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CANCELERIA



PUERTAS



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ESCALERAS

Pagina 2



BARDA



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VACIOS

Página 3

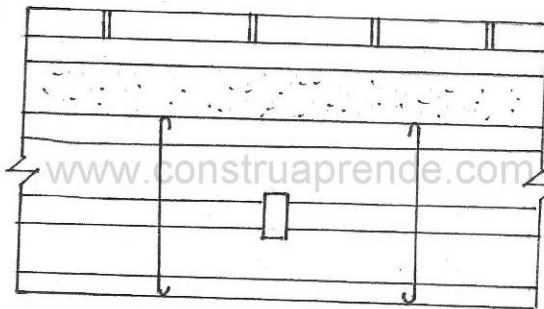


PASILLOS

PREDISEÑO

ANÁLISIS DE CARGA

SISTEMA CONSTRUCTIVO ENTREPISO



MOSAICO 30x30.....	= 55 Kg/m ²
MORTERO CEM-AR-CAL... 1800 Kg/m ³ x .02m =	36 Kg/m ²
LOSA..... 2400 Kg/m ³ x .07m =	168 Kg/m ²
YESO..... 1450 Kg/m ³ x .025m =	36.25 Kg/m ²
INSTALACIONES	
HIDRO-SANITARIAS	
X/O ELÉCTRICAS	= 20.00 Kg/m ²
FALSO PLAFÓN	= 20.00 Kg/m ²
CARGA MUERTA	<u>335.25 Kg/m²</u>

$$C.M. = 335.25 \text{ Kg/m}^2 + 40 \text{ Kg/m}^2$$

SEGUN ART. 197 DEL REGLAMENTO DE CONSTRUCCIONES

$$C.M. = 375.25 \text{ Kg/m}^2$$

C.M. - CARGA MUERTA.

C.V. - CARGA VIVA.

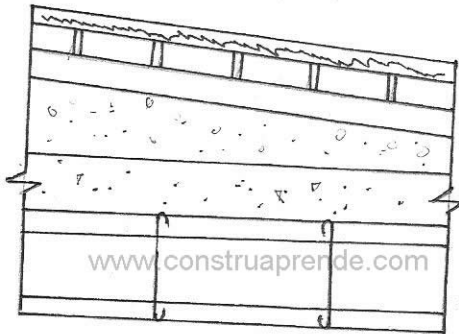
$$= 375.25 + 250 \text{ Kg/m}^2$$

SEGUN ART. 199 DEL REGLAMENTO DE CONSTRUCCIONES.

$$W_{\text{SERVICIO}} = 625.25 \text{ Kg/m}^2$$

SISTEMA CONSTRUCTIVO

LOSA AZOTEA.



IMPERMEABILIZANTE.....	5 kg/m ²
LADRILLO.....	1900 kg/m ³ x .025 = 47.5 kg/m ²
MORTERO.....	1800 kg/m ³ x .02 = 36.0 kg/m ²
TEZONTLE.....	800 kg/m ³ x .15 = 120.0 kg/m ²
LOSA.....	2400 kg/m ³ x .07 = 168.0 kg/m ²
YESO.....	1450 kg/m ³ x .025 = 36.25 kg/m ²
FALSO PLAFON.....	= 20.0 kg/m ²
CARGA MUERTA <u>432.75 kg/m²</u>	

$$C.M. = 432.75 \text{ kg/m}^2 + 40 \text{ kg/m}^2$$

SEGUN ART 197

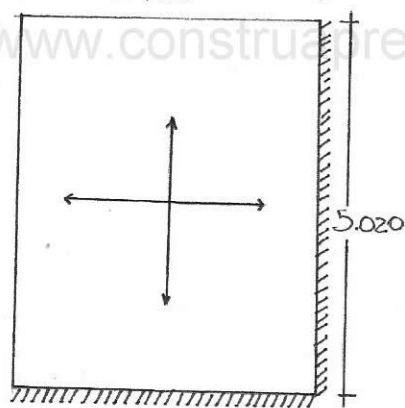
$$C.M. = 472.75 \text{ kg/m}^2$$

$$W_{SERVICIO} = C.M. + C.V.$$

$$= 472.75 + 100$$

$$W_{SERVICIO} = 572.75 \text{ kg/m}^2$$

ESPESOR LOSA ENTREPISO



COLADA MONOLITICAMENTE

$$m = \frac{a_1}{a_2} = \frac{4.405}{5.020} = 0.877 > 0.5$$

∴ El tablero trabaja en dos direcciones

$$d = \frac{\text{Perímetro}}{300} = \frac{1.25(5.020 + 4.405) + 5.020 + 4.405}{300}$$

$$d = 0.0707\text{m} = 7.07\text{cm}$$

$$f_y = 4200 \quad f_s = 0.6 f_y = 2520 \text{ kg/cm}^2 > 2000 \text{ kg/cm}^2$$

$$d_1 = 0.034 \sqrt[4]{f_s w} d$$

$$\text{C.M.} = 381.5 \text{ kg/cm}^2 \quad \text{C.V.} = 250 \text{ kg/cm}^2$$

$$w_{\text{SERVICIO}} = \text{C.M.} + \text{C.V.} = 625.25 \text{ kg/m}^2$$

$$d_1 = 0.034 \sqrt[4]{2520(625.25)} (7.07) = 8.52\text{cm}$$

$$h = 8.52 + 2 (\text{RECUBRIMIENTO}) = 10.52 \approx \underline{\underline{11\text{cm}}}$$

LOSA AZOTEA

$$d_1 = 0.034 \sqrt[4]{(2520)(572.75)} (7.07) = 8.33\text{cm}$$

$$h = 8.33 + 2 (\text{RECUBRIMIENTO}) = 10.33 \approx \underline{\underline{11\text{cm}}}$$

12 CARGAS VERTICALES.

$$W_E = C.M. + C.Y + P_{00} \text{ propio.}$$

$$W_{EV} = 471.25 + 250 + 220 = 941.25$$

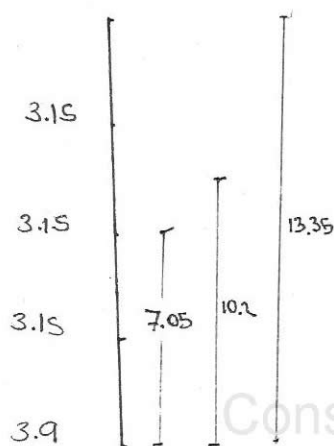
$$W_{AV} = 568.75 + 100 + 220 = 888.75$$

CARGAS SISMICAS

$$W_{ES} = 471.25 + 180 + 220 = 871.25$$

$$W_{AS} = 568.75 + 70 + 220 = 858.75$$

ANALISIS SISMICO



$$W_4 = \frac{A W_{AS}}{1000} = \frac{(376.317)(858.75)}{1000} = 323.16$$

$$W_3 = \frac{A W_{ES}}{1000} = \frac{(376.317)(871.25)}{1000} = 327.87$$

$$W_2 = 327.87$$

$$W_1 = 327.87$$

Area de la planta Estructural tipo: 9.485×39.675

$$A = 376.317 \text{ m}^2$$

(13)

$$F_i = \frac{C \sum W_i}{Q \sum W_i h_i} W_i h_i$$

$$Q = 2$$

$$C = 0.32$$

NIVEL	W_i	h_i	$W_i h_i$	F_i
4	323.16	13.35	4314.186	80.19
3	327.87	10.2	3344.274	62.16
2	327.87	7.05	2311.4835	42.96
1	327.87	3.9	1278.693	23.77
Σ	1306.77		11248.64	

$$F_i = \frac{0.32 (1306.77)}{2 (11248.64)} W_i h_i = 0.01859 W_i h_i$$

REPARTICION DE LA FUERZA SISMICA.

DIRECCION X

NIVEL 4
100% → 80.19
 F_i

NIVEL 3
 $F_i = 62.16$

NIVEL 2
 $F_i = 42.96$

NIVEL 1
 $F_i = 23.77$

A 33.3% → 26.73

20.72

14.32

7.92

B 33.3% → 26.73

20.72

14.32

7.92

C 33.3% → 26.73

20.72

14.32

7.92

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DIRECCION 4

NIVEL 4		NIVEL 3	NIVEL 2	NIVEL 1
100% → $T_d = 80.19$		$T_d = 62.16$	$T_d = 42.96$	$T_d = 23.77$
1.-10%	8.019	6.216	4.296	2.377
2.-10%	8.019	6.216	4.296	2.377
3.-10%	8.019	6.216	4.296	2.377
4.-10%	8.019	6.216	4.296	2.377
5.-10%	8.019	6.216	4.296	2.377
6.-10%	8.019	6.216	4.296	2.377
7.-10%	8.019	6.216	4.296	2.377
8.-10%	8.019	6.216	4.296	2.377
9.-10%	8.019	6.216	4.296	2.377
10.-10%	8.019	6.216	4.296	2.377

ÁREAS DE ENTREPISO

$$\text{ÁREA TRIANGULO} = \frac{2bh}{2} = \triangle = \frac{4.405 \times 1.1013}{2} = 4.851 \text{ m}^2$$

$$\text{ÁREA TRAPECIO 1} = \frac{B+b}{2} h = \text{trapezoid} = \frac{5.020 + 2.8175}{2} \times 2.2025 = 8.6310 \text{ m}^2$$

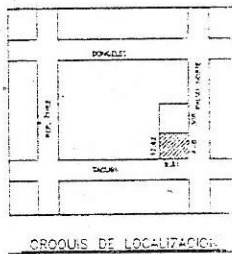
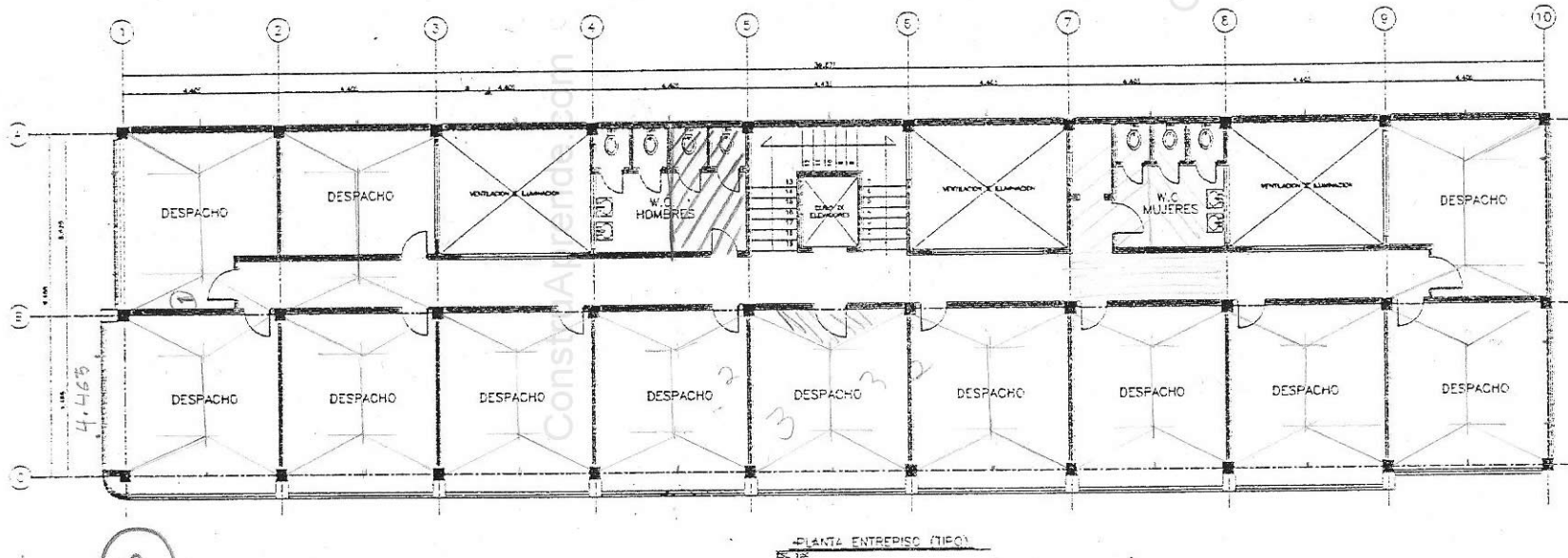
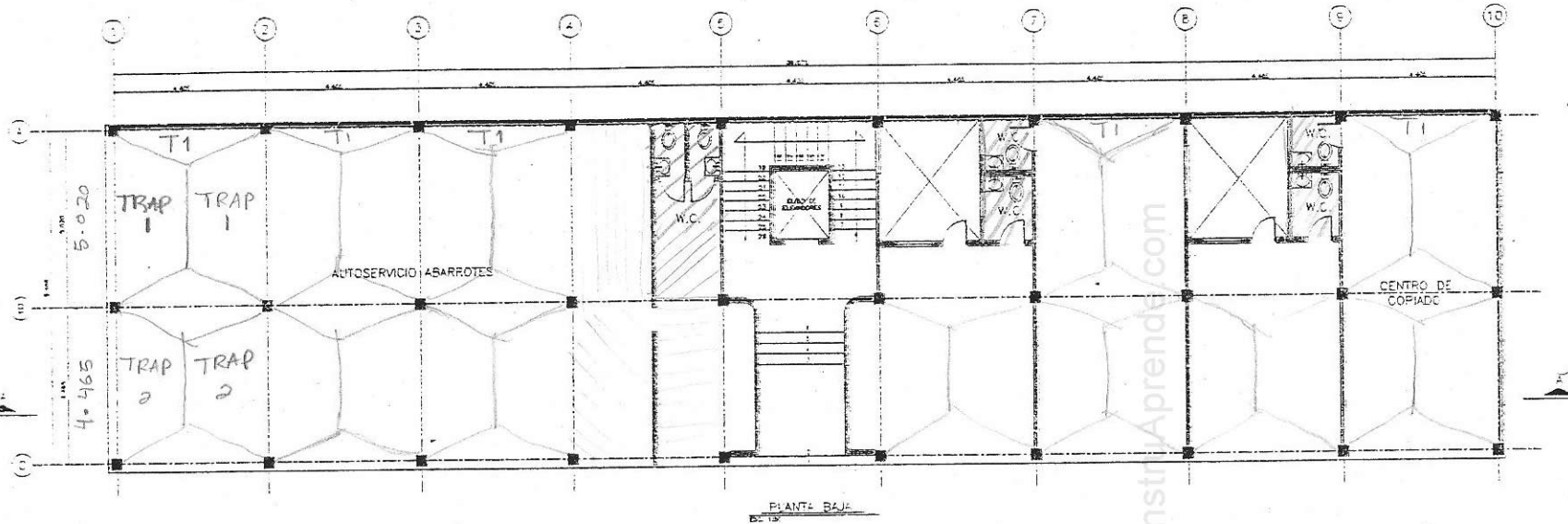
$$\text{ÁREA TRAPECIO 2} = \frac{B+b}{2} h = \text{trapezoid} = \frac{4.9650 + 2.2625}{2} \times 2.2025 = 7.4087 \text{ m}^2$$

