

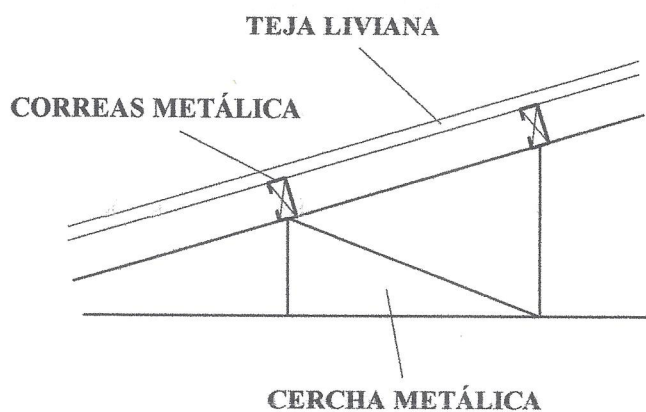
Proyecto: **UNIVERSIDAD TECNOLÓGICA DE PEREIRA**

C I D T - BLOQUE B

Fecha: **JULIO 2023**

88

AVALÚO DE CARGAS CUBIERTA



CARGA MUERTA

TEJA LIVIANA: 0.015 ton/m²

CORREAS: 0.010 ton/m²

CABLEADO E ILUMINACIÓN: 0.005 ton/m²

**EL PESO PROPIO DE LAS
VIGAS DE CUBIERTA
SE INCLUYE
EN EL ANALISIS**

C.M. = 0.030 ton/m²

CARGA VIVA

C.V. = 0.050 ton/m²

CARGA VIENTO

C.W. = +/- 0.050 ton/m²

T E T R A - Diseños Estructurales.

Calle 19 # 9-50 Of. 907 - Edif. DIARIO DEL OTÚN - Tel. 324 50 18

Fernando Escalante Echeverri

Ing. Civil - Magíster y Ph.D. en Estructuras

ESPECTRO UMBRAL DE DAÑO

T (seg.)	Sa (% g)
0.00	0.100
0.10	0.180
0.20	0.260
0.25	0.300
0.30	0.300
0.40	0.300
0.50	0.300
0.60	0.300
0.70	0.300
0.80	0.300
0.90	0.300
1.00	0.300
1.10	0.300
1.20	0.300
1.30	0.300
1.40	0.300
1.50	0.300
1.60	0.281
1.70	0.265
1.80	0.250
1.90	0.237
2.00	0.225
2.10	0.214
2.20	0.205
2.30	0.196
2.40	0.188
2.50	0.180

T (seg.)	Sa (% g)
2.60	0.173
2.70	0.167
2.80	0.161
2.90	0.155
3.00	0.150
3.10	0.145
3.20	0.141
3.30	0.136
3.40	0.132
3.50	0.129
3.60	0.125
3.70	0.122
3.80	0.118
3.90	0.115
4.00	0.113
4.10	0.110
4.20	0.107
4.30	0.105
4.40	0.102
4.50	0.100
4.60	0.098
4.70	0.096
4.80	0.094
4.90	0.092
5.00	0.090
5.10	0.088

90

ETABS v9.7.2 File:UTP BLOQUE B 2023 Units:Ton-m septiembre 8, 2021 16:21 PAGE 14

STORY DRIFTS

STORY	DIRECTION	LOAD	MAX DRIFT
CUBN+16.10	X	UMBRX	1/429
CUBN+14.80	X	UMBRX	1/282
P4N+11.10	X	UMBRX	1/299
P3N+7.40	X	UMBRX	1/298
P2N+3.70	X	UMBRX	1/351
P1N+0.00	X	UMBRX	1/556
SOT1N-3.70	X	UMBRX	1/1249
CUBN+16.10	Y	UMBRY	1/522
CUBN+14.80	Y	UMBRY	1/410
P4N+11.10	Y	UMBRY	1/903
P3N+7.40	Y	UMBRY	1/921
P2N+3.70	Y	UMBRY	1/1064
P1N+0.00	Y	UMBRY	1/1340
SOT1N-3.70	Y	UMBRY	1/2382

OK < 1/250

DERIVAS UMBRAL DE DAÑO

Proyecto: UNIVERSIDAD TECNOLÓGICA DE PEREIRA
CIDT - BLOQUE B

Fecha: JULIO / 2023

Hoja # 91

DISEÑO PILOTES

DIAM. FUSTE = 100 cm.

LONG. = 14.00 m.

CAPACIDAD GEOTECNICA DEL PILOTE = 271 ton.

CAPACIDAD ESTRUCTURAL DEL PILOTE

$$A_s = 16 \times 3.88 \text{ cm}^2 = 62.08 \text{ cm}^2 \quad (16\#7)$$

$$A_c = 3.1415 \times (100)^2 / 4 - 62.08 = 7792 \text{ cm}^2$$

$$f_c = 210 \text{ kg/cm}^2$$

$$f_y = 4200 \text{ kg/cm}^2$$

$$P_u = 0.85 \times 210 \times 7792 + 4200 \times 62.08 = 1390872 \text{ kg} + 260736 \text{ kg} = 1651608 \text{ kg.}$$

$$P_u = 1651 \text{ ton.}$$

$$P \text{ trabajo} = 1651 \text{ ton} / 2 = 825 \text{ ton.} >> 271 \text{ ton.} \quad (\text{OK})$$

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C I D T - BLOQUE B

Fecha: JULIO / 2023

Hoja #

92

DISEÑO CERCHA METALICA CM-1

CARGA MUERTA	60 kg/m ²	
CARGA VIVA	50 kg/m ²	LONGITUD VOLADIZO = 3.65 m.
CARGA VIENTO	<u>50 kg/m²</u>	

TOTAL	160 kg/m ²	ALTURA = 0.60 m.
-------	-----------------------	------------------

ANCHO AFERENTE = 4.20 m.

CARGA DISTRIBUIDA DE TRABAJO = 160 x 4.20 = 672 kg/m.

