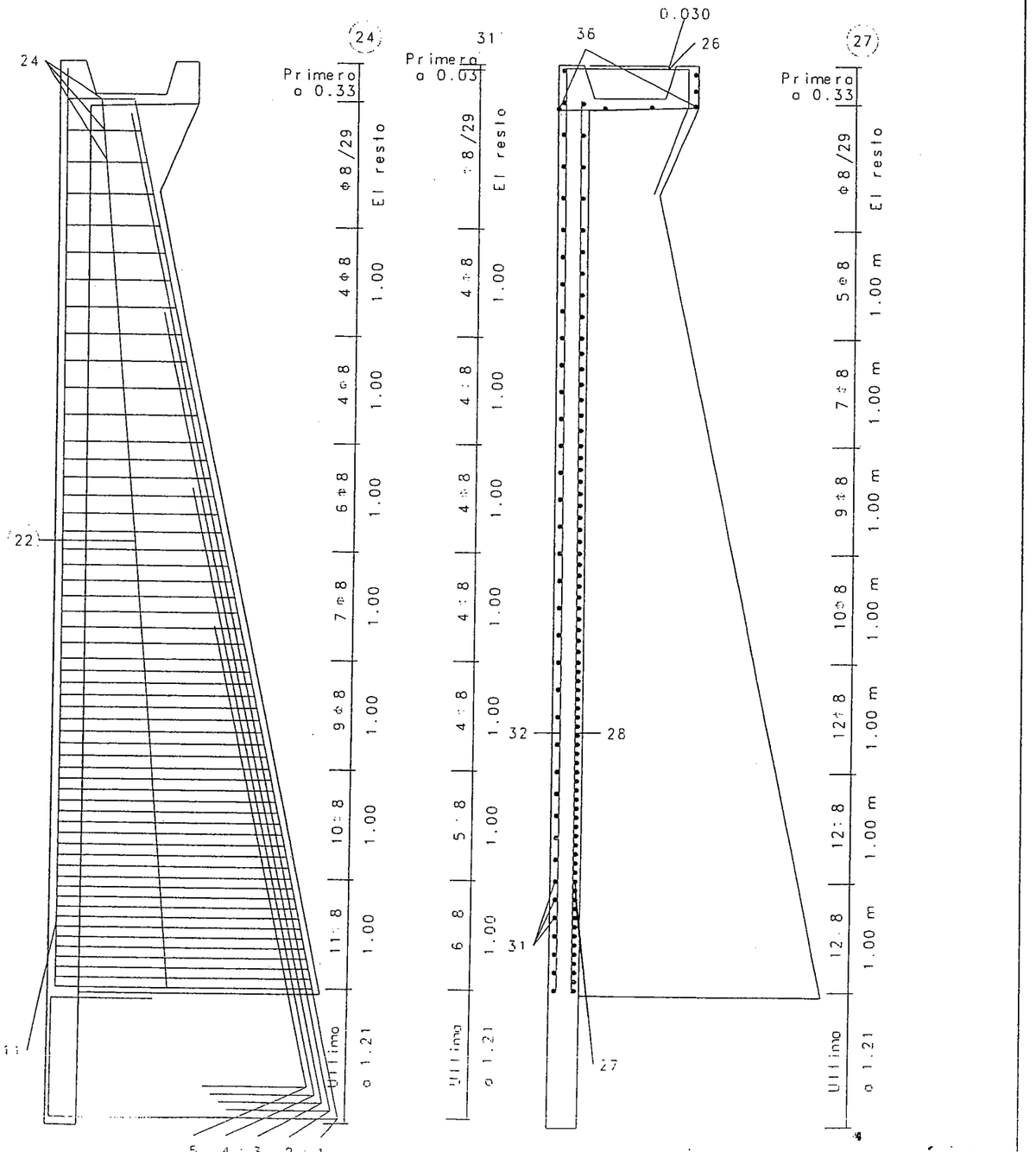
NORTENH
Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2



NORTENH
Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

REFER	H.MED
01CW26	9.700
01CW27	9.700
01CW28	9.700
01CW29	9.700
01CW30	9.700
01CW31	9.700
01CW32	9.700



REFER	L1	B	Q
01CW26	11.780	9.340	8.460
01CW27	11.780	9.340	8.460
01CW28	11.780	9.340	8.460
01CW29	11.780	9.340	8.460
01CW30	11.780	9.340	8.460
01CW31	11.780	9.340	8.460
01CW32	11.780	9.340	8.460

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

			La(m)	Barro (a)	Lb(m)	Barro (b)	LT(m)	P(kg)
1	2	16	R+ 2.44	0.84 R 0.25 9.00% 0.40 1.09 1.10	R+ 2.44	0.84 R 0.25 9.00% 0.40 1.09 1.10	23.56	37.2
2	2	20	9.52	0.82 9.15 9.00% 0.40	7.87	0.67 7.50 9.00% 0.40	17.39	42.9
3	2	32	7.64	0.65 7.27 9.00% 0.40	6.81	0.58 6.45 9.00% 0.40	14.45	91.2
4	2	32	5.94	0.50 5.58 9.00% 0.40	5.28	0.44 4.92 9.00% 0.40	11.22	70.8
5	2	32	4.60	0.38 4.25 0.02 9.00% 0.40	4.07	0.33 3.72 0.07 9.00% 0.40	8.67	54.7
11	2	16	Q	Q	Q	Q	16.92	26.7
22	2	8	Q-0.30	Q-0.30	Q-0.30	Q-0.30	16.32	6.4
24	56	8	1.85	0.14 a b 0.22			12.23	44.3

	a(m)	b(m)	L(m)
EST. SUP	0.27	0.16	1.12
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	1.00	0.22	2.58

TOTAL 1 NERVIO 374.28

Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegido n.º 16495

Los medidas indicadas en [illegible] de los barras de la armadura principal [illegible] son de ejes de barras o trazas, y en ramal largo, que éste inclinado, su proyección horizontal. A doblar los barras las aristas se curvan de acuerdo con la norma [illegible]. Las longitudes Lo y Lb indicadas corresponden a DESARROLLO REAL de la barra [illegible] medido a lo largo de su eje. En el corte o barra a [illegible] quiebre, su valor es inferior a la suma de las medidas [illegible] aristas, en [illegible] el cruce [illegible]

REFER	P MED.	P
01CW26	9.700	8.460
01CW27	9.700	8.460
01CW28	9.700	8.460
01CW29	9.700	8.460
01CW30	9.700	8.460
01CW31	9.700	8.460
01CW32	9.700	8.460

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

			L(m)		L1(m)	P(kg)
26	1	10	2.71	0.34 0.80 0.48 0.15 1.14	2.71	1.7
27	72	8	1.14	1.14	82.08	32.4
28	4	6	P-0.30	P-0.30	32.64	7.2
31	37	8	1.14	1.14	42.18	16.6
32	4	6	P	P	33.84	7.5
36	6	5	0.79 1.14	b=0.15 0.30 0.49	0.90m2	2.03

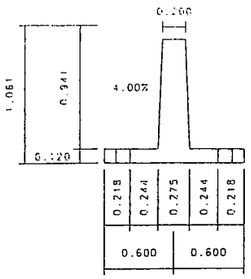
TOTAL 67.48

KILOS DE ACERO POR PIEZA

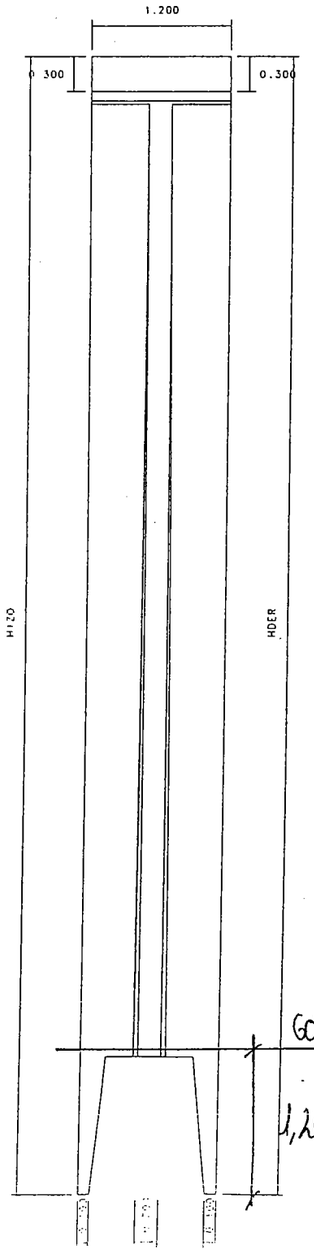
REFER	6	8	10	12	16	20	25	32	M2.CAB	BARRAS
01CW26	14.76	99.76	1.67	0.00	63.89	42.88	0.00	216.78	0.90	439.74
01CW27	14.76	99.76	1.67	0.00	63.89	42.88	0.00	216.78	0.90	439.74
01CW28	14.76	99.76	1.67	0.00	63.89	42.88	0.00	216.78	0.90	439.74
01CW29	14.76	99.76	1.67	0.00	63.89	42.88	0.00	216.78	0.90	439.74
01CW30	14.76	99.76	1.67	0.00	63.89	42.88	0.00	216.78	0.90	439.74
01CW31	14.76	99.76	1.67	0.00	63.89	42.88	0.00	216.78	0.90	439.74
01CW32	14.76	99.76	1.67	0.00	63.89	42.88	0.00	216.78	0.90	439.74

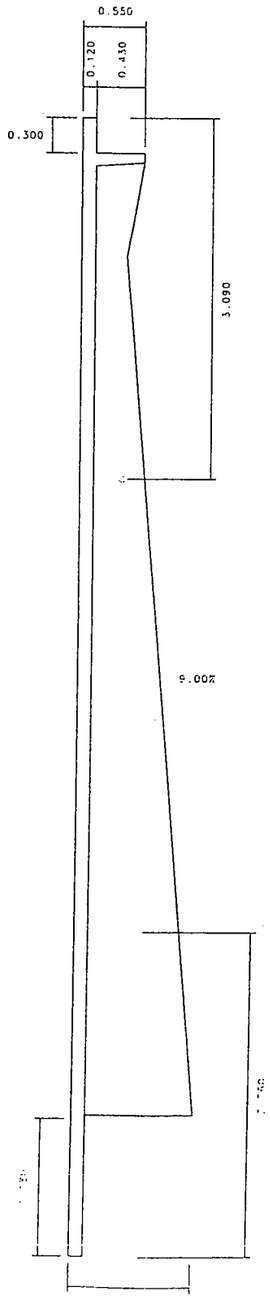
Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegido n.º 16495

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-2		
PERFIL	10118 1 4 17	PEDIDO	10041
NUMERO DE PIEZAS	3	PESO PIEZA (T)	6.27
M3 HORMIGON	2.38	fck (Kp/cm2)	350
KG ACERO	441.71	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	12/9/20 Verduguillo	
MAMPOSTERIA CALIZA			



PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CW33	9.700	9.700	0.000	9.700
	01CW34	9.700	9.700	0.000	9.700
	01CW35	9.700	9.700	0.000	9.700



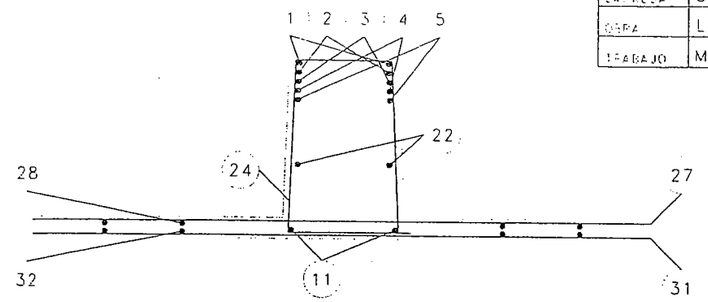


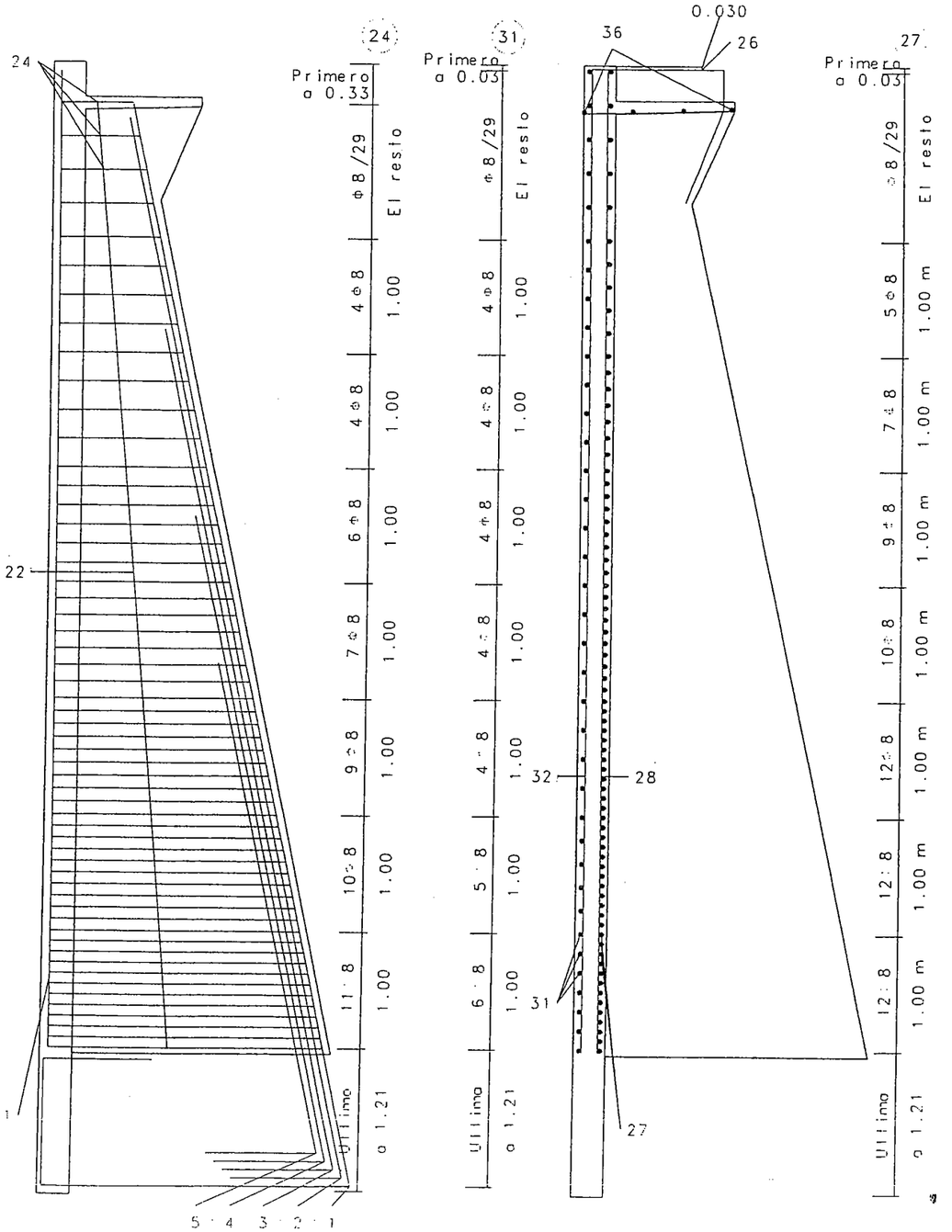
NORTENPH
Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

REFER	H.MED
01CW33	9.700
01CW34	9.700
01CW35	9.700

NORTENPH
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REFER	L1	R	O
01CW33	11.780	9.340	8.460
01CW34	11.780	9.340	8.460
01CW35	11.780	9.340	8.460

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2⌀16	R+ 2.44	0.84 R 0.25 9.00% 0.40 1.09 1.10	R+ 2.44	0.84 R 0.25 9.00% 0.40 1.09 1.10	23.56	37.2
2	2⌀20	9.52	0.82 9.15 9.00% 0.40	7.87	0.67 7.50 9.00% 0.40	17.39	42.9
3	2⌀32	7.64	0.65 7.27 9.00% 0.40	6.81	0.58 6.45 9.00% 0.40	14.45	91.2
4	2⌀32	5.94	0.50 5.58 9.00% 0.40	5.28	0.44 4.92 9.00% 0.40	11.22	70.8
5	2⌀32	4.60	0.38 4.25 0.02 9.00% 0.40	4.07	0.33 3.72 0.07 9.00% 0.40	8.67	54.7
11	2⌀16	O	O	O	O	16.92	26.7
22	2⌀8	O-0.30	O-0.30	O-0.30	O-0.30	16.32	6.4
24	56⌀8	1.85	0.14 a b 0.22			12.23	44.3

	a(m)	b(m)	L(m)
EST. SUP	0.27	0.16	1.12
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	1.00	0.22	2.58

TOTAL 1 NERVIO 374.28

Director Técnico
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Colegiado n.º 16495

Las medidas indicadas en los dibujos de las barras de la armadura principal (1,2.....10) son de vértice a vértice, y del ramal largo, que está inclinado. su proyección horizontal. Al doblar las barras los vértices se curvarán de acuerdo con la Norma EH 91. Las longitudes La y Lb indicadas corresponden a DESARROLLO REAL de la barra, y está a emplear a tener en cuenta al cortar la barra, y, por consiguiente, su valor es inferior a la suma de las medidas parciales acotadas en el dibujo.
En la tabla de despiece se da el peso en kg.

REFER	P.MED	P
01CW33	9.700	8.460
01CW34	9.700	8.460
01CW35	9.700	8.460

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		L(m)		L1(m)	P(kg)
26	1⌀10	2.71	0.34 0.80 0.48 0.15 1.14	2.71	1.7
27	73⌀8	1.14	1.14	83.22	32.8
28	4⌀6	P	P	33.84	7.5
31	37⌀8	1.14	1.14	42.18	16.6
32	4⌀6	P	P	33.84	7.5
36	⌀6 ⌀5	0.49 1.14	b=0.15 0.49	0.56m2	1.26

TOTAL 67.43

KILOS DE ACERO POR PIEZA

REFER	6	8	10	12	16	20	25	32	M2.CAB	BARRAS
01CW33	15.02	100.21	1.67	0.00	63.89	42.88	0.00	216.78	0.56	440.45
01CW34	15.02	100.21	1.67	0.00	63.89	42.88	0.00	216.78	0.56	440.45
01CW35	15.02	100.21	1.67	0.00	63.89	42.88	0.00	216.78	0.56	440.45

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Colegiado n.º 16495

11/01/01 17:09 3. DESPIECE DE LA ARMADURA DEL MURO PL 12602

REFER	L1	R	Q
01CW36	11.780	9.340	8.460
01CW45	11.780	9.340	8.460
01CW46	11.780	9.340	8.460

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

			La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2	16	R+ 2.44	0.84 R 1.09 / 0.25 9.00% 0.40 / 1.10	R+ 2.44	0.84 R 1.09 / 0.25 9.00% 0.40 / 1.10	23.56	37.2
2	2	20	9.52	0.82 9.15 0.40 / 9.00%	7.87	0.67 7.50 0.40 / 9.00%	17.39	42.9
3	2	32	7.64	0.65 7.27 0.40 / 9.00%	6.81	0.58 6.45 0.40 / 9.00%	14.45	91.2
4	2	ø32	5.94	0.50 5.58 0.40 / 9.00%	5.28	0.44 4.92 0.40 / 9.00%	11.22	70.8
5	2	ø32	4.60	0.38 4.25 0.40 / 0.02 9.00%	4.07	0.33 3.72 0.40 / 0.07 9.00%	8.67	54.7
11	2	ø16	Q	Q	Q	Q	16.92	26.7
22	2	ø8	Q-0.30	Q-0.30	Q-0.30	Q-0.30	16.32	6.4
24	56	ø8	1.85	0.14 / a / b / 0.22			12.23	44.3

	a(m)	b(m)	L(m)
EST. SUP	0.27	0.16	1.12
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	1.00	0.22	2.58

TOTAL 1 NERVIO 374.28

NORTENH
Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

Las medidas indicadas en los dibujos de las barras de la armadura principal (1,2.....10) son: de vértice a vértice, y del normal longe, que esta inclinado, su proyección horizontal. A doblar en barras los vértices se curvaran de acuerdo con la Norma EH-91. Las longitudes La y Lb indicadas corresponden a DESARROLLO REAL de la barra: es preciso tener en cuenta al cortar la barra) y, por consiguiente, su valor es inferior a la suma de las medidas parciales acotadas en el dibujo.
La longitud [illegible]

11/01/01 17:09 4. DESPIECE DE LA ARMADURA DEL ALA Y MEDICION PL 12

REFER	P.MED	P
01CW36	9.700	8.460
01CW45	9.700	8.460
01CW46	9.700	8.460

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

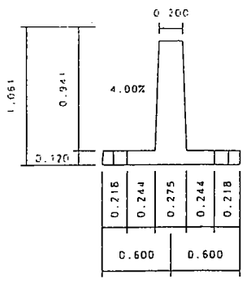
			L(m)		LI(m)	P(kg)
26	1	ø10	2.71	0.34 0.80 / 0.48 0.15 / 1.14	2.71	1.7
27	73	ø8	1.13	1.13	82.61	32.6
28	4	ø6	P	P	33.84	7.5
31	37	ø8	1.14	1.14	42.08	16.6
32	4	ø6	P	P	33.84	7.5
36		ø6	0.49	b=0.15 / 0.49	0.56m2	1.26
		ø5	1.14			

TOTAL 67.15

KILOS DE ACERO POR PIEZA

REFER	6	8	10	12	16	20	25	32	M2.CAB	BARRAS
01CW36	15.02	99.93	1.67	0.00	63.89	42.88	0.00	216.78	0.56	440.17
01CW45	15.02	99.93	1.67	0.00	63.89	42.88	0.00	216.78	0.56	440.17
01CW46	15.02	99.93	1.67	0.00	63.89	42.88	0.00	216.78	0.56	440.17

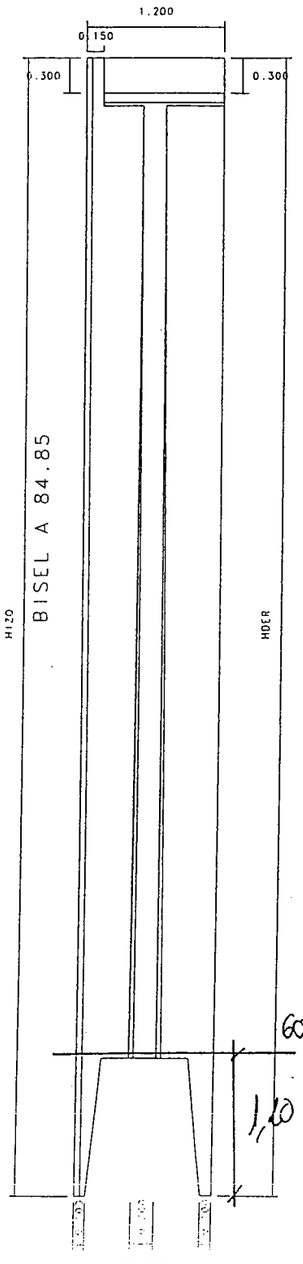
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Colegiado n.º 16495

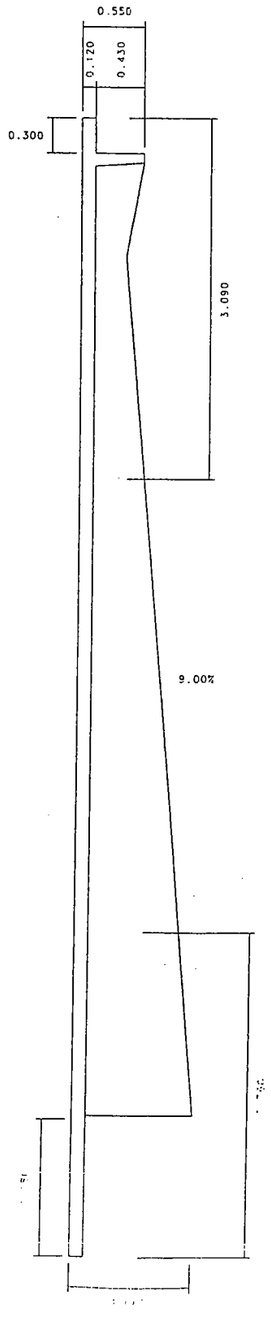


EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-2		
PERFIL	10118 1 4 18	PEDIDO	10041
NUMERO DE PIEZAS	3	PESO PIEZA (T)	6.27
M3 HORMIGON	2.38	fck (Kp/cm2)	350
KG ACERO	441.43	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	12/9/20 Verduguillo	
MAMPOSTERIA CALIZA			

PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CW36	9.700	9.700	0.000	9.700
	01CW45	9.700	9.700	0.000	9.700
	01CW46	9.700	9.700	0.000	9.700

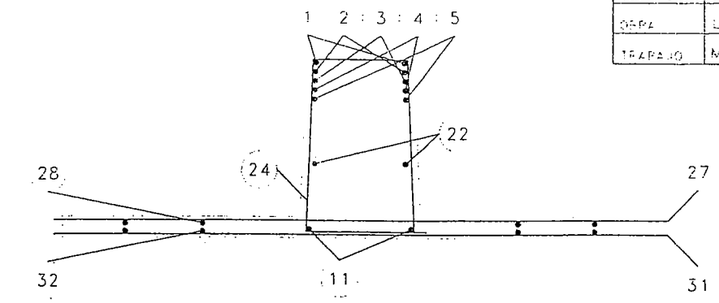
0,02
0,12





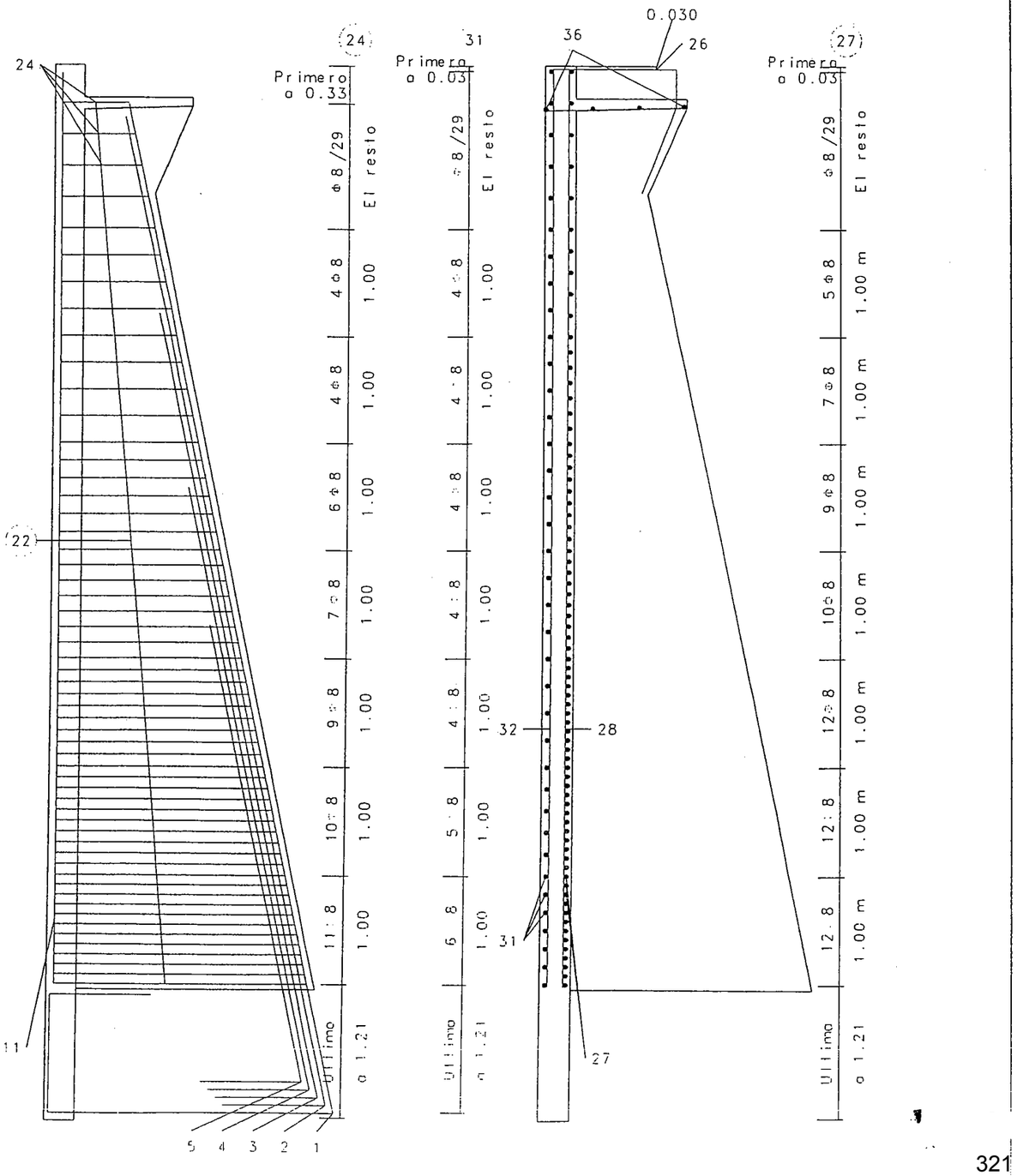
NORTEN(PH)
Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

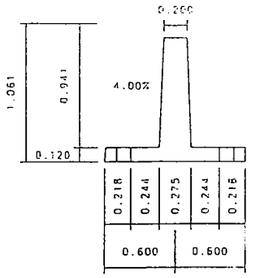


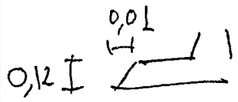
REFER	H.MED
01CW36	9.700
01CW45	9.700
01CW46	9.700

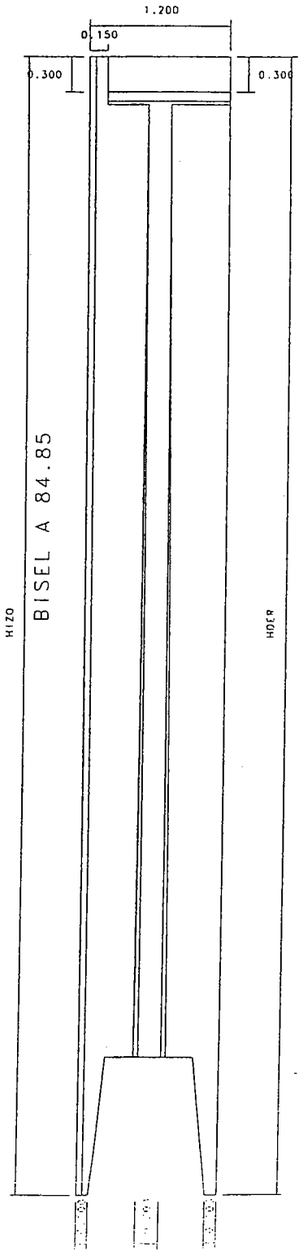
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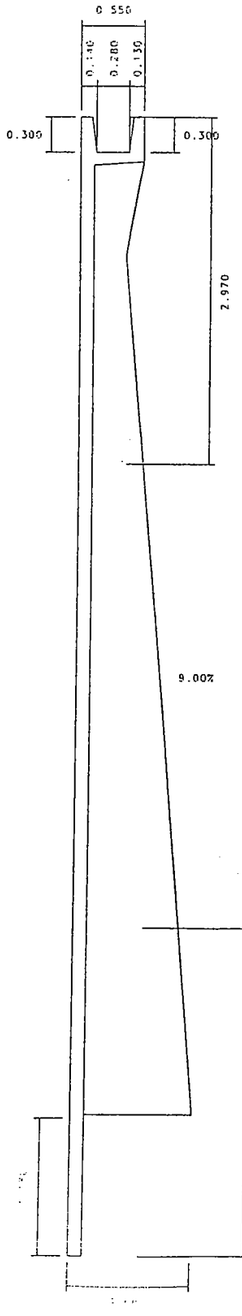


EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-2		
PERFIL	10118 1 4 19	PEDIDO	10041
NUMERO DE PIEZAS	8	PESO PIEZA (T)	6.24
M3 HORMIGON	2.42	fck (Kp/cm2)	350
KG ACERO	441.49	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	12/9/20 Verduguillo	
GOMA ESTANDAR EN JUNTAS			





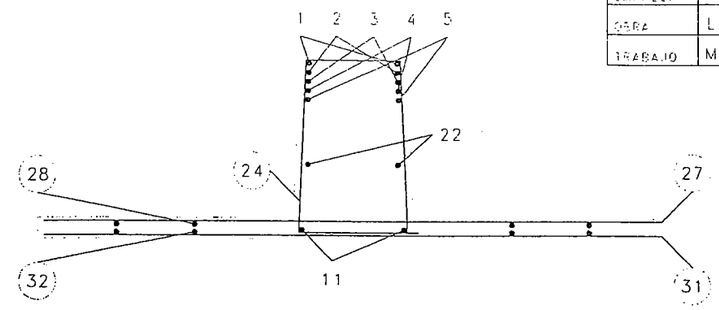




PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CW37	9.700	9.700	0.000	9.700
	01CW38	9.700	9.700	0.000	9.700
	01CW39	9.700	9.700	0.000	9.700
	01CW40	9.700	9.700	0.000	9.700
	01CW41	9.700	9.700	0.000	9.700
	01CW42	9.700	9.700	0.000	9.700
	01CW43	9.700	9.700	0.000	9.700
	01CW44	9.700	9.700	0.000	9.700

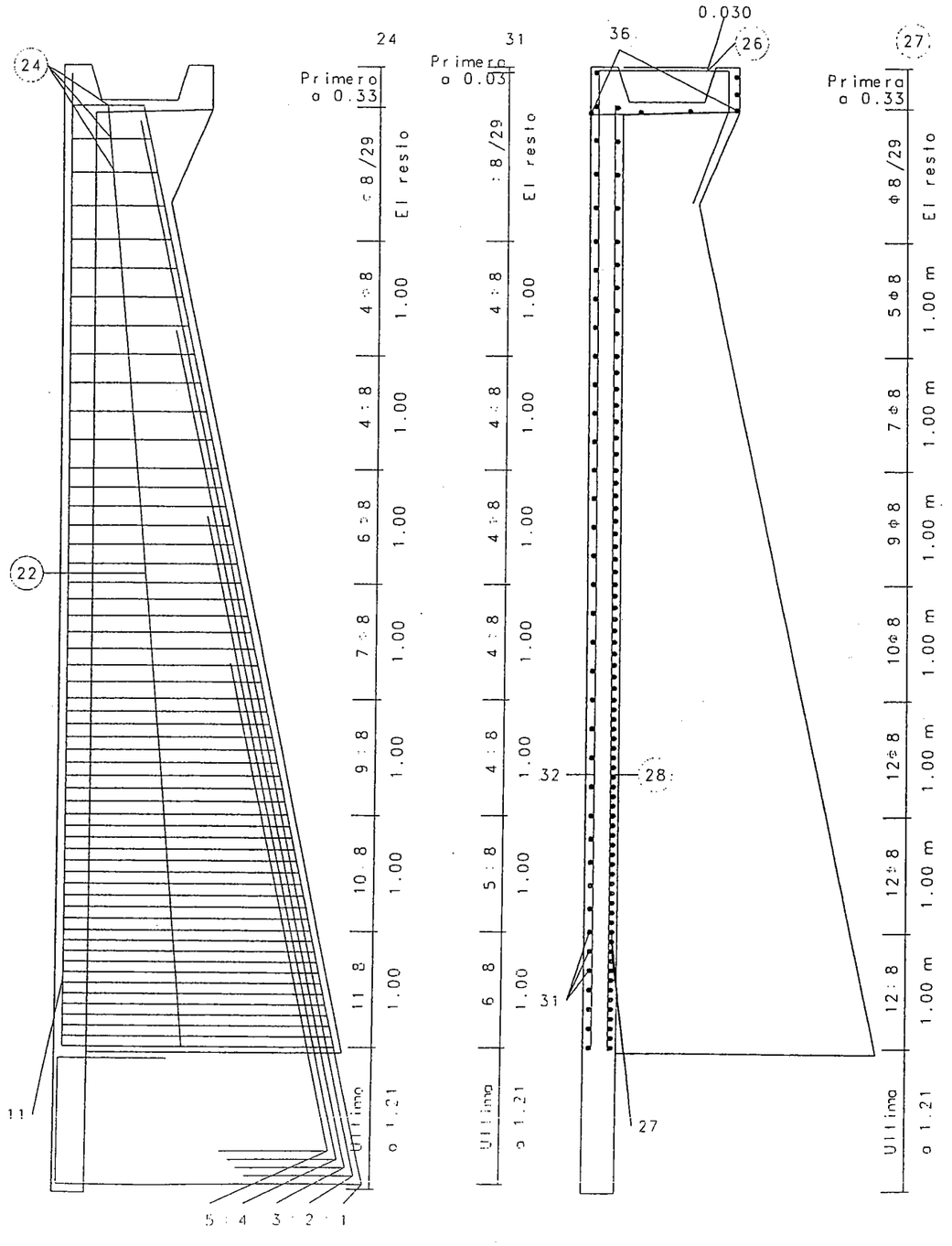
NORTEN PH
Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2



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Colegiado n.º 16495

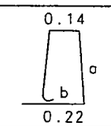
REFER	H.MED
01CW37	9.700
01CW38	9.700
01CW39	9.700
01CW40	9.700
01CW41	9.700
01CW42	9.700
01CW43	9.700
01CW44	9.700