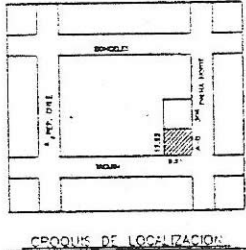
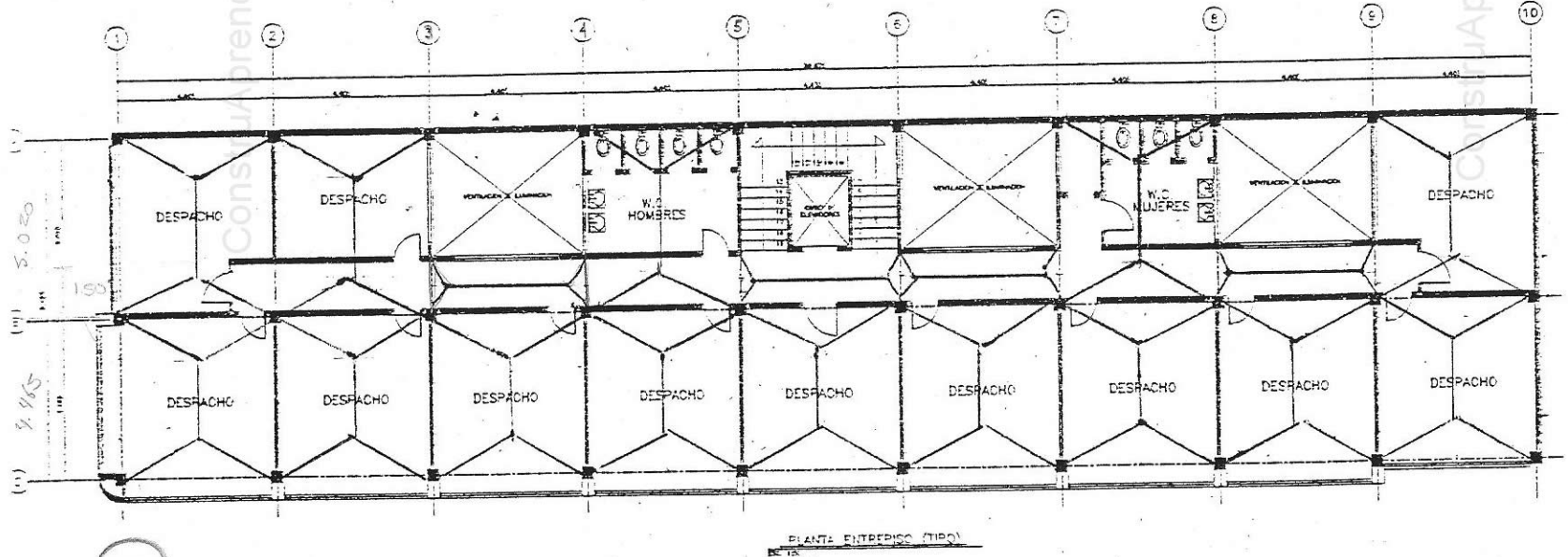
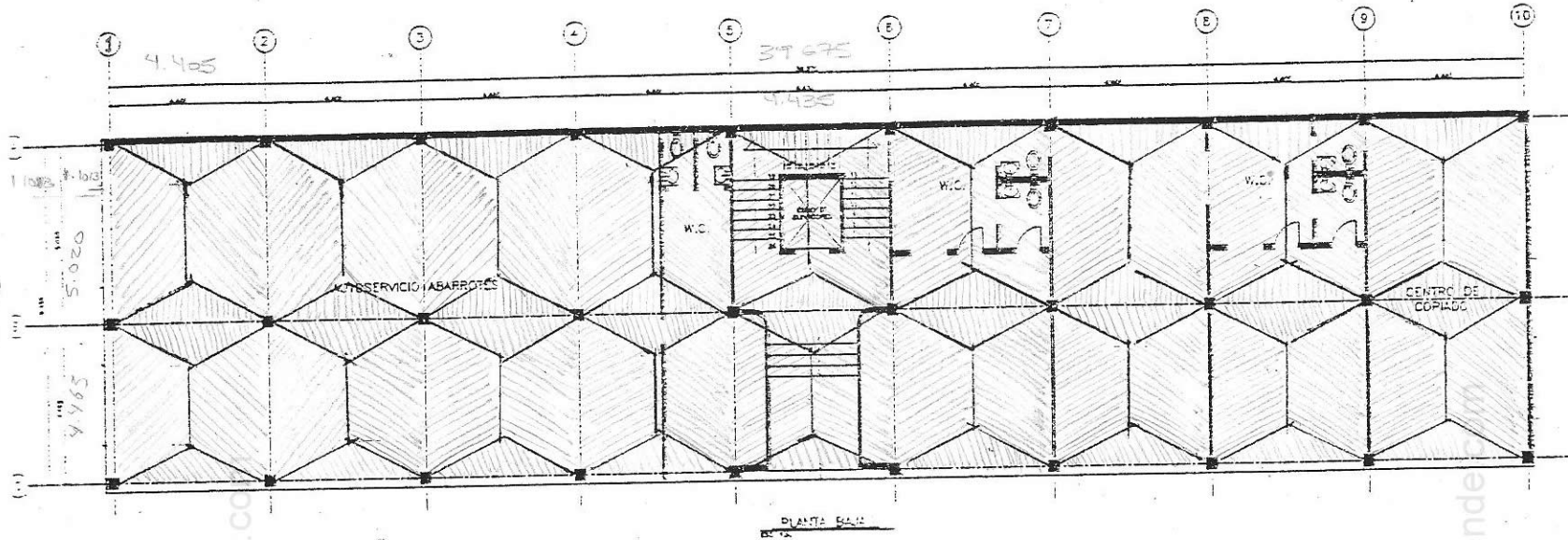
$$\text{ÁREA TRAPECIO 3} = \frac{B+b}{2} h = \text{trapezoid} = \frac{4.465 + 2.2475}{2} \times 2.2175 = 7.4425 \text{ m}^2$$

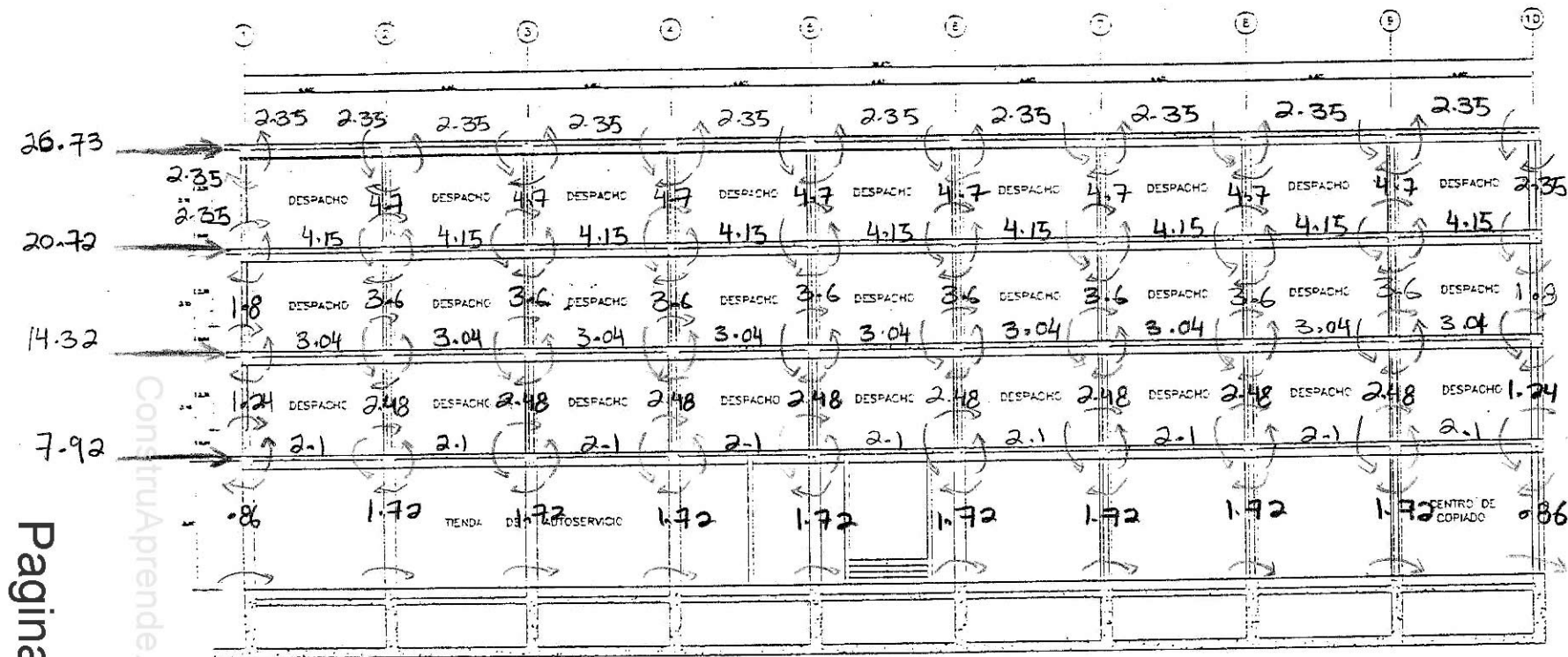
$$\text{ÁREA TRIANGULO 2} = \frac{2bh}{2} = \triangle = \frac{2 \times 4.435 \times 1.1088}{2} = 4.9175 \text{ m}^2$$

$$\text{ÁREA RECTANGULO 1} = b \times h = \text{rectangle} = 4.405 \times 1.50 = 6.6075 \text{ m}^2$$

$$\text{ÁREA RECTANGULO 2} = b \times h = \text{rectangle} = 2.225 \times 3.52 = 7.7528 \text{ m}^2$$

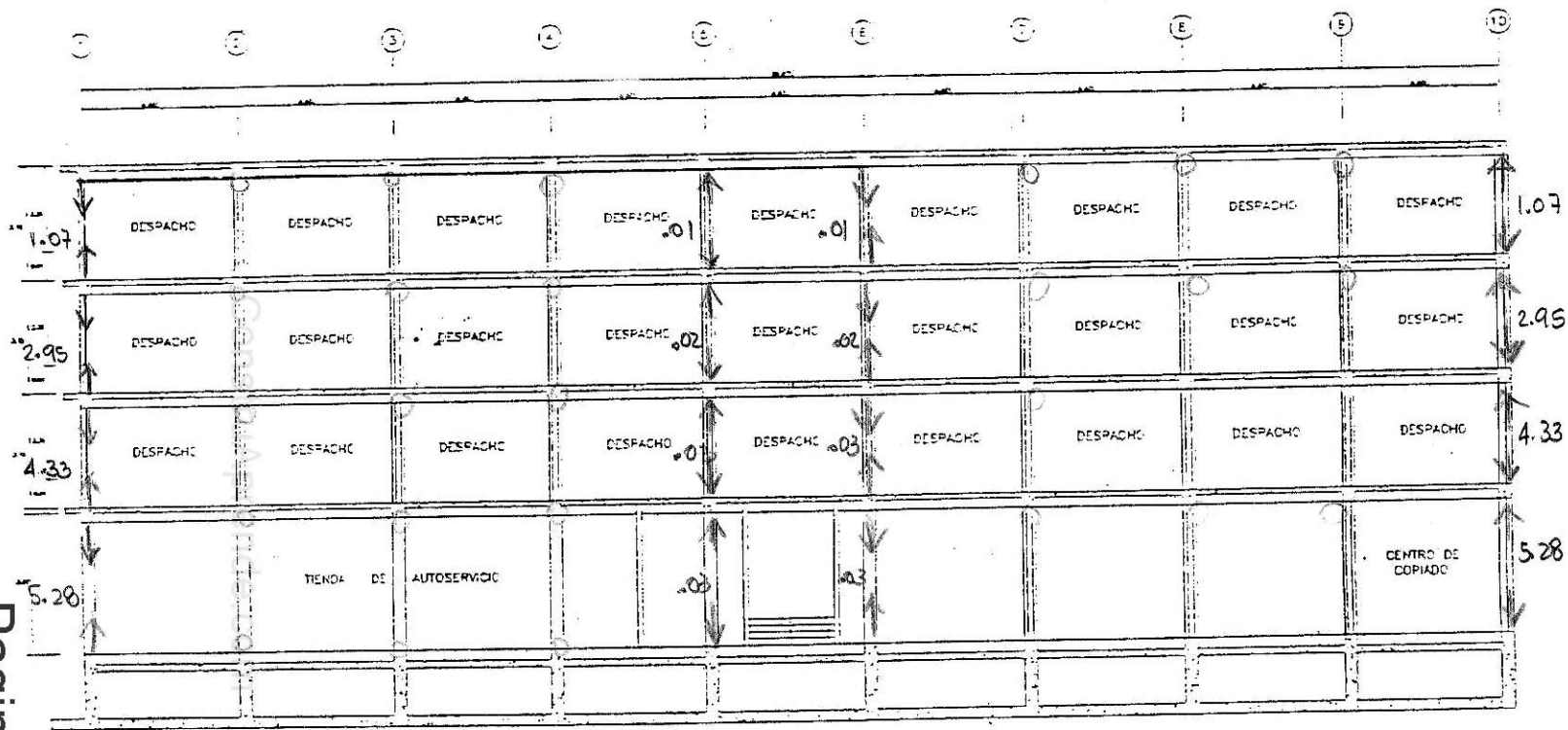






SISMO

ELEMENTOS MECANICOS DIRECCION X



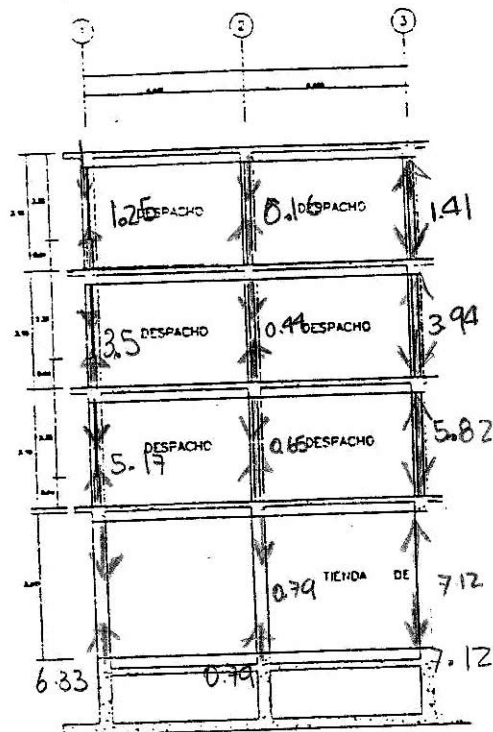
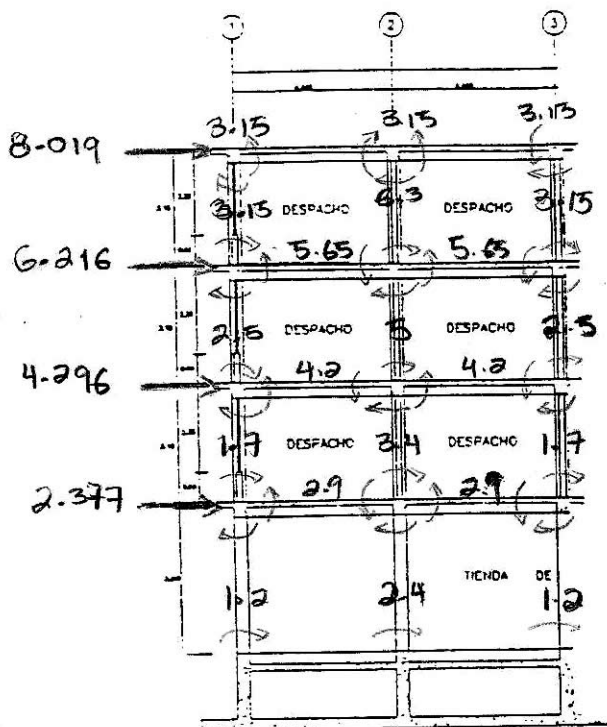
SISMO

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ELEMENTOS MECANICOS

DIRECCION 4

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SISMO

	1	2	3	4	5	6	7	8	9
	$w_1 = 1.96 T/m$	1.96	2.31	2.31	2.31	2.31	2.31	2.31	1.96
1.2m	DESPACHO	DESPACHO	DESPACHO	DESPACHO	DESPACHO	DESPACHO	DESPACHO	DESPACHO	DESPACHO
1.0m	2.07	2.07	2.45	2.45	2.45	2.45	2.45	2.45	2.07
1.2m	DESPACHO	DESPACHO	DESPACHO	DESPACHO	DESPACHO	DESPACHO	DESPACHO	DESPACHO	DESPACHO
1.0m	2.07	2.07	2.45	2.45	2.45	2.45	2.45	2.45	2.07
1.2m	DESPACHO	DESPACHO	DESPACHO	DESPACHO	DESPACHO	DESPACHO	DESPACHO	DESPACHO	DESPACHO
1.0m	2.07	2.07	2.45	2.45	2.45	2.45	2.45	2.45	2.07
1.2m	DESPACHO	DESPACHO	DESPACHO	DESPACHO	DESPACHO	DESPACHO	DESPACHO	DESPACHO	DESPACHO
1.0m	2.07	2.07	2.45	2.45	2.45	2.45	2.45	2.45	2.07
1.2m		TIENDA DE	AUTOSERVICIO						CENTRO DE COPIADO
1.0m									

CM + CV

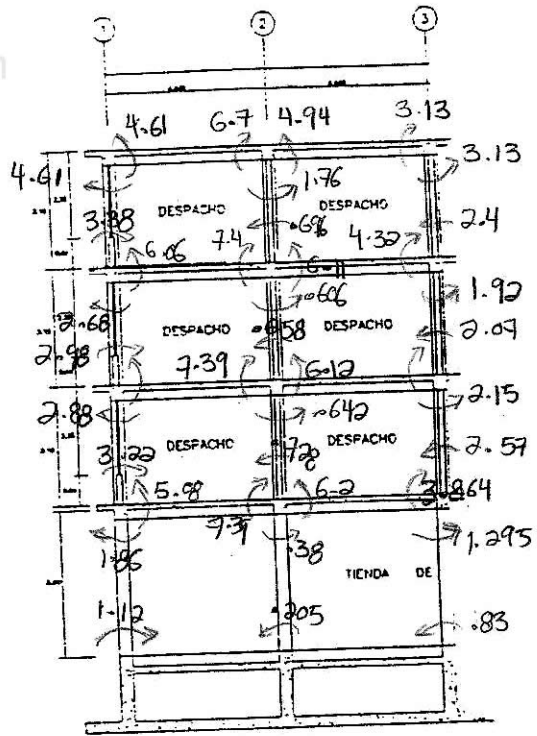
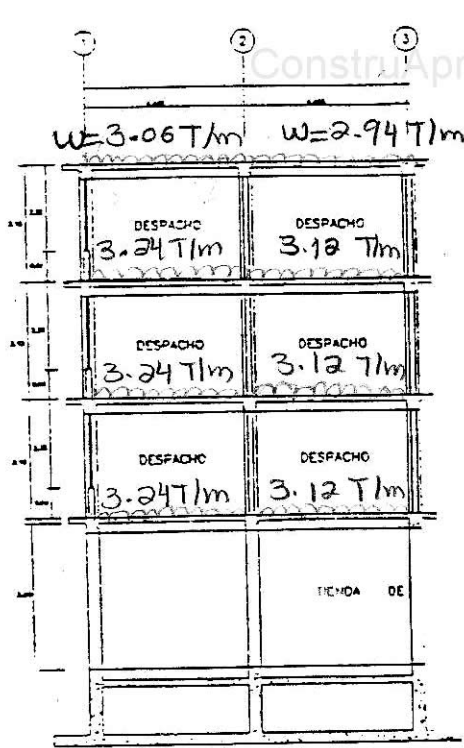
CARGAS VERTICALES