MOMENTO MAXIMO = $672 \times (3.65)^2 / 2 = 4477 \text{ kg-m.}$

$C = 4477 / 0.60 = 7462 \text{ kg.}$ Cordones Superior e Inferior

$f_y = 2520 \text{ kg/cm}^2$ $f_s = 0.48 \times 2520 = 1210 \text{ kg/cm}^2$

$A_s = 7462 / 1210 = 6.17 \text{ cm}^2$

2 Ang. 2" x 3/16" = $2 \times 4.57 \text{ cm}^2 = 9.14 \text{ cm}^2 > 6.17 \text{ cm}^2$ (OK)

R apoyo = $672 \times 3.65 = 2453 \text{ kg.}$ Diagonales

$C = 2453 / 0.953 = 2574 \text{ kg.}$

$f_y = 2520 \text{ kg/cm}^2$ $f_s = 0.47 \times 2520 = 1185 \text{ kg/cm}^2$

$A_s = 2574 / 1185 = 2.18 \text{ cm}^2$

2 Ang. 1 1/2" x 1/8" = $2 \times 2.32 \text{ cm}^2 = 4.64 \text{ cm}^2 > 2.18 \text{ cm}^2$ (OK)

T E T R A - Diseños Estructurales.

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CIDT - BLOQUE B

Fecha: JULIO / 2023

Hoja #

93

DISEÑO CERCHA METALICA CM-2

CARGA MUERTA	60 kg/m ²	
CARGA VIVA	50 kg/m ²	LONGITUD VOLADIZO = 3.65 m.
CARGA VIENTO	<u>50 kg/m²</u>	

TOTAL	160 kg/m ²	ALTURA = 0.60 m.
-------	-----------------------	------------------

ANCHO AFERENTE = 7.80 m.

CARGA DISTRIBUIDA DE TRABAJO = $160 \times 7.80 = 1248$ kg/m.

MOMENTO MAXIMO = $1248 \times (3.65)^2 / 2 = 8314$ kg-m.

$C = 8314 / 0.60 = 13857$ kg. Cordones Superior e Inferior

$f_y = 2520$ kg/cm² $f_s = 0.48 \times 2520 = 1210$ kg/cm²

$A_s = 13856 / 1210 = 11.45$ cm²

2 Ang. 3" x 3/16" = 2×7.03 cm² = 14.06 cm² > 11.45 cm² (OK)

R apoyo = $1248 \times 3.65 = 4555$ kg. Diagonales

$C = 4555 / 0.953 = 4780$ kg.

$f_y = 2520$ kg/cm² $f_s = 0.47 \times 2520 = 1185$ kg/cm²

$A_s = 4780 / 1185 = 4.04$ cm²

2 Ang. 2" x 1/8" = 2×3.09 cm² = 6.18 cm² > 4.04 cm² (OK)

T E T R A - Diseños Estructurales.

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ACELERACION EN EL PUNTO DE SOPORTE
DE LOS ELEMENTOS NO ESTRUCTURALES

heq (m.) 14.63

Sa 1.125	As 0.450
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PISO	ALTURA (m.)	ALTURA ACUMULADA hx (m.)	ACELERACION ax
PISO 4	3.70	19.50	1.500
PISO 3	3.70	15.80	1.215
PISO 2	3.70	12.10	1.008
PISO 1	3.70	8.40	0.838
SOTANO 1	3.70	4.70	0.667
SOTANO 2	4.70	0.00	0.450

Proyecto: UNIVERSIDAD TECNOLÓGICA DE PEREIRA

C I D T - BLOQUE B

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Hoja #

95

DISEÑO MURO DE CERRAMIENTO BLOQUE REFORZADO

GRADO DE DESEMPEÑO = SUPERIOR

PESO MURO = 250 kg/m^2 según Tabla B.3.4.2-4

$a_x = 0.45$ (muro en el sótano 2)

$a_p = 1.00$ $R_p = 6$ Anclajes Dúctiles

$F_p = a_x \cdot a_p \cdot W / R_p = 0.45 \times 1.00 \times 250 \text{ kg/m}^2 / 6 = 19 \text{ kg/m}^2$

Separación máxima Dovelas = 1.20 m.

Altura Muro = 4.10 m.

DISEÑO A FLEXIÓN

$M_u \text{ máximo} = 19 \text{ kg/m}^2 \times 1.20 \text{ m} \times (4.10 \text{ m})^2 / 8 = 48 \text{ kg-m.}$

$b = 15 \text{ cm.}$ $f'_c = 120 \text{ kg/cm}^2$ $A_s = 0.22 \text{ cm}^2$

$h = 12 \text{ cm.}$ $f_y = 4200 \text{ kg/cm}^2$ 1#4

$d' = 6 \text{ cm.}$ $A_s = 1.27 \text{ cm}^2$

DISEÑO A CORTANTE

$V_u = 19 \text{ kg/m}^2 \times 1.20 \text{ m.} \times 4.10 \text{ m} / 2 = 47 \text{ kg.}$

$v_{\text{max.}} = 47 \text{ kg.} / (15 \text{ cm.} \times 6 \text{ cm.}) = 0.523 \text{ kg/cm}^2$

$v_{cr} = 0.75 \times 0.53 \times \text{SQRT}(120) = 4.354 \text{ kg/cm}^2 > 0.523 \text{ kg/cm}^2 \quad (\text{OK})$

EL MORTERO DE RELLENO RESISTE EL CORTANTE

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C I D T - BLOQUE B

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Hoja #

96

DISEÑO MURO DE CERRAMIENTO LADRILLO FAROL CONFINADO

GRADO DE DESEMPEÑO = SUPERIOR

PESO MURO = 250 kg/m^2 según Tabla B.3.4.2-4

$$S_a = 2.5 \times 0.25 \times 1.44 \times 1.25 = 1.125$$

$$a_x = 1.125 / 0.75 = 1.50 \text{ (muro en el piso 4)}$$

$$a_p = 1.00 \quad R_p = 6 \text{ Anclajes Dúctiles}$$

$$F_p = a_x \cdot a_p \cdot W / R_p = 1.50 \times 1.00 \times 250 \text{ kg/m}^2 / 6 = 63 \text{ kg/m}^2$$

Separación máxima entre Columnetas = 2.50 m.