REFER	L1	P	Q
01CW37	11.780	9.340	8.460
01CW38	11.780	9.340	8.460
01CW39	11.780	9.340	8.460
01CW40	11.780	9.340	8.460
01CW41	11.780	9.340	8.460
01CW42	11.780	9.340	8.460
01CW43	11.780	9.340	8.460
01CW44	11.780	9.340	8.460

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		Lo(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2:16	R+2.44	0.84 / 0.25 — R — 9.00% 0.40 — 1.09 / 1.10	R+2.44	0.84 / 0.25 — R — 9.00% 0.40 — 1.09 / 1.10	23.56	37.2
2	2:20	9.52	0.82 — 9.15 — 9.00% — 0.40	7.87	0.67 — 7.50 — 9.00% — 0.40	17.39	42.9
3	2:32	7.64	0.65 — 7.27 — 9.00% — 0.40	6.81	0.58 — 6.45 — 9.00% — 0.40	14.45	91.2
4	2:32	5.94	0.50 — 5.58 — 9.00% — 0.40	5.28	0.44 — 4.92 — 9.00% — 0.40	11.22	70.8
5	2:32	4.60	0.38 / 0.02 — 4.25 — 9.00% — 0.40	4.07	0.33 / 0.07 — 3.72 — 9.00% — 0.40	8.67	54.7
11	2:16	Q	Q	Q	Q	16.92	26.7
22	2:8	Q-0.30	Q-0.30	Q-0.30	Q-0.30	16.32	6.4
24	56:8	1.85				12.23	44.3



	a(m)	b(m)	L(m)
EST. SUP	0.27	0.16	1.12
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	1.00	0.22	2.58

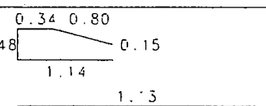
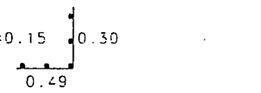
TOTAL 1 NERVIO 374.28

NORTEN PH
Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

Las medidas indicadas en los dibujos de las barras de la armadura principal [illegible] son las de vértice a vértice, y del ramal largo, que está inclinado, su proyección horizontal. Al doblar las barras los vértices se curvan de acuerdo con la Norma EH 91. Las longitudes Lo y Lb indicadas corresponden a DESARROLLO REAL de la barra y es la medida a tener en cuenta al cortar la barra y, por consiguiente, su valor es inferior a la suma de las medidas parciales acotadas en el dibujo.
[illegible] se tiene en cuenta [illegible]

REFER	P.MED	P
01CW37	9.700	8.460
01CW38	9.700	8.460
01CW39	9.700	8.460
01CW40	9.700	8.460
01CW41	9.700	8.460
01CW42	9.700	8.460
01CW43	9.700	8.460
01CW44	9.700	8.460

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

			L(m)		L1(m)	P(kg)
26	1 @ 10		2.71		2.71	1.7
27	72 @ 8		1.13	1.13	81.48	32.2
28	4 @ 6		P-0.30	P-0.30	32.64	7.2
31	37 @ 8		1.14	1.14	42.08	16.6
32	4 @ 6		P	P	33.84	7.5
36	@6 @5		0.79 1.14		0.90m2	2.03

TOTAL 67.21

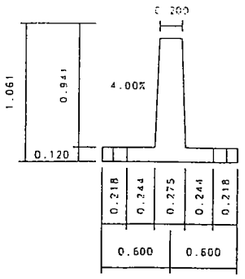
KILOS DE ACERO POR PIEZA

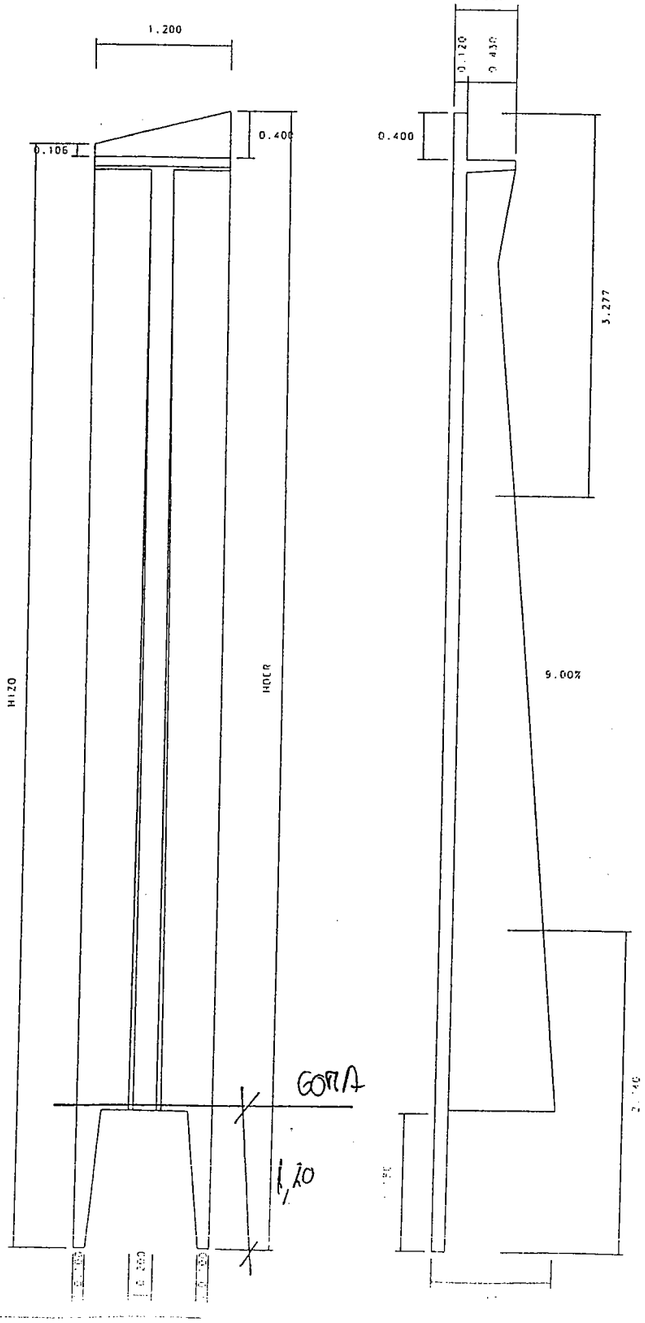
REFER	6	8	10	12	16	20	25	32	M2.CAB	BARRAS
01CW37	14.76	99.48	1.67	0.00	63.89	42.88	0.00	216.78	0.90	439.46
01CW38	14.76	99.48	1.67	0.00	63.89	42.88	0.00	216.78	0.90	439.46
01CW39	14.76	99.48	1.67	0.00	63.89	42.88	0.00	216.78	0.90	439.46
01CW40	14.76	99.48	1.67	0.00	63.89	42.88	0.00	216.78	0.90	439.46
01CW41	14.76	99.48	1.67	0.00	63.89	42.88	0.00	216.78	0.90	439.46
01CW42	14.76	99.48	1.67	0.00	63.89	42.88	0.00	216.78	0.90	439.46
01CW43	14.76	99.48	1.67	0.00	63.89	42.88	0.00	216.78	0.90	439.46
01CW44	14.76	99.48	1.67	0.00	63.89	42.88	0.00	216.78	0.90	439.46

NORTEN PH
Director Técnico
NEKANE MUNDUATE AUZMENDI
Ingeniero de Caminos
Colegiado n.º 16495

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-2		
PERFIL	10118 1 4 20	PEDIDO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	6.12
M3 HORMIGON	2.33	fck (Kp/cm2)	350
KG ACERO	419.44	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	12/9/20 Verduguillo	
MAMPOSTERIA CALIZA			

PISTA	REFER	H.IZO	H.DER	D.ALT	H.MED
	01CW43	9.406	9.700	0.294	9.553

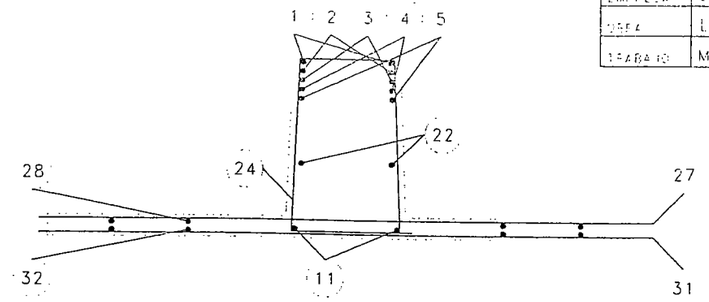




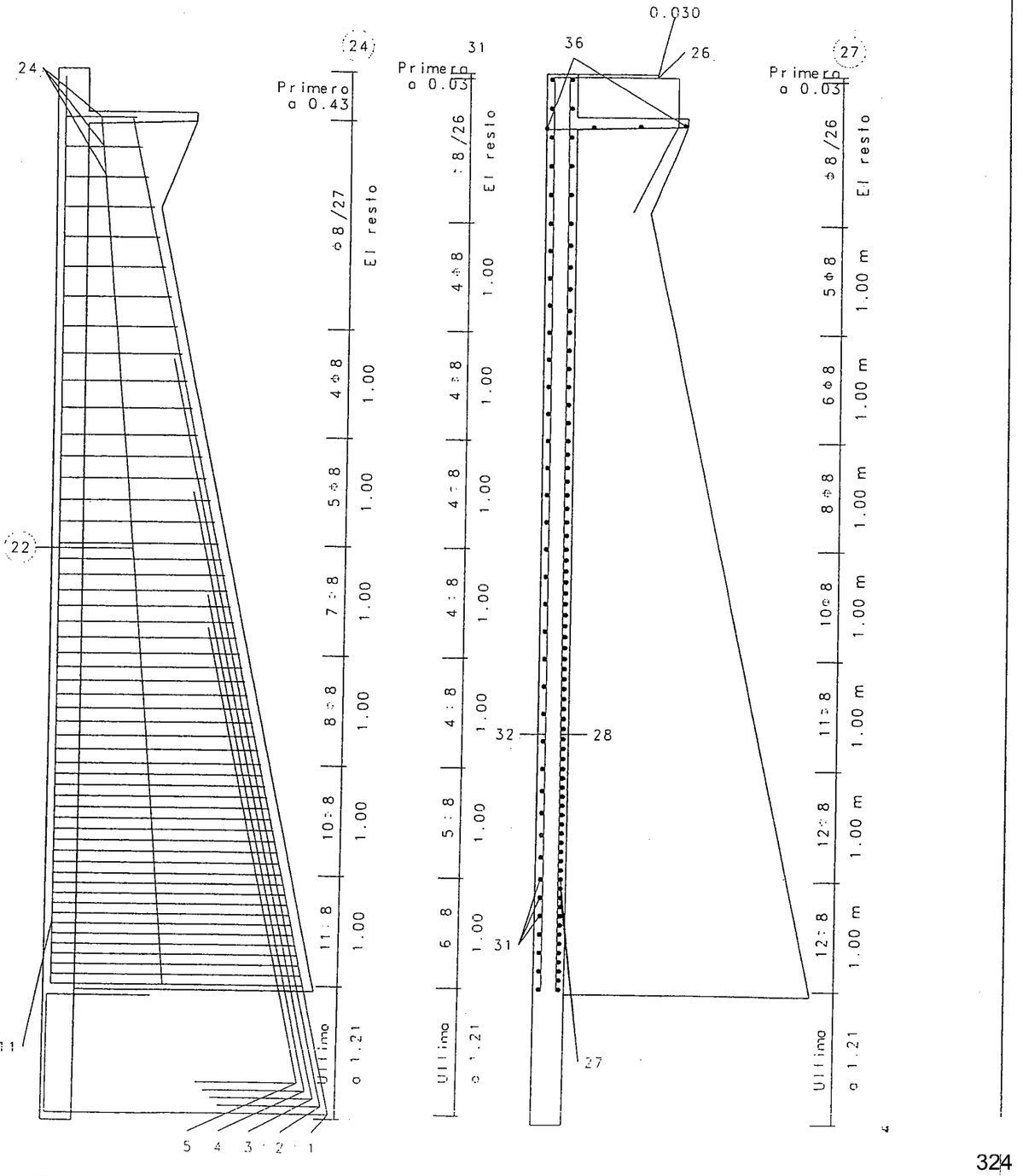
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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

REFER	H.MED
01CW43	9.553



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REFER	L1	R	Q
01CW47	1.661	9.240	8.313

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2⌀25	R+ 2.42	0.83 R 1.08 / 0.25 9.00% 0.40 1.10	R+ 2.42	0.83 R 1.08 / 0.25 9.00% 0.40 1.10	23.32	89.9
2	2⌀25	7.31	0.62 6.95 0.40 / 9.00%	6.66	0.56 6.30 0.40 / 9.00%	13.97	53.8
3	2⌀25	6.00	0.50 5.64 0.40 / 9.00%	5.48	0.46 5.13 0.40 / 9.00%	11.48	44.2
4	2⌀25	4.97	0.41 4.62 0.40 / 9.00%	4.53	0.37 4.18 0.40 / 0.03 9.00%	9.50	36.6
5	2⌀32	4.59	0.38 4.24 0.40 / 0.02 9.00%	4.06	0.33 3.71 0.40 / 0.07 9.00%	8.65	54.6
11	2⌀16	Q	Q	0	Q	16.63	26.2
22	2⌀8	Q-0.25	Q-0.25	Q-0.25	Q-0.25	16.12	6.4
24	53⌀8	1.86	0.14 / a / b / 0.22			105.81	41.7

	a(m)	b(m)	L(m)
EST. SUP	0.28	0.16	1.14
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	1.00	0.22	2.58

TOTAL 1 NERVIO 353.50

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Los medidas indicadas en los dibujos de las barras de la armadura principal (1,2.....10) son: de vértice a vértice, y del ramal largo, que está inclinado, su proyección horizontal. Al doblar las barras los vértices se curvaron de acuerdo con la Norma EH 91. Las longitudes Lo y Lb indicadas corresponden a DESARROLLO REAL de la barra; es decir a medida a tener en cuenta al cortar la barra) y por consiguiente, su valor es inferior a la suma de las medidas parciales señaladas en el dibujo.
La longitud L es el desarrollo de la generatriz de la

REFER	P.MED	P
01CW47	9.553	8.313

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		L(m)		L1(m)	P(kg)
26	1 ⌀10	2.91	0.44 0.80 / 0.48 0.14 / 1.24	2.91	1.8
27	70 ⌀8	1.14	1.14	79.80	31.5
28	4 ⌀6	P	P	33.25	7.4
31	37 ⌀8	1.14	1.14	42.18	16.6
32	4 ⌀6	P	P	33.25	7.4
36	⌀6 ⌀5	0.49 1.14	b=0.15 / 0.49	0.56m2	1.26

TOTAL 65.94

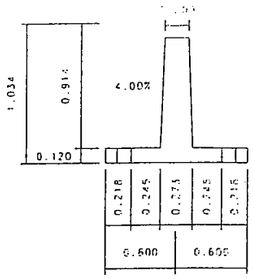
KILOS DE ACERO POR PIEZA

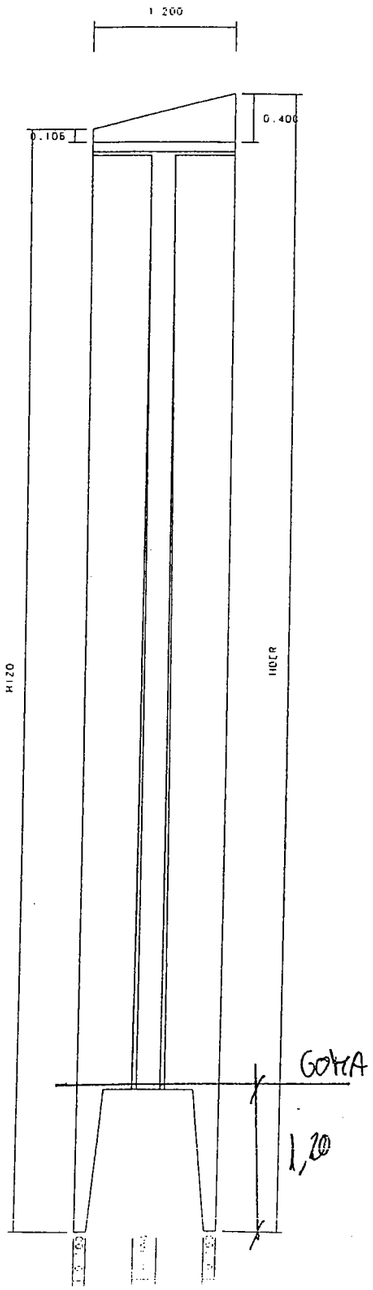
REFER	6	8	10	12	16	20	25	32	M2.CAB	BARRAS
01CW47	14.76	96.24	1.79	0.00	26.24	0.00	224.56	54.59	0.56	418.18

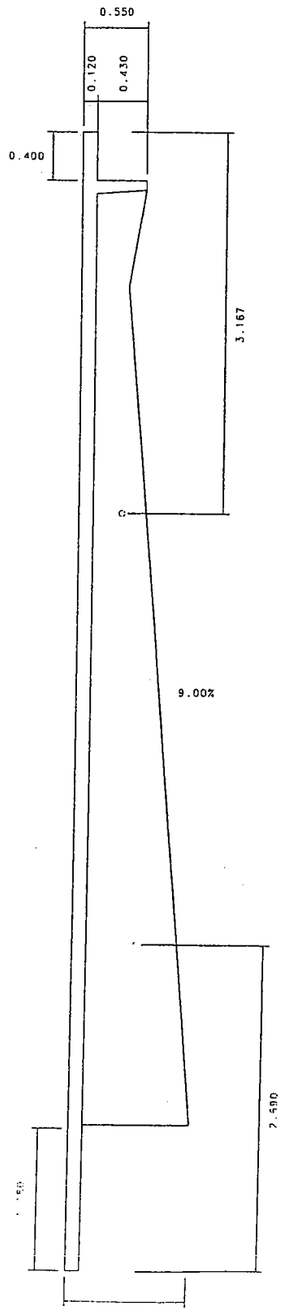
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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-2		
PERFIL	10118 1 4 21	PEDIDO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	5.84
M3 HORMIGON	2.22	fck (Kp/cm2)	350
KG ACERO	396.63	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	12/9/20 Verduguillo	
MAMPOSTERIA CALIZA			

PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CW48	9.112	9.406	0.294	9.259



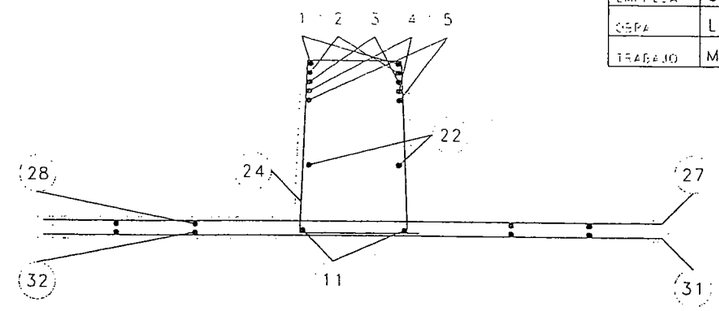




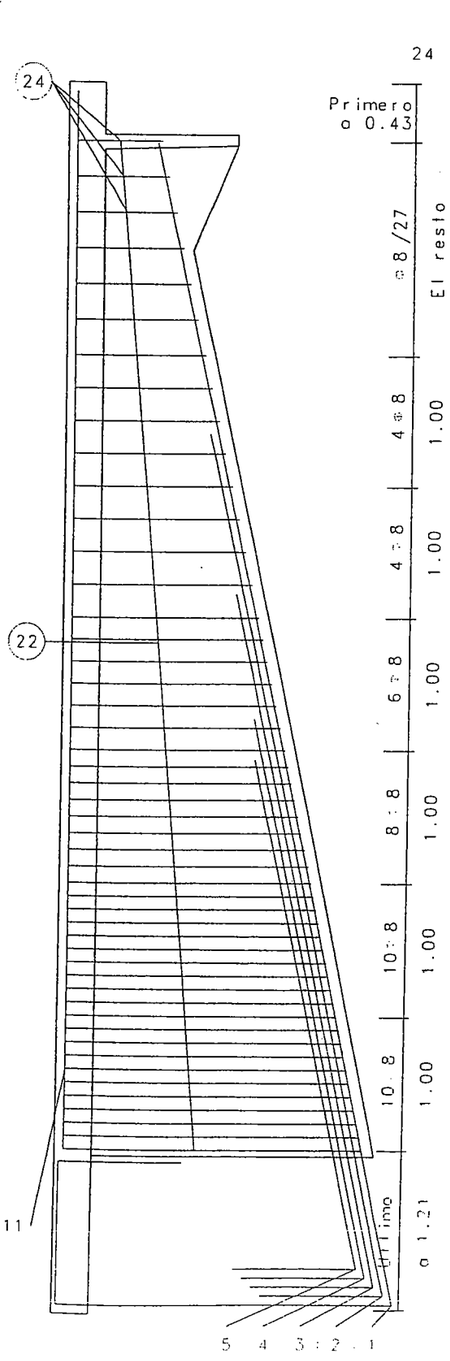
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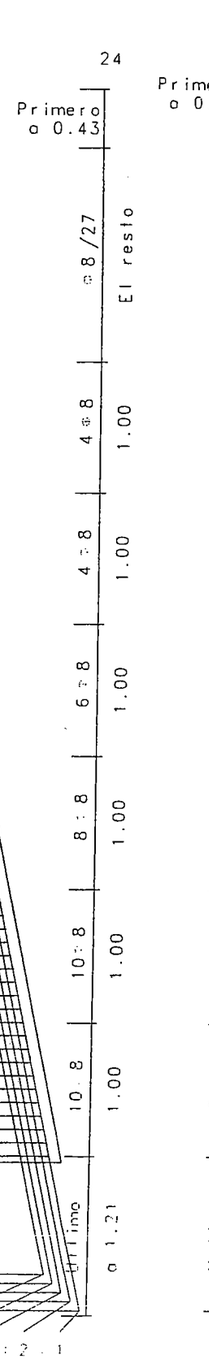
EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-2		

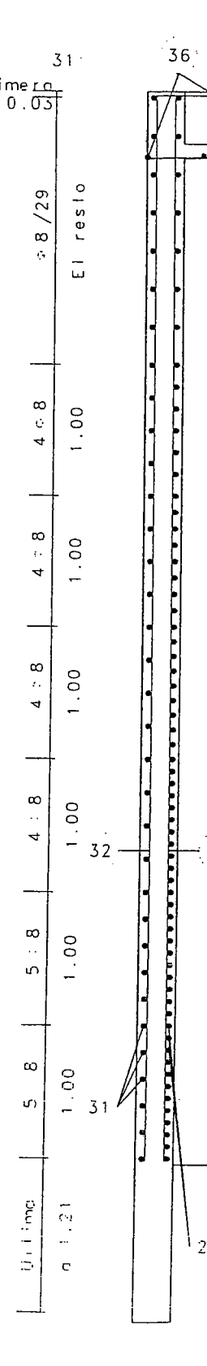
REFER	H.MED
01CW48	9.259

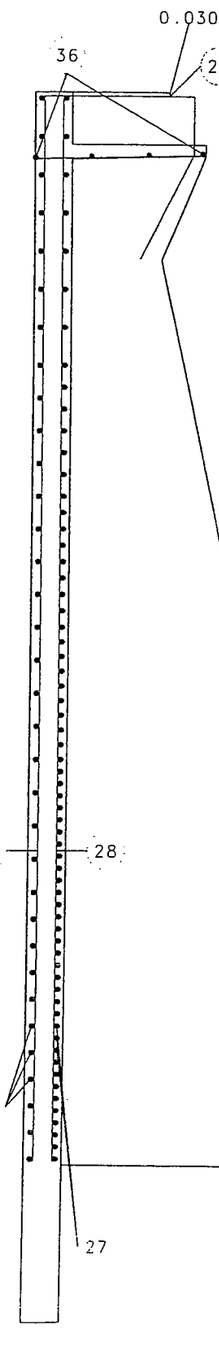


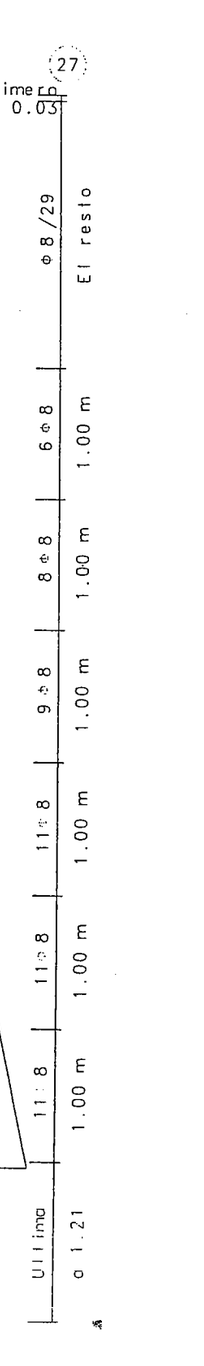
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REFER	L1	R	S
01CW48	11.340	8.948	8.019

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2:25	R+ 2.39	0.80 R 0.25 9.00% 0.40 1.05 1.10	R+ 2.39	0.80 R 0.25 9.00% 0.40 1.05 1.10	22.68	87.4
2	2:25	7.01	0.59 6.65 9.00% 0.40	6.36	0.53 6.00 9.00% 0.40	13.37	51.5
3	2:25	5.70	0.48 5.34 9.00% 0.40	5.18	0.43 4.83 9.00% 0.40	10.88	41.9
4	2:25	4.67	0.38 4.32 9.00% 0.40	4.23	0.34 3.88 9.00% 0.40	8.90	34.3
5	2:32	4.29	0.35 3.94 9.00% 0.40	3.76	0.30 3.41 9.00% 0.40	8.05	50.8
11	2:16	Q	Q	Q	Q	16.04	25.3
22	2:8	Q-0.25	Q-0.25	Q-0.25	Q-0.25	15.53	6.1
24	49:8	1.83	0.14 a b 0.22			95.92	37.8

	a(m)	b(m)	L(m)
EST. SUP	0.28	0.16	1.14
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	0.97	0.22	2.52

TOTAL 1 NERVIO 335.27

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Las medidas indicadas en los dibujos de las barras de la armadura principal (L1, L2, ...) son de vértice a vértice, y del ramal largo, que está incluido su proyección horizontal. Al doblar las barras los vértices se curvan de acuerdo con la Norma EH 91. Las longitudes Lo y Lb indicadas corresponden al DESARROLLO REAL de la barra (es lo medido a tener en cuenta al cortar la barra) y, por consiguiente, su valor es inferior a la suma de los ramales de barra dibujados en el cuadro.

REFER	E.MED	P
01CW48	9.259	8.019

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		L(m)		LT(m)	P(kg)
26	1:10	2.91	0.44 0.80 0.48 0.14 1.24	2.91	1.8
27	64:8	1.14	1.14	72.96	28.8
28	4:6	P	P	32.08	7.1
31	34:8	1.14	1.14	38.76	15.3
32	4:6	P	P	32.08	7.1
36	:6 :5	0.49 1.14	b=0.15 0.49	0.56m2	1.26

TOTAL 61.37

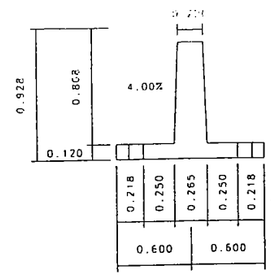
KILOS DE ACERO POR PIEZA

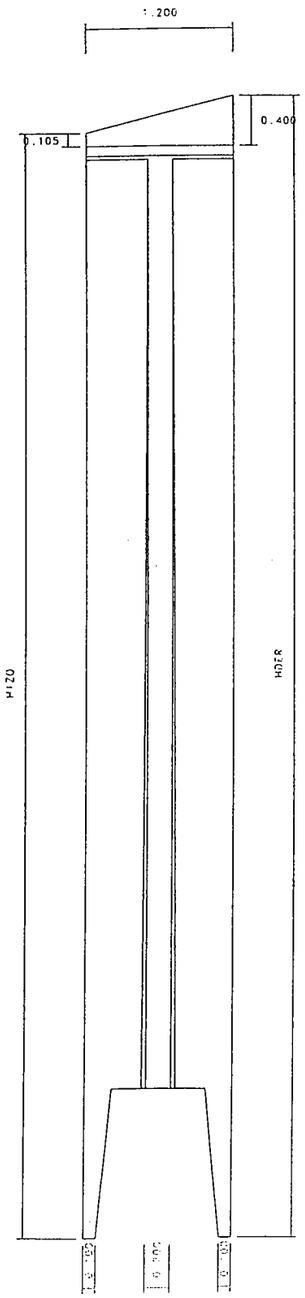
REFER	6	8	10	12	16	20	25	32	M2.CAB	BARRAS
01CW48	14.24	88.06	1.79	0.00	25.31	0.00	215.15	50.82	0.56	395.37

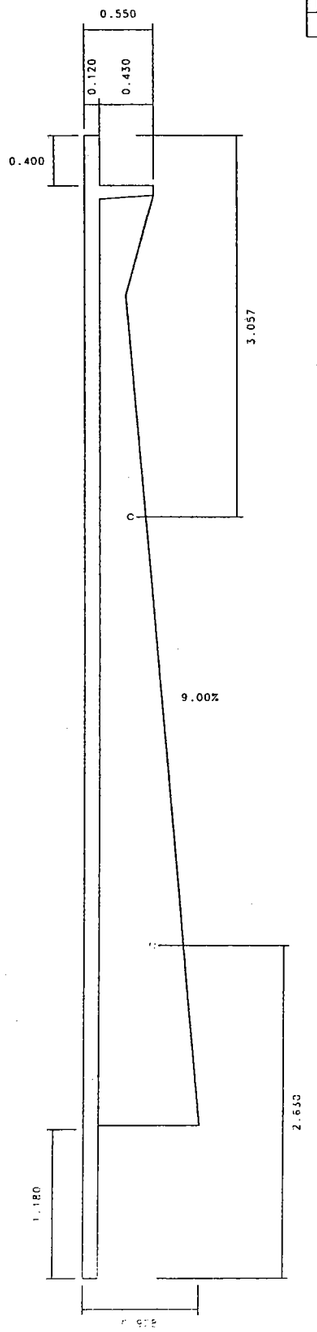
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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-2		
PERFIL	10118 I 4 24	PEDIDO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	5.13
M3 HORMIGON	1.97	fck (Kp/cm2)	350
KG ACERO	388.52	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	12/9/20 Verduguillo	
GOMA ESTANDAR EN JUNTAS			

PISTA	REFER	H.IZO	H.DER	D.ALT	H.MED
	01CW49	8.817	9.112	0.295	8.965





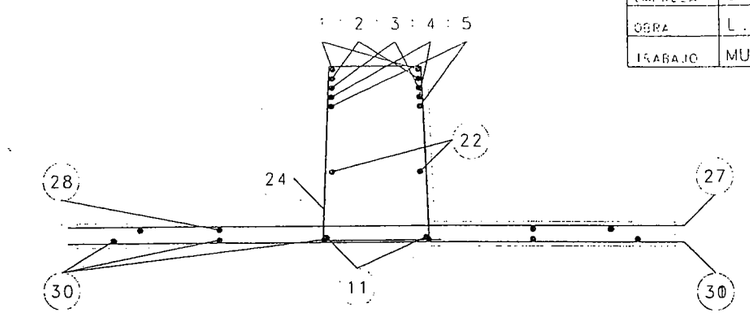


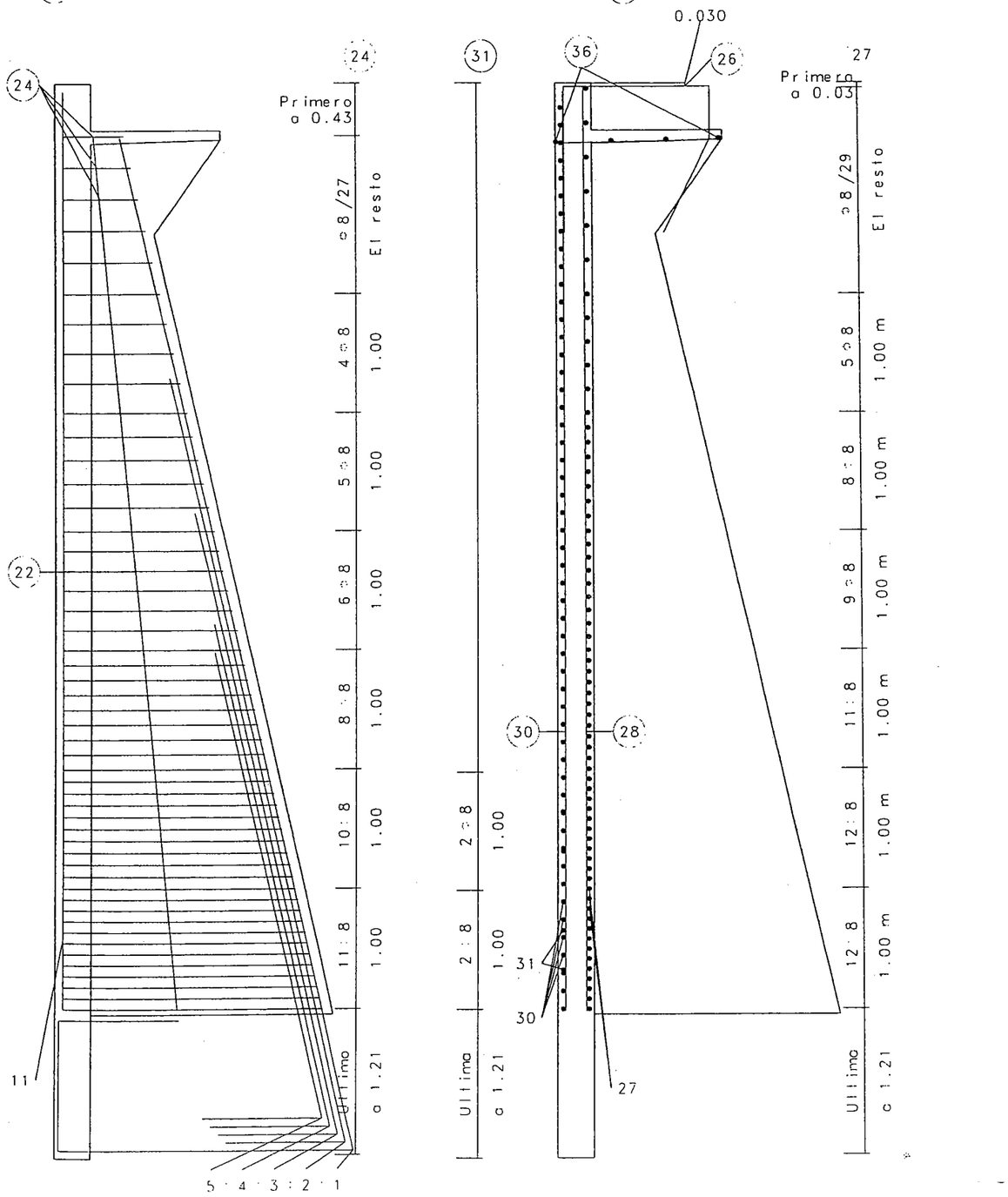
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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

REFER	H.MED
01CW49	8.965

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REFER	L1	R	Q
01CW49	10.938	8.652	7.725

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2⌀25	R+ 2.29	0.77 / 0.17 — R — 9.00% 0.40 — 1.10 — 0.94	R+ 2.29	0.77 / 0.17 — R — 9.00% 0.40 — 1.10 — 0.94	21.88	84.3
2	2⌀25	6.91	0.58 — 6.54 — 9.00% — 0.40	6.27	0.53 — 5.91 — 9.00% — 0.40	13.17	50.8
3	2⌀25	5.67	0.47 — 5.32 — 9.00% — 0.40	5.17	0.43 — 4.81 — 9.00% — 0.40	10.84	41.8
4	2⌀25	4.66	0.38 / 0.02 — 4.31 — 9.00% — 0.40	4.29	0.35 / 0.05 — 3.94 — 9.00% — 0.40	8.96	34.5
5	2⌀32	4.35	0.36 / 0.04 — 4.00 — 9.00% — 0.40	3.84	0.31 / 0.09 — 3.49 — 9.00% — 0.40	8.19	51.7
11	2⌀16	Q	Q	Q	Q	15.45	24.4
22	2⌀8	Q-0.25	Q-0.25	Q-0.25	Q-0.25	14.94	5.9
24	50⌀8	1.65	0.14 / b / a / 0.22			88.29	34.8

	a(m)	b(m)	L(m)
EST. SUP	0.20	0.16	0.98
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	0.87	0.21	2.31

TOTAL 1 NERVIO 328.19

Los medidas indicadas en los dibujos de las barras de la armadura principal (1,2,.....10) son: de vertice a vertice, y del canal largo, que éste inclinado, su proyeccion horizontal. Al doblar las barras los vértices se curvaran de acuerdo con la Norma EH-91. Las longitudes La y Lb indicadas corresponden al DESARROLLO REAL de la barra (es la medida a tener en cuenta al cortar la barra) y, por consiguiente, su valor es inferior a la suma de las medidas parciales acotadas en el dibujo.
La unidad L1 es el resultado de sumar la L

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REFER	H.MED	P
01CW49	8.965	7.725