CARGAS VERTICALES

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ELEMENTOS MECANICOS

DIRECCION 4



CM+CV

CARGAS VERTICALES

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TRABES PRINCIPALES

DIRECCION Y

NIVEL 4.

$$M_{AB} (CM+CV) = 6.7$$

$$M_{AB} (CM+CV+Sismo) = \frac{6.7+3.15}{1.33}$$

$$M_{AB} = \underline{7.4} \therefore \text{RIGE}$$

$$S = \frac{M}{F_b}$$

$$F_b = 0.6 F_y = 1518 \text{ Kg/cm}^2$$

$$S = \frac{740\,000}{1518} = 487.48 \text{ cm}^3$$

$$\therefore \text{IR } 203 \times 52.2 \quad (S_x = 511 \text{ cm}^3)$$

$$I_x = 5286 \text{ cm}^4$$

$$M_{BC} (CM+CV) = 4.94$$

$$M_{BC} (CM+CV+Sismo) = \frac{4.94+3.15}{1.33}$$

$$M_{BC} = \underline{6.08} \therefore \text{RIGE}$$

$$S = \frac{608\,000}{1518} = 400.53 \text{ cm}^3$$

$$\text{IR } 305 \times 32.8 \quad (S_x = 416 \text{ cm}^3)$$

$$I_x = 6493 \text{ cm}^4$$

NIVEL 3

$$M_{AB} (CM+CV) = 7.4$$

$$M_{AB} (CM+CV+Sismo) = \frac{7.4+5.69}{1.33}$$

$$M_{AB} = 9.81 \therefore \text{RIGE}$$

$$S = \frac{981\,000}{1518} = 646.24$$

$$\text{IR } 356 \times 44.8 \quad (S_x = 688)$$

$$I_x = 12112 \text{ cm}^4$$

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$$M_{BC} (CM + CV) = 6.11$$

$$M_{BC} (CM + CV + SSMO) = \frac{6.11 + 5.65}{1.33}$$

$$M_{BC} = \underline{8.84} \therefore \text{RIGT}$$

NIVEL 2

$$M_{AB} (CM + CV) = 7.39$$

$$M_{AB} (CM + CV + SSMO) = \frac{7.39 + 4.2}{1.33}$$

$$M_{AB} = \underline{8.71} \therefore \text{RIGT}$$

$$M_{BC} (CM + CV) = 6.12$$

$$M_{BC} (CM + CV + SSMO) = \frac{6.12 + 4.2}{1.33}$$

$$M_{BC} = \underline{7.76} \therefore \text{RIGT}$$

NIVEL 1

$$M_{AB} (CM + CV) = 7.39$$

$$M_{AB} (CM + CV + SSMO) = \frac{7.39 + 2.9}{1.33}$$

$$M_{AB} = 7.34 \therefore \text{RIGT}$$

$$M_{BC} (CM + CV) = 6.25$$

$$M_{BC} (CM + CV + SSMO) = \frac{6.25 + 2.9}{1.33}$$

$$M_{BC} = 6.88 \therefore \text{RIGT}$$

$$S = \frac{884000}{1518} = 582 \text{ cm}^3$$

$$I_R = 203 \times 59.3 (S_x = 582)$$

$$I_x = 6077 \text{ cm}^4$$

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$$S = \frac{871000}{1518} = 573.8 \text{ cm}^3$$

$$I_R = 203 \times 59.3 (S_x = 582)$$

$$I_x = 6077 \text{ cm}^4$$

$$S = \frac{776000}{1518} = 511 \text{ cm}^3$$

$$I_R = 203 \times 52.2 (S_x = 511)$$

$$I_x = 5286 \text{ cm}^4$$

$$S = \frac{734000}{1518} = 483.53 \text{ cm}^3$$

$$I_R = 203 \times 52.2 (S_x = 511)$$

$$S = \frac{688000}{1518} = 453.23 \text{ cm}^3$$

$$I_R = 254 \times 38.5 (S_x = 457)$$

$$I_x = 5994 \text{ cm}^4$$

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TRABES PRINCIPALES

DIRECCION X

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NIVEL 4

$$M_{1-2} (CM + CV) = 4.295$$

$$M_{1-2} (CM + CV + SISMO) = \frac{4.295 + 2.35}{1.33} = 4.996 \text{ RIGI}$$

$$S = \frac{499\ 600}{1518} = 329.1 \text{ cm}^3 \quad \text{IR } 203 \times 46.2$$

$$M_{2-3} (CM + CV) = M_{3-4} = M_{4-5} = M_{5-6} = M_{6-7} = M_{7-8} = M_{8-9}$$

$$M_{2-3} = 3.97$$

$$M_{2-3} (CM + CV + SISMO) = \frac{3.97 + 2.35}{1.33} = 4.75$$

$$S = \frac{475\ 000}{1518} = 312.9 \text{ cm}^3 \quad \text{IR } 203 \times 46.2$$

$$M_{9-10} (CM + CV) = 4.295$$

$$M_{9-10} (CM + CV + SISMO) = \frac{4.295 + 2.35}{1.33} = 4.996$$

$$S = 329.1 \text{ cm}^3 \quad \text{IR } 203 \times 46.2$$

NIVEL 3

$$M_{1-2} (CM + CV) = 4.37$$

$$M_{1-2} (CM + CV + SISMO) = \frac{4.37 + 4.15}{1.33} = 6.41 \text{ ConstruAprende.com}$$

$$S = \frac{641\ 000}{1518} = 422.3 \text{ cm}^3 \quad \text{IR } 203 \times 46.2 \quad (S_x = 451 \text{ cm}^3)$$

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$$M_{2-3} (CM+CV) = 4.07$$

$$M_{2-3} (CM+CV+SISMO) = \frac{4.07 + 4.15}{1.33} = 6.18$$

$$S = \frac{618\,000}{1518} = 407.11 \text{ cm}^3 \quad I_{R\,305 \times 32.8} \quad (S_x = 416 \text{ cm}^3)$$

$$M_{9-10} (CM+CV) = 4.37$$

$$M_{9-10} (CM+CV+SISMO) = \frac{4.37 + 4.15}{1.33} = 6.4$$

$$S = 422.3 \text{ cm}^3$$

$$I_{R\,203 \times 46.2}$$

NIVEL 2

$$M_{1-2} (CM+CV) = 4.37$$

$$M_{1-2} (CM+CV+SISMO) = \frac{4.37 + 3.04}{1.33} = 5.57$$

$$S = \frac{557\,000}{1518} = 366.9 \text{ cm}^3 \quad I_{R\,254 \times 32.9} \quad (S_x = 380 \text{ cm}^3)$$

$$M_{2-3} (CM+CV) = 4.07$$

$$M_{2-3} (CM+CV+SISMO) = \frac{4.07 + 3.04}{1.33} = 5.37$$

$$S = \frac{537\,000}{1518} = 353.75 \text{ cm}^3 \quad I_{R\,254 \times 32.9}$$

$$M_{9-10} (CM+CV) = 4.37$$

$$M_{9-10} (CM+CV+SISMO) = \frac{4.37 + 3.04}{1.33} = 5.57$$

$$S = 366.9 \text{ cm}^3$$

$$I_{R\,254 \times 32.9}$$

NIVEL 1

$$M_{1-2} (CM+CV) = 4.37$$

$$M_{1-2} (CM+CV+SISMO) = \frac{4.37+2.1}{1.33} = 4.86$$

$$S = \frac{486000}{1518} = 320.2 \text{ cm}^3 \quad I_{R2} = 203 \times 46.2 \quad (S_x = 342)$$

$$M_{2-3} (CM+CV) = 4.07$$

$$M_{2-3} (CM+CV+SISMO) = \frac{4.07+2.1}{1.33} = 4.64$$

$$S = \frac{464000}{1518} = 305.7 \text{ cm}^3 \quad I_{R2} = 254 \times 28.5 \quad (S_x = 308 \text{ cm}^3)$$

$$M_{9-10} (CM+CV) = 4.37$$

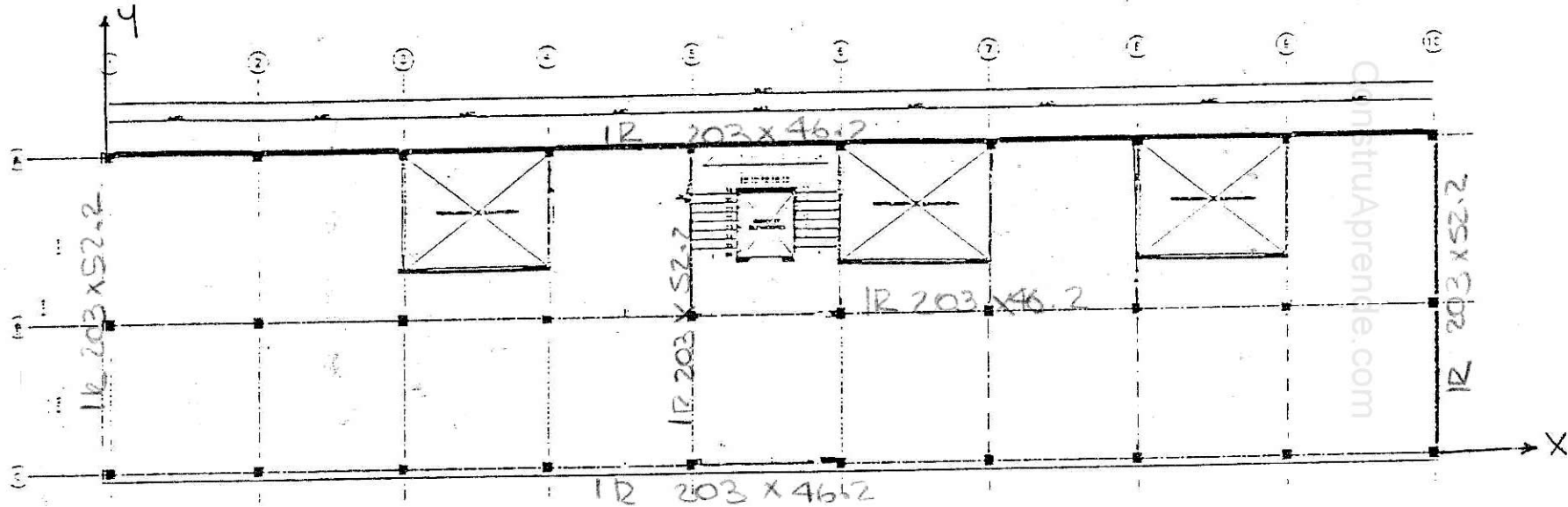
$$M_{9-10} (CM+CV+SISMO) = \frac{4.37+2.1}{1.33} = 4.86$$

$$S = 320.2 \text{ cm}^3 \quad I_{R2} = 203 \times 46.2$$

TRABES PRINCIPALES

NIVEL 4.

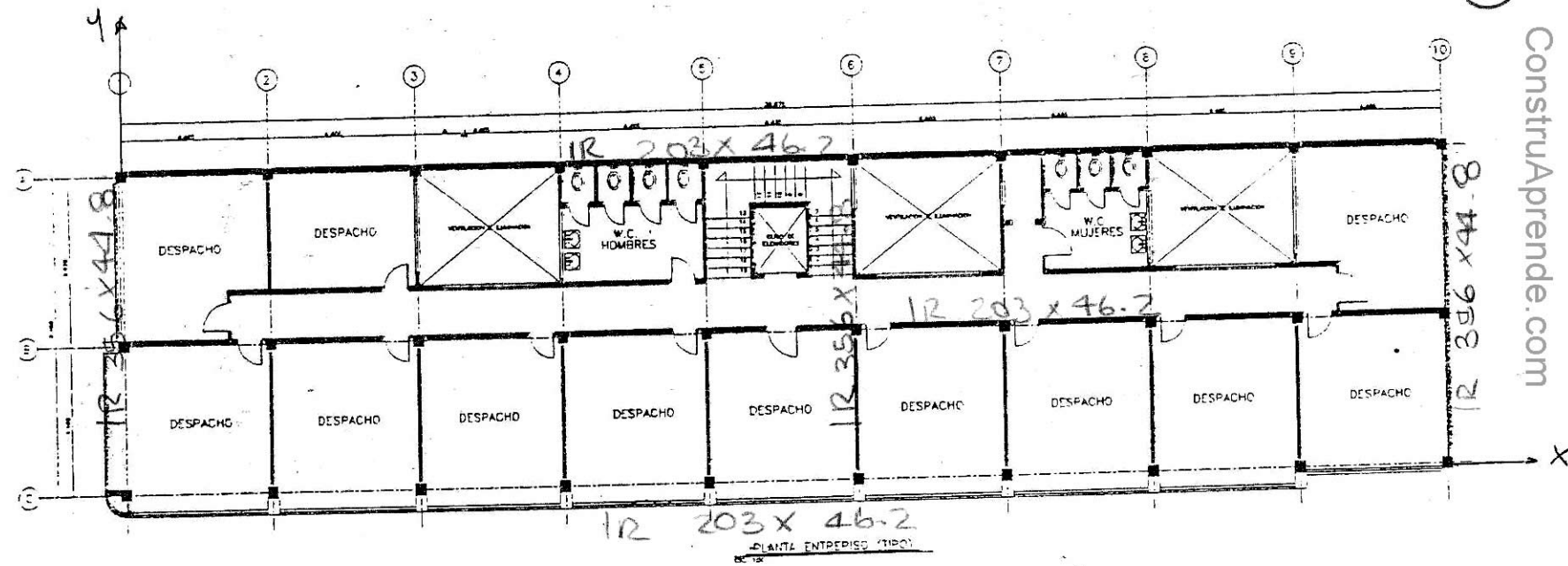
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NIVEL 3