Altura Muro = 3.10 m.

DISEÑO A FLEXIÓN

$$M_u \text{ máximo} = 63 \text{ kg/m}^2 \times 2.50 \text{ m} \times (3.10 \text{ m.})^2 / 8 = 190 \text{ kg-m.}$$

$$b = 25 \text{ cm.}$$

$$f'_c = 210 \text{ kg/cm}^2$$

$$A_s = 0.76 \text{ cm}^2$$

$$h = 10 \text{ cm.}$$

$$f_y = 4200 \text{ kg/cm}^2$$

$$2\#3$$

$$d' = 3 \text{ cm.}$$

$$A_s = 1.42 \text{ cm}^2$$

DISEÑO A CORTANTE

$$V_u = 63 \text{ kg/m}^2 \times 2.50 \text{ m.} \times 3.10 \text{ m} / 2 = 245 \text{ kg.}$$

$$v_{\text{max.}} = 245 \text{ kg.} / (25 \text{ cm.} \times 7 \text{ cm.}) = 1.400 \text{ kg/cm}^2$$

$$v_{cr} = 0.75 \times 0.53 \times \text{SQRT}(210) = 5.760 \text{ kg/cm}^2 > 1.400 \text{ kg/cm}^2 \quad (\text{OK})$$

EL CONCRETO RESISTE EL CORTANTE

Se colocan Estribos # 2 @ 0.15

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Fecha: JULIO / 2023

Hoja #

97

DISEÑO ANCLAJE CERCHAS METÁLICAS

PESO CUBIERTA 80 kg/m^2

AREA AFERENTE / ANCLAJE = $7.80 \times 7.15 = 56 \text{ m}^2$.

PESO ESTRUCTURA = $80 \times 56 = 4480 \text{ kg}$.

$R = 1.00$

CORTANTE POR SISMO / ANCLAJE = $1.785 \times 4480 / 1 = 7997 \text{ kg}$.

Anclaje 6 varillas # 6 A-36 $f_s = 0.3 \times 2520 = 756 \text{ kg/cm}^2$

CAPACIDAD ANCLAJE = $6 \times 2.85 \times 756 = 12927 \text{ kg} > 7997 \text{ kg}$

(OK)

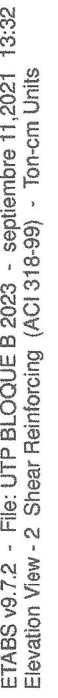
T E T R A - Diseños Estructurales.

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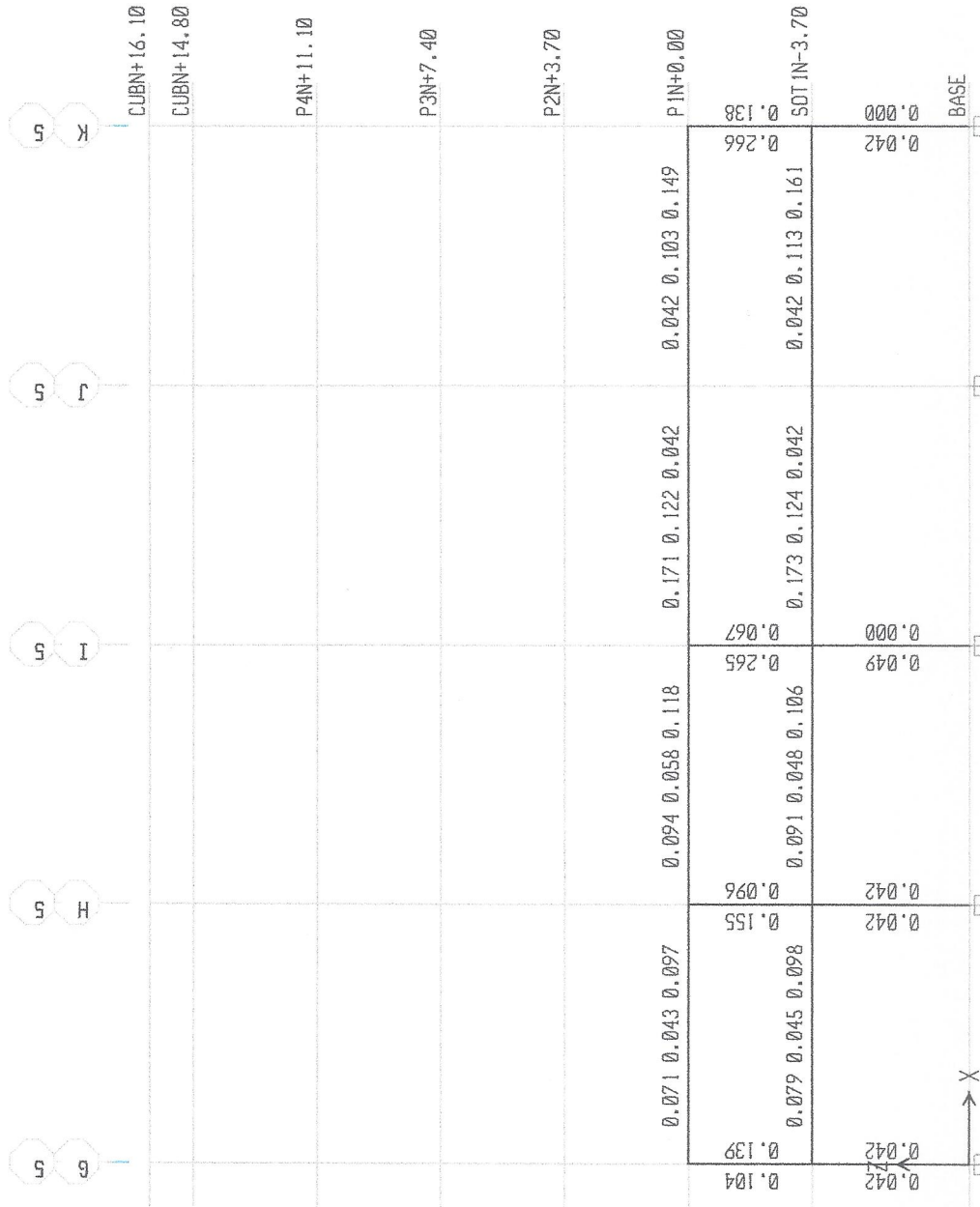
99