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		L(m)		L1(m)	P(kg)
26	1 ⌀10	2.93	0.44 0.80 / 0.48 / 0.12 / 1.24	2.93	1.8
27	64 ⌀8	1.14	1.14	72.96	28.8
28	4 ⌀6	P	P	30.90	6.9
30	⌀6 ⌀5	1.14 P	P — 1.14 — 0.20 — 0.15 — 1.14	8.81m2	19.8
31	4 ⌀8	1.14	1.14	4.56	1.8
36	⌀6 ⌀5	0.49 1.14	b=0.15 — 0.49	0.56m2	1.26

TOTAL 60.32

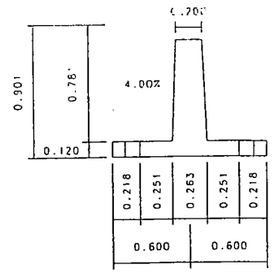
KILOS DE ACERO POR PIEZA

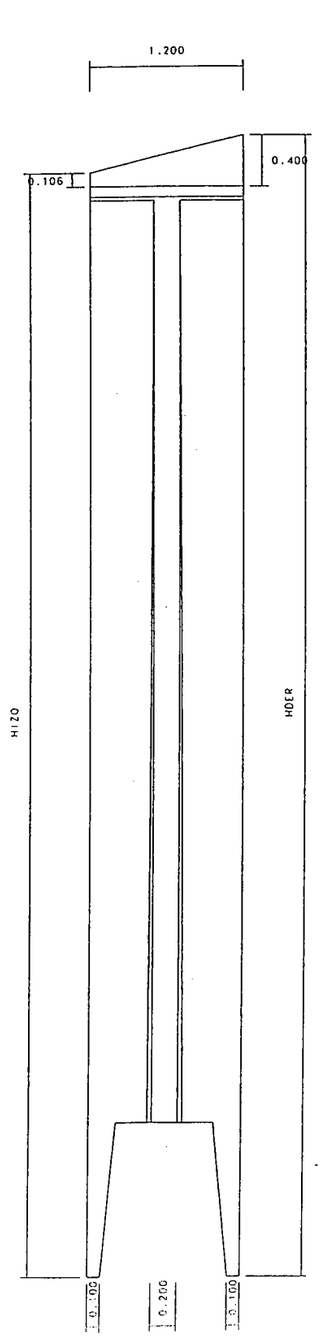
REFER	6	8	10	12	16	20	25	32	M2.ALA	M2.CAB	BARRAS
01CW49	6.86	71.32	1.80	0.00	24.38	0.00	211.36	51.71	8.81	0.56	367.43

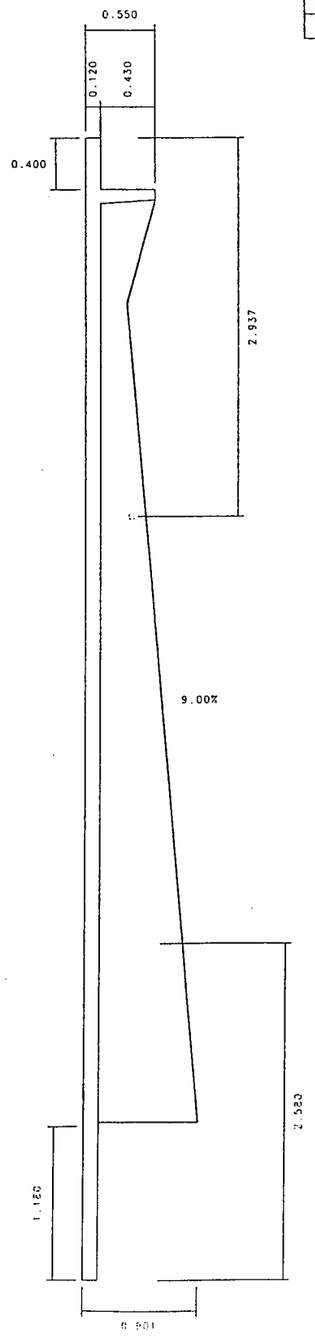
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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-2		
PERFIL	10118 1 4 25	PEDIDO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	4.87
M3 HORMIGON	1.88	fck (Kp/cm2)	350
KG ACERO	367.29	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	12/9/20 Verduguillo	
GOMA ESTANDAR EN JUNTAS			

PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CW50	8.523	8.817	0.294	8.670



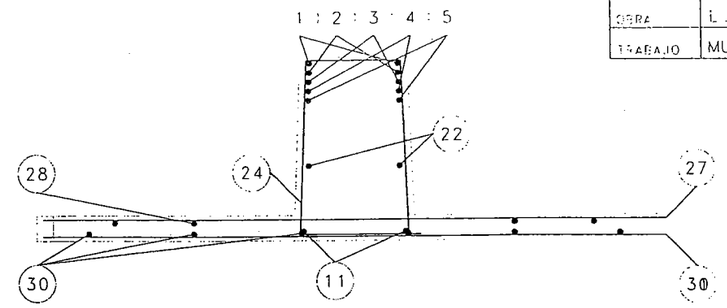




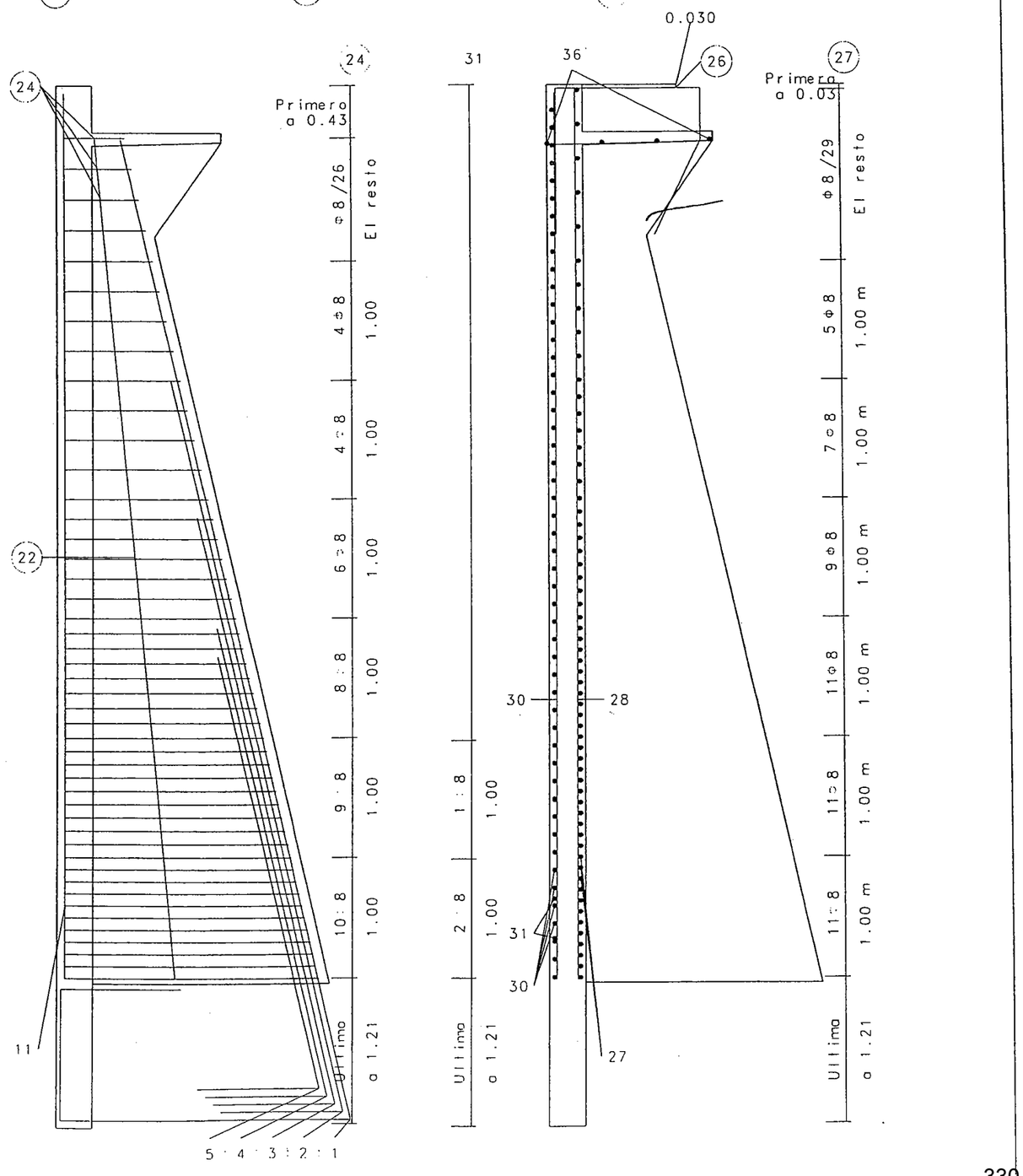
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Colegiado nº 16495

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-2		

REFER	H.MED
01CW50	8.670



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Colegiado nº 16495



REFER	L1	R	Q
01CW50	10.615	8.357	7.430

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2@25	R+ 2.26	0.75 / 0.17 — R — 9.00% — 0.40 — 0.92 — 1.10	R+ 2.26	0.75 / 0.17 — R — 9.00% — 0.40 — 0.92 — 1.10	21.23	81.8
2	2@25	6.61	0.56 — 6.25 — 9.00% — 0.40	5.97	0.50 — 5.61 — 9.00% — 0.40	12.57	48.5
3	2@25	5.38	0.45 — 5.02 — 9.00% — 0.40	4.87	0.40 — 4.51 — 9.00% — 0.40	10.24	39.5
4	2@25	4.36	0.36 / 0.04 — 4.01 — 9.00% — 0.40	3.99	0.32 / 0.08 — 3.64 — 9.00% — 0.40	8.36	32.2
5	2@32	4.05	0.33 / 0.07 — 3.70 — 9.00% — 0.40	3.54	0.28 / 0.12 — 3.19 — 9.00% — 0.40	7.60	47.9
(11)	2@16	Q	Q	Q	Q	14.86	23.5
(22)	2@8	Q-0.25	Q-0.25	Q-0.25	Q-0.25	14.35	5.7
(24)	46@8	1.62	0.14 / a / b / 0.22			79.16	31.2

	a(m)	b(m)	L(m)
EST. SUP	0.20	0.16	0.98
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	0.84	0.21	2.26

TOTAL 1 NERVIO 310.23

MORTEN Pöl

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Las medidas indicadas en los dibujos de las barras de la armadura principal (1,2,....10) son: de vértice a vértice, y del ramal largo, que está inclinado, su proyección horizontal. Al doblar las barras los vértices se curvarán de acuerdo con la Norma EH-91. Las longitudes La y Lb indicadas corresponden al DESARROLLO REAL de la barra (es la medida a tener en cuenta al cortar la barra) y, por consiguiente, su valor es superior a la suma de las medidas parciales acotadas en el dibujo.
En omitir L1 es el resultado de sumar La y L1.

REFER	H.MED	P
01CW50	8.670	7.430

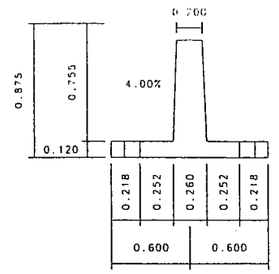
EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		L(m)		Li(m)	P(kg)
26	1 ⌀10	2.93	0.44 0.80 / 0.48 / 0.42 / 1.24	2.93	1.8
27	60 ⌀8	1.14	1.14	68.40	27.0
28	4 ⌀6	P	P	29.72	6.6
30	⌀6 ⌀5	1.14 P	P / 1.14 / 0.20 / 0.15 / 1.14	8.47m2	19.1
31	3 ⌀8	1.14		3.42	1.3
36	⌀6 ⌀5	0.49 1.14	b=0.15 / 0.49	0.56m2	1.26
				TOTAL	57.06

KILOS DE ACERO POR PIEZA

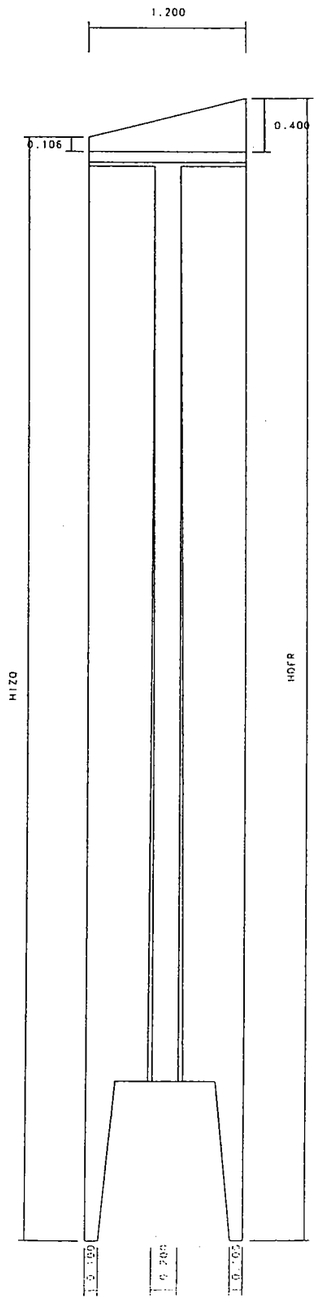
REFER	6	8	10	12	16	20	25	32	M2.ALA	M2.CAB	BARRAS
01CW50	6.60	65.24	1.80	0.00	23.45	0.00	201.93	47.95	8.47	0.56	346.97

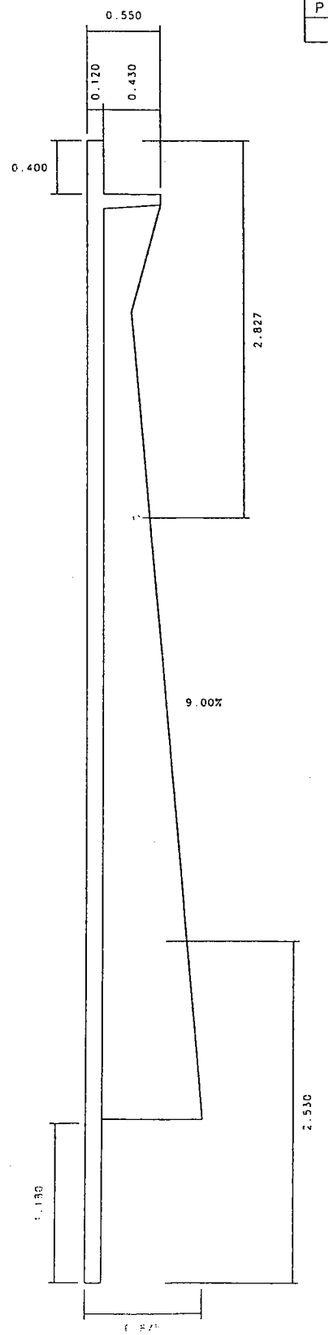
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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2
PERFIL	10118 1 4 26 — PEDIDO 10041
NUMERO DE PIEZAS	1 — PESO PIEZA (T) 4.61
M3 HORMIGON	1.78 — fck (Kp/cm2) 350
KG ACERO	328.60 — fyk (Kp/cm2) 5100
RECUBRIMIENTO (M)	0.030 — 12/9/20 Verduguillo
GOMA ESTANDAR EN JUNTAS	

PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CW51	8.229	8.523	0.294	8.376

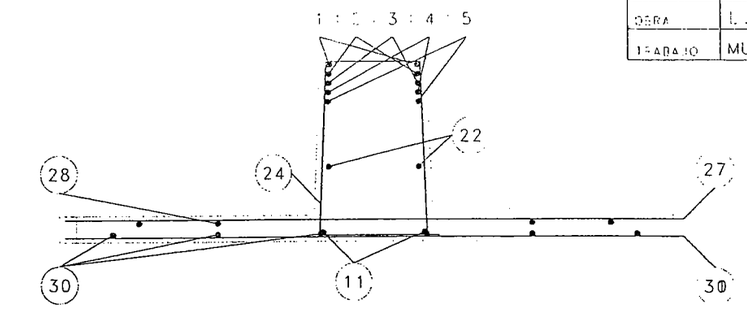




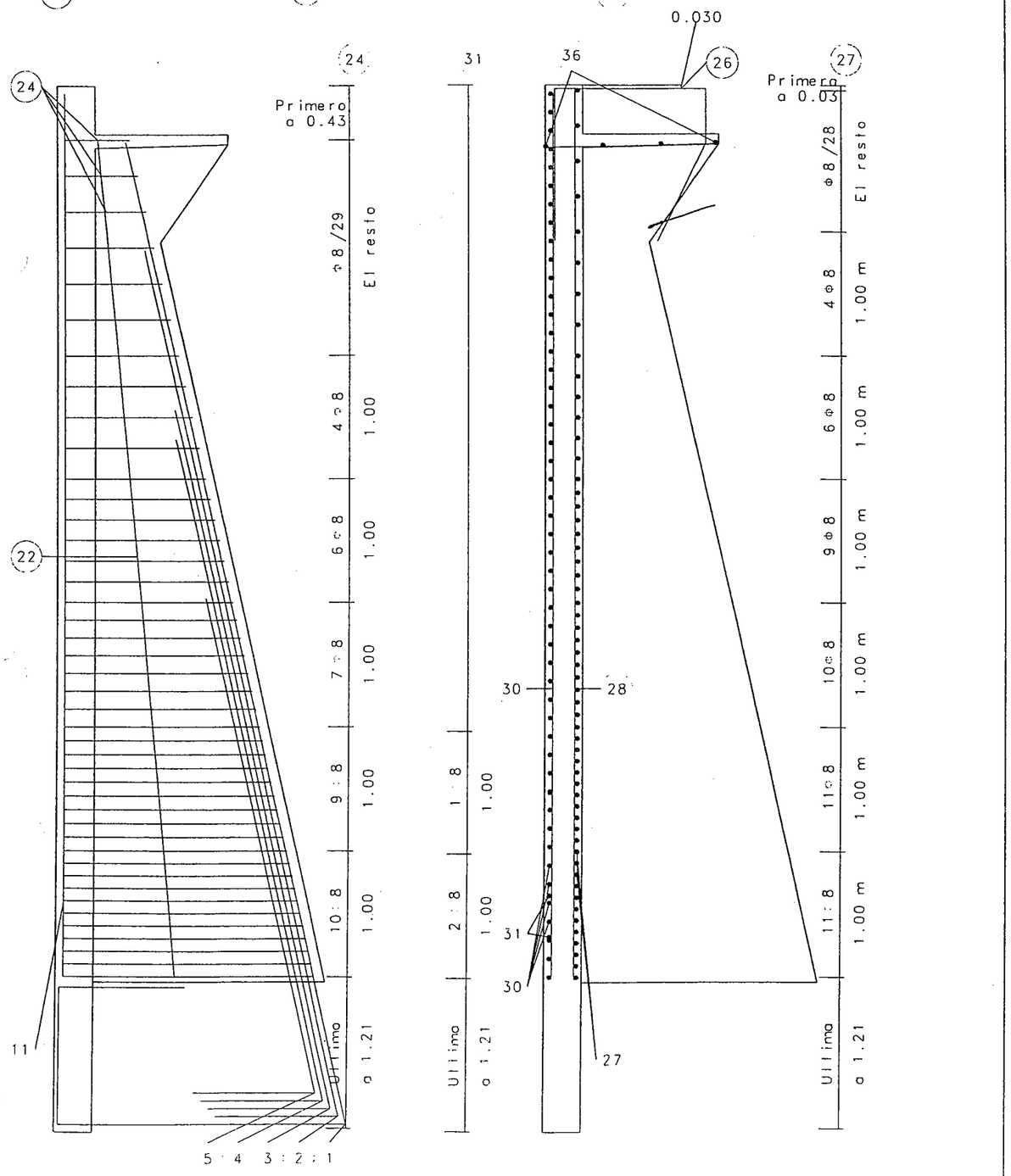
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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

REFER	H.MED
01CW51	8.376



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REFER	LT	R	Q
01CW51	10.312	8.063	7.136

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2 ⌀ 16	R+2.25	0.72 / 0.18 — R — 9.00% — 0.40 — 1.10 — 0.90	R+2.25	0.72 / 0.18 — R — 9.00% — 0.40 — 1.10 — 0.90	20.62	32.6
2	2 ⌀ 20	7.48	0.64 — 7.12 — 9.00% — 0.40	6.67	0.56 — 6.30 — 9.00% — 0.40	14.15	34.9
3	2 ⌀ 20	6.10	0.51 — 5.75 — 9.00% — 0.40	5.68	0.47 — 5.32 — 9.00% — 0.40	11.78	29.1
4	2 ⌀ 32	5.80	0.48 — 5.44 — 9.00% — 0.40	5.11	0.42 — 4.75 — 9.00% — 0.40	10.91	68.8
5	2 ⌀ 32	4.42	0.36 / 0.04 — 4.07 — 9.00% — 0.40	3.85	0.31 / 0.09 — 3.50 — 9.00% — 0.40	8.27	52.2
11	2 ⌀ 16	Q	Q	Q	Q	14.27	22.5
(22)	2 ⌀ 8	Q-0.25	Q-0.25	Q-0.25	Q-0.25	13.77	5.4
(24)	43 ⌀ 8	1.59	0.14 / a / b / 0.22			73.04	28.8

	a(m)	b(m)	L(m)
EST. SUP	0.20	0.16	0.98
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	0.81	0.20	2.21

TOTAL 1 NERVIO 274.35

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Las medidas indicadas en los dibujos de las barras de la armadura principal (1,2,.....10) son: de vertice a vertice, y del ramal largo, que este inclinado, su proyeccion horizontal. Al doblar las barras los vertices se curvaran de acuerdo con la Norma EH 91. Las longitudes La y Lb indicadas corresponden a: DESARROLLO REAL de la barra es la medida a tener en cuenta al cortar la barra y, por consiguiente, su valor es inferior a la suma de las medidas parciales acotadas en el dibujo.
La cantidad L1 es el resultado de sumar la L1b.

REFER	P.MED	P
01CW51	8.376	7.136

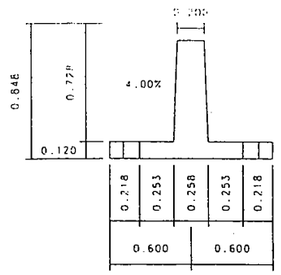
EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		L(m)		Lt(m)	P(kg)
26	1 Φ10	2.93	0.44 0.80 / 0.48 / 0.49 / 1.24	2.93	1.8
27	56 Φ8	1.14	1.14	63.84	25.2
28	4 Φ6	P	P	28.54	6.3
30	Φ6 Φ5	1.14 P	P / 1.14 / 0.20 / 0.15 / 1.14	8.14m2	18.3
31	3 Φ8	1.14	1.14	3.42	1.3
36	Φ6 Φ5	0.49 1.14	b=0.15 / 0.49	0.56m2	1.26
				TOTAL	54.24

KILOS DE ACERO POR PIEZA

REFER	6	8	10	12	16	20	25	32	M2.ALA	M2.CAB	BARRAS
01CW51	6.34	60.79	1.80	0.00	55.08	63.94	0.00	121.07	8.14	0.56	309.02

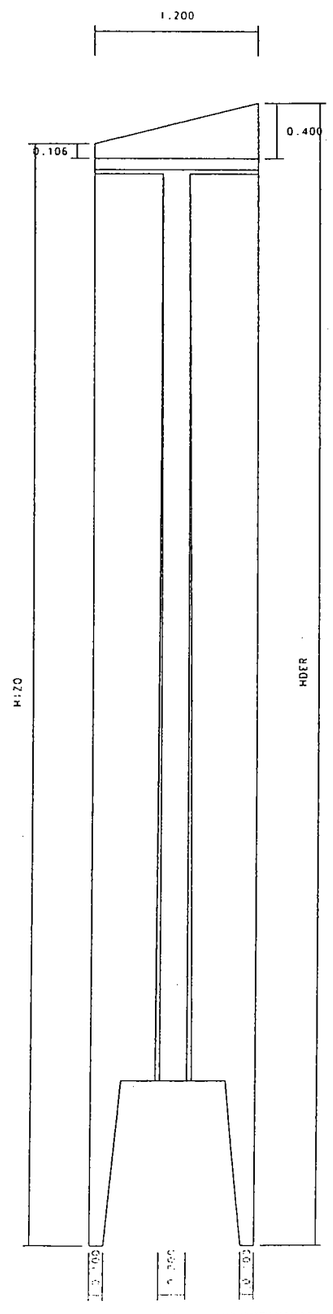
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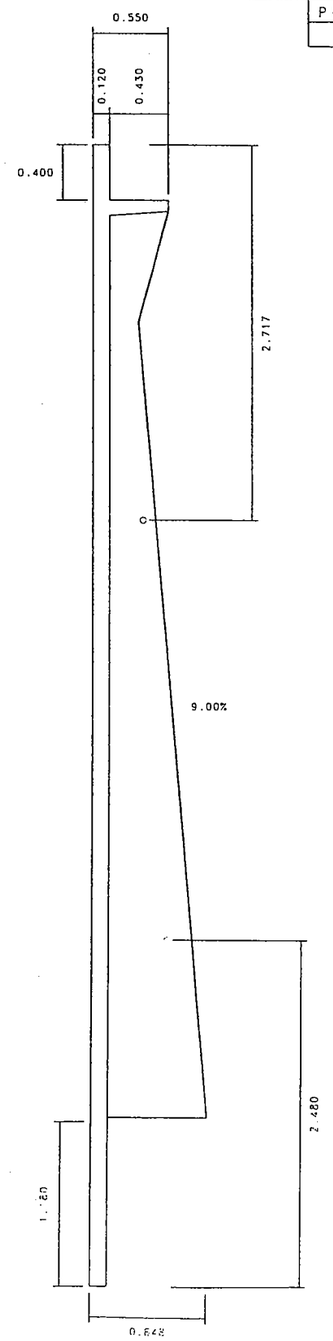


EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

PERFIL	10118 1 4 27	PEDIDO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	4.36
M3 HORMIGON	1.69	fck (Kp/cm2)	350
KG ACERO	296.70	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	12/9/20 Verduguillo	
GOMA ESTANDAR EN JUNTAS			

PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CW52	7.935	8.229	0.294	8.082

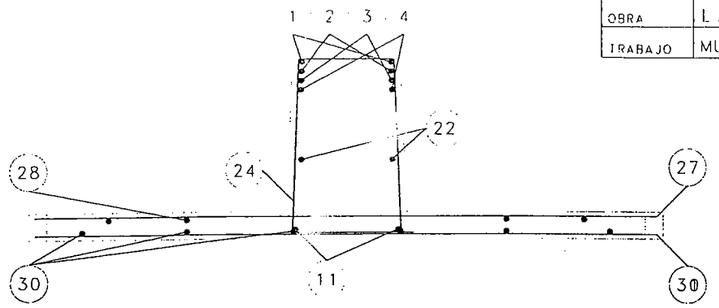




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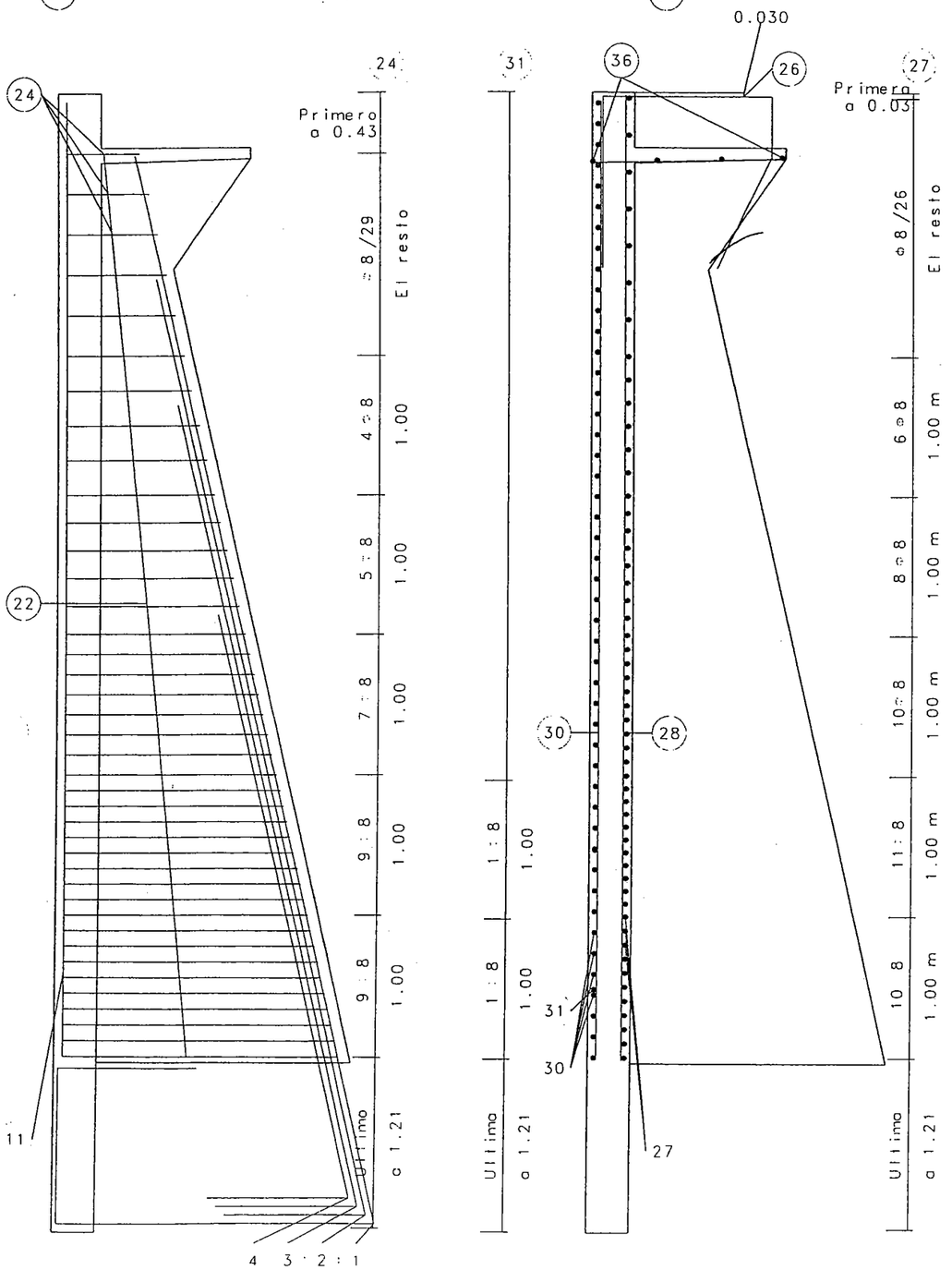
EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

REFER	H.MED
01CW52	8.082





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REFER	L1	R	Q
01CW52	9.990	7.769	6.842

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		Lo(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2 ø 16	R+ 2.22	0.69 / 0.18 R 9.00% 0.40 0.87 1.10	R+ 2.22	0.69 / 0.18 R 9.00% 0.40 0.87 1.10	19.98	31.5
2	2 ø 20	7.18	0.61 6.82 9.00% 0.40	6.37	0.54 6.01 9.00% 0.40	13.55	33.4
3	2 ø 32	6.20	0.52 5.84 9.00% 0.40	5.41	0.45 5.05 9.00% 0.40	11.61	73.3
4	2 ø 32	4.61	0.38 / 0.02 4.25 9.00% 0.40	3.96	0.32 / 0.08 3.61 9.00% 0.40	8.57	54.1
11	2 ø 16	Q	Q	Q	Q	13.68	21.6
22	2 ø 8	Q-0.25	Q-0.25	Q-0.25	Q-0.25	13.18	5.2
24	40 ø 8	1.57	0.14 / a / b / 0.22			66.29	26.2

	a(m)	b(m)	L(m)
EST. SUP	0.20	0.16	0.98
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	0.79	0.20	2.15

TOTAL 1 NERVIO 245.28

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Las medidas indicadas en los dibujos de las barras de la armadura principal (1,2,.....10) son: de vertice a vertice, y del ramal largo, que esta inclinado, su proyeccion horizontal. Al doblar las barras los vertices se curvaron de acuerdo con la Norma EH-91. Las longitudes Lo y Lb incluidas corresponden al DESARROLLO REAL de la barra (es la medida a tener en cuenta al cortar la barra) y, por consiguiente, su valor es inferior a la suma de las medidas parciales acotadas en el dibujo.
En cualquier caso el resultado se redondea a 5 cm.