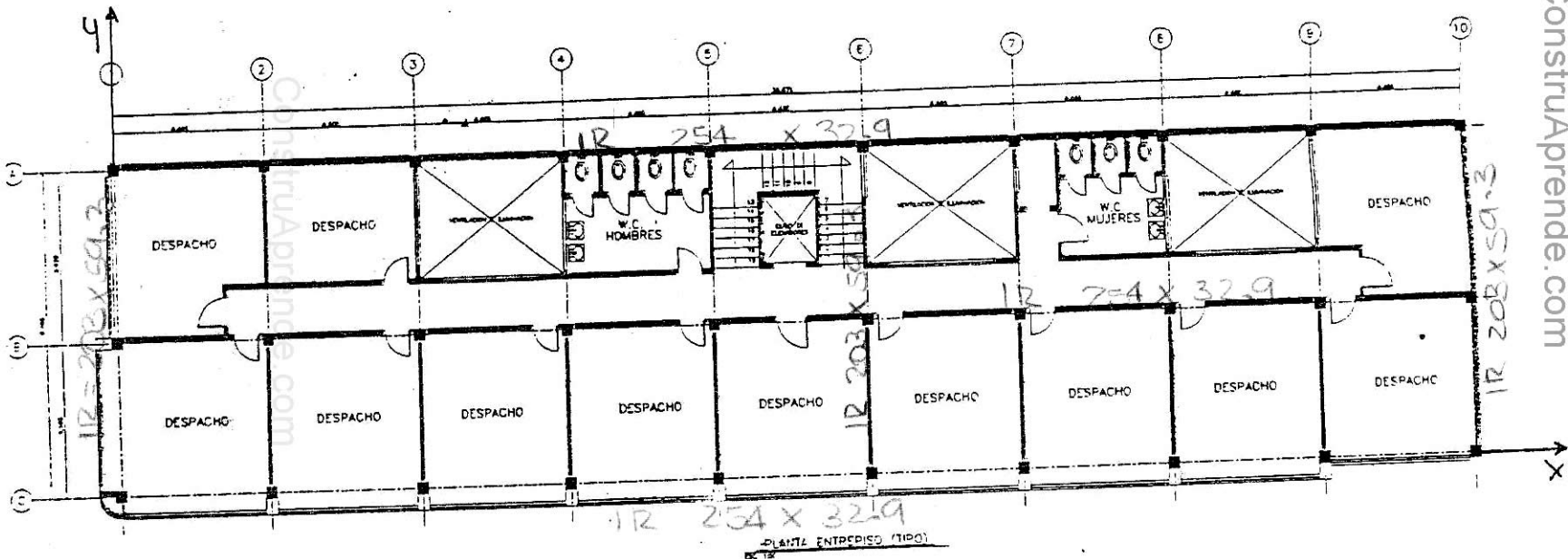
30

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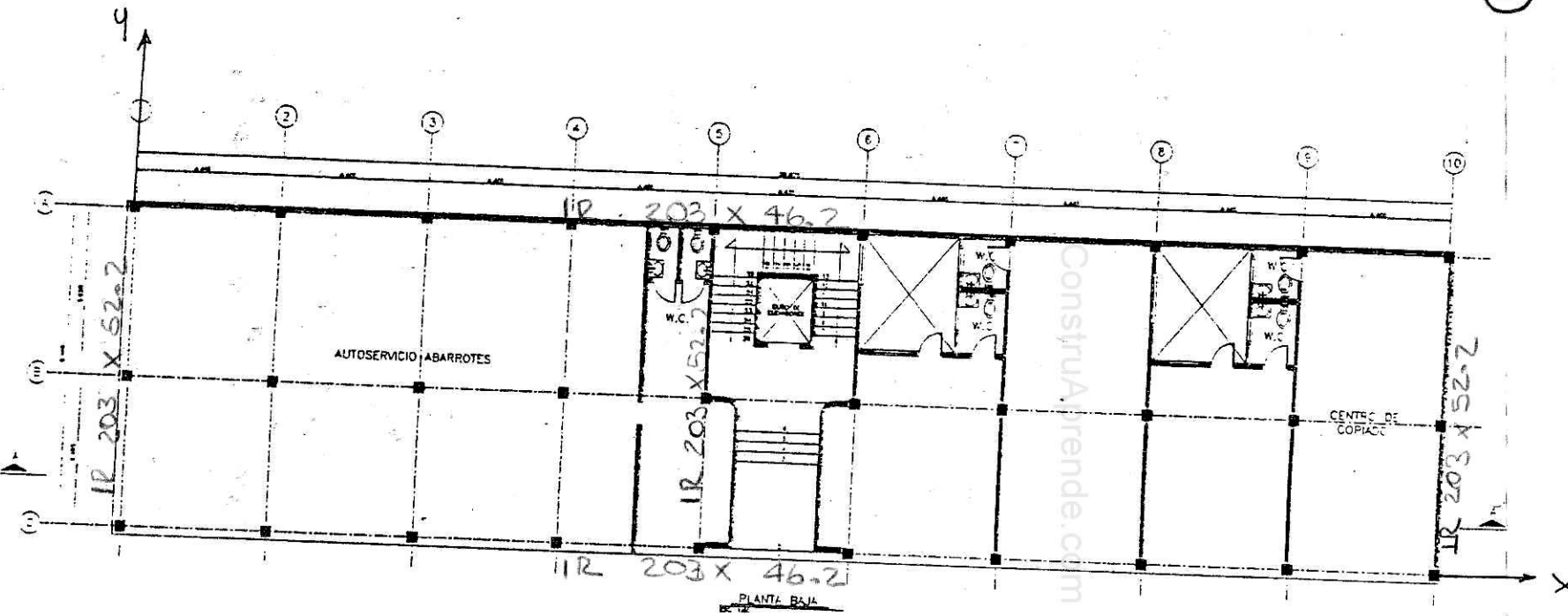
NWEL 2

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NIVEL 1.

32



33

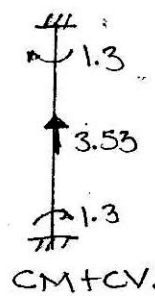
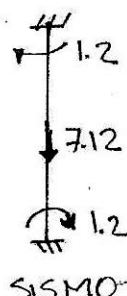
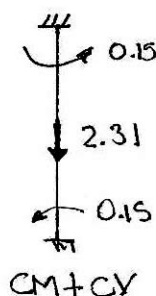
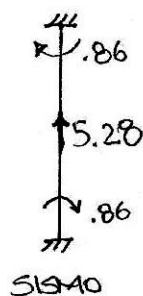
COLUMNAS

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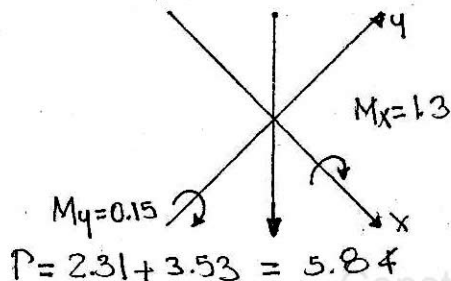
PREDIMENSIONAMIENTO DE COLUMNA MAS CRÍTICA.
PLANTA BAJA, COLUMNA 3-C.

DIRECCION X

DIRECCION Y



CONDICION DE SERVICIO.



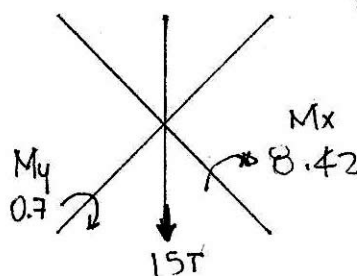
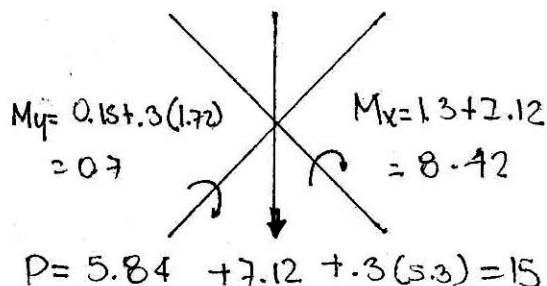
$$M_y = 0.15 + 1.72 = 1.87$$

$$P = 5.84 + 5.3 + 0.3(7.12) = 13.3$$

$$M_x = 1.3 + 0.3(7.1) = 3.43$$

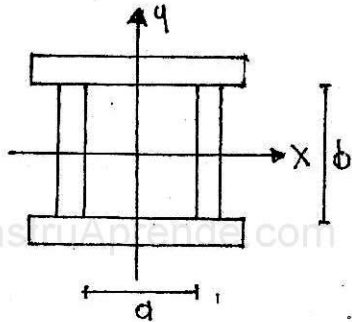
CONDICION MAX CRITICA.

"SISMO Dir. Y"



CON LOS ELEMENTOS MECANICOS ANTERIORES SE
PROPONE LA SECCION DE COLUMNA.

(34)



$$b > d$$

$$\frac{KL}{r} = 65 \text{ (Aprobado)} \Rightarrow f_a = 1191 \text{ kg/cm}^2 \text{ (Esfuerzo admisible)}$$

$$f_a = \frac{P}{A} = 1191 ; A_{\min} = \frac{15000}{1191} = 13 \text{ cm}^2$$

$$\text{Si } \%P = 40\% P, \text{ el } A = \frac{P}{0.4} = 33 \text{ cm}^2$$

$$\therefore \text{ con 4 PLACAS } A_i = \frac{28+5}{4} = \frac{33}{4} = 8.3 \text{ cm}^2$$

$$r_{\min} = \frac{KL}{65} = \frac{1.5(3.9)}{65} = 9 \text{ cm}$$

$$r = 0.41b = 9 \rightarrow b = 22 \text{ cm.}$$

$$\text{Acero A-36, } f_y = 2530 \text{ kg/cm}^2$$

$$\text{REQUISITO DE SECCION COMPACTA: } \frac{b}{t} \leq \frac{1590}{\sqrt{F_y}} = \frac{1590}{\sqrt{2530}}$$

$$\frac{b}{t} \leq 31.61$$

$$A = bt = 8.3 \text{ cm}^2$$

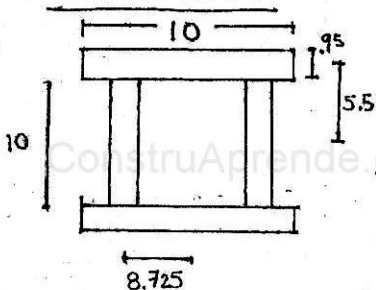
$$t = \frac{8.3}{b}$$

35

b	t	t _{com}	A _i	b/t
cm	cm	cm	cm ²	
15	.56	.64	9.6	23.44
10	.83	.95	9.5	10.5

SE PROPONEN 4 PLACAS DE 100 X .95 cm.

REVISION



$$A_i = 10(.95) = 9.5 \text{ cm}^2$$

$$A = 4(9.5) = 38 \text{ cm}^2$$

Tamaño mínimo de soldadura



$$\bar{I}_x = \sum (I_o + Ad^2)$$

$$= 2 \left[\frac{10(.95)^3}{12} + \frac{.95(10)^3}{12} + 9.5(3.725)^2 \right] = 423.4$$

$$I_x = 735 \text{ cm}^4$$

$$I_y = 423.4 \text{ cm}^4$$

$$S_x = \frac{I_x}{y} = \frac{735}{5.95} = 123.5$$

$$S_y = \frac{I_y}{x} = \frac{423.4}{4.2} = 100.81$$

$$f_q = \frac{P}{A} = \frac{15000}{38} = 394.7 \text{ kg/cm}^2$$

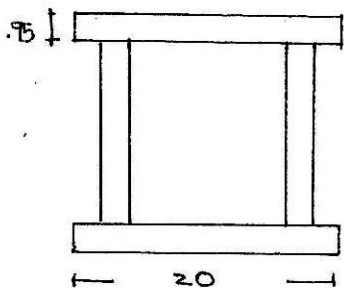
$$f_{bx} = \frac{M_x}{S_x} = \frac{842000}{123.45} = 6820.57$$

$$f_{by} = \frac{M_y}{S_y} = \frac{70000}{100.81} = 694.4$$

$$\Sigma f = 7909.7 \text{ Kg/cm}^2 < f_b = 0.6 F_y (1.33) = 0.6 (2530) (1.33) = 2019 \text{ kg/cm}^2$$

Por lo que aumentamos la sección a placas de

20 x 9.5
cm mm.



$$A_i = 19 \text{ cm}^2$$

$$A = 76 \text{ cm}^2$$

$$I_x = 5439.098$$

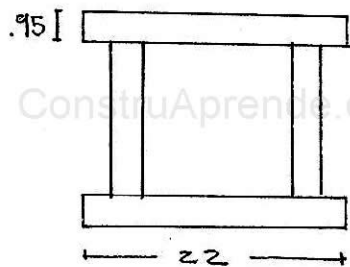
$$I_y = 4162.3$$

$$S_x = 496.72$$

$$S_y = 452.42$$

$$\Sigma f = 2047.2 > 2019.$$

Por lo que aumentamos la sección a c/pls. de
22 cm x 9.5 mm.



$$A_i = 20.9$$

$$A = 83.6 \text{ cm}^2$$

$$I_x = 7193.1$$

$$I_y = 5642.3$$

$$S_x = 601.9$$

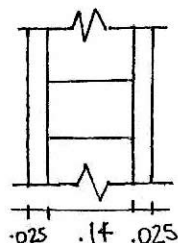
$$S_y = 553.2$$

$$\Sigma f = 1704.8 < 2019 \text{ Kg/cm}^2$$

SE ACEPTA.

(37)

MURO DE COLINDANCIA



MORTERO cm-cal-arena.
 $0.025(1.5)(2) = 0.075 \text{ T/m}^2$

Tabique rojo recocido (t.r.r)
 $0.14(1.5) = 0.21 \text{ T/m}^2$
 $CM = 0.285 \text{ T/m}^2$

$$0.285 \times 3.15 = 0.898 \text{ T/m}$$

$$0.285 \times 0.8 = 0.228 \text{ T/m}$$

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PLACA DE VIDRIO



0.006

VIDRIO PLANO

$$0.006 \times 2.65 = 0.0159$$

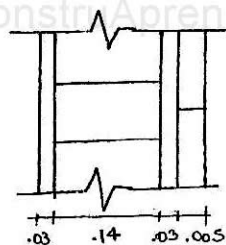
CANCELERIA

$$0.020$$

$$CM = 0.0359$$

$$0.0359 \times 2.35 = 0.0844 \text{ T/m}$$

MURO DE BAÑO



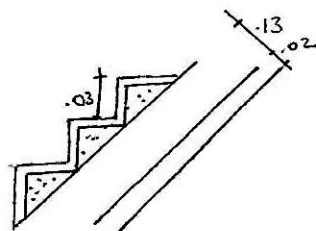
AZULEJO $.005 \times 1.8 \rightarrow 0.009 \text{ T/m}^2$

MORTERO GCM-ARENA
 $.03 \times 2.1 \times 2 \rightarrow 0.126$

t.r.r.
 $.14 \times 1.5 \rightarrow 0.210$

CM = 0.345 T/m^2

ESCALERA.