0.050	0.084	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.050	0.084	BASE
0.082 0.042 0.087	0.082 0.042 0.087	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.050	0.084	
0.050	0.084	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.050	0.084	
0.085	0.085	0.000	0.084	0.000	0.000	0.000	0.000	0.084	0.050	0.085	
0.127 0.097 0.122	0.082 0.028 0.077	0.000	0.105 0.050 0.104	0.000	0.000	0.000	0.000	0.084	0.050	0.090	
0.050	0.090	0.000	0.084	0.000	0.000	0.000	0.000	0.084	0.050	0.090	
0.050	0.084	0.000	0.108 0.053 0.106	0.000	0.000	0.000	0.000	0.084	0.050	0.084	
0.131 0.101 0.124	0.131 0.101 0.124	0.050	0.119	0.000	0.000	0.000	0.000	0.119	0.050	0.084	
0.050	0.084	0.050	0.104 0.049 0.103	0.062	0.062	0.062	0.062	0.068	0.065	0.064	
0.065	0.064	0.068	0.069	0.069	0.069	0.069	0.069	0.069	0.065	0.064	
0.032 0.027 0.026	0.032 0.027 0.026	0.032 0.027 0.026	0.028 0.025 0.025	0.028 0.025 0.025	0.028 0.025 0.025	0.028 0.025 0.025	0.025 0.025 0.028	0.026 0.027 0.032	0.026 0.027 0.032	0.026 0.027 0.032	
0.032 0.027 0.026	0.032 0.027 0.026	0.032 0.027 0.026	0.028 0.025 0.025	0.028 0.025 0.025	0.028 0.025 0.025	0.028 0.025 0.025	0.025 0.025 0.028	0.026 0.027 0.032	0.026 0.027 0.032	0.026 0.027 0.032	
CUBN+16.10	CUBN+14.80	PAN+11.10	P3N+7.40	P2N+3.70	P1N+0.00	SOT1N-3.70					