REFER	H.MED	P
01CW52	8.082	6.842

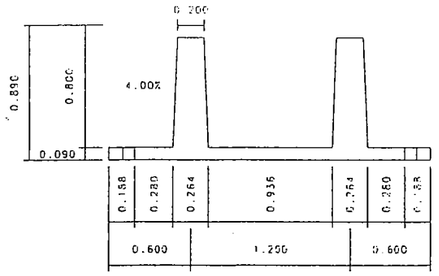
EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		L(m)		Li(m)	P(kg)
26	1 c10	2.93	0.44 0.80 / 0.48 / 0.80 / 1.24	2.93	1.8
27	53 c8	1.14	1.14	60.42	23.8
28	4 Φ6	P	P	27.37	6.1
30	Φ6 Φ5	1.14 P	P / 1.14 / 0.20 / 0.15 / 1.14	7.80m2	17.6
31	2 Φ8	1.14		2.28	0.9
36	Φ6 Φ5	0.49 1.14	b=0.15 / 0.49	0.56m2	1.26
				TOTAL	51.43

KILOS DE ACERO POR PIEZA

REFER	6	8	10	12	16	20	25	32	M2.ALA	M2.CAB	BARRAS
01CW52	6.07	56.10	1.80	0.00	53.13	33.40	0.00	127.39	7.80	0.56	277.89

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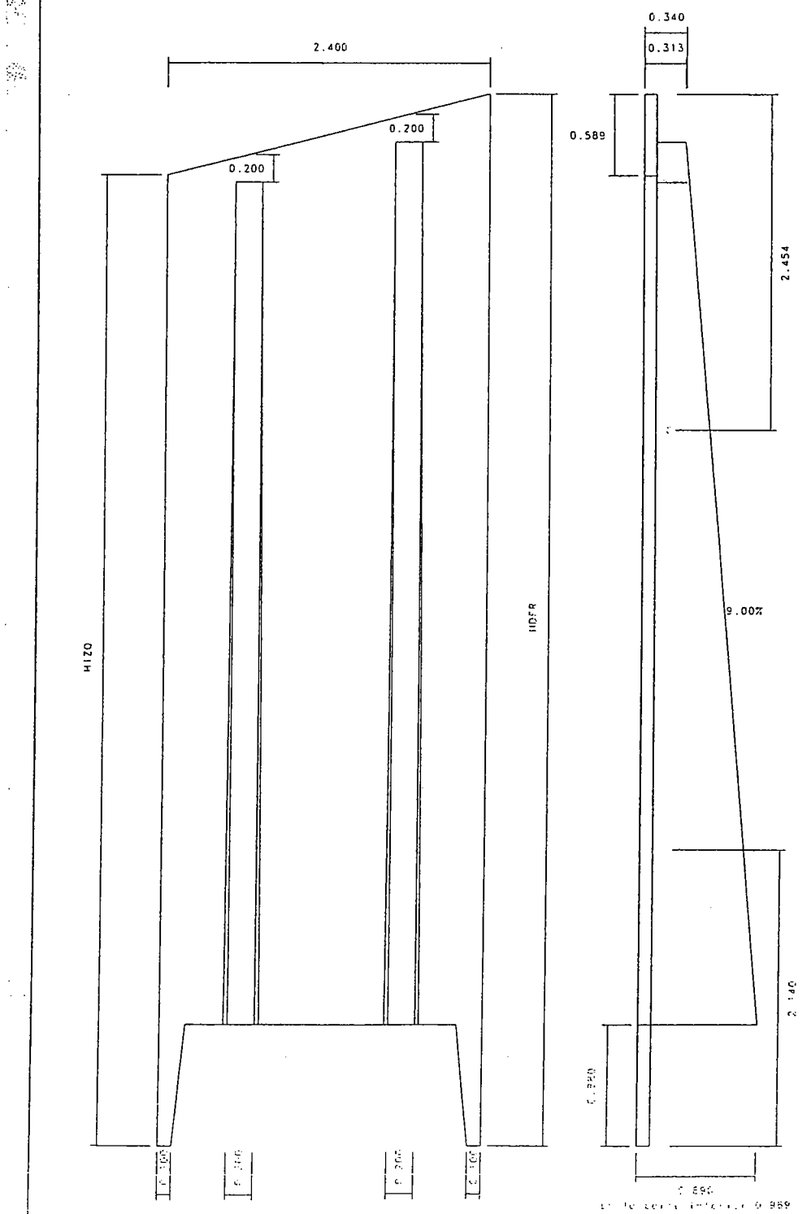
EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

PERFIL	10118 1 4 24	PEDIDO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	7.16
M3 HORMIGON	2.78	fck (Kp/cm2)	350
KG ACERO	473.80	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	9/9/20	

GOMA ESTANDAR EN JUNTAS

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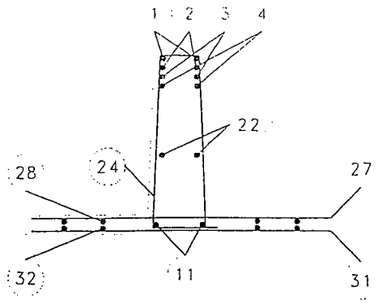
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	01CW53	7.046	7.635	0.589	7.341

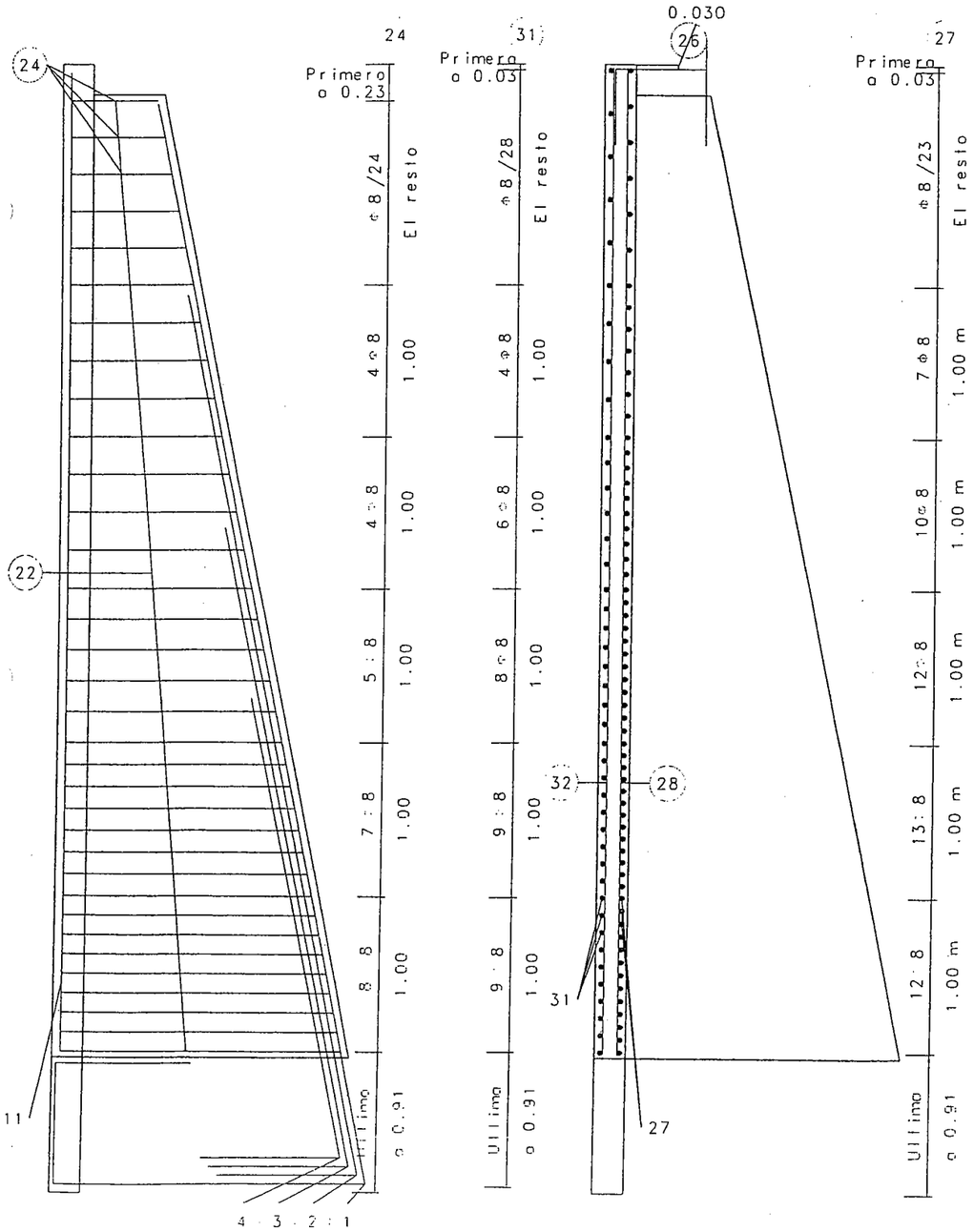


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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

REFER	H.MED
01CW53	7.341





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PEFER	_1	R	Q	R1	R2	Q1	Q2
01CW53	8.987	7.081	6.401	P-0.147	P+0.147	Q-0.147	Q+0.147

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

			La(m)	Barro (a)	Lb(m)	Barro (b)	LT(m)	P(kg)
1	2	16	R+ 1.91	0.63 / 0.23 — R, 9.00% — 0.40 / 0.86 — 0.80	R+ 1.91	0.63 / 0.23 — R, 9.00% — 0.40 / 0.86 — 0.80	17.97	28.4
2	2	25	6.14	0.52 — 5.78, 9.00% — 0.40	5.33	0.44 — 4.98, 9.00% — 0.40	11.47	44.2
3	2	25	4.55	0.37 / 0.03 — 4.19, 9.00% — 0.40	3.96	0.32 / 0.08 — 3.61, 9.00% — 0.40	8.51	32.8
4	2	25	3.38	0.27 / 0.13 — 3.03, 9.00% — 0.40	2.94	0.23 / 0.17 — 2.59, 9.00% — 0.40	6.31	24.3
11	2	16	Q	Q	Q	Q	12.80	20.2
22	2	8	Q-0.20	Q-0.20	Q-0.20	Q-0.20	12.40	4.9
24	34	8	1.68	0.14 / a / b / 0.22			56.97	22.5

	a(m)	b(m)	L(m)
EST. SUP	0.27	0.16	1.12
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	0.83	0.21	2.24

TOTAL 1 NERVIO	177.26
TOTAL 2 NERVIOS	354.52

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los medidos indicados en los dibujos de las barras de la armadura principal (1,2, ... 10) son de cara a cara de vértice, y del ramal largo, de éste indicado, su proyección horizontal. A doblar las barras en vértices se curvarán de acuerdo con la Norma EH 91. Los longitudes La y Lb indicadas corresponden a DESARROLLO REAL de la barra (es la medida a tener en cuenta al cortar la barra y, por consiguiente, su coste en fábrica) a suma de las longitudes parciales de distintos tramos rectos.

REFER	H.MED	P
01CW53	7.341	6.401

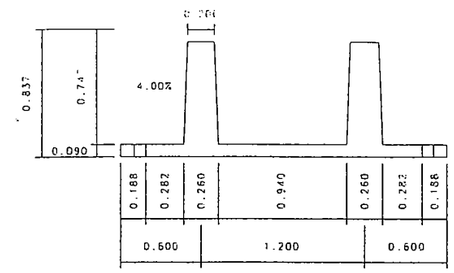
EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

			L(m)		Ll(m)	P(kg)
26	2	ø10	1.18	0.26 — 0.50 / 0.50	2.37	1.5
27	61	ø8	2.34	2.34	142.74	56.3
28	8	ø6	P	P	51.20	11.4
31	42	ø8	2.34	2.34	98.28	38.8
32	8	ø6	P	P	51.20	11.4
					TOTAL	119.29

KILOS DE ACERO POR PIEZA

REFER	6	8	10	12	16	20	25	32	BARRAS
01CW53	22.73	149.85	1.46	0.00	97.14	0.00	202.62	0.00	473.80

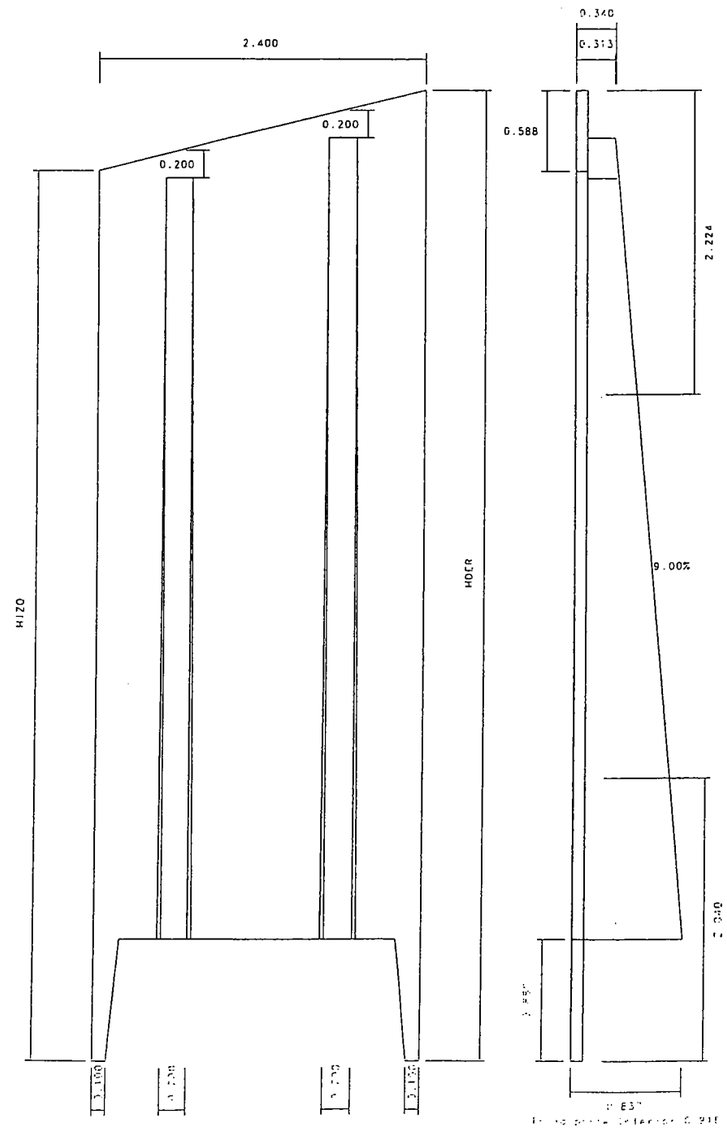
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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

PERFIL	10118 1 4 25	PEDIDO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	6.27
M3 HORMIGON	2.45	fck (Kp/cm2)	350
KG ACERO	376.91	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	9/9/20	
GOMA ESTANDAR EN JUNTAS			
BERENJENO			

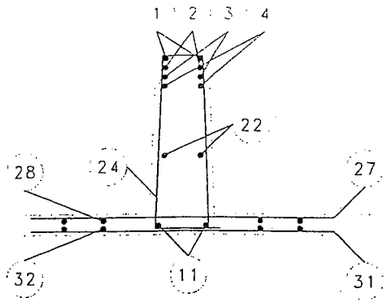
PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CW54	6.458	7.046	0.588	6.752

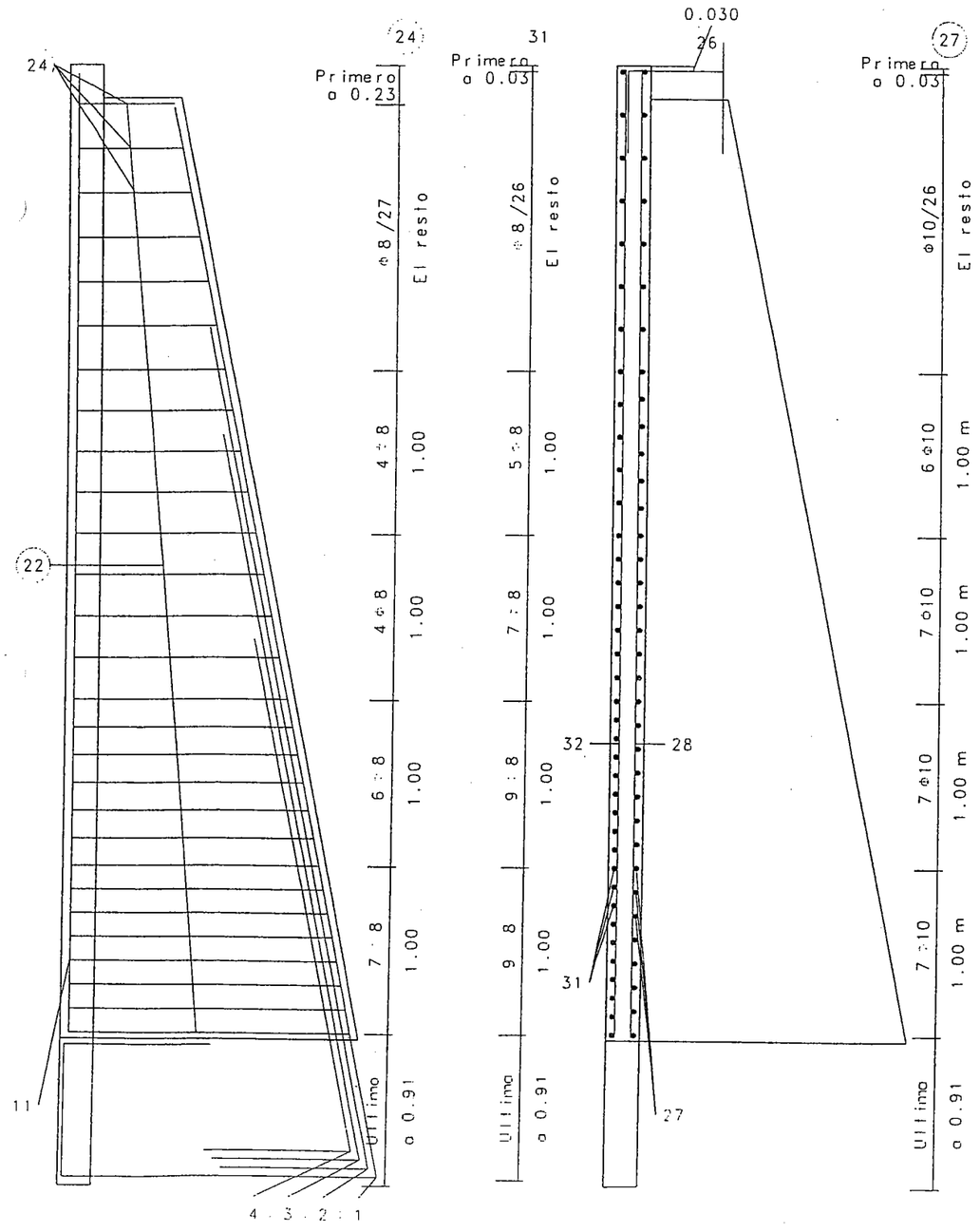


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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

REFER	H.MED
01CW551	6.752





11/01/01 18:11 2. ARMADURA DEL MURO E.A.A. PL 15002

REFER	L1	R	O	R1	R2	O1	O2
01CW551	8.343	5.492	5.812	R-0.147	R+0.147	O-0.147	O+0.147

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2:16	R+ 1.85	0.58 / 0.23 — R — 9.00% — 0.40 — 0.81 — 0.80	R+ 1.85	0.58 / 0.23 — R — 9.00% — 0.40 — 0.81 — 0.80	16.69	26.3
2	2:16	5.47	0.46 — 5.11 — 9.00% — 0.40	5.05	0.42 — 4.70 — 9.00% — 0.40	10.52	16.6
3	2:25	4.76	0.39 / 0.01 — 4.41 — 9.00% — 0.40	4.12	0.33 / 0.07 — 3.77 — 9.00% — 0.40	8.88	34.2
4	2:25	3.46	0.28 / 0.12 — 3.12 — 9.00% — 0.40	3.01	0.23 / 0.17 — 2.67 — 9.00% — 0.40	6.48	25.0
11	2:12	O	0 — 0-0.20	O	0 — 0-0.20	11.62	10.3
22	2:8	O-0.20		O-0.20		11.22	4.4
24	28:8	1.62	0.14 / a / b / 0.22			45.01	17.8

	a(m)	b(m)	L(m)
EST. SUP	0.27	0.16	1.12
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	0.77	0.20	2.13

TOTAL 1 NERVIO 134.62
TOTAL 2 NERVIOS 269.24

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Las medidas indicadas en los dibujos de las barras de la armadura principal (1,2,...,10) son de vértice a vértice, y del ramal largo, que está inclinado, su proyección horizontal. A doblar las barras los vértices se curvarán de acuerdo con la Norma EH 91. Las longitudes La y Lb indicadas corresponden a DESARROLLO REAL de la barra (lo es necesario a tener en cuenta al cortar la barra) y, por consiguiente, su valor es inferior a la suma de las medidas parciales indicadas en el dibujo.

REFER	H.MED	P
01CW54	6.164	5.512

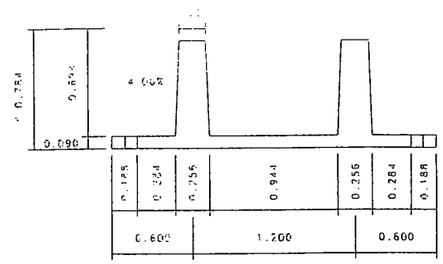
EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		L(m)		LI(m)	P(kg)
26	2 ø10	1.18	0.50 / 0.26 / 0.50	2.36	1.5
27	35 ø10	2.34	2.34	81.90	50.5
28	8 ø6	P	P	46.50	10.3
31	38 ø8	2.34	2.34	88.92	35.1
32	8 ø6	P	P	46.50	10.3
			TOTAL		107.68

KILOS DE ACERO POR PIEZA

REFER	6	8	10	12	16	20	25	32	BARRAS
01CW54	20.64	79.46	51.95	20.64	85.89	0.00	118.33	0.00	376.91

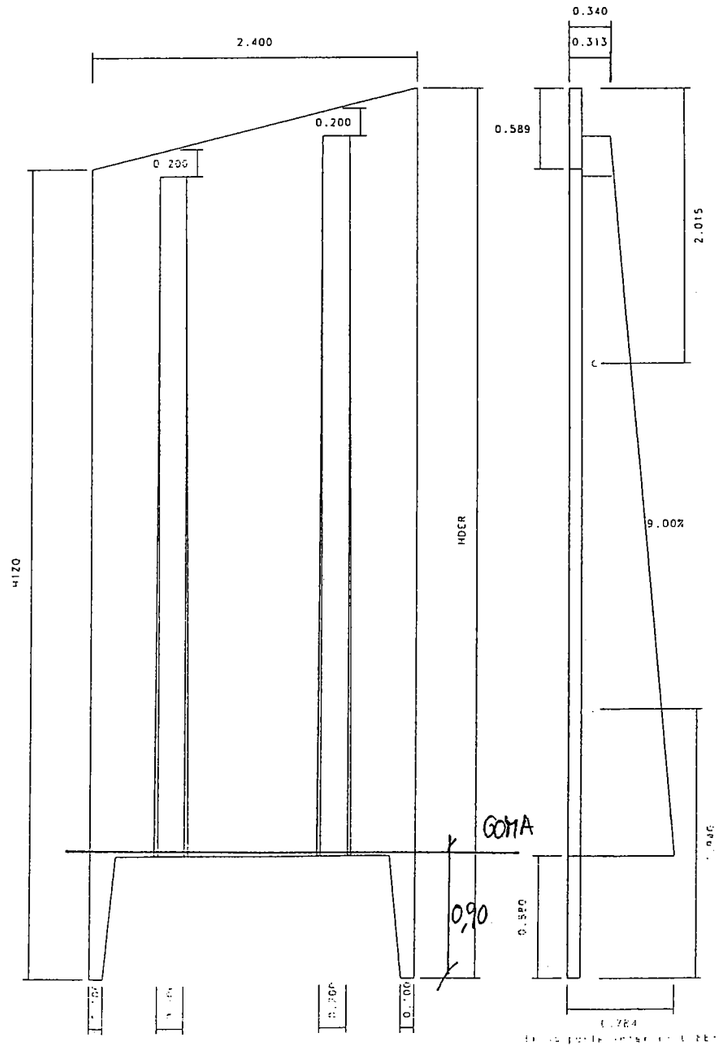
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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

PERFIL	10118 1 4 26	PESO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	5.59
M3 HORMIGON	2.14	fck (Kp/cm2)	350
KG ACERO	295.96	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	9/9/20	
MAMPOSTERIA CALIZA			

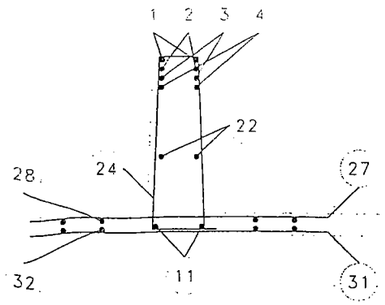
PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CW55	5.869	6.458	0.589	6.164

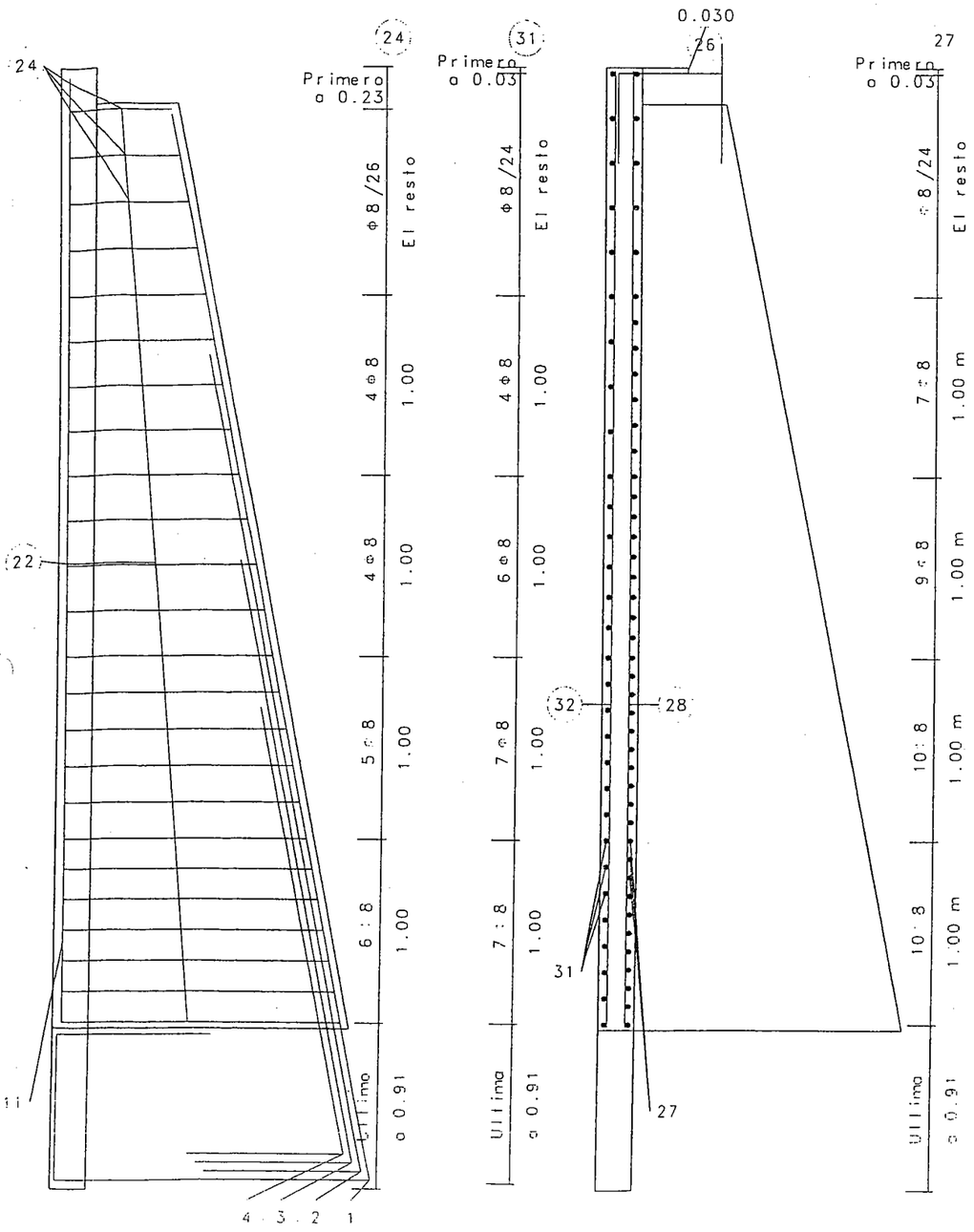


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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

REFER	H.MED
01CW55	6.164





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REFER	A	B	Q	R1	R2	Q1	Q2
01CW55	7.699	5.994	5.234	R-0.147	R+0.147	Q-0.147	Q+0.147

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2:16	R+ 1.79	0.53 / 0.23 — R — 9.00% — 0.40 — 0.76 — 0.80	R+ 1.79	0.53 / 0.23 — R — 9.00% — 0.40 — 0.76 — 0.80	15.40	24.3
2	2:20	4.88	0.40 — 4.53 — 9.00% — 0.40	4.26	0.35 / 0.05 — 3.91 — 9.00% — 0.40	9.14	22.5
3	2:20	3.69	0.30 / 0.10 — 3.34 — 9.00% — 0.40	3.26	0.26 / 0.14 — 2.91 — 9.00% — 0.40	6.94	17.1
4	2:20	2.83	0.22 / 0.18 — 2.49 — 9.00% — 0.40	2.48	0.19 / 0.21 — 2.13 — 9.00% — 0.40	5.31	13.1
11	2:12	0	Q — Q-0.20	0	0 — 0-0.20	10.45	9.3
22	2:8	Q-0.20		Q-0.20		10.05	4.0
24	24:8	1.57	0.14 / a / b / 0.22			36.57	14.4

	a(m)	b(m)	L(m)
EST. SUP	0.27	0.16	1.12
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	0.72	0.20	2.02

TOTAL 1 NERVIO 104.73
TOTAL 2 NERVIOS 209.47

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Las medidas indicadas en los dibujos de las barras de la armadura principal (1,2,...,16) son: de vértice a vértice y del ramal largo que este vaya apoyado, su proyección horizontal. Al doblar las barras en vértices se cumplirán de acuerdo con la Norma EH-91. Las longitudes L y b indicadas corresponden a DESARROLLO REAL de la barra (es decir medido a lo largo de la misma) a tener en cuenta al cortar la barra; y por consiguiente, su valor es diferente a la suma de las medidas parciales de cada tramo.

11/01/01 13:16 I. DESPIECE DE LA ARMADURA DEL ALA Y MEDICION PL 1/2004

REFER	H.MED	P
01CW55	6.164	5.624

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

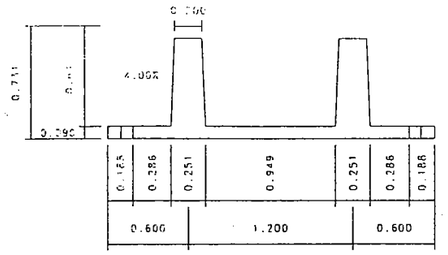
			L(m)		Li(m)	P(kg)
26	2	⌀10	1.18	0.50 / 0.26 / 0.50	2.37	1.5
27	42	⌀8	2.34	2.34	98.28	38.8
28	8	⌀6	P	P	41.79	9.3
31	30	⌀8	2.34	2.34	70.20	27.7
32	8	⌀6	P	P	41.79	9.3
					TOTAL	86.49

KILOS DE ACERO POR PIEZA

REFER	6	8	10	12	16	20	25	32	BARRAS
01CW55	18.55	103.27	1.46	18.55	48.61	105.52	0.00	0.00	295.96

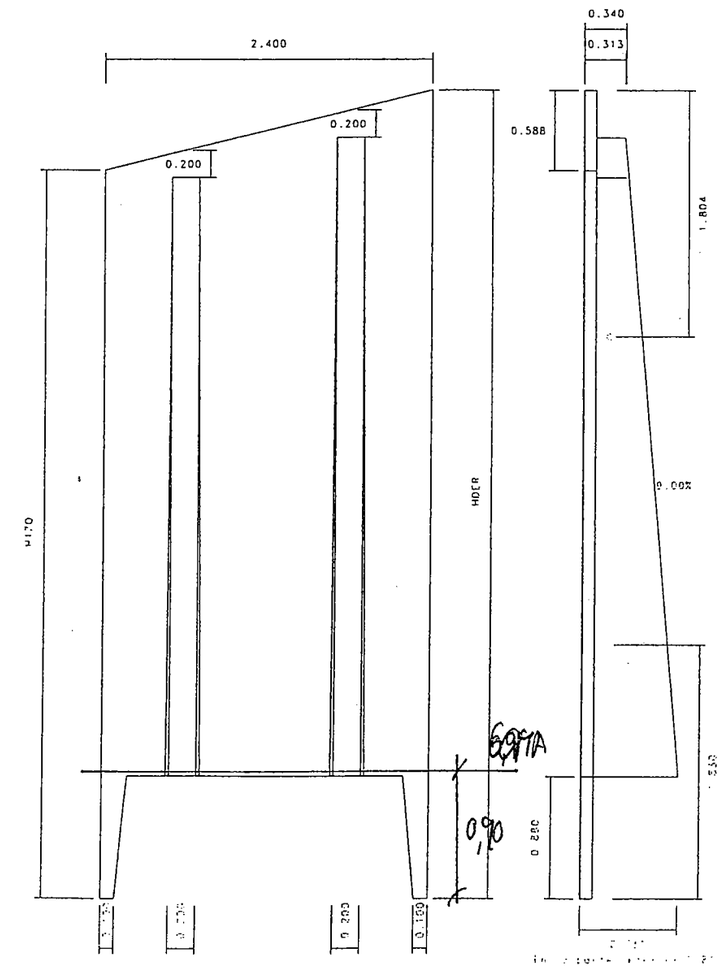
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Ingeniero de Caminos
Colegiado n.º 16495

11/01/01 13:22 I. DEFINICION GEOMETRICA PL 1/2002



EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-2		
PERFIL	10116 1 4 27	PEDIDO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	4.80
M3 HORMIGON	1.84	fck (Kp/cm2)	350
KG ACERO	235.06	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	9/9/20	
MAMPOSTERIA CALIZA			

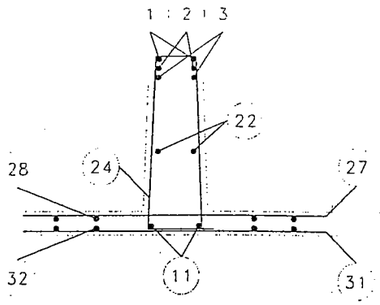
PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CW56	5.281	5.869	0.588	5.575



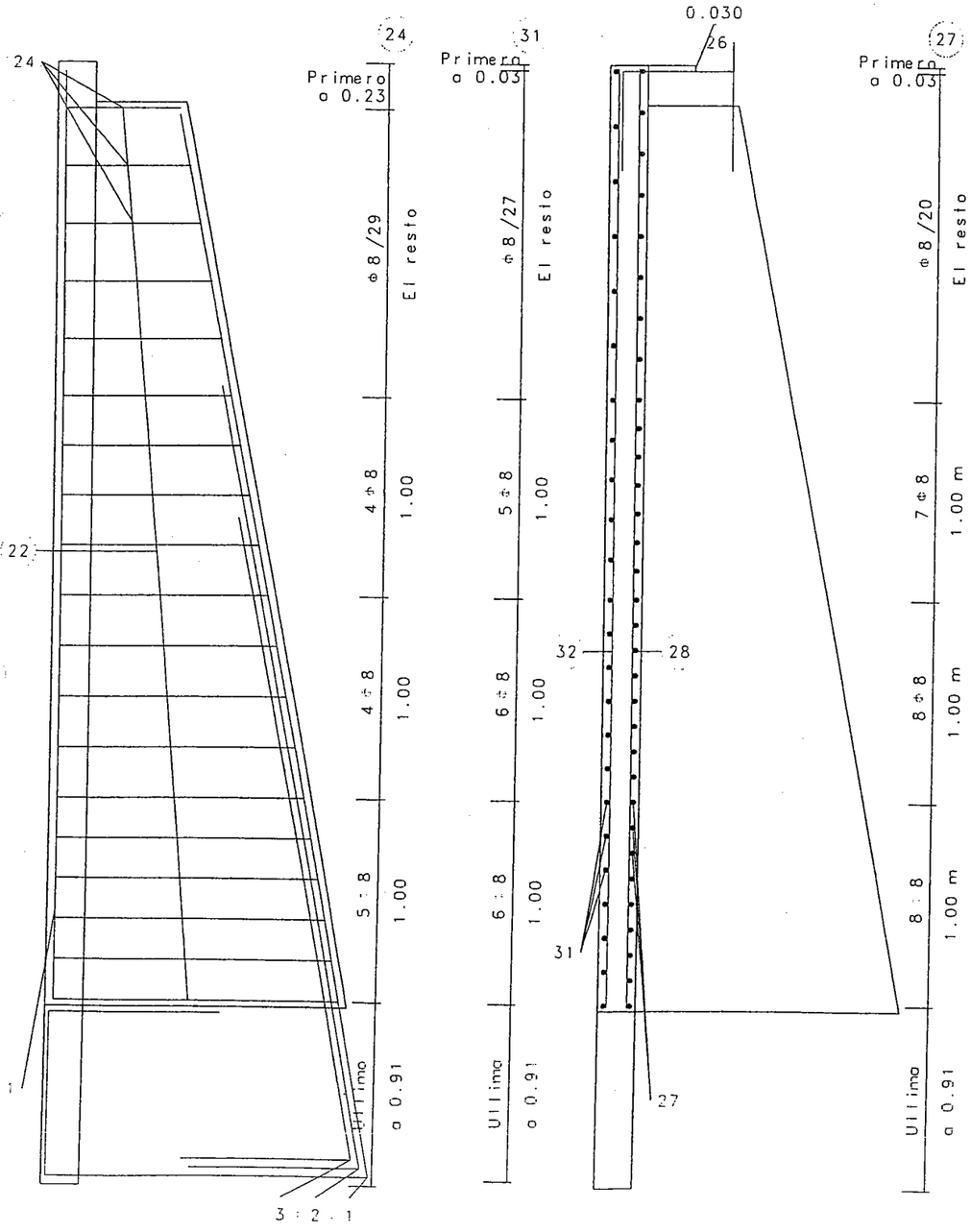
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Colegiado n.º 16495

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

REFER	H.MED
01CW56	5.575



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REFER	_1	R	O	R1	R2	O1	O2
01CW56	7.055	5.315	4.635	R-0.147	R+0.147	O-0.147	O+0.147

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2Φ16	R+1.74	0.47 / 0.23 — R — 9.00% — 0.40 — 0.70 — 0.80	R+1.74	0.47 / 0.23 — R — 9.00% — 0.40 — 0.70 — 0.80	14.11	22.3
2	2Φ16	4.27	0.35 / 0.05 — 3.92 — 9.00% — 0.40	3.86	0.31 / 0.09 — 3.50 — 9.00% — 0.40	8.12	12.8
3	2Φ25	3.56	0.28 / 0.12 — 3.21 — 9.00% — 0.40	2.92	0.23 / 0.17 — 2.58 — 9.00% — 0.40	6.48	25.0
11	2Φ12	0	0	0	0	9.27	8.2
22	2Φ8	O-0.20	O-0.20	O-0.20	O-0.20	8.87	3.5
24	19Φ8	1.52	0.14 / a / b / 0.22			27.68	10.9

	a(m)	b(m)	L(m)
EST. SUP	0.27	0.16	1.12
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	0.67	0.19	1.92

TOTAL 1 NERVIO 82.72
TOTAL 2 NERVIOS 165.44

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Los medidas indicadas en los dibujos de los barras de la armadura principal (1,2.....10) son: de vértice a vértice, y del ramal largo, que esta inclinado, su proyección horizontal. Al doblar las barras, los vértices se curvaron de acuerdo con la Norma EH-91. Las longitudes Lo y Lb indicadas corresponden al DESARROLLO REAL de la barra; es lo medido o tenido en cuenta al cortar la barra) y, por consiguiente, su valor es superior a la suma de las medidas parciales reflejadas en el dibujo.
En el caso de que el recubrimiento de hormigón en la U

REFER	H.MED	F
01CW56	5.575	4.635

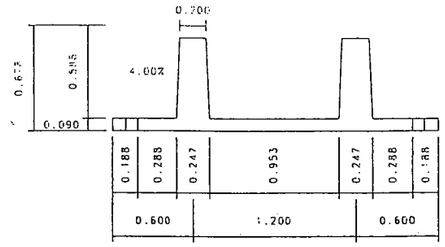
EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

			L(m)		Li(m)	P(kg)
26	2	10	1.18	0.50 / 0.26 / 0.50	2.36	1.5
27	32	8	2.34	2.34	74.88	29.5
28	8	6	P	P	37.08	8.2
31	24	8	2.34	2.34	56.16	22.2
32	8	6	P	P	37.08	8.2
					TOTAL	69.62

KILOS DE ACERO POR PIEZA

REFER	6	8	10	12	16	20	25	32	BARRAS
01CW52	16.46	80.55	1.46	16.46	70.19	0.00	49.94	0.00	235.06

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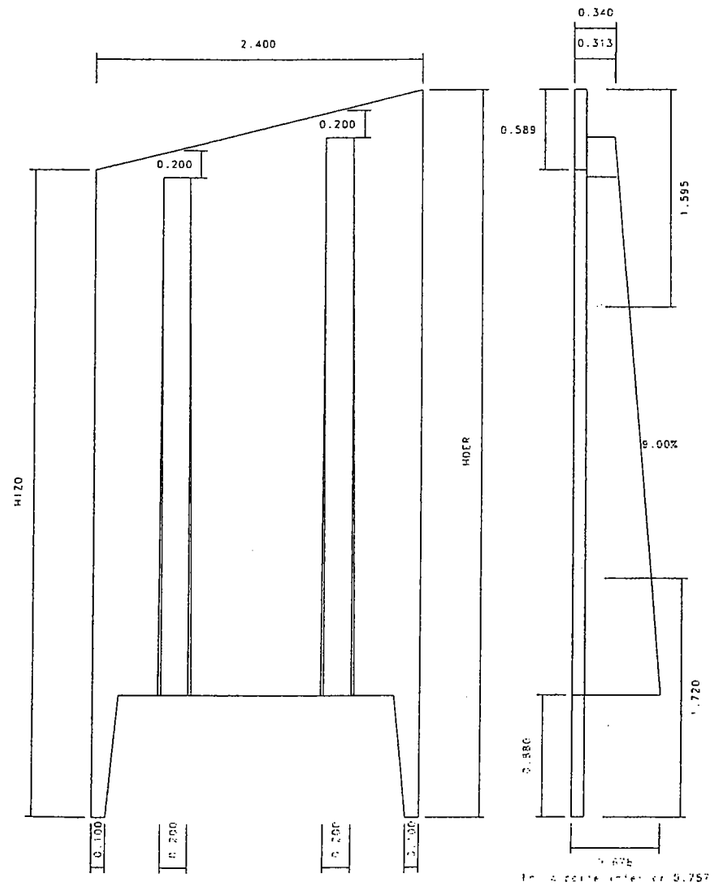
EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