GRANITO $.03 \times 1.752 \rightarrow 0.0526 \text{ T/m}^2$

PEDACERIA de t.r.r. $.10 \times 1.5 \rightarrow 0.15$

LOSA $.13 \times 2.4 \rightarrow 0.312$

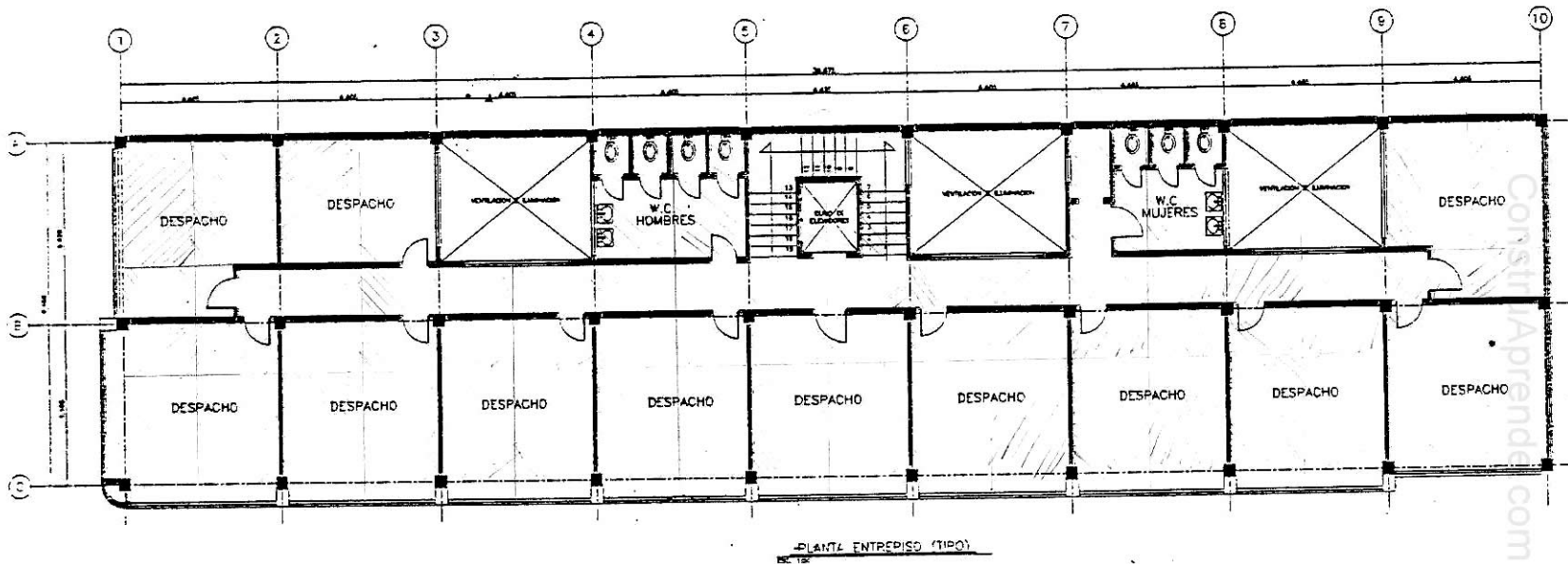
YESO $.02 \times 1.5 \rightarrow 0.030$

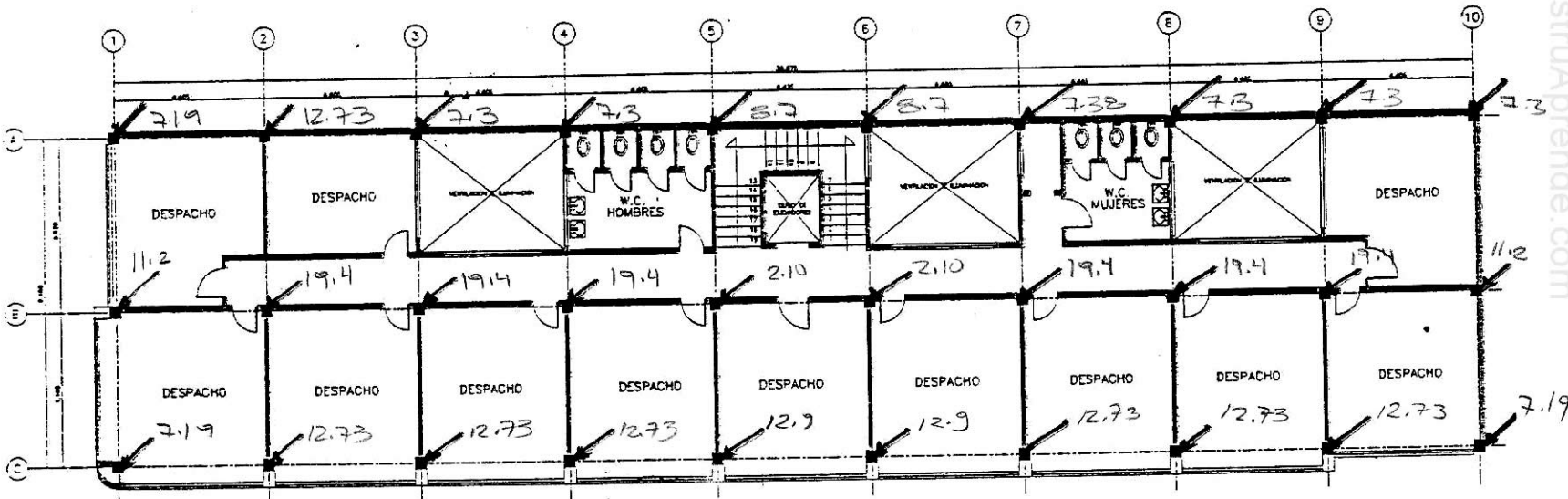
0.409

0.040 Alt. 197

CM = 0.449 T/m^2

39





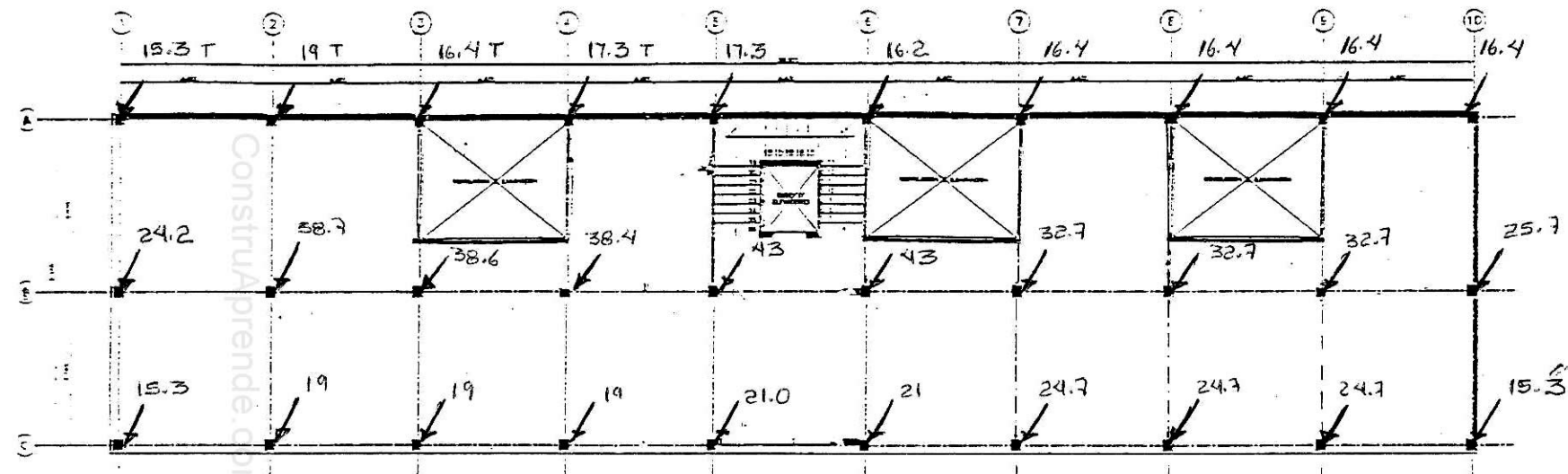
PLANTA ENTREDISO (TIPO)
E.C. 13

NIVEL 4

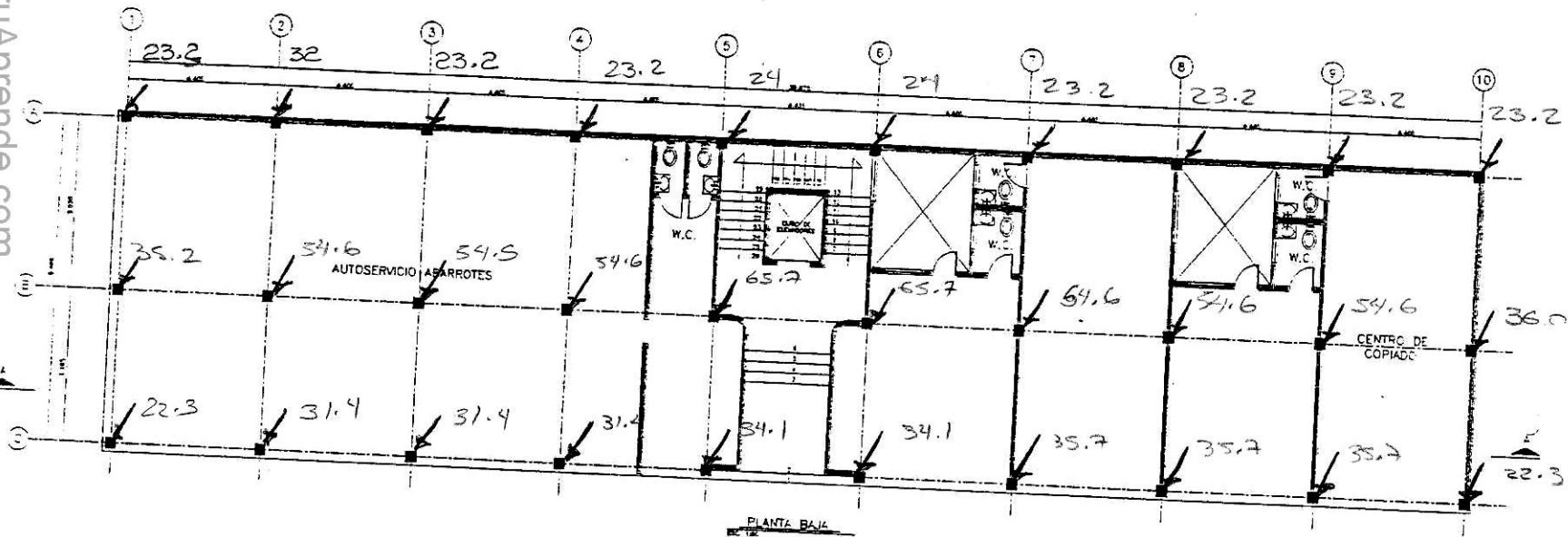
BAJADA DE CARGAS.

41

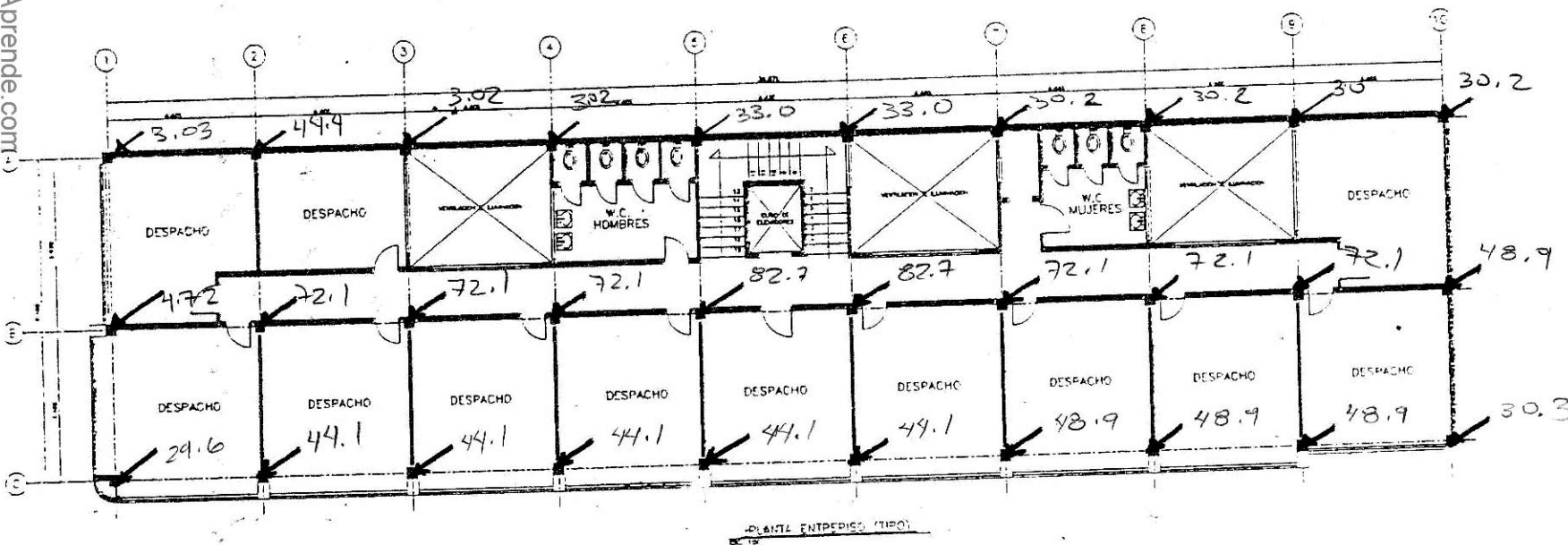
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NIVEL 3



NIVEL 2.



NIVEL 1

(44)

OBTENCION DEL CENTRO DE MASAS

NIVEL 4

$$\sum P_i \cdot x = \bar{x} \cdot \sum P$$

DIRECCION X

$$49(4.4) + 53.2(8.81) + 26.3(13.215) + 32.9(17.62) \\ + 23.1(22.025) + 25.4(26.43) + 48.9(30.84) + 29.3(35.24) \\ + 57.2(39.64) = \bar{x}(339.19)$$

$$\bar{x} = \frac{6909.182}{339.19} = \boxed{20.37}$$

DIRECCION Y

$$180.8(4.435) + 81.2(9.505) = \bar{y}(339.19)$$

$$\bar{y} = \frac{1573.654}{339.19} = \boxed{4.64}$$

CENTRO DE MASAS

NIVEL 3

⑤

$$\sum P \cdot X = \bar{X} \cdot \sum P$$

$$76.7(4.4) + 74(8.81) + 74(13.215) + 81.3(17.62) + 81.3(22.025) \\ + 79.6(26.43) + 79.6(30.84) + 79.6(35.24) + 56.9(39.64) = 738.4 \bar{X}$$

$$\bar{X} = \frac{15,266.85}{738.4} = \boxed{20.68} \rightarrow \boxed{\text{DIRECCION X}}$$

DIRECCION Y

$$367.6(4.435) + 167.1(9.505) = \bar{y}(738.4)$$

$$\bar{y} = \frac{3,218.59}{738.4} = \boxed{4.36}$$

CENTRO DE MASAS
NIVEL 2

DIRECCION X

$$\sum P \cdot X = \bar{X} \cdot \sum P$$

$$108(4.4) + 109.1(8.81) + 109.1(13.215) + 123.8(17.62) + 123.8(22.025) \\ + 123.8(26.43) + 113.5(30.84) + 113.5(35.24) + 113.5(39.64) = 1081.2 \bar{X}$$

$$\bar{X} = \frac{23057.43}{1081.2} = \boxed{21.3}$$

DIRECCION Y

$$532.4(4.435) + 242.9(9.505) = \bar{Y} \cdot (1081.2)$$

$$\bar{Y} = \frac{4669.96}{1081.2} = \boxed{4.32}$$

CENTRO DE MASAS NIVEL 1

DIRECCION X

$$\sum P_i \cdot x_i = \bar{x} \cdot \sum P_i$$

$$160.6(4.4) + 146.2(8.81) + 146.2(13.215) + 159.8(17.62) + 159.8(22.025)$$

$$+ 151.2$$

DISEÑO

DISEÑO DE LOSAS DE CONCRETO ARMADO (MÉTODO DEL REGLAMENTO DEL DEPARTAMENTO DEL DISTRITO FEDERAL)

49

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1. - LOSA DE ENTREPISO (ES IGUAL A LA DE LA PLANTA BAJA).

DATOS GENERALES: $F_c' = 250 \text{ kg/cm}^2$

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

$W_{SERV.} = 625.25 \text{ kg/cm}^2$

a). - Calculando las constantes:

$f_c^* = 0.85 f_c' = 0.85 (250) = 212.5$

$f_c'' = 0.80 f_c^* = 0.80 (212.5) = 170.0$

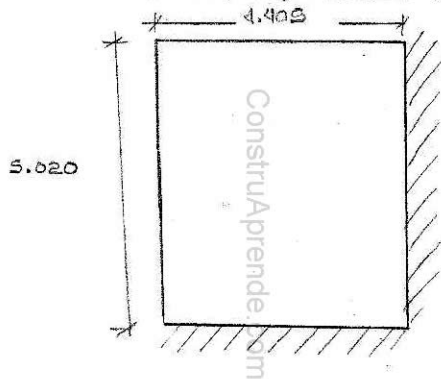
b). - Cálculo del peralte efectivo $d = ?$. -

- Como todos los tableros de la losa tienen igual grado crítico, se eligió el de mayores dimensiones, indicado en el plano correspondiente.

- Como se trata de una losa colada no monolíticamente, sus bordes discontinuos se incrementan el 50%.

$$d = \frac{\text{PERIMETRO}}{300}$$

$$d = \frac{5.020 + 4.405 + (5.020 + 4.405) 1.50}{300} = \underline{\underline{7.854 \text{ cm}}}$$



$$d_{\min} = 0.034 \sqrt{f_s W'} d$$

$$d_{\min} = 0.034 \sqrt{(2520)(625.25)} (7.854)$$

$$f_s = 0.60 f_y = 0.60 (4200) = 2520$$

$$W_{\text{SERV}} = 625.25 \text{ kg/cm}^2$$

$$d_{\min} = \underline{9.461} \text{ cm} \rightarrow \text{Por criterio se propone que sea de: } \underline{10 \text{ cm}}$$

$$h = d_{\min} + \text{REC.} = 10 + 2 = \underline{12 \text{ cm}}$$

c).- Revisión por cortante:

$$V_v = \frac{(0.5 a_1 + d) W_a}{1 + \left(\frac{a_1}{a_2} \right)^6}$$

$$W_a = W_{\text{SERV}} \times F_c$$

$$W_a = 625.25 \times 1.4$$

$$W_a = 875.35$$

→ La estructura pertenece al subgrupo B1.:
 $F_c = 1.4$

$$V_v = \frac{(0.5 (4.405) + 0.10) 875.35}{1 + \left(\frac{4.405}{5.020} \right)^6} = \underline{1383.78 \text{ kg}}$$

$$V_{CR} = 0.5 F_R b d \sqrt{f_c^*}$$

$$V_{CR} = 0.5 (0.8) (100) (10) \sqrt{212.5}$$

$$V_{CR} = \underline{5831 \text{ kg}}$$

→ El factor de resistencia para cortante es igual a:
 $F_R = 0.8$

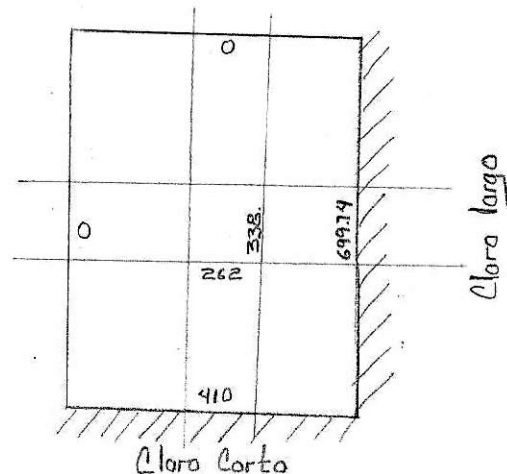
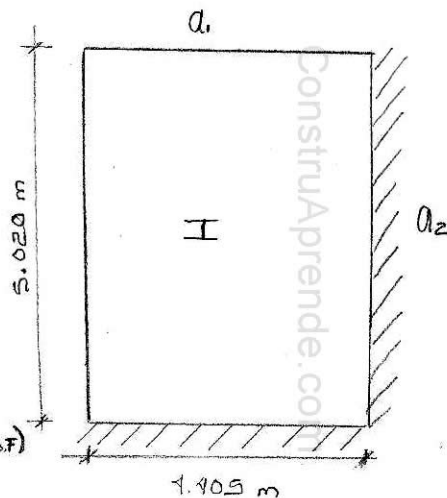
Como:

$$V_{CR} > V_v$$

$5831 > 1383.78 \rightarrow$ EL PERALTE SE ACEPTA.

d). - Cálculo de los momentos para los diferentes tableros que forman las losas (antepiso y planta baja).
 . Los tableros que se analizan a continuación están indicados en los planos correspondientes a las losas.