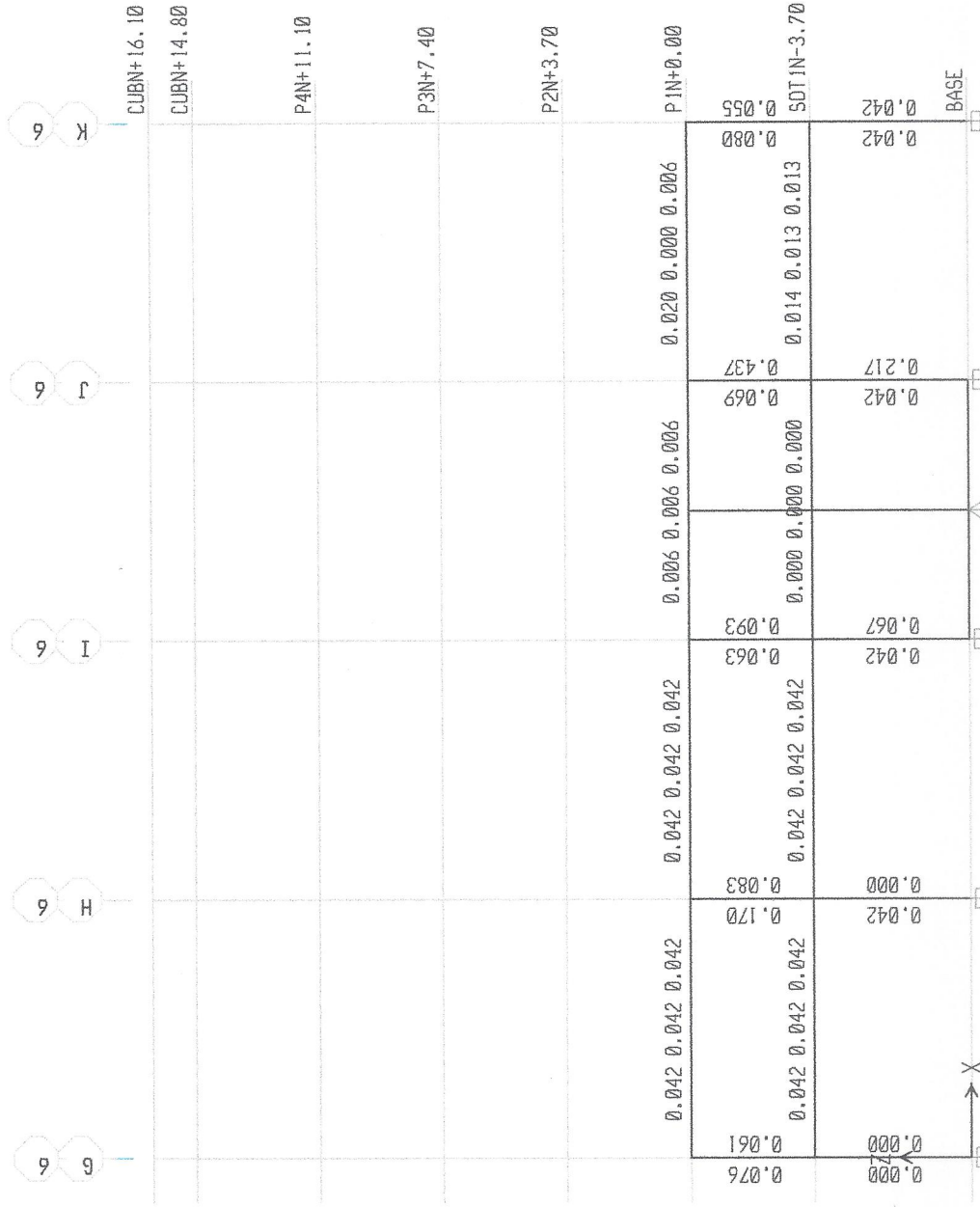
100

	H	I	J	K
CUBN+16.10	0.025 0.025 0.025	0.025 0.025 0.025	0.025 0.025 0.025	0.025 0.025 0.025
CUBN+14.80	0.084 0.084 0.084	0.084 0.084 0.084	0.084 0.084 0.084	0.084 0.084 0.084
P4N+11.10	0.097 0.097 0.097	0.097 0.097 0.097	0.097 0.097 0.097	0.097 0.097 0.097
P3N+7.40	0.050 0.050 0.050	0.050 0.050 0.050	0.050 0.050 0.050	0.050 0.050 0.050
P2N+3.70	0.084 0.084 0.084	0.084 0.084 0.084	0.084 0.084 0.084	0.084 0.084 0.084
PIN+0.00	0.050 0.050 0.050	0.050 0.050 0.050	0.050 0.050 0.050	0.050 0.050 0.050
SOT IN-3.70	0.084 0.084 0.084	0.084 0.084 0.084	0.084 0.084 0.084	0.084 0.084 0.084

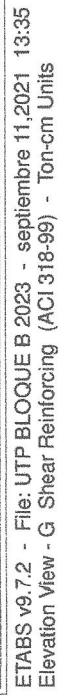
PORTICO 5



PORTICO DE 6



103



104

07

$$V_{\text{bisphate}} =$$

Portico DE I

	I 6	I 5	I 4	I 3	I 2	
	0.093	0.042	0.042	0.042	0.042	CUBN+16.10
	0.042	0.042	0.042	0.042	0.042	CUBN+14.80
	0.063	0.049	0.049	0.049	0.049	P4N+11.10
	0.063	0.049	0.049	0.049	0.049	P3N+7.40
	0.063	0.049	0.049	0.049	0.049	P2N+3.70
	0.063	0.049	0.049	0.049	0.049	P1N+0.00
	0.063	0.049	0.049	0.049	0.049	SOT IN-3.70
	0.063	0.049	0.049	0.049	0.049	BASE

Ver Portico DE #

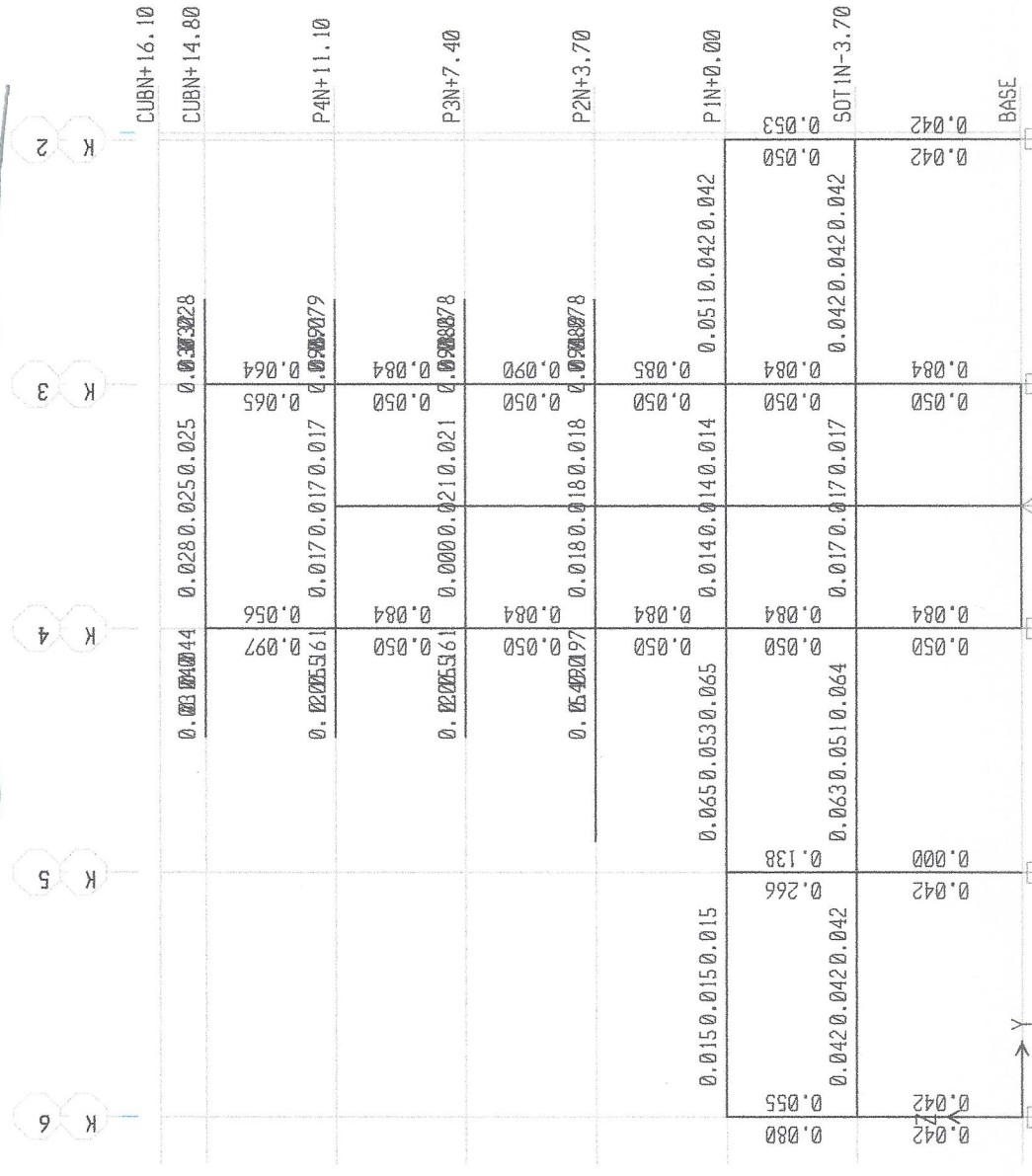
105

106

[illegible]