PERFIL	10118 1 4 28	PEDIDO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	3.93
M3 HORMIGON	1.56	fck (Kp/cm2)	350
KG ACERO	179.69	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	9/9/20	

GOMA ESTANDAR EN JUNTAS

BERENJENO

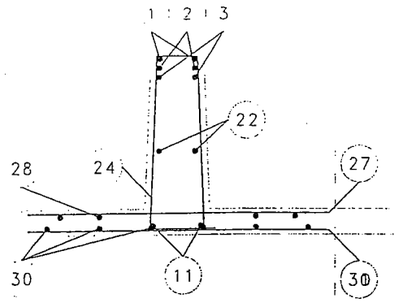
PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CW57	4.692	5.281	0.589	4.987



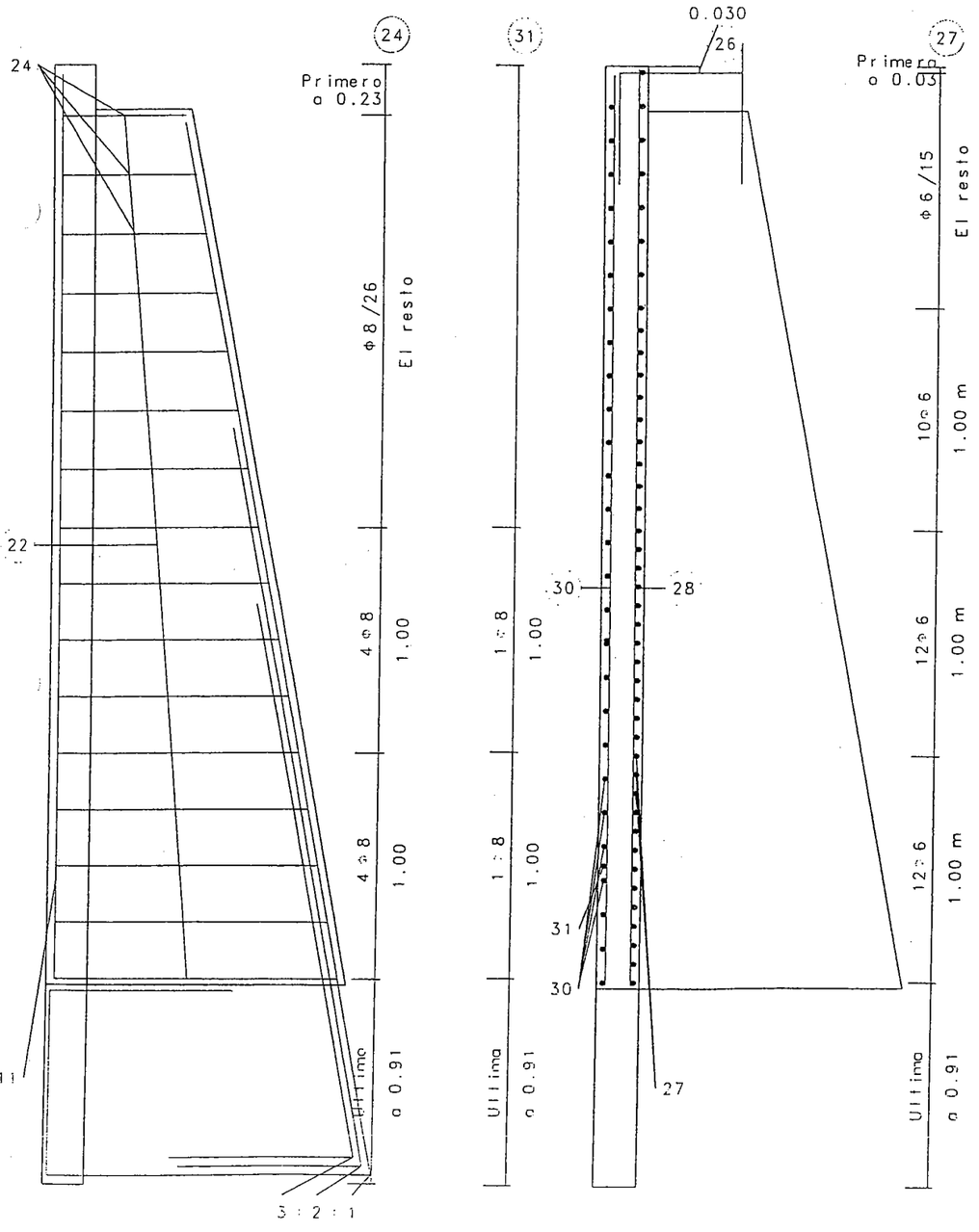
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EMPRESA	UTE ALT-CAMF (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

REFER	H.MED
01CW57	4.987



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REFER	_1	R	O	R1	R2	O1	O2
01CW57	6.411	4.727	4.047	R-0.147	R+0.147	O-0.147	O+0.147

EMPRESA	UTE ALT-CAMF (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		Lo(m)	Barro (a)	Lb(m)	Barro (b)	LT(m)	P(kg)
1	2Φ16	R+ 1.68	0.42 / 0.23 — R — 9.00% — 0.40 — 0.65 — 0.80	R+ 1.68	0.42 / 0.23 — R — 9.00% — 0.40 — 0.65 — 0.80	12.82	20.2
2	2Φ16	3.67	0.29 / 0.11 — 3.32 — 9.00% — 0.40	3.25	0.26 / 0.14 — 2.91 — 9.00% — 0.40	6.92	10.9
3	2Φ20	2.84	0.22 / 0.18 — 2.49 — 9.00% — 0.40	2.40	0.18 / 0.22 — 2.06 — 9.00% — 0.40	5.24	12.9
11	2Φ12	O	0	O	0	8.09	7.2
22	2Φ8	O-0.20	O-0.20	O-0.20	O-0.20	7.69	3.0
24	16Φ8	1.47	0.14 / a / b / 0.22			22.14	8.7

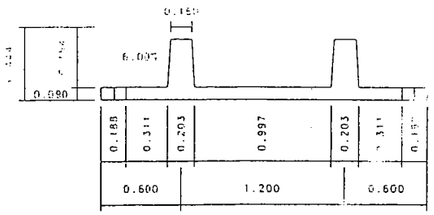
	a(m)	b(m)	L(m)
EST. SUP	0.27	0.16	1.12
VARIACION	1cm/0.11	1cm/1.39	
EST. INF	0.62	0.19	1.81

TOTAL 1 NERVIO 63.04

TOTAL 2 NERVIOS 126.07

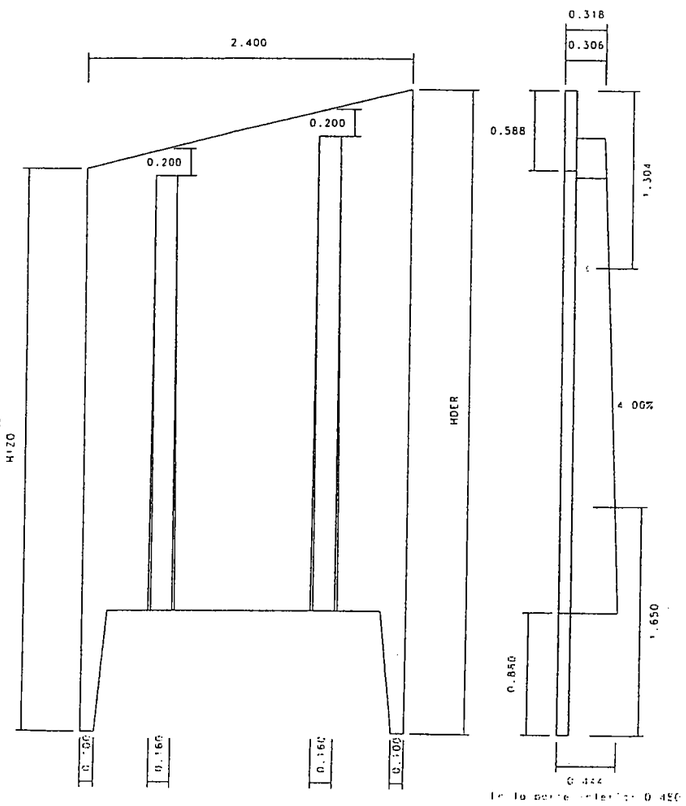
NORTEMPH
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Los medidas indicadas en los dibujos de las barras de la armadura principal (1,2.....10) son de vertice a vertice, y del ramal largo, que esta inclinado, su proyeccion horizontal. A doblar las barras los vertices se curvaran de acuerdo con la Norma EH-91. Las longitudes Lo y Lb indicadas corresponden a "DESARROLLO REAL" de la barra (es la medida a tener en cuenta al cortar la barra) y, por consiguiente, su valor es superior a la suma de las medidas parciales acotadas en el dibujo.



EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-2		
PERFIL	10118 i 4 29	PEDIDO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	2.82
M3 HORMIGON	1.11	fck (Kp/cm2)	350
KG ACERO	163.44	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	9/4/16	
GOMA ESTANDAR EN JUNTAS			
BERENJENO			

PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01CW58	4.104	4.692	0.588	4.398

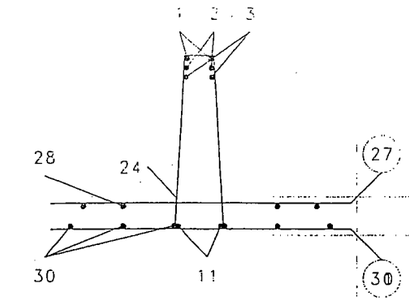


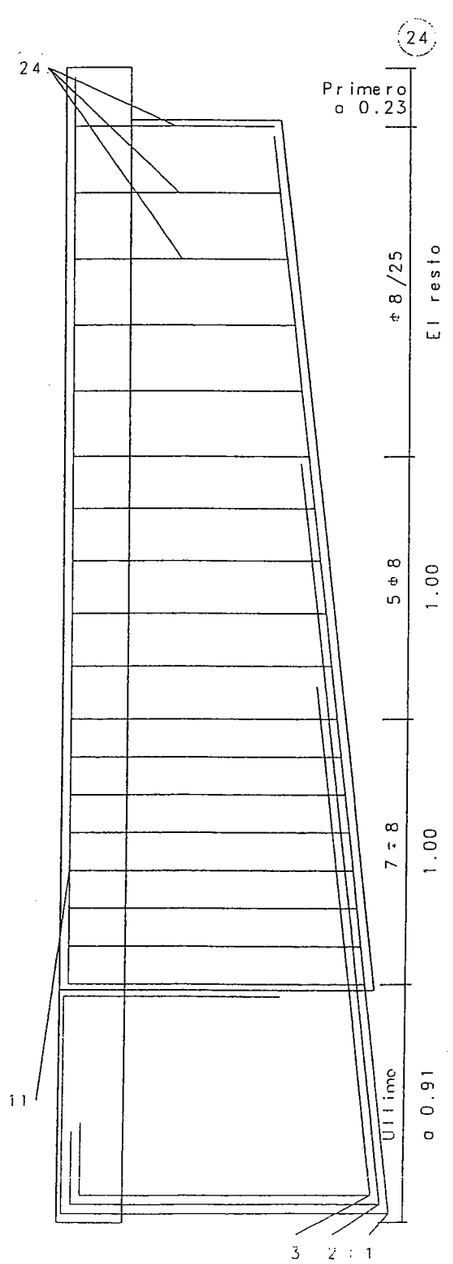
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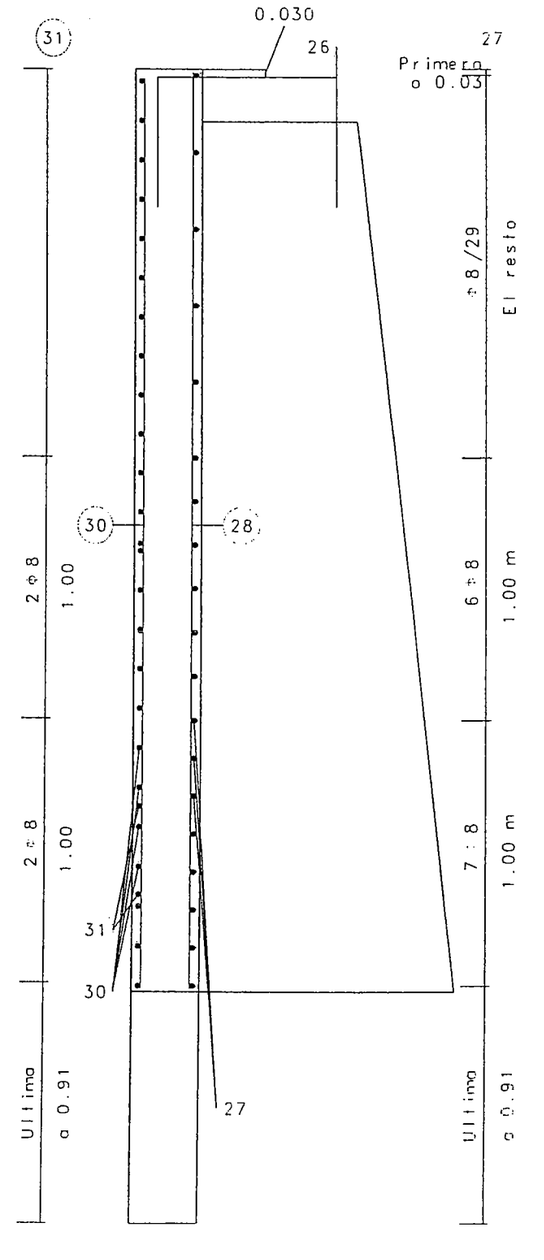
EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

REFER	H.MED
01CW58	4.398

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REFER	_1	R	_2	R1	R2	O1	O2
01CW58	5.506	4.138	5.458	R-0.147	R+0.147	O-0.147	O+0.147

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		Lo(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2:16	R+ 1.37	0.16 R 0.39 / 0.23 4.00% 0.30 / 0.80	R+ 1.37	0.16 R 0.39 / 0.23 4.00% 0.30 / 0.80	11.02	17.4
2	2:20	3.35	0.11 2.85 0.28 / 0.17 4.00% / 0.30	2.94	0.09 2.44 0.28 / 0.19 4.00% / 0.30	6.29	15.5
3	2:20	2.36	0.07 1.96 0.18 / 0.11 4.00% / 0.30	2.08	0.06 1.68 0.18 / 0.12 4.00% / 0.30	4.44	10.9
11	2:12	Q	0	Q	0	6.92	6.1
24	18:8	1.18	0.10 / a / b / 0.22			20.84	8.2

	a(m)	b(m)	L(m)
EST. SUP	0.25	0.13	1.05
VARIACION	1cm/0.25	1cm/2.08	
EST. INF	0.38	0.15	1.31

TOTAL 1 NERVIO 58.21

TOTAL 2 NERVIOS 116.42

Los medidores indicados en los dibujos de las barras de la armadura principal [illegible] son de cálculo a vértice, y del ramal largo, que esta irá anclada en prolongación horizontal. Al doblar las barras los vértices se curvarán de acuerdo con la Norma EH 91. Las longitudes Lo y Lb indicadas corresponden al DESARROLLO REAL de la barra (es lo medido a tener en cuenta al cortar la barra) y, por consiguiente, su valor es inferior a la suma de las que resulta de acotar en el dibujo.

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REFER	P.MED	P
01CW58	4.398	3.458

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

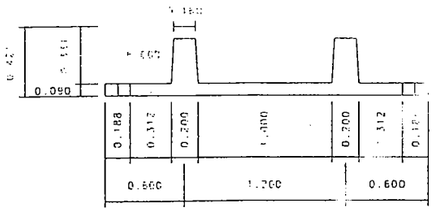
		L(m)		LT(m)	P(kg)
26	2:10	1.17	0.50 / 0.24 / 0.50	2.34	1.4
27	19:8	2.34	2.34	44.46	17.5
28	8:6	P	P	27.66	6.1
30	:6 :5	2.34 P	P / 2.34 / 0.20 / 0.15	8.09m2	18.2
31	4:8	2.34	2.34	9.36	3.7

TOTAL 47.03

KILOS DE ACERO POR PIEZA

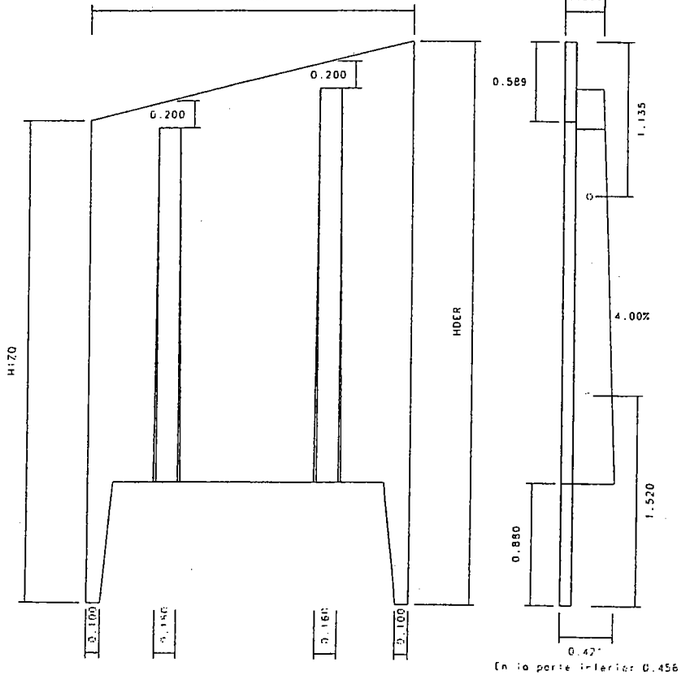
REFER	6	8	10	12	16	20	25	32	M2.ALA	BARRAS
01CW58	6.14	37.68	1.44	12.28	34.78	52.91	0.00	0.00	8.09	145.23

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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-2		
PERFIL	10118 1 4 30	FECHA	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	2.29
M3 HORMIGON	0.91	fck (Kp/cm2)	350
KG ACERO	108.93	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	9/4/16	
GOMA ESTANDAR EN JUNTAS			
BERENJENO			

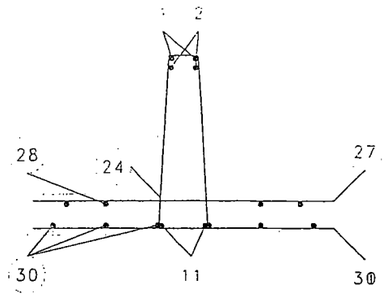
PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01 0859	3.515	4.104	0.589	3.809



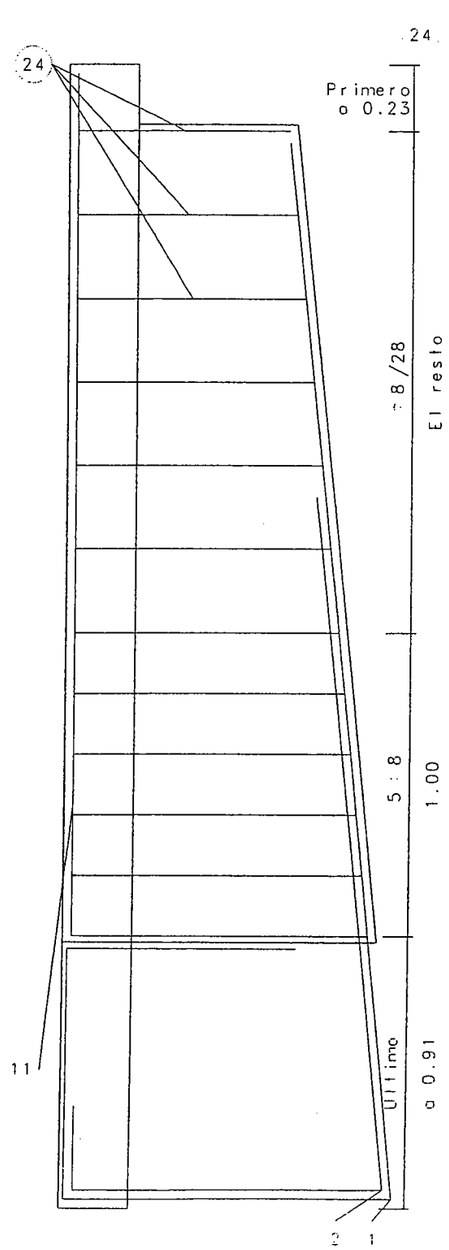
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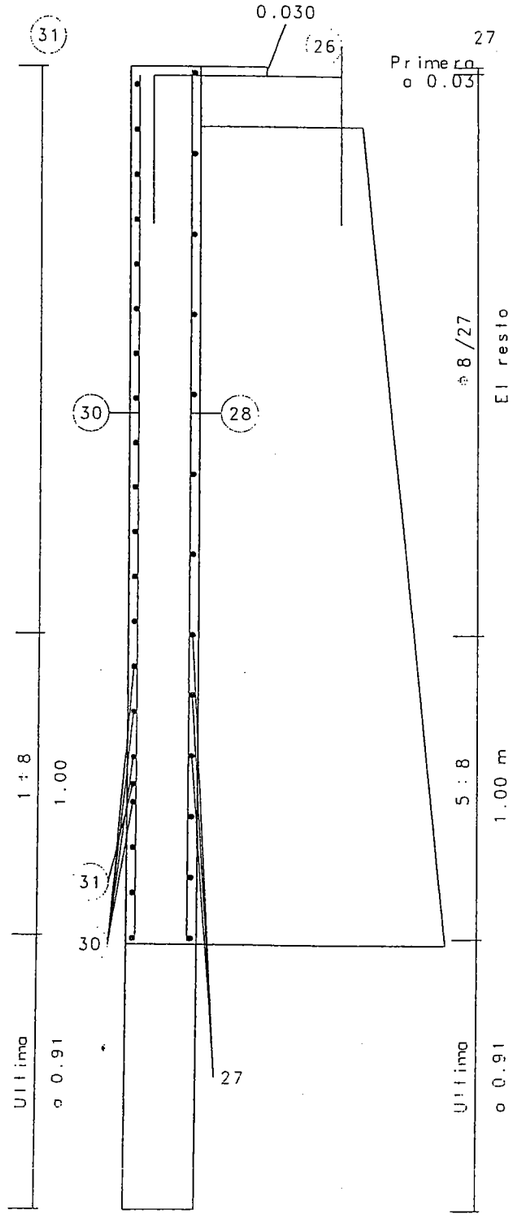
EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

REFER	H.MED
01 0859	3.809



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REFER	L1	R	Q	R1	R2	Q1	Q2
01D859	4.896	3.550	2.870	R-0.147	R+0.147	Q-0.147	Q+0.147

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

			Lo(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2	ø16	R+1.35	0.14 / 0.22, P, 4.00%, 0.30, 0.36, 0.80	R+1.35	0.14 / 0.22, R, 4.00%, 0.30, 0.36, 0.80	9.79	15.5
2	2	ø20	2.81	0.09 / 0.17, 2.33, 4.00%, 0.26, 0.30	2.40	0.07 / 0.19, 1.92, 4.00%, 0.26, 0.30	5.21	12.9
11	2	ø10	Q	Q	0	Q	5.74	3.5
24	12	ø8	1.15	0.10, a, b, 0.22			13.51	5.3

	a(m)	b(m)	L(m)
EST. SUP	0.25	0.13	1.05
VARIACION	1cm/0.25	1cm/2.08	
EST. INF	0.36	0.14	1.26

TOTAL 1 NERVIO 37.18

TOTAL 2 NERVIOS 74.36

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Los medidas indicadas en los dibujos de las barras de la armadura principal (1,2.....10) son de vértice a vértice, y del ramal largo, que está inclinado, su proyección horizontal. Al doblar las barras los vértices se curvarán de acuerdo con la Norma EH 91. Las longitudes La y Lb indicadas corresponden a DESARROLLO REAL de la barra (es decir a medida a tener en cuenta al cortar la barra) y, por consiguiente, su valor es inferior a la suma de las medidas parciales que aparecen en el dibujo.
La longitud L en el resto de barras es [illegible]

REFER	P.MED	P
01D859	3.509	2.869

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

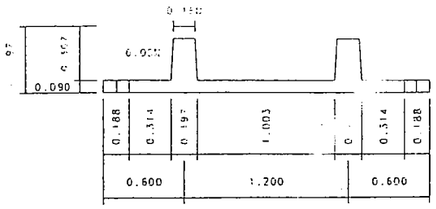
			L(m)		Lt(m)	P(kg)
26	2	ø10	1.17	0.50, 0.24, 0.50	2.34	1.4
27	13	ø8	2.34	2.34	30.42	12.0
28	8	ø6	P	P	22.96	5.1
30		ø6 ø5	2.34 P	P, 2.34, 0.20, 0.15, 2.34	6.71m2	15.1
31	1	ø8	2.34	2.34	2.34	0.9

TOTAL 34.57

KILOS DE ACERO POR PIEZA

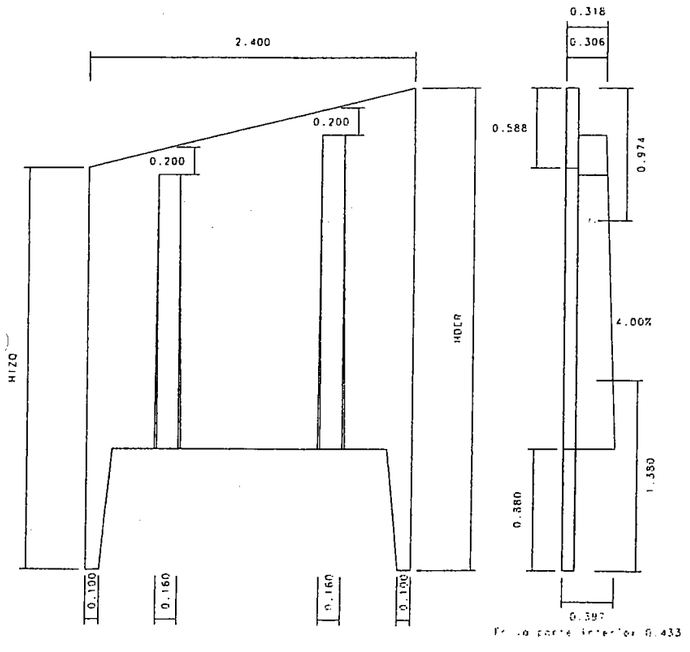
REFER	6	8	10	12	16	20	25	32	M2.ALA	BARRAS
01D859	5.10	23.59	8.52	0.00	30.91	25.71	0.00	0.00	6.71	93.83

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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)			
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN			
TRABAJO	MURO EST. E-2			
PERFIL	10118 1 4 31		PEDIDO	10041
NUMERO DE PIEZAS	1		PESO PIEZA (T)	1.80
M3 HORMIGON	0.72		fck (Kp/cm2)	350
KG ACERO	79.84		fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030		9/4/16	
GOMA ESTANDAR EN JUNTAS				
BERENJENO				

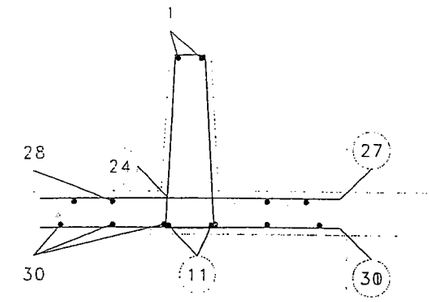
PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01[illegible]860	2.927	3.515	0.588	3.221



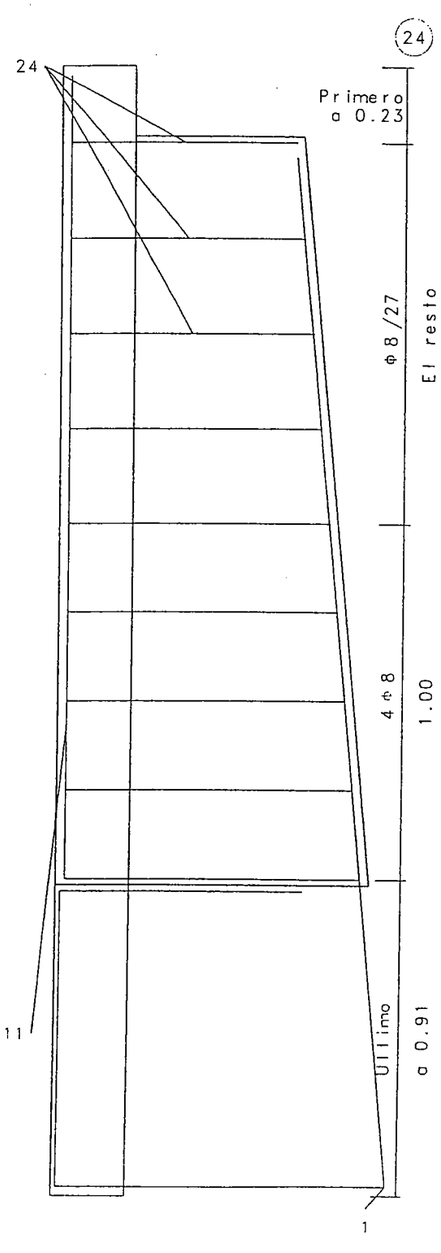
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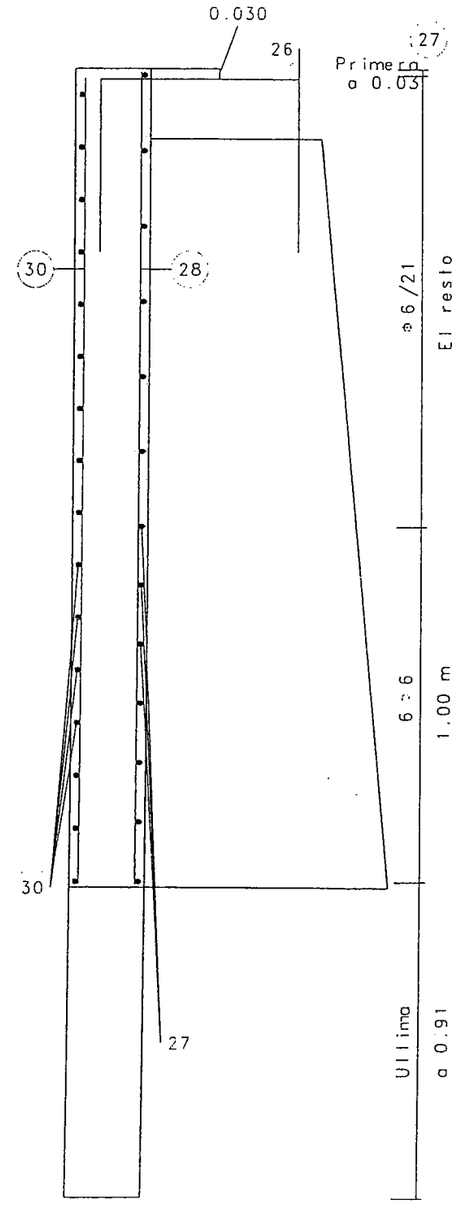
EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

REFER	H.MED
01[illegible]860	3.221



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REFER	L1	R	Q	R1	R2	Q1	Q2
01 [illegible]60	4.275	2.961	2.281	R-0.147	R+0.147	Q-0.147	Q+0.147

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		a(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2:20	R+ 1.31	0.11 / 0.23 / R / 4.00% / 0.30 / 0.34 / 0.80 / Q	R+ 1.31	0.11 / 0.23 / R / 4.00% / 0.30 / 0.34 / 0.80 / Q	8.55	21.1
1	2:10	Q	Q	Q	Q	4.56	2.8
24	9 :8	1.13	0.10 / a / b / 0.22			9.85	3.9

	a(m)	b(m)	L(m)
EST. SUP	0.25	0.13	1.05
VARIACION	1cm/0.25	1cm/2.08	
EST. INF	0.34	0.14	1.21

TOTAL 1 NERVIO 27.78

TOTAL 2 NERVIOS 55.57

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Las medidas indicadas en los dibujos de las barras de la armadura principal (1,2,...,10) son de vértice a vértice, y del ramal largo, que está inclinado, su proyección horizontal. A doblar las barras en vértices se curvarán de acuerdo con la Norma EH-91. Las longitudes Lo y Lo indicadas corresponden a DESARROLLO REAL de la barra (es lo mecico a tener en cuenta al cortar la barra) y, por consiguiente, su valor es superior a la suma de las medidas parciales acotadas en el plano.