TABLERO I



METODO DE COEFICIENTES (R.C.D.D.F)

$$M = \alpha \cdot 10^{-4} W_a a_1^2$$

$$m = \frac{a_1}{a_2}$$

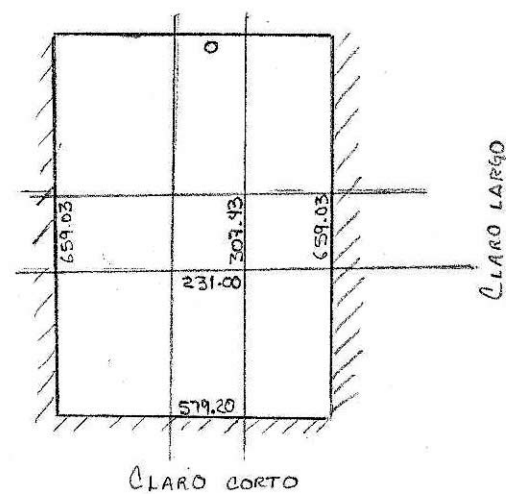
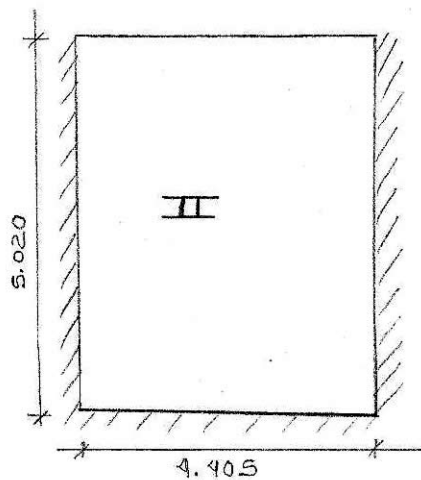
$$m = \frac{4.405}{5.020} = 0.877 \approx 0.90$$

$$M = 412 (10^{-4}) (875.35) (4.405)^2$$

$$M = \underline{\underline{699.74}}$$

TABLERO	MOMENTO	CLARO	$m = 0.90$; C-II	MOMENTO
TABLERO DE ESQUINA DOS LADOS ADYACENTES DISCONTINUOS	(-) B.INT.	CORTO	412	699.74
		LARGO	410	696.39
	(-) B.DISC.	CORTO	0	0
		LARGO	0	0
	POSITIVO	CORTO	199	338.00
		LARGO	154	262.00

TABLERO II. —



$$m = \frac{4.405}{5.020} = 0.877 \approx 0.90$$

$$M = \alpha 10^{-4} (w_d) l_z^2$$

$$M = 388 (10^{-4}) (875.35) (4.405)^2$$

$$M = 659.03$$

TABLERO	MOMENTO	CLARO	$m=0.90$; C-II	MOMENTO
DE BORDE UN LADO CON- TO DISCON- TINUO.	(-) B. INT.	CORTO	388	659.03
		LARGO	341	579.20
	(-) B. DISC.	LARGO	0	0
	POSITIVO	CORTO	181	307.43
		LARGO	136	231.00

'e)... Cálculo de las fzas cortantes y diagrama de momentos. (Loza entrepiso) (Método de Cross)

53

	0	699.74	659.03	659.03	659.03	659.03	699.74	0
	4.405		4.405		4.405		4.405	
K.		0.6810	0.908		0.908		0.6810	
F.D.	1	.43	.57		.57	.43		1
M.E.	0	699.74	659.03	659.03	659.03	659.03	699.74	0
DIST.	0	-17.2473	-22.8627	0	0	22.8627	17.2473	0
TRANSP.	-8.6236	0	0	-11.4313	11.4313	0	0	8.6236
DIST.	8.6236	0	0	0	0	0	0	-8.6236
TRANSP.	0	4.318	0	0	0	0	-4.318	0
DISTRB.	0	-1.8567	-2.4612	0	0	2.4612	1.8567	0
M _F	0	685.00	685.00	648.00	648.00	685.00	685.00	0
F _{2d} V	↑	1928.28	↑	↑	1928.28	↑	↑	1928.28
V _{HIP}	↓	155.5	↑	↑	0	↓	↓	155.5
V _{TOTAL}	1772.78	2083.78	1928.28	1928.28	1928.28	1928.28	2083.78	1772.78

$$k = \frac{4EI}{L} = \frac{4}{4.405} = 0.908$$

$$k = \frac{3EI}{L} = \frac{3}{4.405} = 0.6810$$

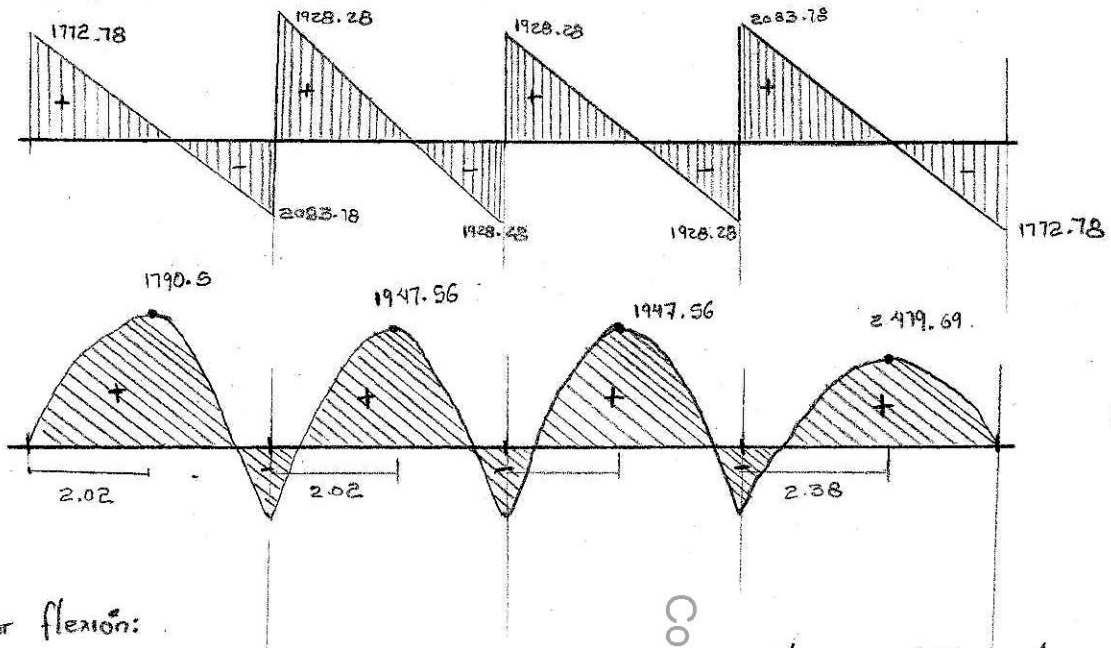
$$V = \frac{WL}{2}$$

$$= \frac{875.35 (4.405)}{2}$$

$$= 1928.28$$

$$V_{HIP} = \frac{ME}{L} = \frac{685}{4.405} = 155.5$$

e). Diagrama de cortante y Momento (Losa de entrapiso).



$$x = \frac{V}{W} = \frac{1772.78}{875.35} = 2.02$$

f). Diseño por flexión:

$$A_{s_{min}} = \left[\frac{660 X_1}{f_y (X_1 + 100)} \right] \times 100 \times 1.5 \quad X_1 = 10 \text{ cm}$$

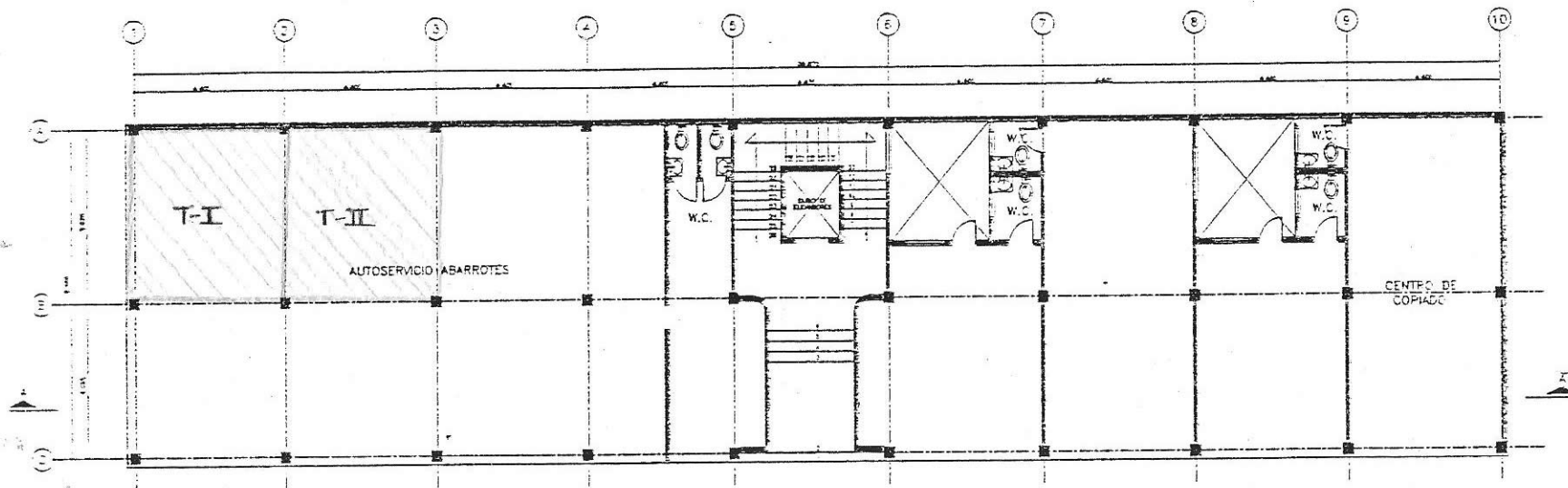
$$A_{s_{min}} = \underline{2.49 \text{ cm}^2}$$

$$A_{s_{flexion}} = \frac{M_u}{F_e F_y Z} \quad \begin{matrix} z = 0.9d \\ z = 0.9(10) \end{matrix}$$

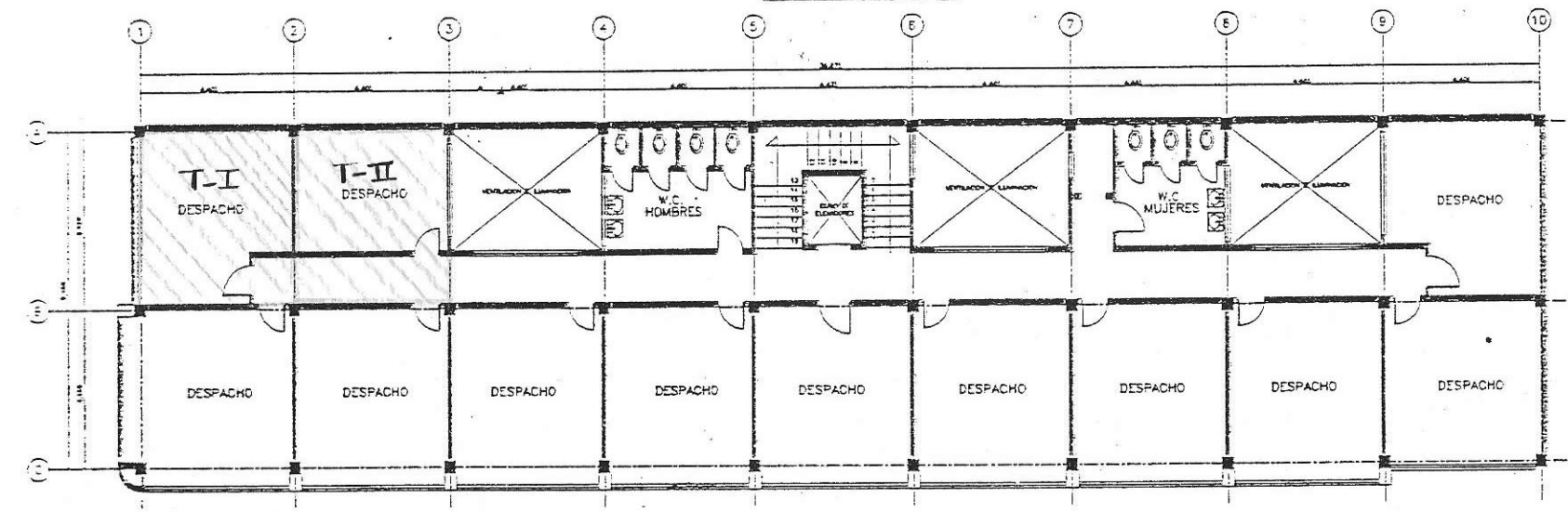
$$A_{s_{flexion}} = \frac{2479.60}{0.9(4200)(0.9)(10)} = \underline{7.28 \text{ cm}^2}$$

$$V_{nominal} \# 3 = \frac{A_s}{d_s} = \frac{7.28}{0.72} = 10.2 = 10 \text{ VARAS}$$

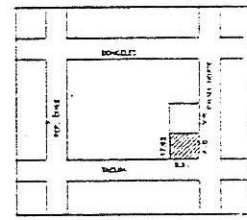
$$SEPARACION = \frac{100}{10} = \underline{10 \text{ cm}}$$



PLANTA BAJA



PLANTA ENTREPISO (TIPO)



CROQUIS DE LOCALIZACIÓN

II.- LOSA DE AZOTEA.

DATOS GENERALES:

$$F_c = 250 \text{ kg/cm}^2$$

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

$$W_{SERV} = 572.75$$

a). - $f_c^* = 212.5$
 $f_c'' = 170.0$

b). - Cálculo del Peralte efectivo $d = ?$

Se analiza el mismo tablero de la losa de entrepiso por lo que $d = \underline{7.854 \text{ cm}}$

$$d_{\min} = 0.034 \sqrt{f_s W} d \quad f_s = 2520$$

$$d_{\min} = 0.034 \sqrt{(2520)(572.75)} (7.854) \quad W_{SERV} = 572.75$$

$$d_{\min} = 9.2557$$

→ Por Criterio se propone $d_{\min} = \underline{10 \text{ cm}}$

$$h = d_{\min} + \text{REC.}$$

$$h = 10 + 2 = \underline{12 \text{ cm}}$$

c). - REVISIÓN por cortante:

$$V_u = \frac{(0.5 a_1 + d) W_a}{1 + \left(\frac{a_1}{a_2}\right)^4}$$

$$W_a = W_{SERV} \times F_c$$

$$W_a = 572.75 \times 1.4 = \underline{801.85}$$

$$V_u = \frac{(0.5 (4.405) + 1.0) 801.85}{1 + \left(\frac{4.405}{5.020}\right)^4} = \underline{1267.58}$$

$$V_{CR} = 0.5 (F_y) b d \sqrt{f_c^*} = 0.5 (0.8) (100) (10) \sqrt{212.5} = \underline{5831 \text{ kg}}$$

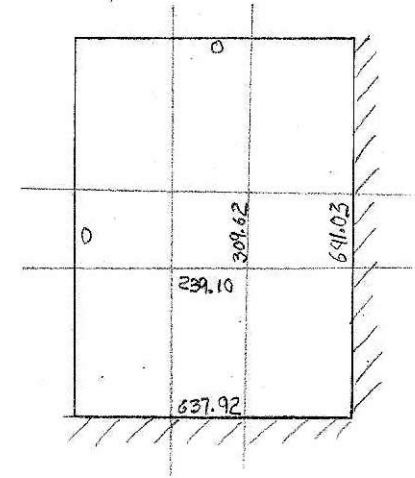
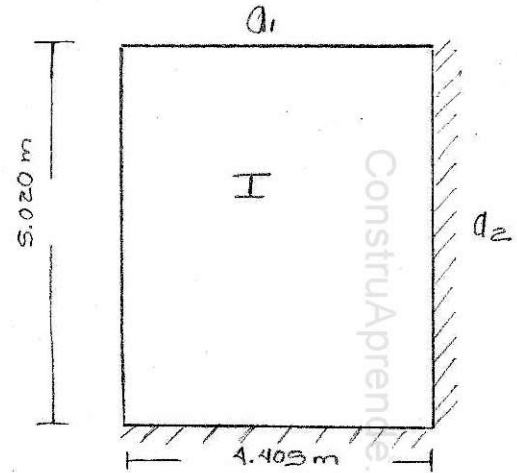
$$V_{CR} > V_u$$

$$5831 > 1267.58$$

SE ACEPTA EL PERALTE

d)... Cálculo de los momentos a los que se sujetan los diferentes tableros que componen la losa de azotea.
 . Los tableros analizados están indicados en el plano correspondiente a la azotea.