Portico 422 K

107



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ETABS v9.7.2 - File: UTP BLOQUE B 2023 - septiembre 11, 2021 16:47
Elevation View - 2 Joint Shear Capacity Ratios (ACI 318-99) - Ton-m Units

109

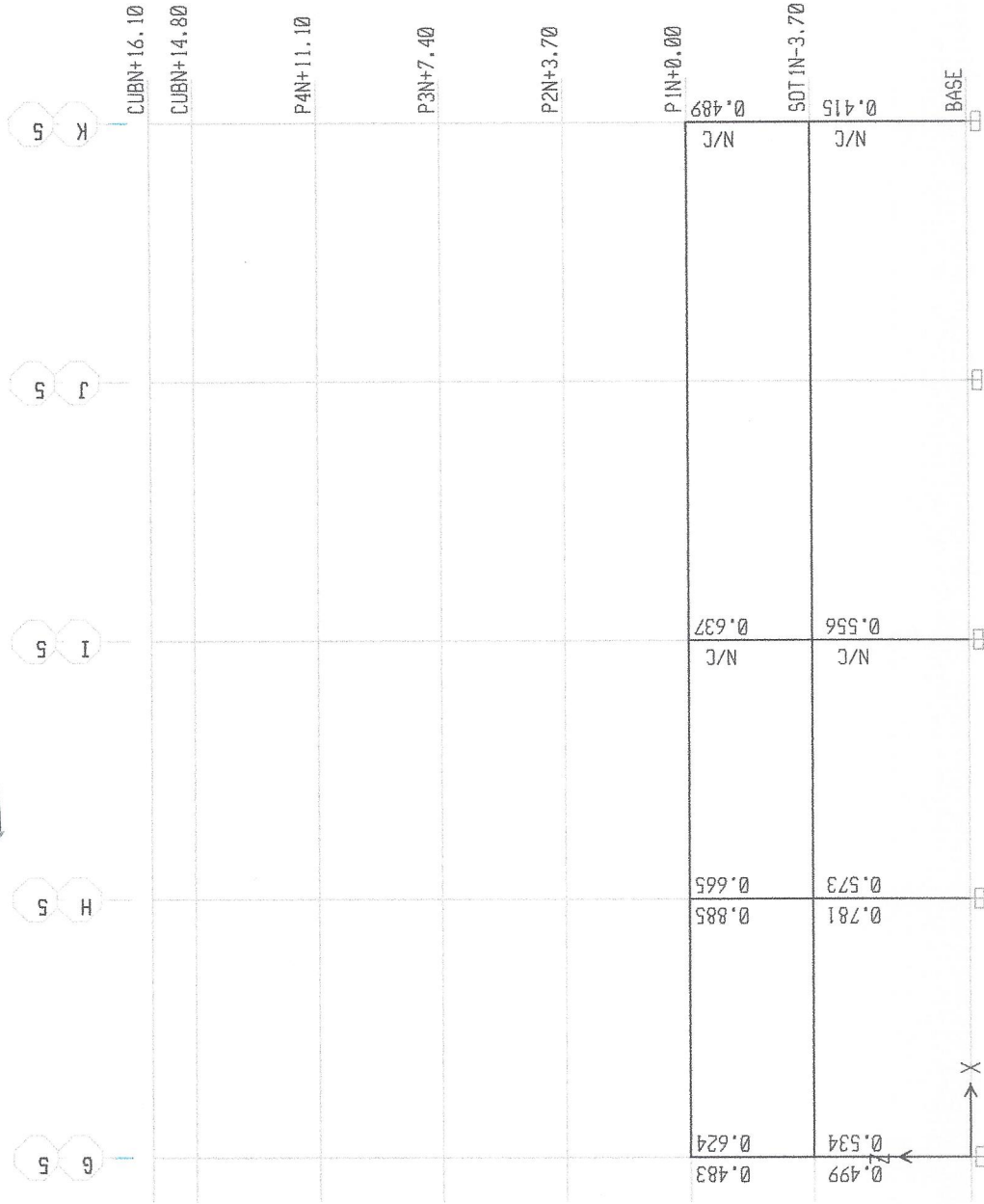
ETABS v9.7.2 - File: UTP BLOQUE B 2023 - septiembre 11, 2021 16:47
Elevation View - 3 Joint Shear Capacity Ratios (ACI 318-99) - Ton-m Units

110

[illegible]

Portico 5

111



112

[illegible]

113

ETABS v9.7.2 - File: UTP BLOQUE B 2023 - septiembre 11, 2021 16:49
Elevation View - G Joint Shear Capacity Ratios (ACI 318-99) - Ton-m Units



114

ETABS v9.7.2 - File: UTP BLOQUE B 2023 - septembre 11, 2021 16:50
Elevation View - H Joint Shear Capacity Ratios (ACI 318-99) - Ton-m Units

115

ETABS v9.7.2 - File: UTP BLOQUE B 2023 - septiembre 11, 2021 16:50
Elevation View - I Joint Shear Capacity Ratios (ACI 318-99) - Ton-m Units

116

	BASE	SOT IN-3.70	P1N+0.00	P2N+3.70	P3N+7.40	P4N+11.10	UBN+14.80	UBN+16.10
2	0.227	0.285	0.120	0.223	0.232	0.255	0.139	0.290
3	0.244	0.539	0.212	0.216	0.219	0.217	0.454	0.457
4	N/C	0.542	N/C	0.662	0.689	0.661	N/C	0.586
5								
6	0.265	0.339	N/C					