REFER	H.MED	P
01 [illegible]60	3.221	2.281

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

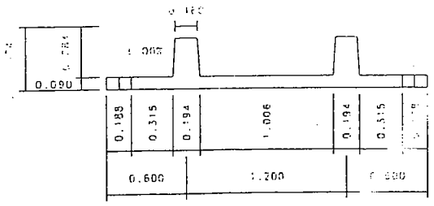
			L(m)		Li(m)	P(kg)
26	2 ø10		1.17	0.50 / 0.24 / 0.50	2.34	1.4
27	13 ø6		2.34	2.34	30.42	6.8
28	8 ø6		P	P	18.25	4.1
30	ø6 ø5		2.34 P	P / 2.34 / 0.20 / 0.15	5.34m2	12.0

TOTAL 24.25

KILOS DE ACERO POR PIEZA

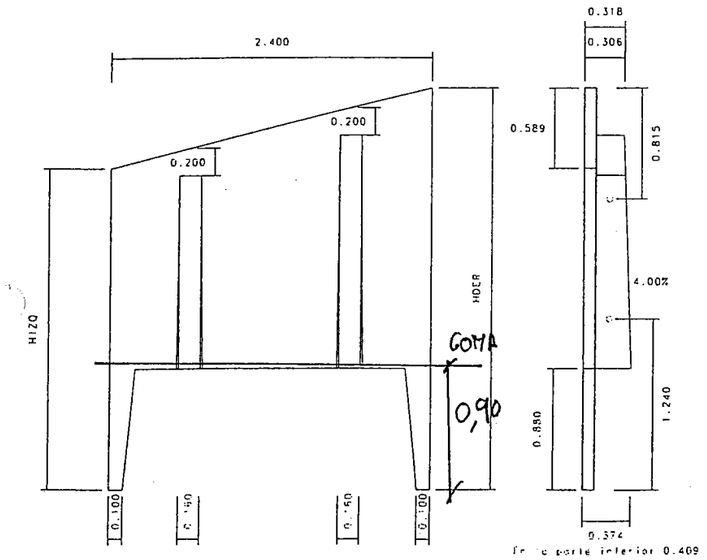
REFER	6	8	10	12	16	20	25	32	M2.ALA	BARRAS
01 [illegible]60	10.80	7.77	7.07	0.00	0.00	42.18	0.00	0.00	5.34	67.82

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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-2		
PERFIL	10118 1 4 32	PEDIDO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	1.38
M3 HORMIGON	0.53	fck (Kp/cm2)	350
KG ACERO	49.58	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	9/4/16	
MAMPOSTERIA CALIZA			

PISTA	REFER	H.IZO	H.DER	D.ALT	H.MED
	01[illegible]861	2.338	2.927	0.589	2.633

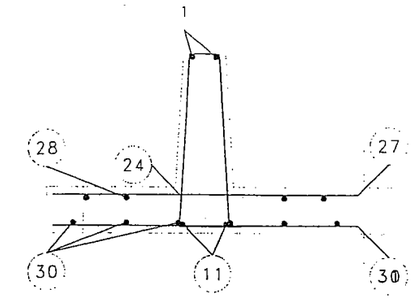


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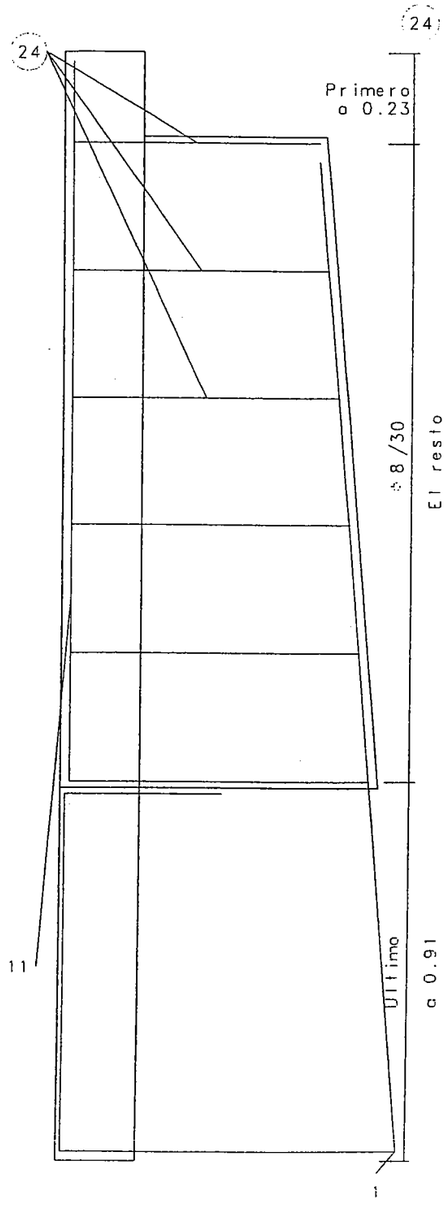
11/01/01 13:25 2. DESCRIPCION GEOMETRICA PL 15002

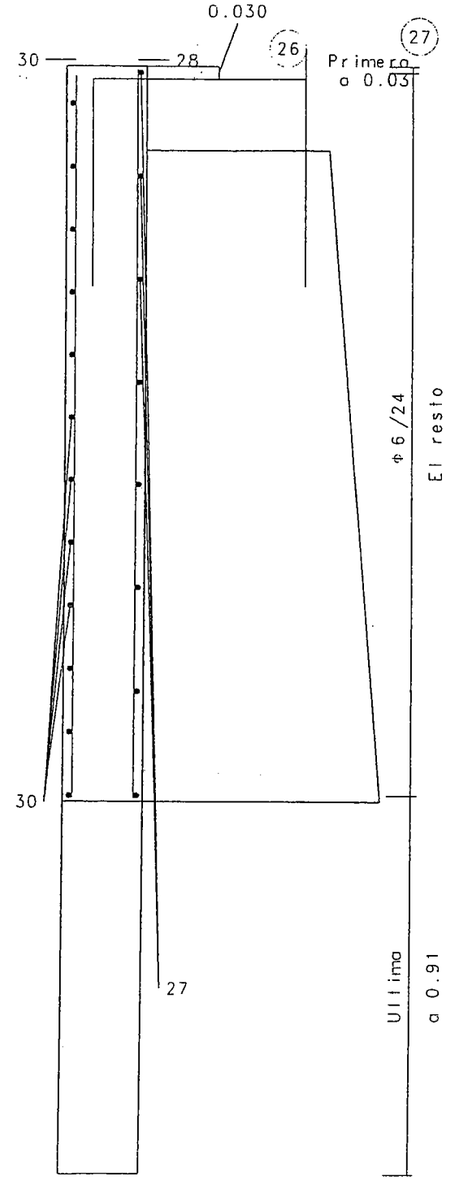
EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

REFER	H.MED
01[illegible]861	2.633



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11/01/01 13:25 L. DESPIECE DE LA ARMADURA DEL NERVIO PL 1PRO.1

REFER	L1	R	O	X1	X2	O1	O2
01D861	3.615	2.373	1.693	P-0.147	P+0.147	0-0.147	0+0.147

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		La(m)	Barra (a)	Lb(m)	Barra (b)	LT(m)	P(kg)
1	2 16	R+1.24	0.09 / 0.23, R, 4.00% 0.18, 0.32, 0.80, 0	R+1.24	0.09 / 0.23, R, 4.00% 0.18, 0.32, 0.80, 0	7.23	11.4
11	2 10	0		0		3.39	2.1
24	6 8	1.11	0.10, a, b, 0.22			6.44	2.5

	a(m)	b(m)	L(m)
EST. SUP	0.25	0.13	1.05
VARIACION	1cm/0.25	1cm/2.08	
EST. INF	0.31	0.14	1.17

TOTAL 1 NERVIO 16.04

TOTAL 2 NERVIOS 32.08

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Las medidas indicadas en los dibujos de las barras de la armadura principal (1,2.....10) son de vértice a vértice, y del ramal largo, que está inclinado, su proyección horizontal. Al doblar las barras los vértices se curvarán de acuerdo con la Norma EH-91. Las longitudes Lc y la indicadas corresponden a DESARROLLO REAL de la barra (es la medida a tener en cuenta al cortar la barra) y, por consiguiente, su valor es inferior a la suma de las medidas parciales acotadas en el dibujo.
Las barras 11 a 24 resultan de sumar la 1 a

11/01/01 13:25 L. DESPIECE DE LA ARMADURA DEL ALA Y MEDICION PL 1PRO.2

REFER	P.MED	P
01D861	2.633	1.693

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

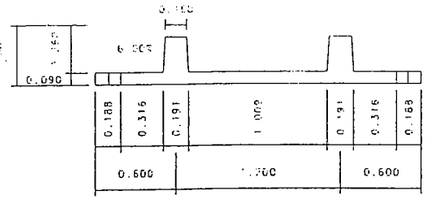
			L(m)		LI(m)	P(kg)
26	2 10		1.17	0.50, 0.24, 0.50	2.34	1.4
27	8	ø6	2.34	2.34	18.72	4.2
28	8	ø6	P	P	13.54	3.0
30		ø6 ø5	2.34 P	P, 2.34, 0.20, 0.15	3.96m2	8.9

TOTAL 17.51

KILOS DE ACERO POR PIEZA

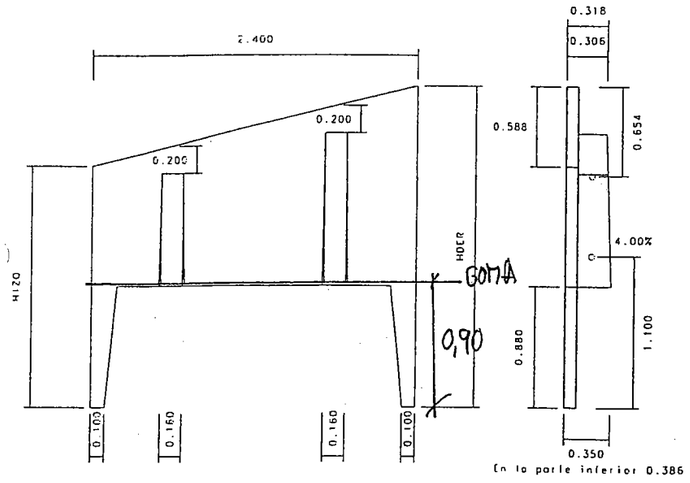
REFER	6	8	10	12	16	20	25	32	M2.ALA	BARRAS
01D861	7.16	5.08	5.61	0.00	22.82	0.00	0.00	0.00	3.96	40.67

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EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)		
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN		
TRABAJO	MURO EST. E-2		
PERFIL	10118 1 4 33	PEDIDO	10041
NUMERO DE PIEZAS	1	PESO PIEZA (T)	0.91
M3 HORMIGON	0.35	fck (Kp/cm2)	350
KG ACERO	38.16	fyk (Kp/cm2)	5100
RECUBRIMIENTO (M)	0.030	9/4/16	
MAMPOSTERIA CALIZA			

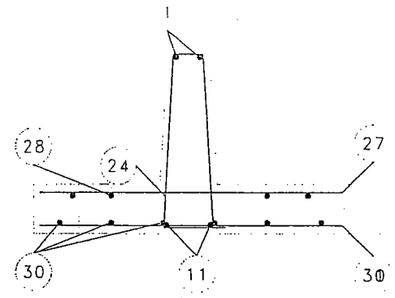
PISTA	REFER	H.IZQ	H.DER	D.ALT	H.MED
	01 LB62	1.750	2.338	0.588	2.044



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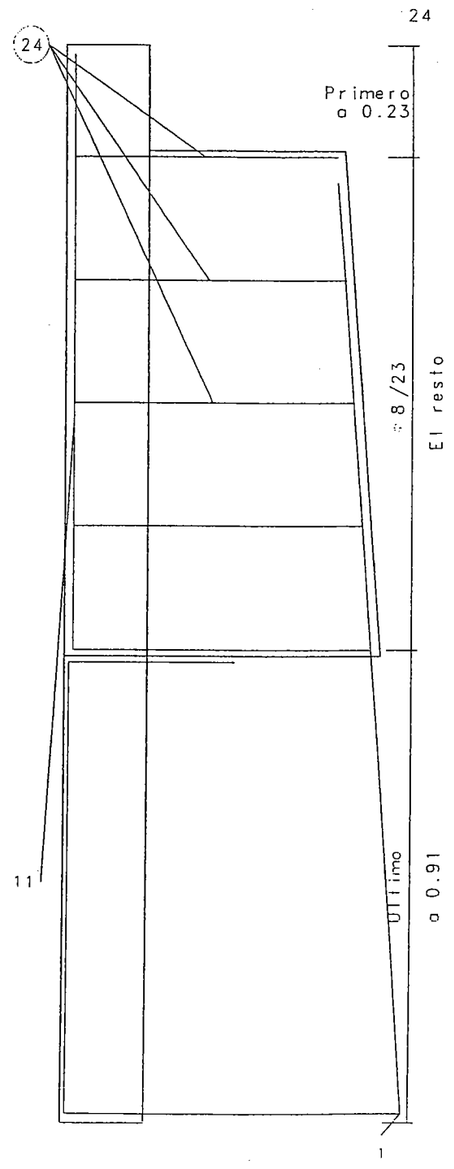
EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

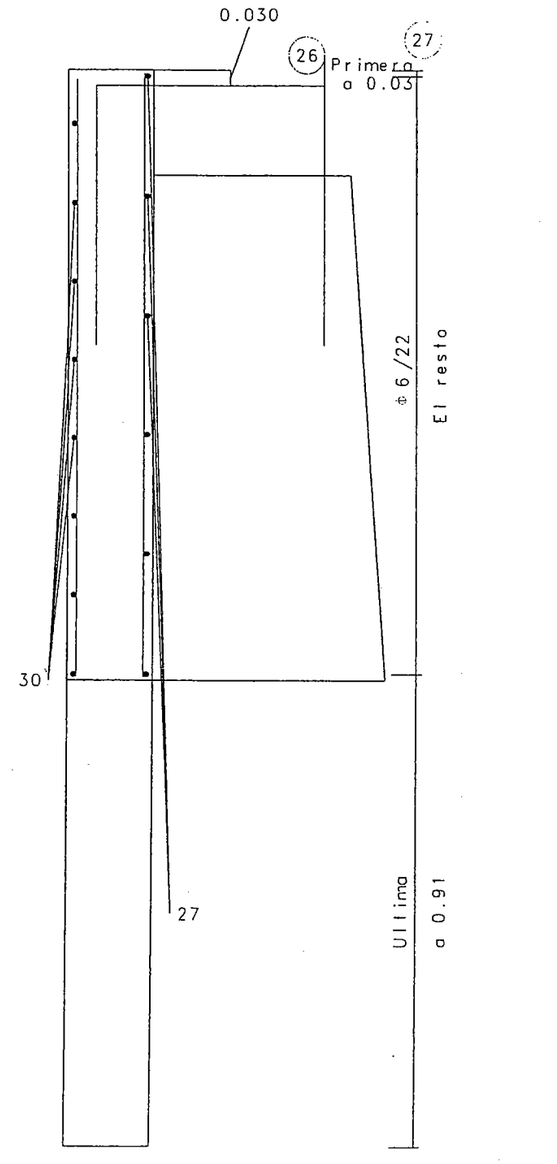
REFER	H.MED
01 LB62	2.044





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REFER	L1	P	Q	R1	R2	O1	O2
01 D862	3.003	1.264	1.104	R-0.147	R-0.147	0-0.147	0+0.147

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		Lo(m)	Barra (a)	Lb(m)	Barra (b)	L1(m)	P(kg)
1	2 : 16	R+ 1.22	0.07 R 0.22 4.00% 0.18 0.29 0.80	R+ 1.22	0.07 R 0.22 4.00% 0.18 0.29 0.80	6.01	9.5
11	2 : 10	0	Q	Q	Q	2.21	1.4
24	5 : 8	1.08	0.10 a b 0.22			5.26	2.1

	a(m)	b(m)	L(m)
EST. SUP	0.25	0.13	1.05
VARIACION	1cm/0.25	1cm/2.08	
EST. INF	0.29	0.13	1.12

TOTAL 1 NERVIO 12.92

TOTAL 2 NERVIOS 25.83

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Las medidas indicadas en los dibujos de las barras de la armadura principal (L, P, Q, R) son de vértice a vértice, y del normal largo, que este incluido, su proyección horizontal. Al doblar las barras los vértices se circunscriben de acuerdo con la Norma EH-91. Las longitudes Lo y Lb indicadas corresponden a DESARROLLO REAL de la barra (es decir a medida a tener en cuenta al cortar la barra) y, por consiguiente, su valor es inferior a la suma de las medidas parciales acotadas en el dibujo.

REFER	H.MED	P
01 D862	2.044	1.104

EMPRESA	UTE ALT-CAMP (DRAGADOS-TECSA)
OBRA	L.A.V. MADRID-BARCELONA-FRONT. FRAN
TRABAJO	MURO EST. E-2

		L(m)		L1(m)	P(kg)
26	2 : 10	1.17	0.50 0.24 0.50	2.34	1.4
27	6 : 6	2.34	2.34	14.04	3.1
28	8 : 6	P	P	8.83	2.0
30	6 : 5	2.34 P	P 2.34 0.20 0.15	2.58m2	5.8

TOTAL 12.35

KILOS DE ACERO POR PIEZA

REFER	6	8	10	12	16	20	25	32	M2.ALA	BARRAS
01 D862	5.08	4.15	4.16	0.00	18.96	0.00	0.00	0.00	2.58	32.35

NORTEN PH

Director Técnico
NEKANE MUNDUATE AUZMENDI
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U.T.E. ALT CAMP

AVE LLEIDA - MARTORELL
SUBTRAMO V EN VALLS
VIADUCTO 1

PRUEBA DE CARGA ESTÁTICA
ANEJO DE CÁLCULOS

OCTUBRE 2002

1. INTRODUCCIÓN

2. REALIZACIÓN DE LA PRUEBA DE CARGA

3. RELACIÓN DE ESFUERZOS Y MAGNITUDES PREVISTAS

3.1.1. HIPÓTESIS 1

3.1.2. HIPÓTESIS 2

3.1.3. HIPÓTESIS 3

3.1.4. HIPÓTESIS 4

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1. Introducción

La Prueba de Carga de una estructura es un proceso que, mediante la reproducción de un estado de carga sobre la misma, pretende obtener datos suficientes de su respuesta frente a dicho estado, de forma que pueda deducirse su comportamiento funcional.

No es objeto de este documento la comprobación de elementos estructurales aislados tales como piezas prefabricadas o pilotes, consideradas como unidades parciales de la estructura global. Las pruebas de recepción de estos elementos corresponden a ensayos de control a realizar antes o después de la ejecución de las obras, aunque a veces un comportamiento distinto al supuesto sea detectado en las pruebas de carga.

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2. Realización de la Prueba de carga

2.1.- Dirección de las pruebas

La dirección de las pruebas estará a cargo del Ingeniero Director de la Obra, el cual podrá, ante las incidencias habidas durante la ejecución de la misma, introducir cuantas modificaciones al programa general sean necesarias, ordenar la realización de pruebas complementarias, modificar o adaptar el tren de carga a las condiciones de las pruebas o a las características de la estructura, intensificar las medidas a realizar, ampliar los tiempos de carga, etcétera.

Será quien, una vez que considere realizadas en todas sus fases, dará por terminadas las pruebas, y deberá en su caso ordenar la suspensión de las mismas cuando así lo exija el comportamiento de la estructura durante el ensayo.

Deberá efectuar una inspección previa a la realización del ensayo y otra posterior al mismo en la que se refleje el estado final de la obra después del proceso de carga.

El Director de la Obra podrá encargar la realización de las pruebas a personal cualificado, al frente del cual figurará un Ingeniero especializado en este tipo de trabajos, a quién en adelante denominaremos Director de las Pruebas. Dependiendo de la naturaleza de la Obra puede ser conveniente la asesoría del Autor del Proyecto.

2.2.- Materialización del tren de cargas

Se empleará, normalmente, un tren de cargas constituido por camiones u otros vehículos análogos, que deberán ser entre sí lo más parecidos que sea posible en cuanto a forma, peso y dimensiones. Su número y características deberán ser los necesarios para adaptarse a los distintos estados de carga definidos en el proyecto de las pruebas.

Las solicitaciones a que dé lugar el tren de cargas real nunca podrán ser superiores a los valores que teóricamente produciría la aplicación del tren de cargas definido en la “Instrucción de Acciones”. Se aconseja no superar el 70% de dichos esfuerzos. Se señala igualmente que debido a las características de cada estructura es complicado, en algunas ocasiones, alcanzar tales valores con lo que se designarán

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siempre las relaciones entre valores reales y valores teóricos previstas en cada caso propuesto.

2.3.- Zonas de aplicación de la carga

Como norma general, la sobrecarga que sustituye al tren de la Instrucción se aplicará solamente en la calzada y arcenes, sin que sea necesario someter a prueba las aceras. También como norma general se distribuirán uniformemente los vehículos de carga en el ancho de la calzada y arcenes, si bien pueden definirse estados de carga en los que ésta se distribuya únicamente en la mitad izquierda o derecha de la misma.

Los estados de carga serán determinados por el proyectista de la prueba de forma que, cargando convenientemente distintas partes de la estructura, se alcancen los porcentajes deseados de los esfuerzos máximos producidos por el tren de cargas de la Instrucción en las secciones críticas.

En el caso de que el puente este compuesto por varios vanos iguales, la prueba de carga completa puede reducirse a un número de ellos, siempre que el control de la obra fuera del tipo intenso, realizando en el resto pruebas de carga reducidas. En el caso de vanos iguales isostáticos será suficiente realizar la prueba sobre un 30% del número total de vanos.

2.4.- Magnitudes a medir y aparatos de medida

Las magnitudes a medir serán aquellas que especifique el autor del Proyecto, de forma que permitan deducir el correcto comportamiento de la obra frente a los trenes de carga utilizados en las pruebas.

Asimismo, el proyectista fijará los puntos de la estructura en los que deban medirse las magnitudes correspondientes.

En el caso de medida de desplazamientos se referirán las medidas a puntos fijos que, siempre que sea posible, serán independientes de la estructura del puente.

Los aparatos de medida que se utilicen deberán estar sancionados por la experiencia en pruebas similares y deberán garantizar una apreciación mínima del orden

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de un 5% de los valores máximos esperados de las magnitudes que se vayan a medir. Su campo debe ser como mínimo superior en un 50% a los valores esperados de dichas magnitudes.

2.5.- Plazo de ejecución

La Prueba de Carga se realizará antes de la puesta en servicio de la estructura. En el momento de iniciarse las pruebas, el hormigón de cualquier elemento resistente de la obra deberá haber alcanzado la resistencia característica del proyecto. El Director de Obra podrá autorizar la realización de la prueba aunque no se cumpla esta condición, una vez analizada la repercusión estructural de tal decisión.

En el caso de que fuera necesario realizar la prueba antes de la ejecución de algunas unidades no estructurales que formen parte de la carga permanente, tales como el pavimento, aceras, barandillas, etc. pueden seguirse dos caminos:

a) Materializar una carga permanente supletoria equivalente a esas unidades de obra, colocándola, en este caso, con una antelación no inferior a 12 horas en puentes de hormigón.
b) Incrementar la carga de ensayo en la proporción que la ausencia de tales unidades represente.

2.6.- Forma de aplicación de las cargas

Se aconseja efectuar un mínimo de dos ciclos para cada uno de los estados de carga definidos en el proyecto de la prueba, con el fin de observar la concordancia de las medidas obtenidas. Una vez realizado el segundo ciclo y a la vista de los resultados obtenidos y del comportamiento general de la estructura, el Director de la prueba podrá determinar la necesidad de algún ciclo adicional.

En el caso de puentes con varios vanos iguales o análogos el Director de la prueba podrá reducir el número de ciclos, incluso a uno solo, cuando se vayan ocupando posiciones de carga similares en otros vanos, si el comportamiento es satisfactorio y concordante con los de los vanos precedentes.

La carga de ensayo se aplicará en un mínimo de dos escalones, si bien en el caso ya comentado de puentes con vanos análogos podrán a juicio del Director reducirse, e

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incluso limitarse a uno solo, cuando se vayan ocupando posiciones de carga similares en otros vanos, si el comportamiento de los anteriores ha sido satisfactorio. También podrá reducirse el número de escalones en los ciclos de carga posteriores al primero, una vez visto el comportamiento de la estructura en los ciclos anteriores.

La descarga se realizará, en general, en un solo escalón. No obstante el Director de las pruebas podrá, si lo juzga oportuno, disponer su realización en escalones análogos a los del proceso de carga.

En cualquier caso el número de ciclos y de escalones vendrá determinado por las condiciones previstas en el proyecto de la prueba de carga.

Los movimientos de los vehículos en cualquier fase del proceso de carga o descarga se efectuará con la suficiente lentitud para no provocar efectos dinámicos no deseados, y se organizarán de forma que la realización de cualquier estado de carga no produzca sobre otras partes de la estructura solicitaciones superiores a las previstas.

2.7.- Duración de la aplicación de las cargas

El tiempo que se debe mantener la aplicación de la carga en un escalón intermedio antes de pasar al escalón siguiente, así como el tiempo que se debe mantener la carga total correspondiente a un cierto estado de carga, vendrá determinado por el criterio de estabilización de las medidas (Ver apartado siguiente).

Se advierte especialmente sobre el hecho de que la aplicación de cargas de larga duración producirá frecuentemente resultados de difícil interpretación, a menos que se controlen los efectos de los distintos factores externos que pueden perturbar las medidas de la respuesta real de la estructura frente a la acción exclusiva de las cargas de ensayo aplicadas. Entre estas causas habrá que considerar las climatológicas y ambientales (variaciones térmicas, soleamiento, viento, lluvia…).

2.8.- Criterios de estabilización

Los valores de la respuesta de la estructura se obtienen en cada momento como diferencia entre las lecturas de los aparatos en ese instante y las lecturas iniciales en descarga del ciclo que se está realizando.

Una vez situado el tren de cargas correspondiente, bien a un escalón intermedio o al final de cualquier estado de carga, se realizará una medida de la respuesta instantánea de la estructura, y se controlarán los aparatos de medida situados en los puntos en que se esperen las deformaciones más desfavorables desde el punto de vista de la estabilización.

Transcurridos 10 minutos se realizará una nueva lectura en dichos puntos. Si las diferencias entre los nuevos valores de la respuesta y los instantáneos son inferiores al 5% de estos últimos, o bien son del mismo orden de la precisión de los aparatos de medida, se considerará estabilizado el proceso de carga y se realizará la lectura final en todos los puntos de medida. En caso contrario se mantendrá la carga durante un nuevo intervalo de 10 minutos, y deberá cumplirse al final de los mismos que la diferencia de lecturas correspondiente a ese intervalo no supere en más de un 20% a la diferencia de lecturas correspondiente al intervalos anterior, o bien sea del orden de la precisión de los aparatos de medida. Si esto no se cumpliera, se comprobará la misma condición en un nuevo intervalo de 10 minutos. Si el criterio de estabilización siguiera sin cumplirse, se procederá, a juicio del Ingeniero Director de las pruebas, a mantener la carga durante un nuevo intervalo, a suspender dicho estado de carga o bien a reducir la carga correspondiente al escalón considerado.

Una vez alcanzada la estabilización se tomarán las lecturas finales en todos los puntos de la misma. Por otra parte, deberá comprobarse que no se detecta ningún signo o muestra de fallo o inestabilidad en alguna parte de la estructura.

Una vez descargada totalmente la estructura se esperará a que los valores de las medidas estén estabilizados, aplicando el mismo criterio seguido para el proceso de carga. La diferencia entre los valores estabilizados después de la descarga y los iniciales antes de cargar serán los valores remanentes correspondientes al estado considerado.

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2.9.- Criterios de aceptación

Los valores de las magnitudes máximas al finalizar el ciclo de carga, medidas después de la estabilización, no superarán en más de un 15% a los valores previstos. Además la relación flecha-luz no superará el valor de 1/500. Se establece una anchura máxima de fisura que asciende a 0.1 mm y no deberán aparecer signos de agotamiento de la capacidad portante en ninguna parte de la estructura.

3. Relación de esfuerzos y magnitudes previstas

Se han realizado cálculos para obtener valores de flectores máximos en centro-luz de cada vano y en las secciones de pila.

Los camiones utilizados son del tipo bañera con la separación de ejes y la distribución de cargas indicada en los planos adjuntos. El primer escalón será aquel en el que se encuentren colocadas dos filas de camiones. El segundo escalón terminará cuando la tercera fila este colocada.

A continuación se adjuntan dichos cálculos.

3.1.1. HIPÓTESIS 1

Prueba de carga nº 1

Cargas Puntuales

X(m)	Y(m)	Carga(t)
-0.600	1.500	-3.500
-0.600	3.900	-3.500
3.100	1.500	-6.000
3.100	3.900	-6.000
6.600	1.500	-5.250
6.600	3.900	-5.250
8.000	1.500	-5.250
8.000	3.900	-5.250
-0.600	5.800	-3.500
-0.600	8.200	-3.500
3.100	5.800	-6.000
3.100	8.200	-6.000
6.600	5.800	-5.250
6.600	8.200	-5.250
8.000	5.800	-5.250
8.000	8.200	-5.250
12.000	1.500	-3.500
12.000	3.900	-3.500
15.700	1.500	-6.000
15.700	3.900	-6.000
19.200	1.500	-5.250
19.200	3.900	-5.250
20.600	1.500	-5.250
20.600	3.900	-5.250
12.000	5.800	-3.500
12.000	8.200	-3.500
15.700	5.800	-6.000
15.700	8.200	-6.000
19.200	5.800	-5.250
19.200	8.200	-5.250
20.600	5.800	-5.250
20.600	8.200	-5.250

Cargas en Nudos

Nudo	Carga(t)
9	-2.260
10	-5.358
11	-6.062
12	-4.560
15	-1.650
16	-3.913
17	-4.427
18	-3.330
21	-3.747
22	-8.884
23	-10.050
24	-7.560
27	-0.867
28	-2.056
29	-2.326
30	-1.750
33	-1.388
34	-3.290
35	-3.722
36	-2.800
39	-2.141
40	-5.076
41	-5.743
42	-4.320
45	-1.665
46	-3.948
47	-4.466
48	-3.360
51	-3.851
52	-9.130
54	-10.329
55	-7.770
59	-0.520
60	-1.234
61	-1.396
62	-1.050
Total...	-146.000

Prueba de carga nº 2

Cargas Puntuales

X(m)	Y(m)	Carga(t)
-0.600	1.500	-3.500
-0.600	3.900	-3.500
3.100	1.500	-6.000
3.100	3.900	-6.000
6.600	1.500	-5.250
6.600	3.900	-5.250
8.000	1.500	-5.250
8.000	3.900	-5.250
-0.600	5.800	-3.500
-0.600	8.200	-3.500
3.100	5.800	-6.000
3.100	8.200	-6.000
6.600	5.800	-5.250
6.600	8.200	-5.250
8.000	5.800	-5.250
8.000	8.200	-5.250
-0.600	10.100	-3.500
-0.600	12.500	-3.500
3.100	10.100	-6.000
3.100	12.500	-6.000
6.600	10.100	-5.250
6.600	12.500	-5.250
8.000	10.100	-5.250
8.000	12.500	-5.250
12.000	1.500	-3.500
12.000	3.900	-3.500
15.700	1.500	-6.000
15.700	3.900	-6.000
19.200	1.500	-5.250
19.200	3.900	-5.250
20.600	1.500	-5.250
20.600	3.900	-5.250
12.000	5.800	-3.500
12.000	8.200	-3.500
15.700	5.800	-6.000
15.700	8.200	-6.000
19.200	5.800	-5.250
19.200	8.200	-5.250
20.600	5.800	-5.250
20.600	8.200	-5.250
12.000	10.100	-3.500
12.000	12.500	-3.500
15.700	10.100	-6.000
15.700	12.500	-6.000
19.200	10.100	-5.250
19.200	12.500	-5.250
20.600	10.100	-5.250
20.600	12.500	-5.250

Cargas en Nudos

Nudo	Carga(t)
9	-2.260
10	-5.358
11	-6.062
12	-6.062
13	-5.358
14	-2.260
15	-1.650
16	-3.913
17	-4.427
18	-4.427
19	-3.913
20	-1.650
21	-3.747
22	-8.884
23	-10.050
24	-10.050
25	-8.884
26	-3.747
27	-0.867
28	-2.056
29	-2.326
30	-2.326
31	-2.056
32	-0.867
33	-1.388
34	-3.290
35	-3.722
36	-3.722
37	-3.290
38	-1.388
39	-2.141
40	-5.076
41	-5.743
42	-5.743
43	-5.076
44	-2.141
45	-1.665
46	-3.948
47	-4.466
48	-4.466
49	-3.948
50	-1.665
51	-3.851
52	-9.130
54	-10.329
55	-10.329
57	-9.130
58	-3.851
59	-0.520
60	-1.234
61	-1.396
62	-1.396
63	-1.234
64	-0.520
Total...	-219.000

Resultados del cálculo

Prueba de carga nº 1

Desplazamientos de nudos

Nudo	Giro X	Despl Y	Giro Z
27	-1.490473e-003	-4.743451e-003	2.219530e-004
28	-2.645230e-004	-1.584301e-003	3.163435e-005
29	-2.617213e-004	-8.448863e-004	1.964387e-005
30	-6.762239e-005	-4.813543e-004	7.102589e-006
31	-6.750883e-005	-2.910424e-004	-5.859491e-007
32	-6.192717e-005	-9.930520e-005	-8.023884e-006

Prueba de carga nº 2

Desplazamientos de nudos

Nudo	Giro X	Despl Y	Giro Z
27	-1.934802e-003	-6.670289e-003	2.274175e-004
28	-7.069006e-004	-2.191787e-003	3.067652e-005
29	-7.027184e-004	-2.098533e-004	1.255915e-005
30	7.027184e-004	-2.098533e-004	1.255915e-005
31	7.069006e-004	-2.191787e-003	3.067652e-005
32	1.934802e-003	-6.670289e-003	2.274175e-004

Envolvente de Esfuerzos

Momentos flectores en t.m

Viga	Tramo	Carro	Carro
		M·ximo	MÌnimo
1	5	178.35	0.00
-	-	142.53	0.00
2	53	175.37	0.00
-	-	142.53	0.00

Con el tren de cargas utilizado para esta prueba de carga se ha alcanzado, en el centro del vano 1, un 26% del momento positivo máximo que se produciría por la aplicación del tren de cargas definido en la "Instrucción de Acciones".

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3.1.2. HIPÓTESIS 2

Prueba de carga nº 1

Cargas Puntuales

X(m)	Y(m)	Carga(t)
22.900	1.500	-3.500
22.900	3.900	-3.500
26.600	1.500	-6.000
26.600	3.900	-6.000
30.100	1.500	-5.250
30.100	3.900	-5.250
31.500	1.500	-5.250
31.500	3.900	-5.250
22.900	5.800	-3.500
22.900	8.200	-3.500
26.600	5.800	-6.000
26.600	8.200	-6.000
30.100	5.800	-5.250
30.100	8.200	-5.250
31.500	5.800	-5.250
31.500	8.200	-5.250
35.500	1.500	-3.500
35.500	3.900	-3.500
39.200	1.500	-6.000
39.200	3.900	-6.000
42.700	1.500	-5.250
42.700	3.900	-5.250
44.100	1.500	-5.250
44.100	3.900	-5.250
35.500	5.800	-3.500
35.500	8.200	-3.500
39.200	5.800	-6.000
39.200	8.200	-6.000
42.700	5.800	-5.250
42.700	8.200	-5.250
44.100	5.800	-5.250
44.100	8.200	-5.250

Cargas en Nudos

Nudo	Carga(t)
51	-0.058
52	-0.137
54	-0.155
55	-0.117
59	-1.677
60	-3.976
61	-4.497
62	-3.383
65	-1.487
66	-3.525
67	-3.988
68	-3.000
71	-1.595
72	-3.782
73	-4.279
74	-3.219
77	-3.686
78	-8.740
79	-9.887
80	-7.437
83	-1.409
84	-3.342
85	-3.780
86	-2.844
89	-1.373
90	-3.256
91	-3.683
92	-2.771
95	-1.105
96	-2.619
97	-2.963
98	-2.229
101	-2.230
102	-5.288
103	-5.982
104	-4.500
107	-2.602
108	-6.169
109	-6.979
110	-5.250
113	-2.602
114	-6.169
115	-6.979
116	-5.250
Total...	-160.000

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Prueba de carga nº 2

Cargas Puntuales

X(m)	Y(m)	Carga(t)
22.900	1.500	-3.500
22.900	3.900	-3.500
26.600	1.500	-6.000
26.600	3.900	-6.000
30.100	1.500	-5.250
30.100	3.900	-5.250
31.500	1.500	-5.250
31.500	3.900	-5.250
22.900	5.800	-3.500
22.900	8.200	-3.500
26.600	5.800	-6.000
26.600	8.200	-6.000
30.100	5.800	-5.250
30.100	8.200	-5.250
31.500	5.800	-5.250
31.500	8.200	-5.250
22.900	10.100	-3.500
22.900	12.500	-3.500
26.600	10.100	-6.000
26.600	12.500	-6.000
30.100	10.100	-5.250
30.100	12.500	-5.250
31.500	10.100	-5.250
31.500	12.500	-5.250
35.500	1.500	-3.500
35.500	3.900	-3.500
39.200	1.500	-6.000
39.200	3.900	-6.000
42.700	1.500	-5.250
42.700	3.900	-5.250
44.100	1.500	-5.250
44.100	3.900	-5.250
35.500	5.800	-3.500
35.500	8.200	-3.500
39.200	5.800	-6.000
39.200	8.200	-6.000
42.700	5.800	-5.250
42.700	8.200	-5.250
44.100	5.800	-5.250
44.100	8.200	-5.250
35.500	10.100	-3.500
35.500	12.500	-3.500
39.200	10.100	-6.000
39.200	12.500	-6.000
42.700	10.100	-5.250
42.700	12.500	-5.250

44.100	10.100	-5.250
44.100	12.500	-5.250

Cargas en Nudos

Nudo	Carga(t)
51	-0.058
52	-0.137
54	-0.155
55	-0.155
57	-0.137
58	-0.058
59	-1.677
60	-3.976
61	-4.497
62	-4.497
63	-3.976
64	-1.677
65	-1.487
66	-3.525
67	-3.988
68	-3.988
69	-3.525
70	-1.487
71	-1.595
72	-3.782
73	-4.279
74	-4.279
75	-3.782
76	-1.595
77	-3.686
78	-8.740
79	-9.887
80	-9.887
81	-8.740
82	-3.686
83	-1.409
84	-3.342
85	-3.780
86	-3.780
87	-3.342
88	-1.409
89	-1.373
90	-3.256
91	-3.683
92	-3.683
93	-3.256
94	-1.373
95	-1.105
96	-2.619
97	-2.963
98	-2.963
99	-2.619
100	-1.105
101	-2.230
102	-5.288
103	-5.982
104	-5.982
105	-5.288
106	-2.230
107	-2.602
108	-6.169
109	-6.979
110	-6.979
111	-6.169
112	-2.602
113	-2.602
114	-6.169
115	-6.979
116	-6.979
117	-6.169
118	-2.602
Total...	-240.000

Resultados del cálculo

Prueba de carga nº 1

Desplazamientos de nudos

Nudo	Giro X	Despl Y	Giro Z
83	-1.571449e-003	-6.241959e-003	1.574046e-004
84	-2.813667e-004	-2.841140e-003	-3.638193e-005
85	-2.791591e-004	-2.053650e-003	-3.233073e-005
86	-1.334382e-004	-1.343992e-003	-1.938094e-005
87	-1.326124e-004	-9.695477e-004	-1.545743e-005
88	-1.203579e-004	-5.951828e-004	-1.095671e-005

Prueba de carga nº 2

Desplazamientos de nudos

Nudo	Giro X	Despl Y	Giro Z
83	-1.839463e-003	-7.650123e-003	1.613518e-004
84	-5.420671e-004	-3.461608e-003	-3.806346e-005
85	-5.380594e-004	-1.943152e-003	-3.968262e-005
86	5.380594e-004	-1.943152e-003	-3.968262e-005
87	5.420671e-004	-3.461608e-003	-3.806346e-005
88	1.839463e-003	-7.650123e-003	1.613518e-004

Envolvente de Esfuerzos

Momentos flectores en t.m

Viga	Tramo	Carro	Carro
		M·ximo	MÌnimo
1	14	245.55	0.00
-	-	236.47	0.00
2	62	245.55	0.00
-	-	236.47	0.00

Con el tren de cargas utilizado para esta prueba de carga se ha alcanzado, en el centro del vano 2, un 30% del momento máximo positivo que se produciría por la aplicación del tren de cargas definido en la "Instrucción de Acciones".