TABLERO I



$$M = \alpha \cdot 10^{-4} W a d^2$$

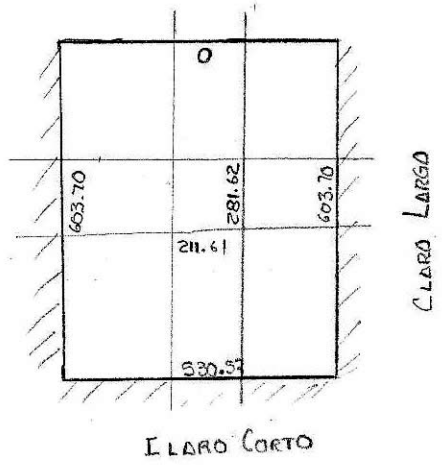
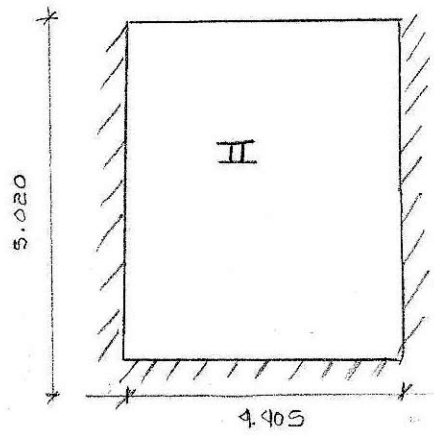
$$m = \frac{4.405}{5.020} = 0.877 \approx 90$$

$$M = 412 (10^{-4}) (801.85) (4.405)^2$$

$$M = \underline{\underline{641.03}}$$

TABLERO	MOMENTO	Δ LARGO	m = 0.90, c-II	MOMENTO
TABLERO DE ESQUINA CON LARGOS ADYACENTES DISCONTINUOS.	(-) B. INT	CORTO	412	641.03
		LARGO	410	637.92
	(-) B. DISC.	CORTO	0	0
		LARGO	0	0
	POSITIVO	CORTO	199	309.62
		LARGO	154	239.10

TABLERO II



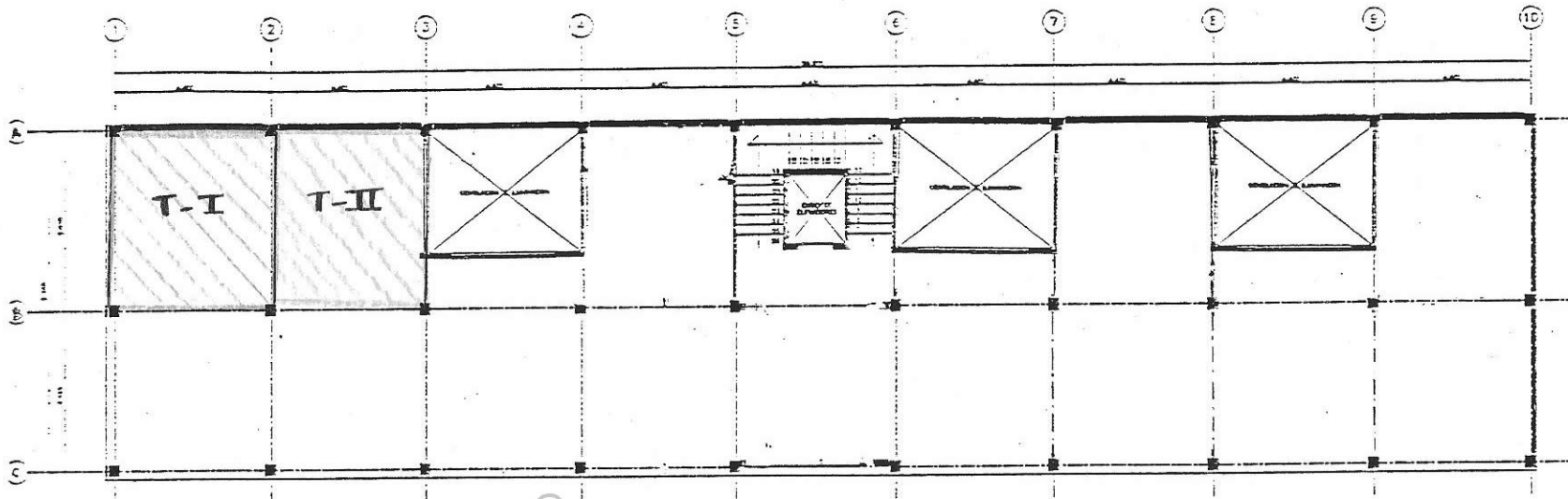
$$m = \frac{4.405}{5.020} = 0.877 \approx 0.90$$

$$M = \alpha 10^{-4} W_a a. z$$

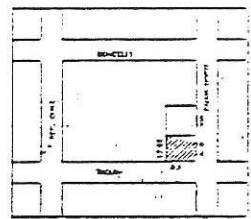
$$M = 388 (10^{-4}) (801.35) (4.405)^2$$

$$M =$$

TABLERO	MOMENTO	CLARO	$m=0.90 \cdot L-II$	MOMENTO
DE BORDE LIN LADO CORTO DIS- CONTINUO.	(-) B. INT.	CORTO	388	603.70
		LARGO	341	530.57
	(-) B. DISC.	LARGO	0	0
	POSITIVO	CORTO	181	281.62
		LARGO	136	211.61



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OPORTUNIDAD DE LOCALIZACIÓN

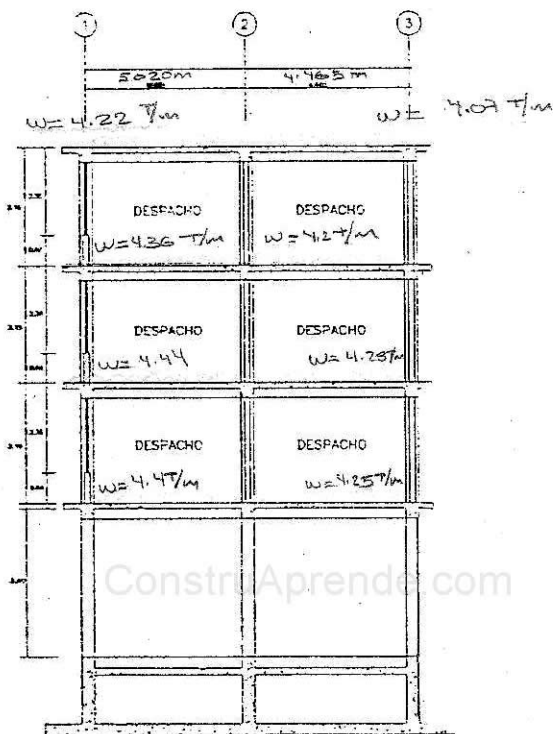
PLANTA DE AZOTEA.

(8)

c). Cálculo de las fuerzas cortantes y Momentos de losa de azotea (METODO DE CROSS)

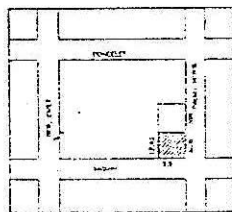
	4.405 0.6810		4.405 0.908		4.405 0.6810	
K	.43 .57		.57 .43			
F.D.	1				1	
ME	0	641.03	603.70	603.70	641.03	0
DIST.	0	-16.05	-21.2781	21.2781	16.05	0
TRANS.	-8.025	0	10.639	-10.639	0	8.025
DIST.	8.025	-4.5747	-6.064	6.064	4.5747	-8.025
TRANS.	-2.2814	4.0125	3.032	-3.032	-4.0125	2.2814
DIST.	2.2874	-3.029	-4.015	4.015	3.029	-2.2874
TRASP.	-1.5145	1.1437	2.007	-2.007	-1.1437	1.5145
DIST.	1.5145	-1.35	-1.7458	1.7458	1.35	-1.5145
M.F.	0	621.18	621.18	621.18	621.18	0
Fza. V	↑ 1764.75	↑	↑ 1764.75	↑	↑ 1764.75	↑
V _{HIP}	↓ 141	↑	0	0	↑ 141	↓
V _{TOTAL}	1623.75	1905.75	1764.75	1764.75	1905.75	1623.75

61



MARCO 2

DISEÑO DE VIGA CONSIDERANDO QUE SE ENCUENTRA ARRISTRADA EN LOS APOYOS



ESQUEMA DE LOCALIZACIÓN

62

$$F_b = 1000 \Rightarrow F_b = \frac{843700}{\frac{L_d}{b t}} \approx \leq 0.6 F_y$$

$$F_b = 1020 \text{ kg/cm}^2$$

$$F_b = 1520 \text{ kg/cm}^2$$

$$M_{max} = \frac{wL^2}{8} \Rightarrow \frac{4.40 \times 5.02^2}{8} = 13.8602 \text{ ton-m} = 1386020.00 \text{ kg-cm}$$

$$V = \frac{4400 \times 5.02}{2} = 11044.0000 \text{ kg-m}$$

$$F_b = \frac{M_{max}}{S}$$

$$S = \frac{M_{max}}{F_b} = \frac{1386020 \text{ kg-cm}}{1520} = 911.8553 \text{ cm}^3$$

Buscando en Manual

SE PROPONE 12 356 X 63.8
WAL K_g/m
PERALTE PESO

$$S_x = 1027 \text{ cm}^3$$

$$\text{Momento peso propio} = M_{pp} = \frac{63.8 \times 5.02^2}{8} = \frac{wL^2}{8} = 200.9732 \text{ kg-m}$$

$$M_F = M_{max} + M_{pp} \Rightarrow M_F = 1386020.00 + 20097.3170 = 1406117.3190 \text{ kg-cm}$$

$$S = \frac{1406117.3190}{1520} = 925.0772 \text{ cm}^3$$

REVISIÓN POR FLEXIÓN

$$1520 = \frac{1406117.3190}{1027}$$

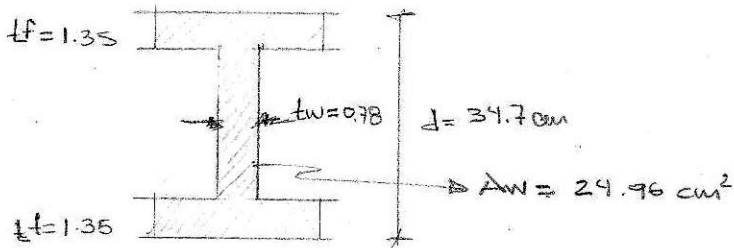
$$1520 > 1369.1503 \text{ kg/cm}^2$$

63

POR CORTANTE

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$$R = V = 11044 \text{ Kg}$$



$$t_b f = 20.34$$

$$f_v = \frac{V}{A_w} \Rightarrow \frac{11044}{24.96} = 442.4679 \text{ Kg/cm}^2$$

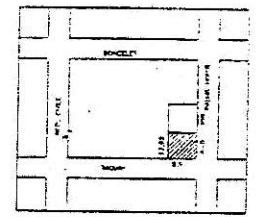
$$F_v = 0.4 F_y \Rightarrow 0.4(2530) = 1012.00 \text{ Kg/cm}^2$$

$$1012 > 442.4679 \quad \text{SE ACEPTA}$$

	1	2	3	4	5	6	7	8	9	10
	W=3.06	W=3.06	W=3.40	W=3.40	W=3.40	W=3.40	W=3.40	W=3.40	W=3.06	
1.20	DESPACHO W=3.17	DESPACHO W=3.17	DESPACHO W=3.55	DESPACHO W=3.55	DESPACHO W=3.55	DESPACHO W=3.55	DESPACHO W=3.55	DESPACHO W=3.55	DESPACHO W=3.17	
2.40	DESPACHO W=3.11	DESPACHO W=3.11	DESPACHO W=3.49	DESPACHO W=3.49	DESPACHO W=3.49	DESPACHO W=3.49	DESPACHO W=3.49	DESPACHO W=3.49	DESPACHO W=3.11	
3.60	DESPACHO W=3.17	DESPACHO W=3.17	DESPACHO W=3.55	DESPACHO W=3.55	DESPACHO W=3.55	DESPACHO W=3.55	DESPACHO W=3.55	DESPACHO W=3.55	DESPACHO W=3.17	
4.80		TIENDA DE AUTOSERVICIO							CENTRO DE COPIADO	
6.00										

MARCO B

CORTE 2-2
DISEÑO DE VIGA



CRONOS DE LOCALIZACION

5

$$W = 3.55 \text{ Ton/m}$$

$$4.405 \text{ m}$$

M_{max}

$\oplus$

$\ominus$

$$7818.8750$$

$$F_b = 1000 \Rightarrow F_b = \frac{8.43750}{L_d} \leq 0.6 F_y$$

$$F_b = 1020$$

$$F_b = 1520$$

$$F_b = \frac{M_{max}}{S}$$

$$M_{max} = \frac{WL^2}{8} = \frac{3.55 \times 4.405^2}{8} = 8.6105 \text{ Ton-m} = 861053.6094 \text{ Kg-cm}$$

$$V = \frac{3550 \times 4.405}{2} = 7818.8750 \text{ Kg}$$

$$S = \frac{M_{max}}{F_b} = \frac{861053.6094 \text{ Kg-cm}}{1520 \text{ Kg/cm}^2} = 566.4826 \text{ cm}^3$$

DE EL MANUAL SE PROPONE

$$I_x = 254 \times 49.2$$

$$S_x = 690 \text{ cm}^3$$

$$\text{Momento Peso Propio} = M_{pp} = \frac{49.2 \times (4.405)^2}{8} = \frac{WL^2}{8} = 119.3348 \text{ Kg-m}$$

$$M_F = M_{max} + M_{pp} \Rightarrow M_F = 861053.6094 + 11933.4754 = 872987.0848 \text{ Kg-cm}$$

$$S = \frac{M_F}{F_b} \Rightarrow S = \frac{872987.0848}{1520} = 574.3336 \text{ cm}^3$$

REVISIÓN POR FLEXIÓN

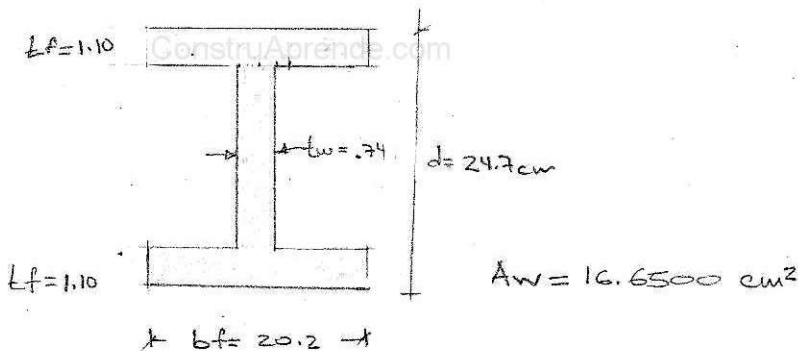
$$1520 = \frac{M_{F_{ind}}}{S} = \frac{872987.0848}{690} = 1265.1987$$

$$1520 > 1265.1987$$

66

P02 CONSTANTE

$$R = Y = 7818.8750 \text{ kg}$$



$$f_v = \frac{V}{A_w} \Rightarrow \frac{7818.8750 \text{ kg}}{16.6500 \text{ cm}^2} = 469.6021 \text{ kg/cm}^2$$

$$F_v = 0.4 F_y \Rightarrow 0.4 (2530) = 1012 \text{ kg/cm}^2$$

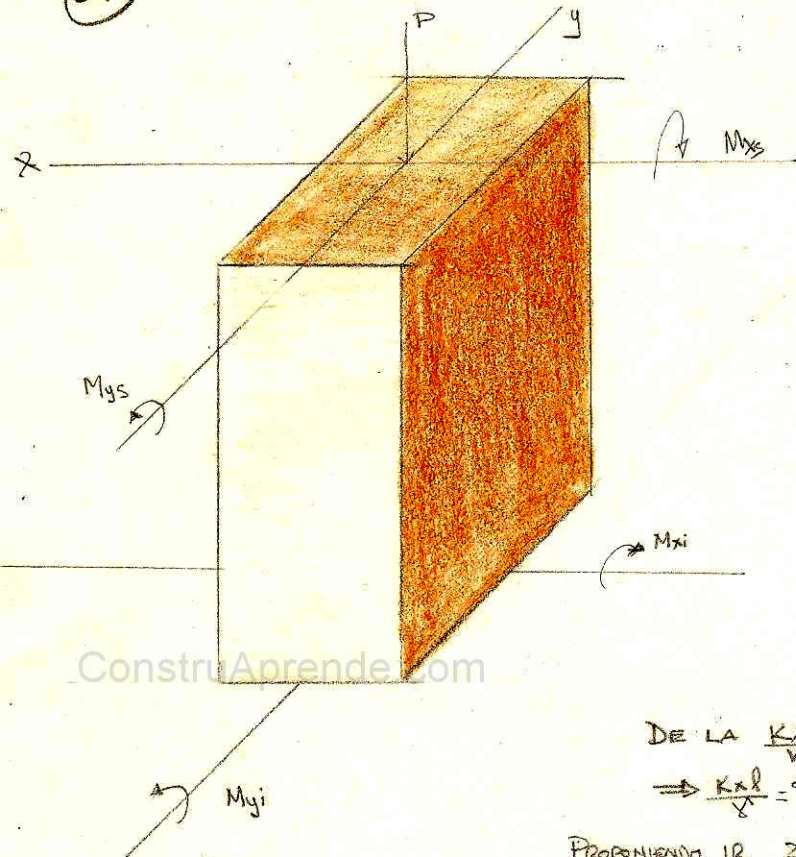
$$1012 > 469.6021$$

SE ACEPTA.