PORTICO DE K

	CUBN+16.10	CUBN+14.80	P4N+11.10	P3N+7.40	P2N+3.70	P1N+0.00	SOT1N-3.70	BASE
2 K						0.274	0.460	0.399
3 K		0.443	0.489	0.478	0.551	0.512	0.431	0.356
4 K		0.428	0.679	0.419	0.475	0.451	0.413	0.328
5 K					0.236	0.301	0.139	0.143
6 K							0.489	0.415
							N/C	N/C
							0.391	0.399
							0.324	0.457

717

Antia

118

119

	BASE	SOT 1N-3.70	PIN+0.00	P2N+3.70	P3N+7.40	P4N+11.10	CUBN+14.80	CUBN+16.10
6	0.088	0.081	0.067	0.063	0.102	0.391	0.386	
3	0.304	0.305	0.320	0.317	0.402	0.386	0.391	
H	0.094	0.092	0.090	0.097	0.153	0.253	0.463	0.257
3	0.250	0.283	0.328	0.358	0.494	0.463	0.463	0.257
I	0.091	0.096	0.097	0.105	0.169	0.126	0.221	0.147
3	0.243	0.280	0.325	0.354	0.488	0.126	0.221	0.147
J	0.090	0.086	0.091	0.097	0.153	0.253	0.463	0.256
3	0.250	0.282	0.328	0.357	0.493	0.256	0.463	0.256
K	0.097	0.081	0.068	0.063	0.103	0.390	0.386	0.390
3	0.302	0.304	0.319	0.317	0.401	0.386	0.390	0.386