3.1.3. HIPÓTESIS 3

Prueba de carga nº 1

Cargas Puntuales

X(m)	Y(m)	Carga(t)
49.900	1.500	-3.500
49.900	3.900	-3.500
53.600	1.500	-6.000
53.600	3.900	-6.000
57.100	1.500	-5.250
57.100	3.900	-5.250
58.500	1.500	-5.250
58.500	3.900	-5.250
49.900	5.800	-3.500
49.900	8.200	-3.500
53.600	5.800	-6.000
53.600	8.200	-6.000
57.100	5.800	-5.250
57.100	8.200	-5.250
58.500	5.800	-5.250
58.500	8.200	-5.250
62.500	1.500	-3.500
62.500	3.900	-3.500
66.200	1.500	-6.000
66.200	3.900	-6.000
69.700	1.500	-5.250
69.700	3.900	-5.250
71.100	1.500	-5.250
71.100	3.900	-5.250
62.500	5.800	-3.500
62.500	8.200	-3.500
66.200	5.800	-6.000
66.200	8.200	-6.000
69.700	5.800	-5.250
69.700	8.200	-5.250
71.100	5.800	-5.250
71.100	8.200	-5.250

Cargas en Nudos

Nudo	Carga(t)
119	-0.058
120	-0.137
122	-0.155
123	-0.117
127	-1.677
128	-3.976
129	-4.497
130	-3.383
133	-1.869
134	-4.432
135	-5.013
136	-3.771
139	-1.873
140	-4.440
141	-5.023
142	-3.779
145	-3.816
146	-9.048
147	-10.236
148	-7.700
151	-1.033
152	-2.448
153	-2.769
154	-2.083
157	-1.322
158	-3.134
159	-3.545
160	-2.667
163	-2.464
164	-5.842
165	-6.609
166	-4.971
169	-1.798
170	-4.264
171	-4.823
172	-3.629
175	-3.829
176	-9.077
177	-10.269
178	-7.725
181	-0.087
182	-0.206
184	-0.233
185	-0.175
Total...	-160.000

Prueba de carga nº 2

Cargas Puntuales

X(m)	Y(m)	Carga(t)
49.900	1.500	-3.500
49.900	3.900	-3.500
53.600	1.500	-6.000
53.600	3.900	-6.000
57.100	1.500	-5.250
57.100	3.900	-5.250
58.500	1.500	-5.250
58.500	3.900	-5.250
49.900	5.800	-3.500
49.900	8.200	-3.500
53.600	5.800	-6.000
53.600	8.200	-6.000
57.100	5.800	-5.250
57.100	8.200	-5.250
58.500	5.800	-5.250
58.500	8.200	-5.250
49.900	10.100	-3.500
49.900	12.500	-3.500
53.600	10.100	-6.000
53.600	12.500	-6.000
57.100	10.100	-5.250
57.100	12.500	-5.250
58.500	10.100	-5.250
58.500	12.500	-5.250
62.500	1.500	-3.500
62.500	3.900	-3.500
66.200	1.500	-6.000
66.200	3.900	-6.000
69.700	1.500	-5.250
69.700	3.900	-5.250
71.100	1.500	-5.250
71.100	3.900	-5.250
62.500	5.800	-3.500
62.500	8.200	-3.500
66.200	5.800	-6.000
66.200	8.200	-6.000
69.700	5.800	-5.250
69.700	8.200	-5.250
71.100	5.800	-5.250
71.100	8.200	-5.250
62.500	10.100	-3.500
62.500	12.500	-3.500
66.200	10.100	-6.000
66.200	12.500	-6.000
69.700	10.100	-5.250
69.700	12.500	-5.250
71.100	10.100	-5.250
71.100	12.500	-5.250

Cargas en Nudos

Nudo	Carga(t)
119	-0.058
120	-0.137
122	-0.155
123	-0.155
125	-0.137
126	-0.058
127	-1.677
128	-3.976
129	-4.497
130	-4.497
131	-3.976
132	-1.677
133	-1.869
134	-4.432
135	-5.013
136	-5.013
137	-4.432
138	-1.869
139	-1.873
140	-4.440
141	-5.023
142	-5.023
143	-4.440
144	-1.873
145	-3.816
146	-9.048
147	-10.236
148	-10.236
149	-9.048
150	-3.816
151	-1.033
152	-2.448
153	-2.769
154	-2.769
155	-2.448
156	-1.033
157	-1.322
158	-3.134
159	-3.545
160	-3.545
161	-3.134
162	-1.322
163	-2.464
164	-5.842
165	-6.609
166	-6.609
167	-5.842
168	-2.464
169	-1.798
170	-4.264
171	-4.823
172	-4.823
173	-4.264
174	-1.798
175	-3.829
176	-9.077
177	-10.269
178	-10.269
179	-9.077
180	-3.829
181	-0.087
182	-0.206
184	-0.233
185	-0.233
187	-0.206
188	-0.087
Total...	-240.000

Resultados del cálculo

Prueba de carga nº 1

Desplazamientos de nudos

Nudo	Giro X	Despl Y	Giro Z
151	-1.484614e-003	-6.051648e-003	1.779267e-004
152	-2.752508e-004	-2.889381e-003	1.297799e-006
153	-2.733212e-004	-2.118593e-003	1.969590e-006
154	-1.402735e-004	-1.406552e-003	8.695587e-007
155	-1.394607e-004	-1.012911e-003	2.811874e-007
156	-1.276298e-004	-6.173743e-004	3.413317e-007

Prueba de carga nº 2

Desplazamientos de nudos

Nudo	Giro X	Despl Y	Giro Z
151	-1.712470e-003	-7.310627e-003	1.757849e-004
152	-4.961770e-004	-3.479595e-003	5.721556e-007
153	-4.925422e-004	-2.089580e-003	2.646879e-006
154	4.925422e-004	-2.089580e-003	2.646879e-006
155	4.961770e-004	-3.479595e-003	5.721556e-007
156	1.712470e-003	-7.310627e-003	1.757849e-004

Envolvente de Esfuerzos

Momentos flectores en t.m

Viga	Tramo	Carro	Carro
		M·ximo	MÌnimo
1	25	246.88	0.00
-	-	228.63	0.00
2	73	246.88	0.00
-	-	228.63	0.00

Con el tren de cargas utilizado para esta prueba de carga se ha alcanzado, en el centro del vano 3, un 29% del momento máximo positivo que se produciría por la aplicación del tren de cargas definido en la "Instrucción de Acciones".

3.1.4. HIPÓTESIS 4

Prueba de carga nº 1

Cargas Puntuales

X(m)	Y(m)	Carga(t)
9.400	1.500	-3.500
9.400	3.900	-3.500
13.100	1.500	-6.000
13.100	3.900	-6.000
16.600	1.500	-5.250
16.600	3.900	-5.250
18.000	1.500	-5.250
18.000	3.900	-5.250
9.400	5.800	-3.500
9.400	8.200	-3.500
13.100	5.800	-6.000
13.100	8.200	-6.000
16.600	5.800	-5.250
16.600	8.200	-5.250
18.000	5.800	-5.250
18.000	8.200	-5.250
22.000	1.500	-3.500
22.000	3.900	-3.500
25.700	1.500	-6.000
25.700	3.900	-6.000
29.200	1.500	-5.250
29.200	3.900	-5.250
30.600	1.500	-5.250
30.600	3.900	-5.250
22.000	5.800	-3.500
22.000	8.200	-3.500
25.700	5.800	-6.000
25.700	8.200	-6.000
29.200	5.800	-5.250
29.200	8.200	-5.250
30.600	5.800	-5.250
30.600	8.200	-5.250

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Cargas en Nudos

Nudo	Carga(t)
21	-0.416
22	-0.987
23	-1.117
24	-0.840
27	-1.318
28	-3.126
29	-3.536
30	-2.660
33	-2.260
34	-5.358
35	-6.062
36	-4.560
39	-1.650
40	-3.913
41	-4.427
42	-3.330
45	-3.747
46	-8.884
47	-10.050
48	-7.560
51	-1.099
52	-2.605
54	-2.947
55	-2.217
59	-1.156
60	-2.742
61	-3.102
62	-2.333
65	-2.602
66	-6.169
67	-6.979
68	-5.250
71	-1.456
72	-3.452
73	-3.905
74	-2.937
77	-3.686
78	-8.740
79	-9.887
80	-7.437
83	-0.434
84	-1.028
85	-1.163
86	-0.875
Total...	-160.000

Prueba de carga nº 2

Cargas Puntuales

X(m)	Y(m)	Carga(t)
9.400	1.500	-3.500
9.400	3.900	-3.500
13.100	1.500	-6.000
13.100	3.900	-6.000
16.600	1.500	-5.250
16.600	3.900	-5.250
18.000	1.500	-5.250
18.000	3.900	-5.250
9.400	5.800	-3.500
9.400	8.200	-3.500
13.100	5.800	-6.000
13.100	8.200	-6.000
16.600	5.800	-5.250
16.600	8.200	-5.250
18.000	5.800	-5.250
18.000	8.200	-5.250
9.400	10.100	-3.500
9.400	12.500	-3.500
13.100	10.100	-6.000
13.100	12.500	-6.000
16.600	10.100	-5.250
16.600	12.500	-5.250
18.000	10.100	-5.250
18.000	12.500	-5.250
22.000	1.500	-3.500
22.000	3.900	-3.500
25.700	1.500	-6.000
25.700	3.900	-6.000
29.200	1.500	-5.250
29.200	3.900	-5.250
30.600	1.500	-5.250
30.600	3.900	-5.250
22.000	5.800	-3.500
22.000	8.200	-3.500
25.700	5.800	-6.000
25.700	8.200	-6.000
29.200	5.800	-5.250
29.200	8.200	-5.250
30.600	5.800	-5.250
30.600	8.200	-5.250
22.000	10.100	-3.500
22.000	12.500	-3.500
25.700	10.100	-6.000
25.700	12.500	-6.000
29.200	10.100	-5.250
29.200	12.500	-5.250
30.600	10.100	-5.250
30.600	12.500	-5.250

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Cargas en Nudos

Nudo	Carga(t)
21	-0.416
22	-0.987
23	-1.117
24	-1.117
25	-0.987
26	-0.416
27	-1.318
28	-3.126
29	-3.536
30	-3.536
31	-3.126
32	-1.318
33	-2.260
34	-5.358
35	-6.062
36	-6.062
37	-5.358
38	-2.260
39	-1.650
40	-3.913
41	-4.427
42	-4.427
43	-3.913
44	-1.650
45	-3.747
46	-8.884
47	-10.050
48	-10.050
49	-8.884
50	-3.747
51	-1.099
52	-2.605
54	-2.947
55	-2.947
57	-2.605
58	-1.099
59	-1.156
60	-2.742
61	-3.102
62	-3.102
63	-2.742
64	-1.156
65	-2.602
66	-6.169
67	-6.979
68	-6.979
69	-6.169
70	-2.602
71	-1.456
72	-3.452
73	-3.905
74	-3.905
75	-3.452
76	-1.456
77	-3.686
78	-8.740
79	-9.887
80	-9.887
81	-8.740
82	-3.686
83	-0.434
84	-1.028
85	-1.163
86	-1.163
87	-1.028
88	-0.434
Total...	-240.000

Resultados del cálculo

Prueba de carga nº 1

Desplazamientos de nudos

Nudo	Giro X	Despl Y	Giro Z
83	-9.587300e-004	-3.263511e-003	4.604675e-004
84	-1.858455e-004	-1.193774e-003	1.177077e-005
85	-1.841228e-004	-6.739194e-004	-4.481892e-006
86	-4.171528e-005	-3.895611e-004	3.255974e-006
87	-4.151177e-005	-2.723406e-004	-4.220904e-006
88	-3.693689e-005	-1.563526e-004	-1.085346e-005

Prueba de carga nº 2

Desplazamientos de nudos

Nudo	Giro X	Despl Y	Giro Z
83	-1.291949e-003	-4.729717e-003	4.913187e-004
84	-5.160633e-004	-1.672686e-003	2.107976e-005
85	-5.132118e-004	-2.254982e-004	-1.645191e-005
86	5.132118e-004	-2.254982e-004	-1.645191e-005
87	5.160633e-004	-1.672686e-003	2.107976e-005
88	1.291949e-003	-4.729717e-003	4.913187e-004

Envolvente de Esfuerzos

Momentos flectores en t.m

Viga	Tramo	Carro M·ximo	Carro MÌnimo
1	9	0.00	-221.32
-	-	0.00	-67.63
2	57	0.00	-200.23
-	-	0.00	-62.43

Con el tren de cargas utilizado para esta prueba de carga se ha alcanzado, en la zona de apoyo sobre la pila 1, un 26% del momento máximo negativo que se produciría por la aplicación del tren de cargas definido en la "Instrucción de Acciones".

3.1.5. HIPÓTESIS 5

Prueba de carga nº 1

Cargas Puntuales

X(m)	Y(m)	Carga(t)
36.400	1.500	-3.500
36.400	3.900	-3.500
40.100	1.500	-6.000
40.100	3.900	-6.000
43.600	1.500	-5.250
43.600	3.900	-5.250
45.000	1.500	-5.250
45.000	3.900	-5.250
36.400	5.800	-3.500
36.400	8.200	-3.500
40.100	5.800	-6.000
40.100	8.200	-6.000
43.600	5.800	-5.250
43.600	8.200	-5.250
45.000	5.800	-5.250
45.000	8.200	-5.250
49.000	1.500	-3.500
49.000	3.900	-3.500
52.700	1.500	-6.000
52.700	3.900	-6.000
56.200	1.500	-5.250
56.200	3.900	-5.250
57.600	1.500	-5.250
57.600	3.900	-5.250
49.000	5.800	-3.500
49.000	8.200	-3.500
52.700	5.800	-6.000
52.700	8.200	-6.000
56.200	5.800	-5.250
56.200	8.200	-5.250
57.600	5.800	-5.250
57.600	8.200	-5.250

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Cargas en Nudos

Nudo	Carga(t)
89	-0.723
90	-1.714
91	-1.939
92	-1.458
95	-1.012
96	-2.399
97	-2.714
98	-2.042
101	-2.602
102	-6.169
103	-6.979
104	-5.250
107	-1.456
108	-3.452
109	-3.905
110	-2.937
113	-3.686
114	-8.740
115	-9.887
116	-7.437
119	-1.012
120	-2.399
122	-2.714
123	-2.042
127	-1.156
128	-2.742
129	-3.102
130	-2.333
133	-2.889
134	-6.849
135	-7.748
136	-5.829
139	-2.018
140	-4.784
141	-5.412
142	-4.071
145	-3.271
146	-7.755
147	-8.773
148	-6.600
Total...	-160.000

Prueba de carga nº 2

Cargas Puntuales

X(m)	Y(m)	Carga(t)
36.400	1.500	-3.500
36.400	3.900	-3.500
40.100	1.500	-6.000
40.100	3.900	-6.000
43.600	1.500	-5.250
43.600	3.900	-5.250
45.000	1.500	-5.250
45.000	3.900	-5.250
36.400	5.800	-3.500
36.400	8.200	-3.500
40.100	5.800	-6.000
40.100	8.200	-6.000
43.600	5.800	-5.250
43.600	8.200	-5.250
45.000	5.800	-5.250
45.000	8.200	-5.250
36.400	10.100	-3.500
36.400	12.500	-3.500
40.100	10.100	-6.000
40.100	12.500	-6.000
43.600	10.100	-5.250
43.600	12.500	-5.250
45.000	10.100	-5.250
45.000	12.500	-5.250
49.000	1.500	-3.500
49.000	3.900	-3.500
52.700	1.500	-6.000
52.700	3.900	-6.000
56.200	1.500	-5.250
56.200	3.900	-5.250
57.600	1.500	-5.250
57.600	3.900	-5.250
49.000	5.800	-3.500
49.000	8.200	-3.500
52.700	5.800	-6.000
52.700	8.200	-6.000
56.200	5.800	-5.250
56.200	8.200	-5.250
57.600	5.800	-5.250
57.600	8.200	-5.250
49.000	10.100	-3.500
49.000	12.500	-3.500
52.700	10.100	-6.000
52.700	12.500	-6.000
56.200	10.100	-5.250
56.200	12.500	-5.250
57.600	10.100	-5.250
57.600	12.500	-5.250

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Cargas en Nudos

Nudo	Carga(t)
89	-0.723
90	-1.714
91	-1.939
92	-1.939
93	-1.714
94	-0.723
95	-1.012
96	-2.399
97	-2.714
98	-2.714
99	-2.399
100	-1.012
101	-2.602
102	-6.169
103	-6.979
104	-6.979
105	-6.169
106	-2.602
107	-1.456
108	-3.452
109	-3.905
110	-3.905
111	-3.452
112	-1.456
113	-3.686
114	-8.740
115	-9.887
116	-9.887
117	-8.740
118	-3.686
119	-1.012
120	-2.399
122	-2.714
123	-2.714
125	-2.399
126	-1.012
127	-1.156
128	-2.742
129	-3.102
130	-3.102
131	-2.742
132	-1.156
133	-2.889
134	-6.849
135	-7.748
136	-7.748
137	-6.849
138	-2.889
139	-2.018
140	-4.784
141	-5.412
142	-5.412
143	-4.784
144	-2.018
145	-3.271
146	-7.755
147	-8.773
148	-8.773
149	-7.755
150	-3.271
Total...	-240.000

Resultados del cálculo

Prueba de carga nº 1

Desplazamientos de nudos

Nudo	Giro X	Despl Y	Giro Z
151	-7.714952e-004	-2.761712e-003	4.258658e-004
152	-1.685437e-004	-1.128884e-003	2.573319e-005
153	-1.673162e-004	-6.568612e-004	9.095025e-006
154	-5.021680e-005	-3.704821e-004	8.437737e-006
155	-5.000802e-005	-2.294340e-004	-1.475982e-006
156	-4.621444e-005	-8.683268e-005	-1.057279e-005

Prueba de carga nº 2

Desplazamientos de nudos

Nudo	Giro X	Despl Y	Giro Z
151	-1.029771e-003	-3.887955e-003	4.442018e-004
152	-4.242632e-004	-1.490149e-003	3.062470e-005
153	-4.220657e-004	-3.001120e-004	6.180504e-007
154	4.220657e-004	-3.001120e-004	6.180504e-007
155	4.242632e-004	-1.490149e-003	3.062470e-005
156	1.029771e-003	-3.887955e-003	4.442018e-004

Envolvente de Esfuerzos

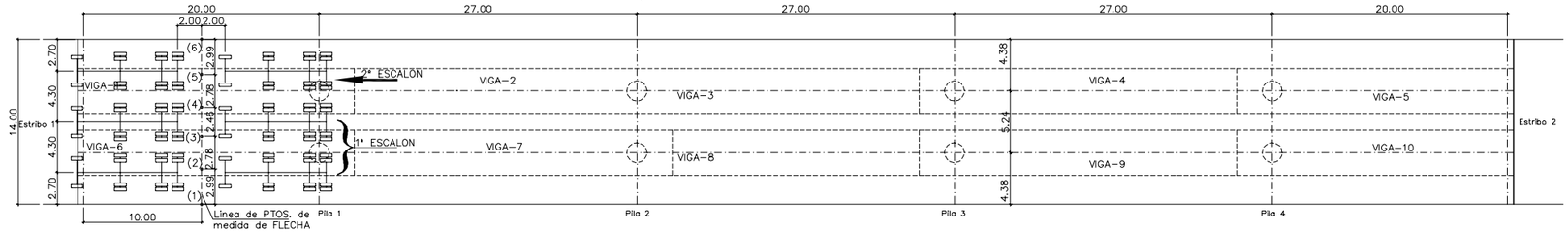
Momentos flectores en t.m

Viga	Tramo	Carro M·ximo	Carro MÌnimo
1	20	0.00	-227.25
-	-	0.00	-72.56
2	68	0.00	-208.11
-	-	0.00	-69.23

Con el tren de cargas utilizado para esta prueba de carga se ha alcanzado, en la zona de apoyo sobre la pila 2, un 23% del momento máximo negativo que se produciría por la aplicación del tren de cargas definido en la "Instrucción de Acciones".

PRUEBA DE CARGA (HIPOTESIS 1)

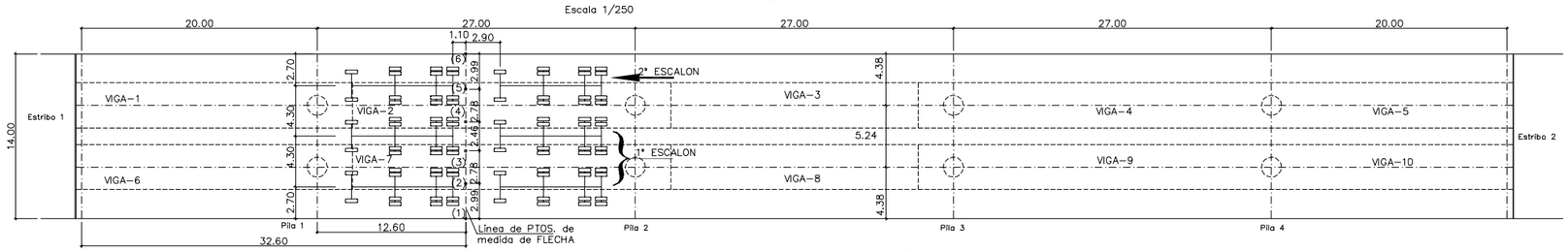
Escala 1/250



FLECHAS TEORICAS (mm.) HIPOTESIS 1 PRODUCIDO EN EL TREN DE CARGAS DE:		
	PRUEBA DE CARGA	
	1°ESCALON	2° ESCALON
p-1	4.74	6.67
p-2	1.58	2.19
p-3	0.84	0.21
p-4	0.48	0.21
p-5	0.29	2.19
p-6	0.10	6.67

PRUEBA DE CARGA (HIPOTESIS 2)

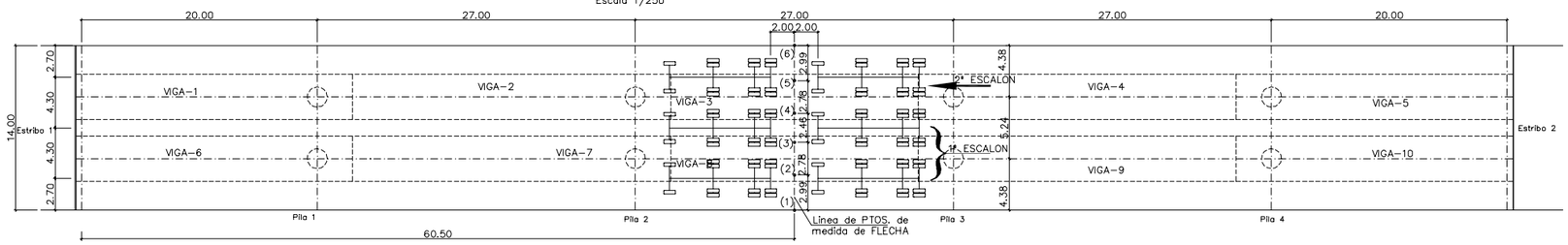
Escala 1/250



FLECHAS TEORICAS (mm.) HIPOTESIS 2 PRODUCIDO EN EL TREN DE CARGAS DE:		
	PRUEBA DE CARGA	
	1°ESCALON	2° ESCALON
p-1	6.24	7.65
p-2	2.84	3.46
p-3	2.05	1.94
p-4	1.34	1.94
p-5	0.97	3.46
p-6	0.60	7.65

PRUEBA DE CARGA (HIPOTESIS 3)

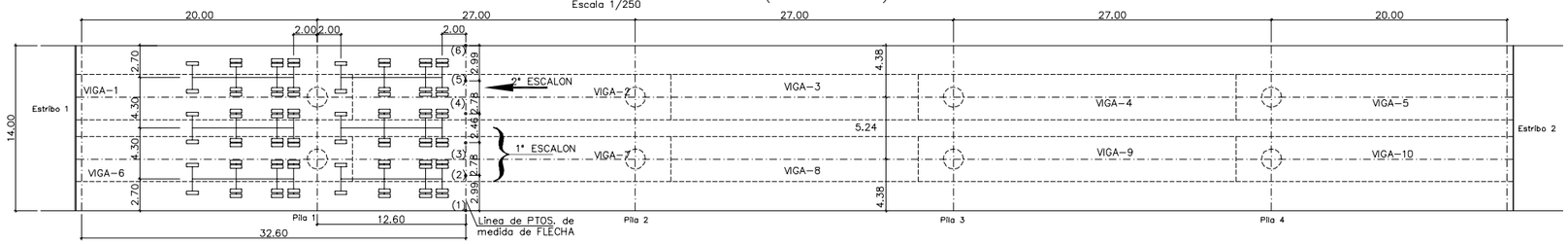
Escala 1/250



FLECHAS TEORICAS (mm.) HIPOTESIS 3 PRODUCIDO EN EL TREN DE CARGAS DE:		
	PRUEBA DE CARGA	
	1°ESCALON	2° ESCALON
p-1	6.05	7.31
p-2	2.89	3.48
p-3	2.12	2.09
p-4	1.41	2.09
p-5	1.01	3.48
p-6	0.62	7.31

PRUEBA DE CARGA (HIPOTESIS 4)

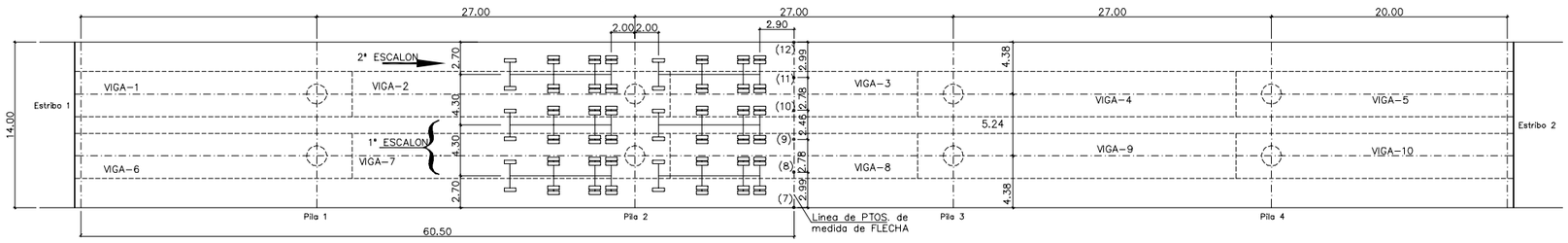
Escala 1/250



FLECHAS TEORICAS (mm.) HIPOTESIS 4 PRODUCIDO EN EL TREN DE CARGAS DE:		
	PRUEBA DE CARGA	
	1°ESCALON	2° ESCALON
p-1	3.26	4.73
p-2	1.19	1.67
p-3	0.67	0.23
p-4	0.39	0.23
p-5	0.27	1.67
p-6	0.16	4.73

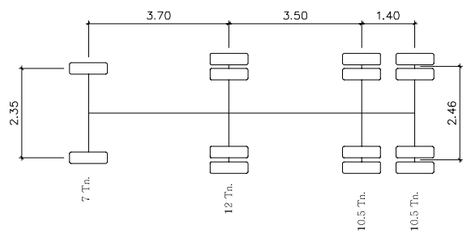
PRUEBA DE CARGA (HIPOTESIS 5)

Escala 1/250



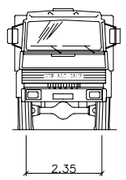
FLECHAS TEORICAS (mm.) HIPOTESIS 5 PRODUCIDO EN EL TREN DE CARGAS DE:		
	PRUEBA DE CARGA	
	1°ESCALON	2° ESCALON
p-1	2.76	3.89
p-2	1.13	1.49
p-3	0.67	0.30
p-4	0.37	0.30
p-5	0.23	1.49
p-6	0.08	3.89

PLANTA

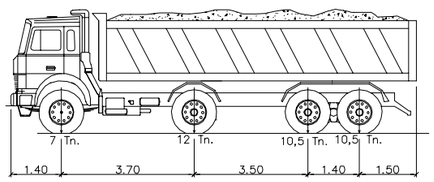


CAMION TIPO BAÑERA

ALZADO FRONTAL



ALZADO LATERAL



	FIRMA	FECHA
DIBUJADO	j. a. faro	21-02-02
COMPROBADO		
MODIFICADO	M.SUBIAS	30-10-02
SUSTITUYE A	01-08.937\18	
SUSTITUIDO POR		

PREFABRICACION LIGERA Y PESADA

OFICINA TECNICA ALVISA

CLIENTE: UTE. ALT CAMP
L.A.V. MADRID-BARCELONA
Tramo: LLEIDA-MARTORELL Subtramo V. VALLS

N° PLANO: 01-08.937\18-B

ESCALA: Indicadas

DESIGNACION: PRUEBA DE CARGA

REFERENCIA
N° de Expte. : B-08.937

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CLIENTE: UTE ALT CAMP

OBRA: L.A.V. MADRID – BARCELONA – FRONTERA – FRANCESA
TRAMO LLEIDA – MARTORELL. SUBTRAMO V

CÁLCULO DE FRECUENCIAS PROPIAS DE VIBRACIÓN

ESTRUCTURA E-1
L.A.V. MADRID – BARCELONA – FRONTERA FRANCESA
TRAMO LLEIDA – MARTORELL. SUBTRAMO V

OCTUBRE 2002

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AUSCULTACIÓN DE ESTRUCTURAS
Obra: L.A.V. Madrid – Barcelona – Frontera Francesa
Tramo Lleida - Martorell
Cliente: UTE ALT CAMP
Fecha: Octubre 2002

1. INTRODUCCIÓN

1. INTRODUCCIÓN

De acuerdo con la "*IAP: Instrucción sobre las acciones a considerar en el Proyecto de Puentes de Ferrocarril*" de 1.975, se deben realizar las correspondientes pruebas de carga en los puentes de ferrocarril que se proyectan y construyen, previamente a la puesta en servicio de los mismos. De esta forma se verifica si los parámetros de comportamiento son correctos y ajustados a los previstos según el modelo teórico de cálculo empleado en el Proyecto de la estructura.

Este documento se refiere a la **Estructura E-1** de la Línea de Alta Velocidad Madrid – Barcelona – Frontera Francesa, Tramo Lleida - Martorell, Subtramo V. Con el fin de comprobar el comportamiento dinámico de esta estructura, **UTE ALT CAMP** encargó a **INGENIERÍA DE INSTRUMENTACIÓN Y CONTROL, S.A.** la obtención de los **modos y frecuencias propias de vibración** de la misma.

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2. DESCRIPCIÓN DE LA OBRA

2. DESCRIPCIÓN DE LA OBRA

A continuación se describen las principales características de la "Estructura E-1" de la L.A.V. Madrid – Barcelona – Frontera Francesa, Tramo Lleida - Martorell, Subtramo V, de acuerdo con la documentación facilitada a IIC por UTE ALT CAMP.

La estructura es una solución hiperestática de cinco vanos, de luces 20,00 + 3*27,00 + 20,00 m. La planta de la misma es recta. El ancho total de la losa de compresión es de 14,00m, y está preparada para el paso de una línea de alta velocidad de ancho internacional, de 4,50m de distancia entre ejes de vía.

El tablero de la estructura está formado por dos vigas artesa de hormigón pretensado (HP-60/B/17/IIb). El canto de las vigas es de 2,00 m y la separación entre los ejes de las mismas de 5,24 m.

Sobre las vigas se dispone una losa de hormigón armado (HA-30/F/20/IIb), de 0,27 m de espesor medio y 14,00 m de ancho total.

Estructura	Tipo de Estructura	Nº de vanos	Luz (m)	Longitud (m)	Tipo de apoyo
E-1	Viaducto	5	20,00 + 3*27,00 + 20,00	121,00	POT

En el Anejo Nº 2 se incluye el plano de la estructura.

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3. PREVISIÓN DE RESULTADOS

3. PREVISIÓN DE RESULTADOS

En el Anejo nº 1 se incluyen los cálculos justificativos realizados para evaluar las **frecuencias propias de vibración** previstas durante la realización de la prueba de carga. Para el cálculo de la estructura se ha empleado un programa de estructuras basado en el método de los elementos finitos.

En el proceso de cálculo existen tres fases operativas: la introducción de datos (inputs) al programa, la resolución mediante un sistema de ecuaciones y la salida (outputs) y análisis de resultados.

La operación de cálculo comienza con la discretización geométrica de la estructura. Ello lleva consigo la definición de cada uno de los elementos estructurales en cuanto a dimensiones y características mecánicas. Al mismo tiempo, se requiere la localización de cada punto o nodo de la estructura discretizada en el espacio, eligiendo para ello unos ejes de coordenadas locales para cada uno de los elementos finitos definidos, con la finalidad de conocer las direcciones y sentidos de actuación de los esfuerzos sobre cada uno de ellos.

Una vez introducida en el programa la geometría de la estructura, se definen las cargas actuantes y condiciones de contorno, de modo que mediante la resolución de un sistema de ecuaciones de la forma de Carga = Rigidez x Desplazamiento, se obtienen los movimientos en cada uno de los nodos discretizados de la estructura, y por retrosustitución se calculan los esfuerzos actuantes en los elementos definidos.

Estas operaciones son realizadas de forma automática por el programa de cálculo de estructuras por elementos finitos SAP90 (CSI, Inc., Berkeley). Es un programa desarrollado en FORTRAN y diseñado para ser usado en entorno operativo MS-DOS. Todas las operaciones numéricas son desarrolladas con la precisión de 64 bits y permite llevar a cabo un análisis de comportamiento no solo estático, sino también dinámico.

En nuestro caso, para la obtención de las frecuencias propias de vibración, se ha optado por el desarrollo de un modelo bidimensional (*modelo emparrillado*), formado por elementos barra unidimensionales. En los cálculos se ha empleado un módulo instantáneo de deformación de 40.812 N/mm^2 para las barras longitudinales y de 33.612 N/mm^2 para las transversales. El módulo de deformación se ha calculado de acuerdo a la información del Anejo de Cálculo del Proyecto de la estructura y a las consideraciones referidas en el Artículo 39.6 de la EHE–98 "Instrucción de Hormigón Estructural". En el modelo se han considerado secciones resistentes no fisuradas.

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Fecha: Octubre 2002

En la salida impresa del cálculo mecanizado figuran las características geométricas y elásticas de la estructura discretizada.

3.1. CÁLCULO DE FRECUENCIAS

El cálculo de las frecuencias de los tres primeros modos de vibración libre de la estructura, presenta los siguientes valores previstos:

Primer modo	Segundo modo	Tercer modo
6,83 Hz Longitudinal	8,74 Hz Longitudinal	10,24 Hz Transversal

El presente documento consta de **OCHO (8)** páginas numeradas y de **DOS (2)** Anejos sin paginar.