(67)

DISEÑO DE COLUMNA

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$$P = 15 \text{ ton}$$

$$M_{xs} = 0.86 \text{ ton-m} \checkmark$$

$$M_{ys} = 1.2 \text{ ton-m}$$

$$M_{xi} = 0.15 \text{ ton-m}$$

$$M_{yi} = 1.3 \text{ ton-m} \checkmark$$

$$H = 3.9 \text{ m}$$

$$K_x = 2$$

$$K_y = 2$$

PROPORIONAMOS

$$SI \frac{KL}{\lambda} = 90$$

$$F_a = 998 \text{ Kg/cm}^2 \approx 1000 \text{ Kg/cm}^2$$

$$F = \frac{P}{A} \Rightarrow A = \frac{15000}{1000} = 15 \text{ cm}^2$$

$$A_{\text{total}} = 15 \times 3 = 45 \text{ cm}^2 \text{ (PARA OBTENER } \frac{1}{3} \text{ DEL ESPESOR)} \checkmark$$

DE LA $\frac{KL}{\lambda}$

$$\Rightarrow \frac{KL}{\lambda} = 90 \Rightarrow \frac{2(390 \text{ cm})}{\lambda} = 90$$

$$\lambda_{\text{min}} = 8.6667 \text{ cm}$$

PROPORIONANDO 12 203 X 99.8

$$\lambda_x = 8.4 \text{ cm}$$

$$S_x = 990 \text{ cm}^3 \quad A = 127.1 \text{ Kg/cm}^2$$

$$\lambda_y = 5.4 \text{ cm}$$

$$S_y = 351 \text{ cm}^3$$

$$f_a = \frac{P}{A} = \frac{15000}{127.1} = 118.0173 \text{ Kg/cm}^2$$

$$f_{bx} = \frac{M_x}{S_x} = \frac{860000}{990} = 868.6869 \text{ Kg/cm}^2$$

$$f_{by} = \frac{M_y}{S_y} = \frac{130000}{351} = 370.3704 \text{ Kg/cm}^2$$

PERMISIBLES

$$F_a = 0.6 F_y = 0.6(2530) = 1518 \text{ Kg/cm}^2 \rightarrow \text{Perm. Comp. } F_{by}$$

$$F_b = 0.75 F_y = 0.75(2530) = 1897.50 \text{ Kg/cm}^2 \rightarrow \text{Perm. Flex } F_{by}$$

(68)

$$\frac{f_a}{F_a} \leq 0.15$$

$$\frac{118.0173}{1518} = 0.0783 \leq 0.15$$

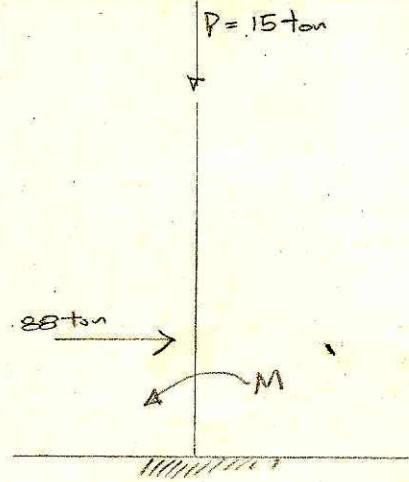
$$\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}} + \frac{f_{by}}{F_{by}} \leq 1.0$$

$$0.0783 + \frac{868.6869}{1518} + \frac{370.3707}{1897.50} \leq 1.0$$

$$0.0783 + 0.5723 + 0.1952 \leq 1.0$$

$$0.8458 \leq 1.0$$

PLACA BASE



$$P = 15 \text{ ton} \quad S = 12 \text{ 203} \times 99.8$$

$$V = .88 \text{ ton}$$

$$F_c = 200 \text{ Kg/cm}^2$$

CALCULO DE LAS DIMENSIONES DE LA PLACA

$$A_p = \frac{P}{F_p} \quad \therefore A_p = \text{AREA DE LA PLACA}$$

$$P = \text{CARGA AXIAL}$$

$$F_p = \text{ESF. PERM. DEL CONCRETO}$$

$$F_p = 0.35 F_c = 0.35 \times 200 = 70 \text{ Kg/cm}^2$$

$$A_p = \frac{15000}{70} = 214.2857$$

$$B = D = \sqrt{A_p} = 14.6385 \text{ cm}$$

$$\text{APROXIMANDO } B = D = 20 \text{ cm}$$

$$t = 2m \sqrt{\frac{W}{F_y}} \quad \therefore W = \frac{P}{B \times D} = \frac{15000}{20 \times 20} = 37.5 \text{ Kg/cm}^2$$

$$m = \frac{D - 0.8d}{2} = \frac{20 - 0.8 \times 20.3}{2} = 1.88 \text{ cm}$$

$$t = 2 \times 1.88 \sqrt{\frac{37.5}{2530}} = 0.4578$$

$$\text{EN PULGADAS: } 0.5 \text{ in} \sim 1.969 \text{ in} \approx \frac{1}{4} \text{ ESPESOR}$$

$$A_{\text{ANCLAS}} = \frac{V}{F_v} = \frac{880.00}{700} = 1.2571 \text{ cm}^2 \text{ (AREA DE LAS ANCLAS)}$$

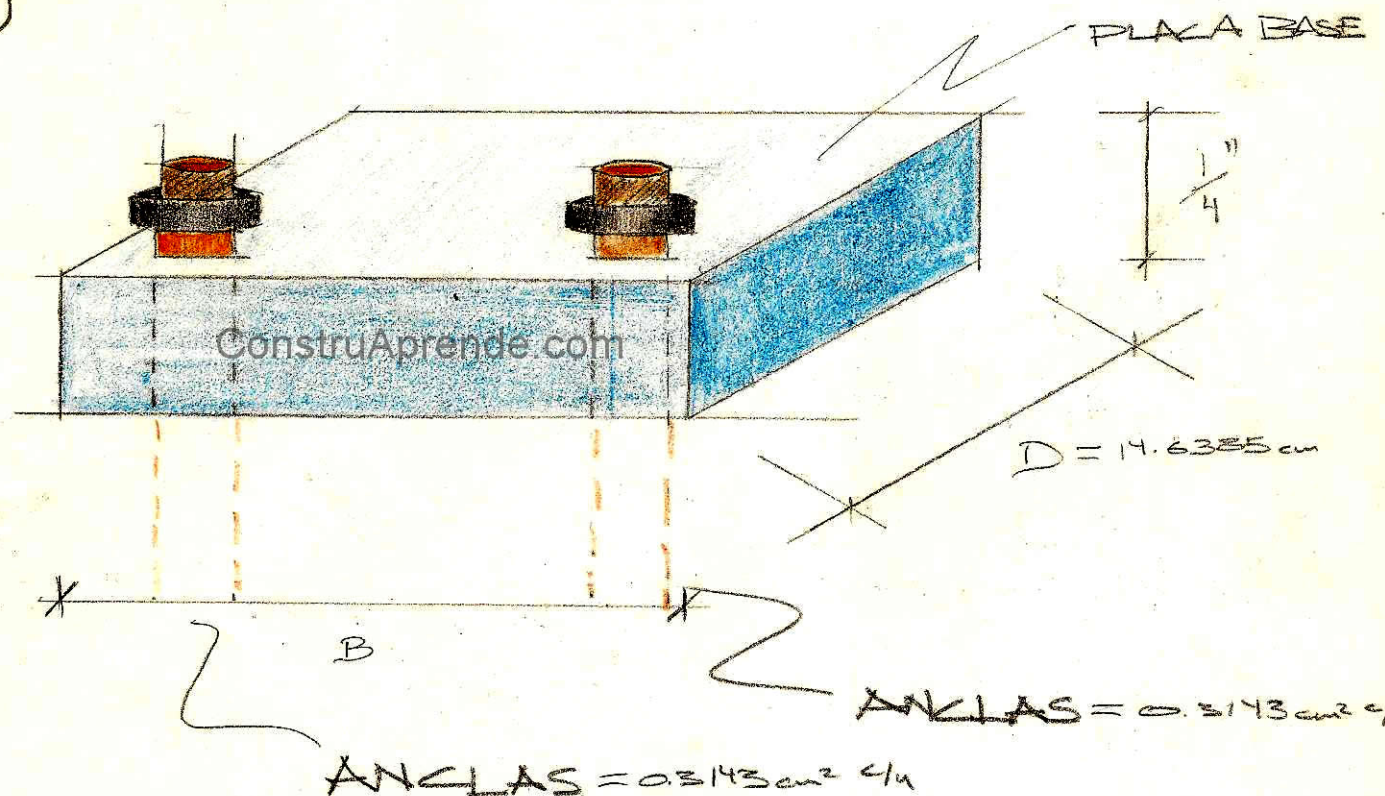
CONSIDERANDO 4 ANCLAS

$$A_{\phi} = \frac{1.2571}{4} = 0.3143 \text{ (AREA DE CADA ANCLA)}$$

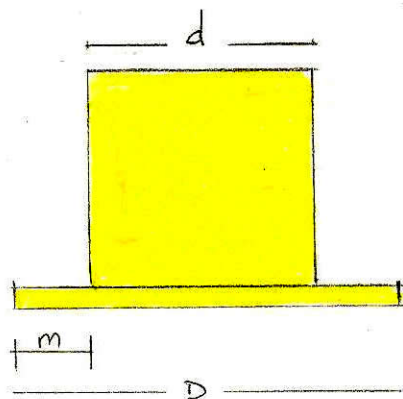
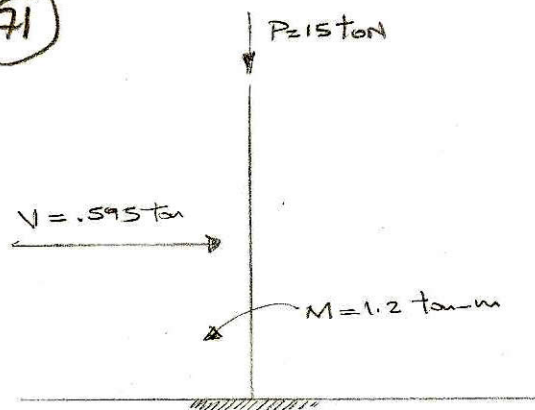
V = FUERZA CORTANTE ACTUANTE

F_v = ESFUERZO PERMISIBLE DE LOS TORNILLOS PROPUESTOS (MINIMO)

70



71



PLACA BASE

$$P = 15 \text{ ton}$$

$$S = 112.203 \times 79.8$$

$$V = .595 \text{ ton}$$

$$F_c = 200 \text{ kg/cm}^2$$

CALCULO DE LAS DIMENSIONES DE LA PLACA

$$A_p = \frac{P}{F_p} \quad \therefore A_p = \text{AREA DE LA PLACA}$$

P = CARGA AXIAL

F_p = ESF. PERM. DEL CONCRETO

$$F_p = 0.35 F_c = 0.35 \times 200 = 70 \text{ kg/cm}^2$$

$$A_p = \frac{15000}{70} = 214.2857 \text{ cm}^2$$

$$B = D = \sqrt{A_p} = 14.6385 \text{ cm}$$

APROXIMANDO B = D = 20 cm

$$t = 2m \sqrt{\frac{W}{F_y}} \quad \therefore W = \frac{P}{B \times D} = \frac{15000}{20 \times 20} = 37.5 \text{ kg/cm}^2$$

$$m = \frac{D - 0.8d}{2} = \frac{20 - 0.8 \times 20.3}{2} = 1.88 \text{ cm}$$

$$t = 2 \times 1.88 \sqrt{\frac{37.5}{2530}} = 0.4578$$

EN PULGADAS 0.5 cm $\approx$.1969 in $\approx$ 1/4" ESPESOR

$$A_{\text{ANCLAS}} = \frac{V}{F_v} = \frac{595}{700} = 0.85 \text{ cm}^2 \text{ (AREA ANCLAS)}$$

CONSIDERANDO 4 ANCLAS

$$A_{\phi} = \frac{0.85 \text{ cm}^2}{4} = 0.2125 \text{ (AREA DE CADA ANCLA)}$$

V = FUERZA CORTANTE ACTUANTE

F_v = ESFUERZO PERMISIBLE DE LOS TORNILLOS PROPUESTOS (MINIMOS)

72

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PLACA BASE

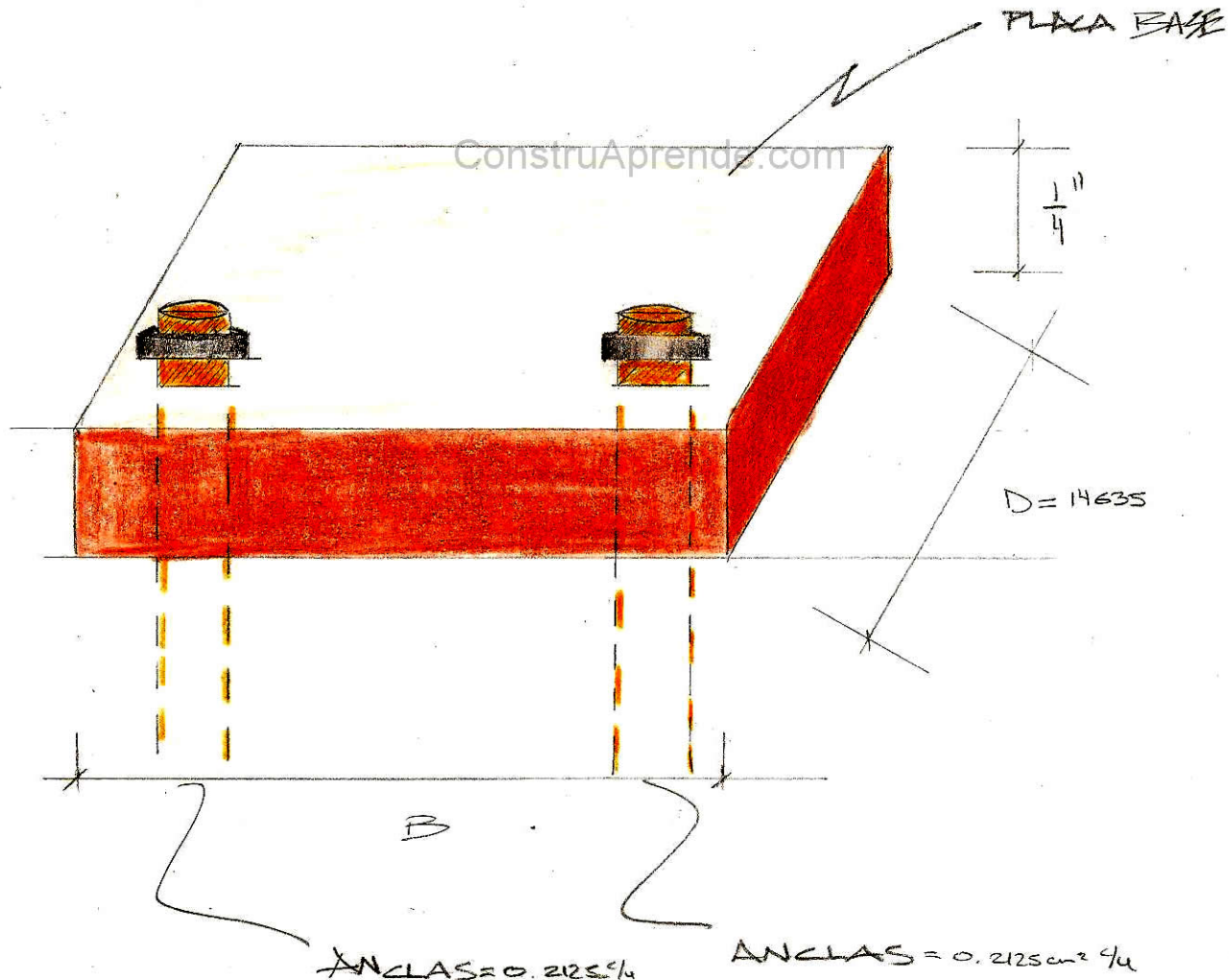
$\frac{1}{4}''$

$D = 14635$

B

$ANCLAS = 0.2125 \frac{cm}{4}$

$ANCLAS = 0.2125 cm^2 \frac{4}{u}$



73

SOLDADURA

$$T_{RESIST} = A_{FALLA} \cdot F_{PERM}$$

$$\text{CON E-60XX} \rightarrow F_u = 4222 \text{ Kg/cm}^2$$

$$Long = 200 \text{ mm}$$

$$E_{sp} = 0.6350 \text{ cm}$$

$$A_{FALLA} = (0.7071t)(20)$$

$$F_p = 0.3 \times 4222 = 1266 \text{ Kg/cm}^2$$

$$RESISTENCIA = [0.7071t(20) \times 1266]2 = 35807.5440t \text{ Kg}$$

$$T_{max} = A_{placa} F_T$$

$$F_T = 0.6 F_y = 1518 \text{ Kg/cm}^2$$

$$T_{max} = (20 \times 0.635)(1518) = 19278.60 \text{ Kg}$$

$$t = \frac{35807.5440}{19278.60} = 1.8574 \text{ cm} \approx 18.57 \text{ mm}$$