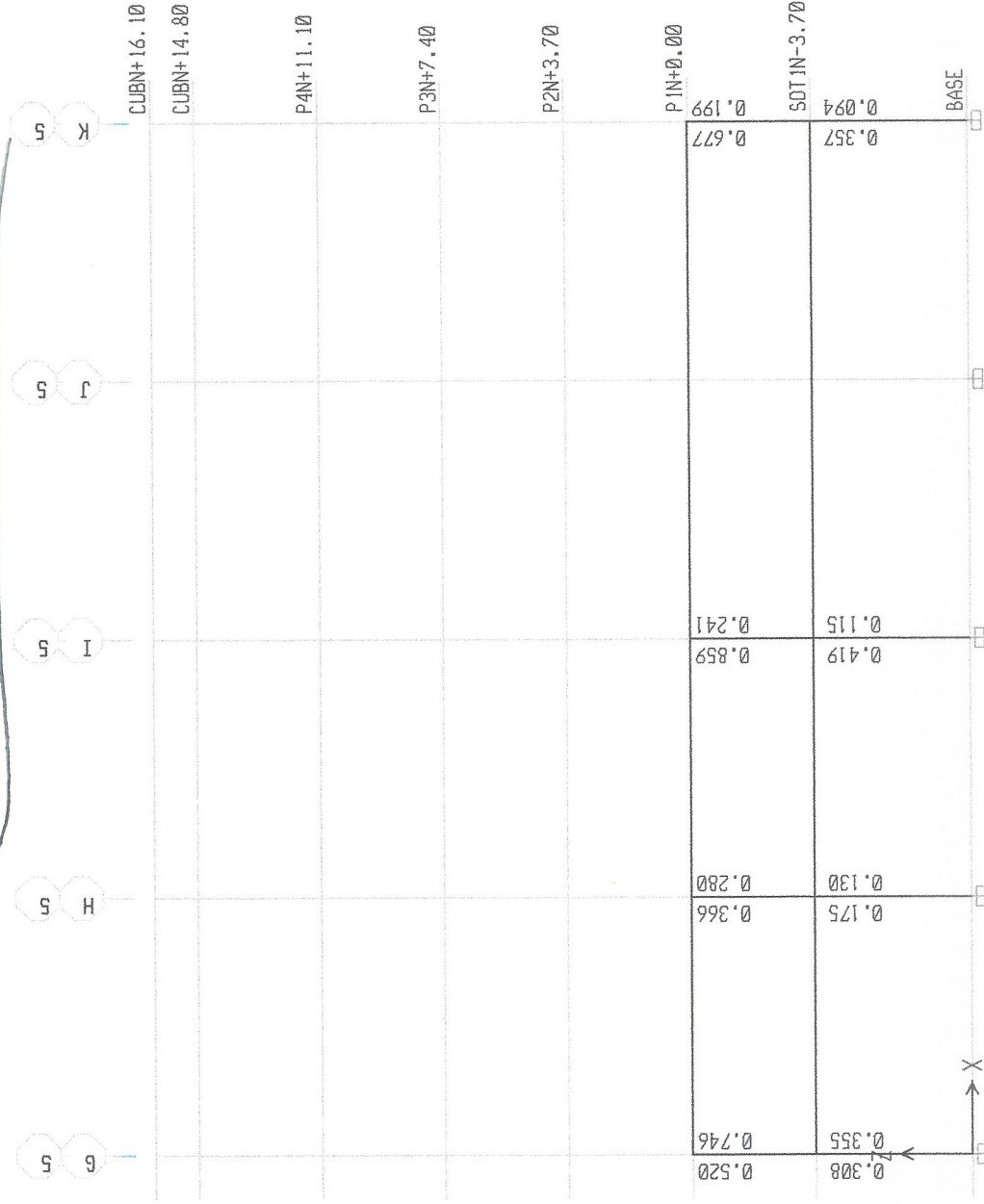
120

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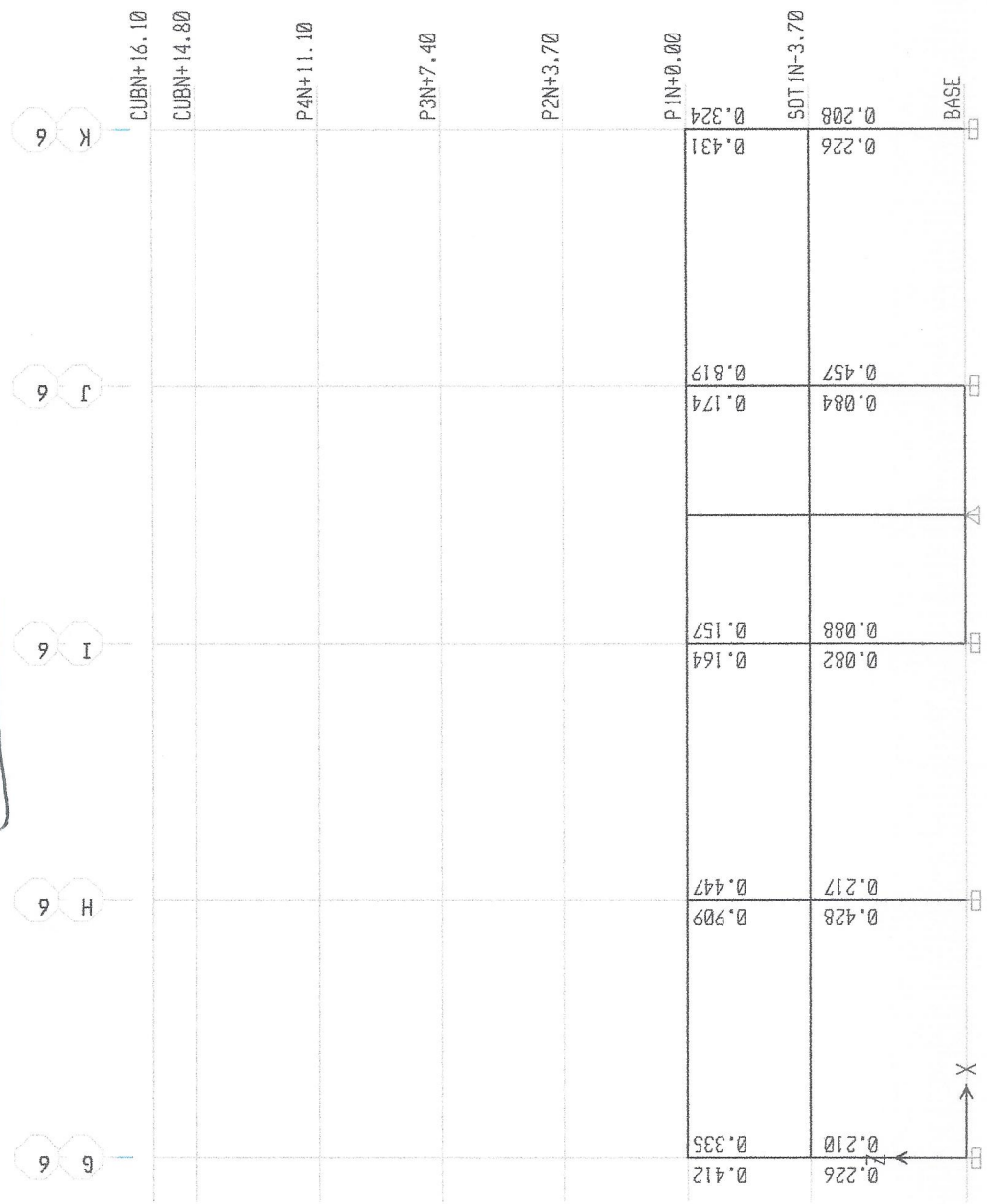
Actual

PORTICO EJE 5

121



122



PORTICO EJE G

	6	5	4	3	2
BASE	0.226	0.210	0.412	0.223	0.281
SOTIN-3.70	0.308	0.355	0.091	0.098	0.230
P1N+0.00	0.520	0.746	0.080	0.081	0.294
P2N+3.70			0.155	0.067	0.320
P3N+7.40			0.118	0.063	0.317
P4N+11.10			0.195	0.102	0.402
CUBN+14.80			0.587	0.391	0.386
CUBN+16.10					

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Portico #

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	BASE	SOTIN-3.70	PIN+0.00	P2N+3.70	P3N+7.40	P4N+11.10	CUBN+14.80	CUBN+16.10	
2 H	0.101	0.093	0.091	0.087	0.091	0.040	0.073	0.289	
3 H	0.094	0.092	0.090	0.097	0.153	0.253	0.257	0.463	
4 H	0.450	0.533	0.522	0.533	0.603	0.845	0.434		
5 H	0.175	0.366							
6 H	0.428	0.217	0.909						

PARADA

Portico ~~BE~~ I

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	BASE	SOT1N-3.70	P1N+0.00	P2N+3.70	P3N+7.40	P4N+11.10	CUBN+14.80	CUBN+16.10	
I 2	0.066	0.074	0.080	0.084	0.091	0.033	0.129	0.162	
I 3	0.243	0.280	0.325	0.354	0.488	0.147	0.516		
I 4	0.185	0.192	0.492	0.448	0.707	0.301			
I 5	0.419	0.859							
I 6	0.082	0.157							

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PORTICO 5

	J 2	J 3	J 4	J 5	J 6
BASE	0.101	0.090	0.620	0.084	0.174
SOT IN-3.70	0.203	0.250	0.258	0.457	0.819
P1N+0.00	0.095	0.086	0.951		
P2N+3.70	0.092	0.091	0.524		
P3N+7.40	0.088	0.097	0.533		
P4N+11.10	0.091	0.153	0.604		
CUBN+14.80	0.040	0.253	0.846		
CUBN+16.10	0.290	0.463	0.435		

PARTICULA

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	BASE	SOT IN-3.70	P IN+0.00	P2N+3.70	P3N+7.40	P4N+11.10	CUBN+14.80	CUBN+16.10
2	0.225	0.230	0.281	0.297				
3	0.302	0.097	0.081	0.068	0.317	0.103	0.386	
4	0.262	0.091	0.080	0.156	0.264	0.197	0.587	
5	0.357	0.094	0.677					
6	0.226	0.208	0.431					