Madrid, Octubre de 2002

Vº Bº Oficina Técnica, Área de Construcción y Civil

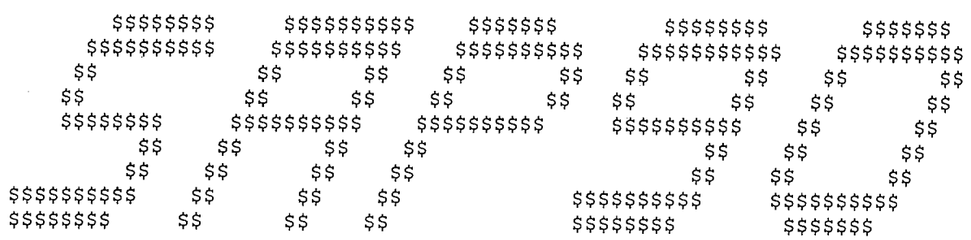
Fdo.: Juan Manuel García Guerra
Ingeniero de Caminos

Fdo.: Pablo Fernández Bea
Ingeniero de Caminos

4. ANEJOS

AUSCULTACIÓN DE ESTRUCTURAS
Obra: L.A.V. Madrid – Barcelona – Frontera Francesa
Tramo Lleida - Martorell
Cliente: UTE ALT CAMP
Fecha: Octubre 2002

4.1. ANEJO Nº 1: CÁLCULOS JUSTIFICATIVOS



STRUCTURAL ANALYSIS PROGRAMS

VERSION 5.30

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ESTRUCTURA E-1. LAV MADRID-BARCELONA-F.FRANCESA. LLEIDA-MARTORELL. UD:

S Y S T E M D A T A

EXECUTION CODE	0
NUMBER OF LOAD CONDITIONS	0
STEADY STATE LOAD FREQUENCY	.0000E+00
NUMBER OF EIGENVALUES	3
EIGEN CONVERGENCE TOLERANCE	.1000E-03
EIGEN CUTOFF TIME PERIOD	.0000E+00

G E N E R A T E D J O I N T C O O R D I N A T E S

JOINT	X	Y	Z
1	.000	.000	.000
2	2.000	.000	.000
3	4.000	.000	.000
4	6.000	.000	.000
5	8.000	.000	.000
6	10.000	.000	.000
7	12.000	.000	.000
8	14.000	.000	.000
9	16.000	.000	.000
10	18.000	.000	.000
11	20.000	.000	.000
12	22.700	.000	.000
13	25.400	.000	.000
14	28.100	.000	.000
15	30.800	.000	.000
16	33.500	.000	.000
17	36.200	.000	.000
18	38.900	.000	.000
19	41.600	.000	.000
20	44.300	.000	.000
21	47.000	.000	.000
22	49.700	.000	.000
23	52.400	.000	.000
24	55.100	.000	.000
25	57.800	.000	.000
26	60.500	.000	.000
27	63.200	.000	.000
28	65.900	.000	.000
29	68.600	.000	.000
30	71.300	.000	.000
31	74.000	.000	.000
32	76.700	.000	.000
33	79.400	.000	.000
34	82.100	.000	.000
35	84.800	.000	.000
36	87.500	.000	.000
37	90.200	.000	.000
38	92.900	.000	.000
39	95.600	.000	.000
40	98.300	.000	.000
41	101.000	.000	.000
42	103.000	.000	.000
43	105.000	.000	.000
44	107.000	.000	.000
45	109.000	.000	.000
46	111.000	.000	.000
47	113.000	.000	.000
48	115.000	.000	.000
49	117.000	.000	.000
50	119.000	.000	.000
51	121.000	.000	.000
101	.000	5.240	.000

G E N E R A T E D J O I N T C O O R D I N A T E S

JOINT	X	Y	Z
102	2.000	5.240	.000
103	4.000	5.240	.000
104	6.000	5.240	.000
105	8.000	5.240	.000
106	10.000	5.240	.000
107	12.000	5.240	.000
108	14.000	5.240	.000
109	16.000	5.240	.000
110	18.000	5.240	.000
111	20.000	5.240	.000
112	22.700	5.240	.000
113	25.400	5.240	.000
114	28.100	5.240	.000
115	30.800	5.240	.000
116	33.500	5.240	.000
117	36.200	5.240	.000
118	38.900	5.240	.000
119	41.600	5.240	.000
120	44.300	5.240	.000
121	47.000	5.240	.000
122	49.700	5.240	.000
123	52.400	5.240	.000
124	55.100	5.240	.000
125	57.800	5.240	.000
126	60.500	5.240	.000
127	63.200	5.240	.000
128	65.900	5.240	.000
129	68.600	5.240	.000
130	71.300	5.240	.000
131	74.000	5.240	.000
132	76.700	5.240	.000
133	79.400	5.240	.000
134	82.100	5.240	.000
135	84.800	5.240	.000
136	87.500	5.240	.000
137	90.200	5.240	.000
138	92.900	5.240	.000
139	95.600	5.240	.000
140	98.300	5.240	.000
141	101.000	5.240	.000
142	103.000	5.240	.000
143	105.000	5.240	.000
144	107.000	5.240	.000
145	109.000	5.240	.000
146	111.000	5.240	.000
147	113.000	5.240	.000
148	115.000	5.240	.000
149	117.000	5.240	.000
150	119.000	5.240	.000
151	121.000	5.240	.000

R E S T R A I N T D A T A

JOINT	RX	RY	RZ	RXX	RYY	RZZ
1	1	1	1	0	0	0
11	1	1	1	0	0	0
21	1	1	1	0	0	0
31	1	1	1	0	0	0
41	1	1	1	0	0	0
51	1	1	1	0	0	0
101	1	1	1	0	0	0
111	1	1	1	0	0	0
121	1	1	1	0	0	0
131	1	1	1	0	0	0
141	1	1	1	0	0	0
151	1	1	1	0	0	0

F R A M E C O N T R O L D A T A

NUMBER OF MEMBER SECTION PROPERTIES	5
NUMBER OF SPAN LOADING PATTERNS	0

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

PROP ID	AREA	TORSIONAL INERTIA	MOMENTS OF INERTIA I33	I22	SHEAR AREAS A2	A3
1	.292E+01	.68670E+00	.19066E+01	.10000E+02	.000E+00	.000E+00
2	.270E+00	.33000E-02	.13230E+00	.22500E-01	.000E+00	.000E+00
3	.540E+00	.66000E-02	.26450E+00	.18000E+00	.000E+00	.000E+00
4	.365E+00	.44000E-02	.17860E+00	.55400E-01	.000E+00	.000E+00
5	.729E+00	.89000E-02	.35710E+00	.44290E+00	.000E+00	.000E+00

M A T E R I A L P R O P E R T Y D A T A

PROP ID	MODULUS OF ELASTICITY	SHEAR MODULUS	WEIGHT PER UNIT LEN	MASS PER UNIT LEN	THERMAL EXPANSION
1	.4082E+11	.1570E+11	.9521E+05	.9706E+04	.0000E+00
2	.3362E+11	.1293E+11	.0000E+00	.0000E+00	.0000E+00
3	.3362E+11	.1293E+11	.0000E+00	.0000E+00	.0000E+00
4	.3362E+11	.1293E+11	.0000E+00	.0000E+00	.0000E+00
5	.3362E+11	.1293E+11	.0000E+00	.0000E+00	.0000E+00

F R A M E E L E M E N T D A T A

ELT ID	JOINT END-I	JOINT END-J	LOCAL-AXIS N1	LOCAL-AXIS N2	PROPERTY-ID END-I	PROPERTY-ID END-J	VAR	REL CODES	REF TEMP	ELEMENT LENGTH
1	1	2	-2	0	1	1	0	000000	.00	2.00
2	2	3	-2	0	1	1	0	000000	.00	2.00
3	3	4	-2	0	1	1	0	000000	.00	2.00
4	4	5	-2	0	1	1	0	000000	.00	2.00
5	5	6	-2	0	1	1	0	000000	.00	2.00
6	6	7	-2	0	1	1	0	000000	.00	2.00
7	7	8	-2	0	1	1	0	000000	.00	2.00
8	8	9	-2	0	1	1	0	000000	.00	2.00
9	9	10	-2	0	1	1	0	000000	.00	2.00
10	10	11	-2	0	1	1	0	000000	.00	2.00
11	11	12	-2	0	1	1	0	000000	.00	2.70
12	12	13	-2	0	1	1	0	000000	.00	2.70
13	13	14	-2	0	1	1	0	000000	.00	2.70
14	14	15	-2	0	1	1	0	000000	.00	2.70
15	15	16	-2	0	1	1	0	000000	.00	2.70
16	16	17	-2	0	1	1	0	000000	.00	2.70
17	17	18	-2	0	1	1	0	000000	.00	2.70
18	18	19	-2	0	1	1	0	000000	.00	2.70
19	19	20	-2	0	1	1	0	000000	.00	2.70
20	20	21	-2	0	1	1	0	000000	.00	2.70
21	21	22	-2	0	1	1	0	000000	.00	2.70
22	22	23	-2	0	1	1	0	000000	.00	2.70
23	23	24	-2	0	1	1	0	000000	.00	2.70
24	24	25	-2	0	1	1	0	000000	.00	2.70
25	25	26	-2	0	1	1	0	000000	.00	2.70
26	26	27	-2	0	1	1	0	000000	.00	2.70
27	27	28	-2	0	1	1	0	000000	.00	2.70
28	28	29	-2	0	1	1	0	000000	.00	2.70
29	29	30	-2	0	1	1	0	000000	.00	2.70
30	30	31	-2	0	1	1	0	000000	.00	2.70
31	31	32	-2	0	1	1	0	000000	.00	2.70
32	32	33	-2	0	1	1	0	000000	.00	2.70
33	33	34	-2	0	1	1	0	000000	.00	2.70
34	34	35	-2	0	1	1	0	000000	.00	2.70
35	35	36	-2	0	1	1	0	000000	.00	2.70
36	36	37	-2	0	1	1	0	000000	.00	2.70
37	37	38	-2	0	1	1	0	000000	.00	2.70
38	38	39	-2	0	1	1	0	000000	.00	2.70
39	39	40	-2	0	1	1	0	000000	.00	2.70
40	40	41	-2	0	1	1	0	000000	.00	2.70
41	41	42	-2	0	1	1	0	000000	.00	2.00
42	42	43	-2	0	1	1	0	000000	.00	2.00
43	43	44	-2	0	1	1	0	000000	.00	2.00
44	44	45	-2	0	1	1	0	000000	.00	2.00
45	45	46	-2	0	1	1	0	000000	.00	2.00
46	46	47	-2	0	1	1	0	000000	.00	2.00
47	47	48	-2	0	1	1	0	000000	.00	2.00
48	48	49	-2	0	1	1	0	000000	.00	2.00
49	49	50	-2	0	1	1	0	000000	.00	2.00
50	50	51	-2	0	1	1	0	000000	.00	2.00
101	101	102	-2	0	1	1	0	000000	.00	2.00

F R A M E E L E M E N T D A T A

ELT ID	JOINT END-I	JOINT END-J	LOCAL-AXIS N1	LOCAL-AXIS N2	PROPERTY-ID END-I	PROPERTY-ID END-J	VAR	REL CODES	REF TEMP	ELEMENT LENGTH
102	102	103	-2	0	1	1	0	000000	.00	2.00
103	103	104	-2	0	1	1	0	000000	.00	2.00
104	104	105	-2	0	1	1	0	000000	.00	2.00
105	105	106	-2	0	1	1	0	000000	.00	2.00
106	106	107	-2	0	1	1	0	000000	.00	2.00
107	107	108	-2	0	1	1	0	000000	.00	2.00
108	108	109	-2	0	1	1	0	000000	.00	2.00
109	109	110	-2	0	1	1	0	000000	.00	2.00
110	110	111	-2	0	1	1	0	000000	.00	2.00
111	111	112	-2	0	1	1	0	000000	.00	2.70
112	112	113	-2	0	1	1	0	000000	.00	2.70
113	113	114	-2	0	1	1	0	000000	.00	2.70
114	114	115	-2	0	1	1	0	000000	.00	2.70
115	115	116	-2	0	1	1	0	000000	.00	2.70
116	116	117	-2	0	1	1	0	000000	.00	2.70
117	117	118	-2	0	1	1	0	000000	.00	2.70
118	118	119	-2	0	1	1	0	000000	.00	2.70
119	119	120	-2	0	1	1	0	000000	.00	2.70
120	120	121	-2	0	1	1	0	000000	.00	2.70
121	121	122	-2	0	1	1	0	000000	.00	2.70
122	122	123	-2	0	1	1	0	000000	.00	2.70
123	123	124	-2	0	1	1	0	000000	.00	2.70
124	124	125	-2	0	1	1	0	000000	.00	2.70
125	125	126	-2	0	1	1	0	000000	.00	2.70
126	126	127	-2	0	1	1	0	000000	.00	2.70
127	127	128	-2	0	1	1	0	000000	.00	2.70
128	128	129	-2	0	1	1	0	000000	.00	2.70
129	129	130	-2	0	1	1	0	000000	.00	2.70
130	130	131	-2	0	1	1	0	000000	.00	2.70
131	131	132	-2	0	1	1	0	000000	.00	2.70
132	132	133	-2	0	1	1	0	000000	.00	2.70
133	133	134	-2	0	1	1	0	000000	.00	2.70
134	134	135	-2	0	1	1	0	000000	.00	2.70
135	135	136	-2	0	1	1	0	000000	.00	2.70
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141	141	142	-2	0	1	1	0	000000	.00	2.00
142	142	143	-2	0	1	1	0	000000	.00	2.00
143	143	144	-2	0	1	1	0	000000	.00	2.00
144	144	145	-2	0	1	1	0	000000	.00	2.00
145	145	146	-2	0	1	1	0	000000	.00	2.00
146	146	147	-2	0	1	1	0	000000	.00	2.00
147	147	148	-2	0	1	1	0	000000	.00	2.00
148	148	149	-2	0	1	1	0	000000	.00	2.00
149	149	150	-2	0	1	1	0	000000	.00	2.00
150	150	151	-2	0	1	1	0	000000	.00	2.00
201	1	101	1	0	2	2	0	000000	.00	5.24
251	51	151	1	0	2	2	0	000000	.00	5.24

F R A M E E L E M E N T D A T A

ELT ID	JOINT END-I	JOINT END-J	LOCAL-AXIS N1	LOCAL-AXIS N2	PROPERTY-ID END-I	PROPERTY-ID END-J	VAR	REL CODES	REF TEMP	ELEMENT LENGTH
202	2	102	1	0	3	3	0	000000	.00	5.24
203	3	103	1	0	3	3	0	000000	.00	5.24
204	4	104	1	0	3	3	0	000000	.00	5.24
205	5	105	1	0	3	3	0	000000	.00	5.24
206	6	106	1	0	3	3	0	000000	.00	5.24
207	7	107	1	0	3	3	0	000000	.00	5.24
208	8	108	1	0	3	3	0	000000	.00	5.24
209	9	109	1	0	3	3	0	000000	.00	5.24
210	10	110	1	0	3	3	0	000000	.00	5.24
211	11	111	1	0	4	4	0	000000	.00	5.24
241	41	141	1	0	4	4	0	000000	.00	5.24
212	12	112	1	0	5	5	0	000000	.00	5.24
213	13	113	1	0	5	5	0	000000	.00	5.24
214	14	114	1	0	5	5	0	000000	.00	5.24
215	15	115	1	0	5	5	0	000000	.00	5.24
216	16	116	1	0	5	5	0	000000	.00	5.24
217	17	117	1	0	5	5	0	000000	.00	5.24
218	18	118	1	0	5	5	0	000000	.00	5.24
219	19	119	1	0	5	5	0	000000	.00	5.24
220	20	120	1	0	5	5	0	000000	.00	5.24
221	21	121	1	0	5	5	0	000000	.00	5.24
222	22	122	1	0	5	5	0	000000	.00	5.24
223	23	123	1	0	5	5	0	000000	.00	5.24
224	24	124	1	0	5	5	0	000000	.00	5.24
225	25	125	1	0	5	5	0	000000	.00	5.24
226	26	126	1	0	5	5	0	000000	.00	5.24
227	27	127	1	0	5	5	0	000000	.00	5.24
228	28	128	1	0	5	5	0	000000	.00	5.24
229	29	129	1	0	5	5	0	000000	.00	5.24
230	30	130	1	0	5	5	0	000000	.00	5.24
231	31	131	1	0	5	5	0	000000	.00	5.24
232	32	132	1	0	5	5	0	000000	.00	5.24
233	33	133	1	0	5	5	0	000000	.00	5.24
234	34	134	1	0	5	5	0	000000	.00	5.24
235	35	135	1	0	5	5	0	000000	.00	5.24
236	36	136	1	0	5	5	0	000000	.00	5.24
237	37	137	1	0	5	5	0	000000	.00	5.24
238	38	138	1	0	5	5	0	000000	.00	5.24
239	39	139	1	0	5	5	0	000000	.00	5.24
240	40	140	1	0	5	5	0	000000	.00	5.24
242	42	142	1	0	3	3	0	000000	.00	5.24
243	43	143	1	0	3	3	0	000000	.00	5.24
244	44	144	1	0	3	3	0	000000	.00	5.24
245	45	145	1	0	3	3	0	000000	.00	5.24
246	46	146	1	0	3	3	0	000000	.00	5.24
247	47	147	1	0	3	3	0	000000	.00	5.24
248	48	148	1	0	3	3	0	000000	.00	5.24
249	49	149	1	0	3	3	0	000000	.00	5.24
250	50	150	1	0	3	3	0	000000	.00	5.24

F R A M E E L E M E N T D A T A

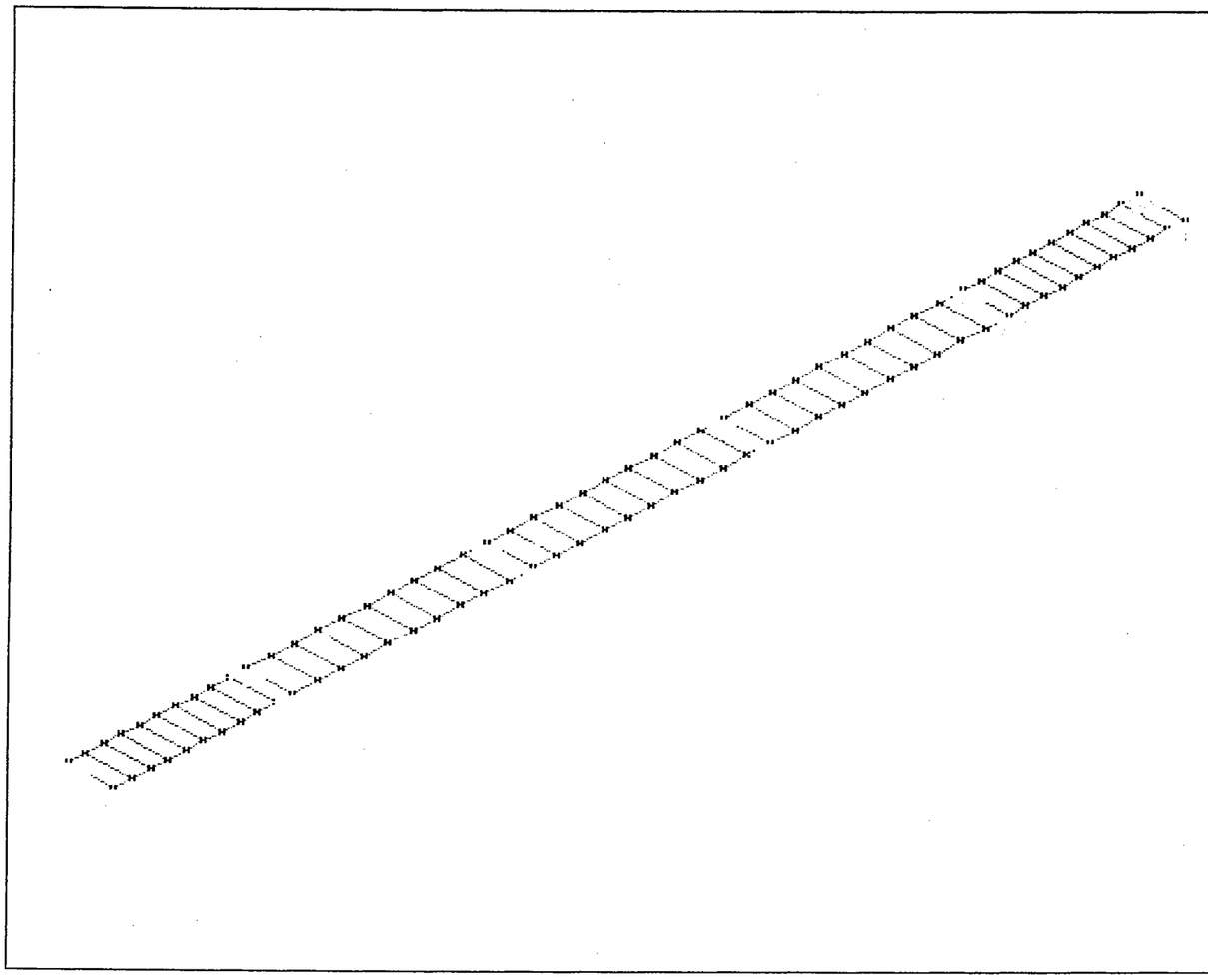
ELT ID	MASTER-JOINTS END-I	MASTER-JOINTS END-J	RIGID-OFFSETS END-I	RIGID-OFFSETS END-J	REDUCTION FACTOR
201	0	0	1.89	1.89	.00
251	0	0	1.89	1.89	.00
202	0	0	1.89	1.89	.00
203	0	0	1.89	1.89	.00
204	0	0	1.89	1.89	.00
205	0	0	1.89	1.89	.00
206	0	0	1.89	1.89	.00
207	0	0	1.89	1.89	.00
208	0	0	1.89	1.89	.00
209	0	0	1.89	1.89	.00
210	0	0	1.89	1.89	.00
211	0	0	1.89	1.89	.00
241	0	0	1.89	1.89	.00
212	0	0	1.89	1.89	.00
213	0	0	1.89	1.89	.00
214	0	0	1.89	1.89	.00
215	0	0	1.89	1.89	.00
216	0	0	1.89	1.89	.00
217	0	0	1.89	1.89	.00
218	0	0	1.89	1.89	.00
219	0	0	1.89	1.89	.00
220	0	0	1.89	1.89	.00
221	0	0	1.89	1.89	.00
222	0	0	1.89	1.89	.00
223	0	0	1.89	1.89	.00
224	0	0	1.89	1.89	.00
225	0	0	1.89	1.89	.00
226	0	0	1.89	1.89	.00
227	0	0	1.89	1.89	.00
228	0	0	1.89	1.89	.00
229	0	0	1.89	1.89	.00
230	0	0	1.89	1.89	.00
231	0	0	1.89	1.89	.00
232	0	0	1.89	1.89	.00
233	0	0	1.89	1.89	.00
234	0	0	1.89	1.89	.00
235	0	0	1.89	1.89	.00
236	0	0	1.89	1.89	.00
237	0	0	1.89	1.89	.00
238	0	0	1.89	1.89	.00
239	0	0	1.89	1.89	.00
240	0	0	1.89	1.89	.00
242	0	0	1.89	1.89	.00
243	0	0	1.89	1.89	.00
244	0	0	1.89	1.89	.00
245	0	0	1.89	1.89	.00
246	0	0	1.89	1.89	.00
247	0	0	1.89	1.89	.00
248	0	0	1.89	1.89	.00
249	0	0	1.89	1.89	.00
250	0	0	1.89	1.89	.00

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

PROP	WEIGHT	MASS
1	23041546.0000	2348852.0000
2	.0000	.0000
3	.0000	.0000
4	.0000	.0000
5	.0000	.0000
TOTAL	23041546.0000	2348852.0000

O U T P U T F I L E S C R E A T E D B Y P R O G R A M

INPUT DATA ECHO	E1V.SAP
SOLUTION ERRORS AND WARNINGS	E1V.ERR
EQUATION NUMBERING	E1V.EQN
FREQUENCIES	E1V.EIG



STRUCTURAL ANALYSIS PROGRAMS

VERSION 5.30

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E I G E N S Y S T E M P A R A M E T E R S

NUMBER OF EQUATIONS	=	576
NUMBER OF MASSES	=	270
NUMBER OF VALUES TO BE EVALUATED	=	3
SIZE OF SUBSPACE	=	7

E I G E N V A L U E S A N D F R E Q U E N C I E S

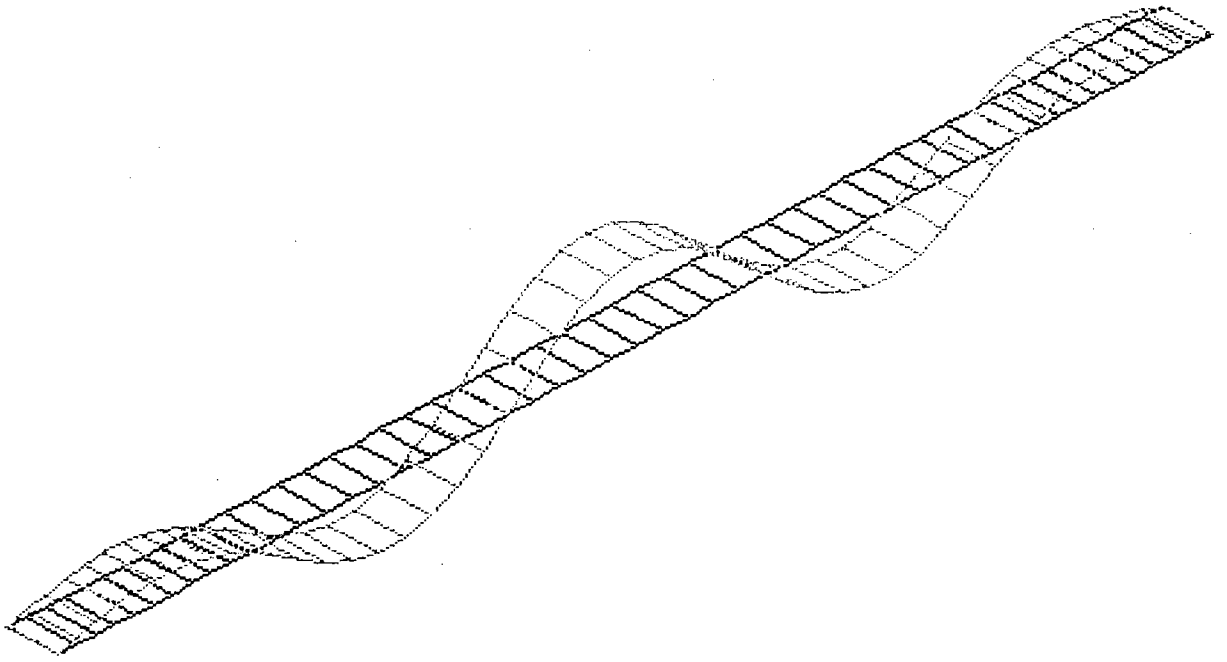
MODE NUMBER	EIGENVALUE (RAD/SEC)**2	CIRCULAR FREQ (RAD/SEC)	FREQUENCY (CYCLES/SEC)	PERIOD (SEC)
1	.184223E+04	.429212E+02	6.831121	.146389
2	.301242E+04	.548855E+02	8.735305	.114478
3	.414155E+04	.643549E+02	10.242402	.097633

B A S E F O R C E R E A C T I O N F A C T O R S

MODE #	PERIOD (sec)	X DIRECTION	Y DIRECTION	Z DIRECTION	X MOMENT	Y MOMENT	Z MOMENT
1	.146	-.232E-03	-.238E-02	-.[illegible]6E+02	-.164E+03	.379E+04	-.143E+00
2	.114	.419E-03	-.474E-03	.353E-03	-.287E+00	-.537E+04	.229E+00
3	.098	.144E-01	.127E-01	-.817E-02	-.203E+03	.199E+02	.453E+01

P A R T I C I P A T I N G M A S S - (percent)

MODE	X-DIR	Y-DIR	Z-DIR	X-SUM	Y-SUM	Z-SUM
1	.000	.000	.185	.000	.000	.185
2	.000	.000	.000	.000	.000	.185
3	.000	.000	.000	.000	.000	.185



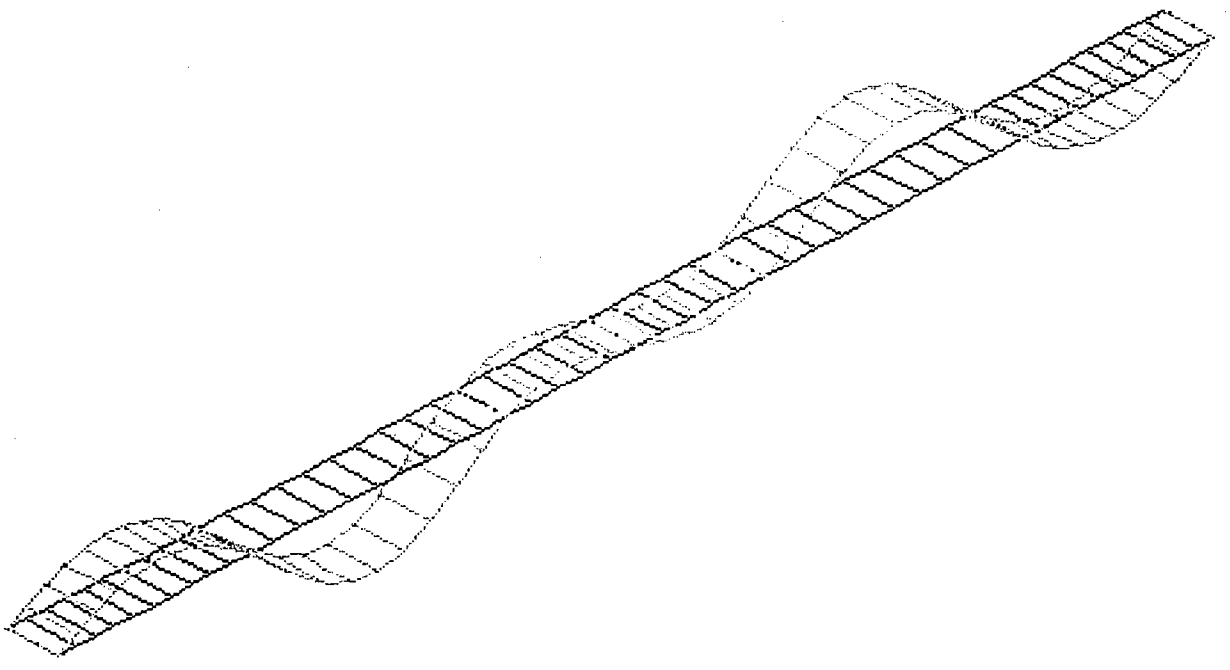
Z
Y X

MODE
SHAPE
MODE 1

X -.3941E-08
Y -.1357E-07
Z -.1009E-02

X .5123E-08
Y .1717E-07
Z .1275E-02

SAP90



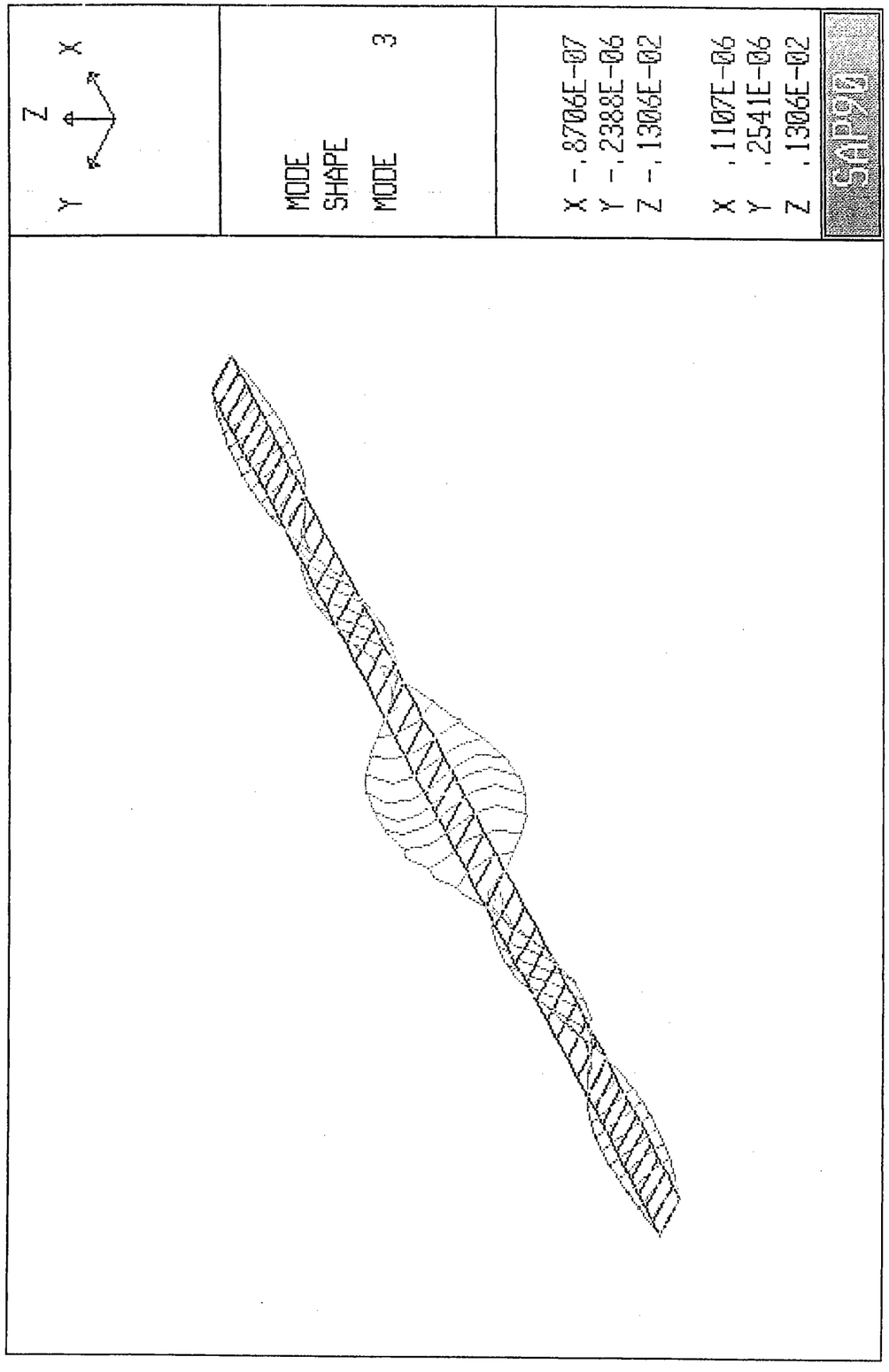
Z
Y X

MODE
SHAPE
MODE 2

X -.8145E-08
Y -.1579E-07
Z -.1287E-02

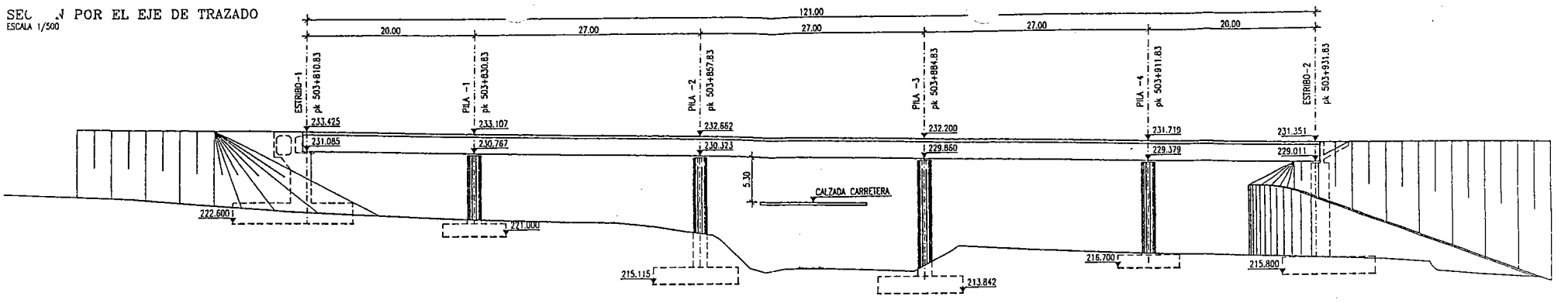
X .8499E-08
Y .1470E-07
Z .1287E-02

SAP90

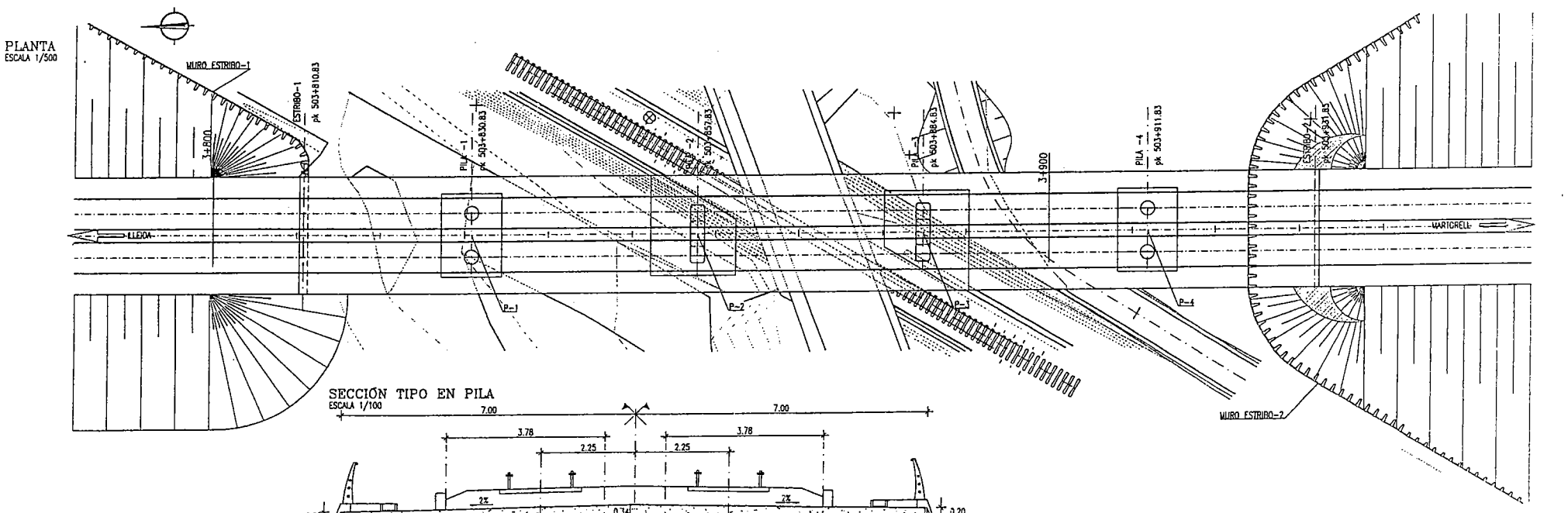


4.2. ANEJO Nº 2: PLANOS

SECCIÓN POR EL EJE DE TRAZADO
ESCALA 1/500



PLANTA
ESCALA 1/500



SECCIÓN TIPO EN PILA
ESCALA 1/100



CARACTERISTICAS DE LOS MATERIALES
NIVELES DE CONTROL Y COEFICIENTES DE SEGURIDAD ADOPTADOS

HORMIGONES			
ELEMENTO ESTRUCTURAL	TIPO	CONTROL	γ_c
TABLERO	HA-30/B/20/IIa	NORMAL	1.50
ALZADOS	HA-30/B/20/IIa	NORMAL	1.50
CIMENTACIONES	HA-25/B/20/IIa	NORMAL	1.50
NIVELACIÓN	HM-15	NORMAL	1.50

ACEROS PARA ARMAR CORRUGADOS			
ELEMENTO	TIPO	CONTROL	γ_s
CIMENTACIONES, ALZADOS Y TABLERO	B 500 S	NORMAL	1.15

ACERO PARA PRETENSAR			
ELEMENTO	TIPO	CONTROL	γ_s
TABLERO	Y 1860 S7	NORMAL	1.15

MODIFICACIONES:
Plano nuevo.
Cambios en la tipología del Estribo-2.
Corrección del Cuadro de Control.

GIF Gestor de Infraestructuras Ferroviarias	TITULO: PROYECTO CONSTRUCTIVO LINEA DE ALTA VELOCIDAD MADRID–ZARAGOZA–BARCELONA–FRONTERA FRANCESA TRAMO: LLEIDA–MARTORELL. SUBTRAMO V. PLATAFORMA	CONTRATISTA: U.T.E. ALT CAMP DRAGADOS - TECSA	ESCALA NORMAL 1:500 1:100 Numérica 0 5 10 15m / 0 1 2 3m Gráfica	FECHA: NOV – 01	TITULO DEL PLANO: ESTRUCTURA I PLANTA, ALZADO Y SECCION	Nº DE PLANO: 2.9.2 Hoja 1d de