



**TMMOB
ELEKTRİK
MÜHENDİSLERİ
ODASI**

1954

T. P. 3 - 5

KULE ÇIKIŞLI 4 HÜCRELİ

30 - 34,5 kV.

TRANSFORMATÖR BİNASI

72
55

DEĞİŞİKLİK

DEĞİŞİKLİK SEBEBİ

DEĞİŞİKLİĞE AIT
PROJEYİ YAPANIN

ADI VE SOYADI

UNVANI

ODA NO

TARİH

İMZA

30-34,5 kV 4 HÜCRELİ KULE
ÇIKIŞLI TİP ÖLÇÜ VE TRANSFOR-
MATÖR BİNASI MONTAJ PLÂNI

ÖLÇEK
1/50

NO LU
PLÂN İPTÂL EDİLDİ

NO LU
PLÂN İPTÂL EDİLDİ

PROJEYİ YAPANIN
ADI VE SOYADI

İMZA

İMZA
TARİHİ

ELK. MÜH.
NİMET GÜNER
KONT. ELK.Y. MÜH.
ADNAN OKTAÇ

M. G. - 1.

29.4.1976

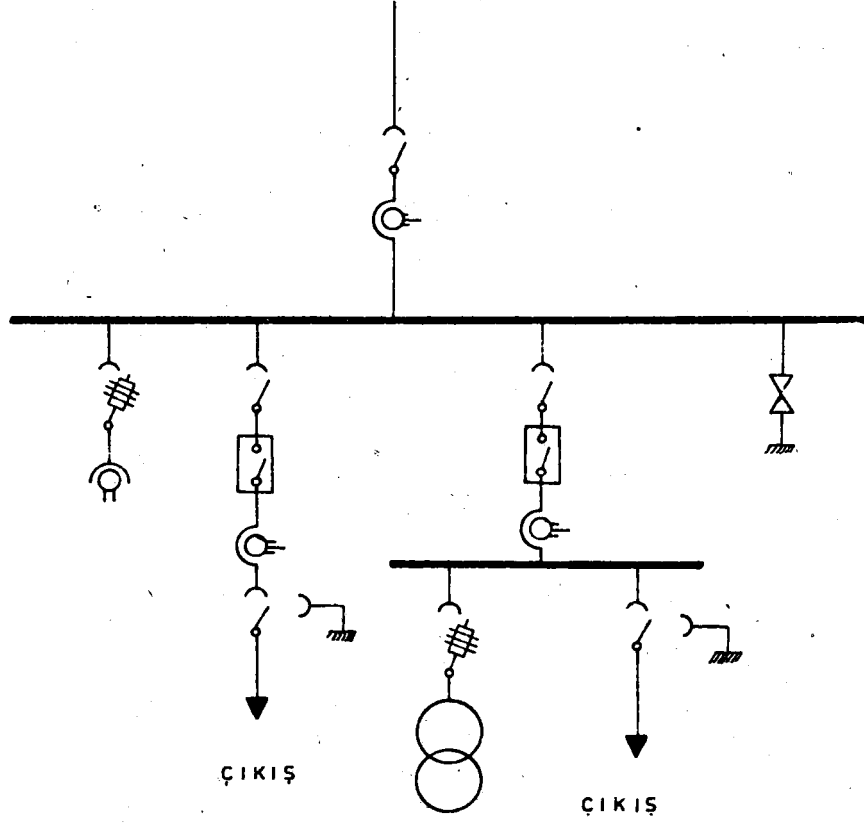
PLÂN NO
116

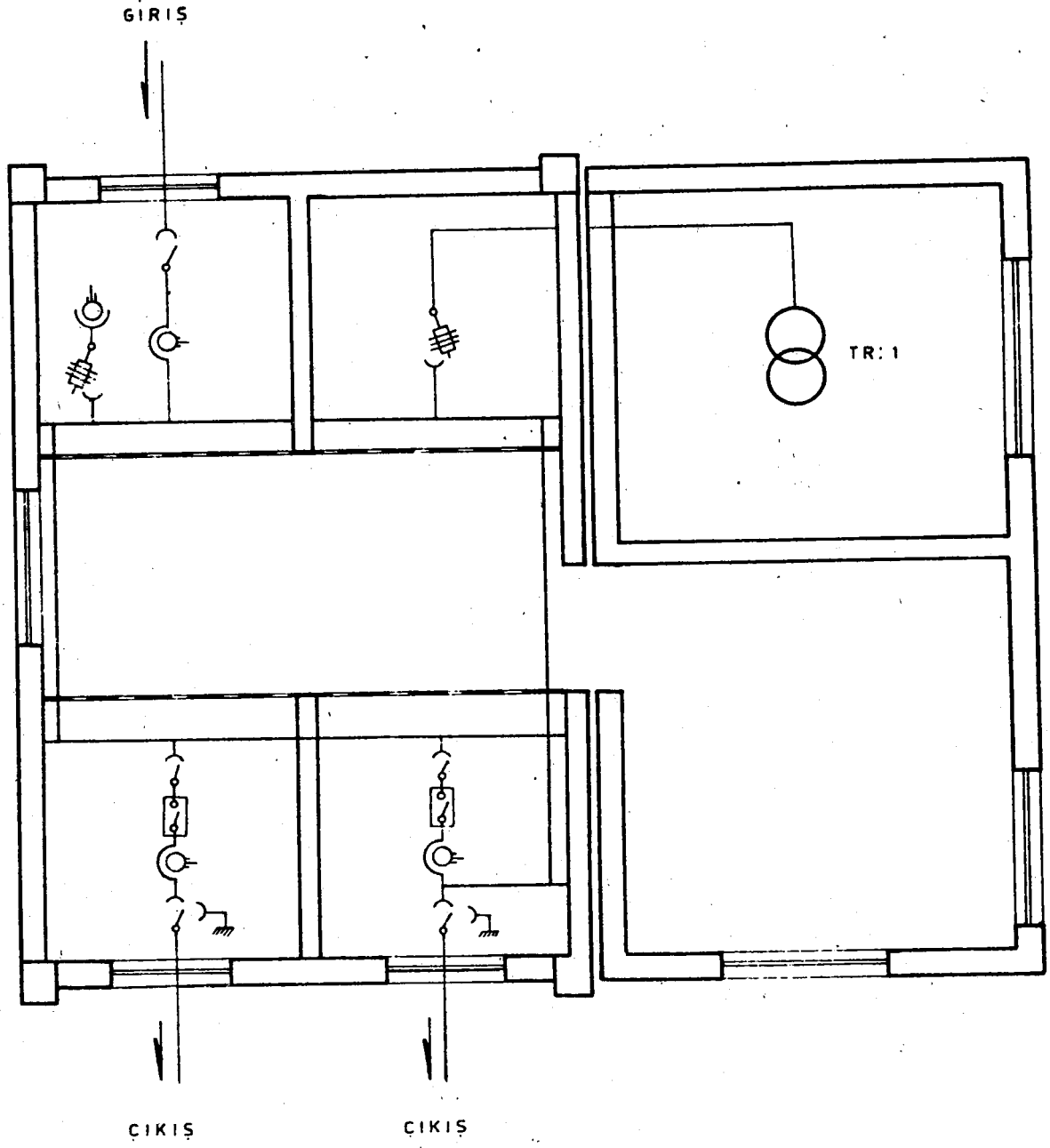
1/43 a

ARSİV KAYIT NO

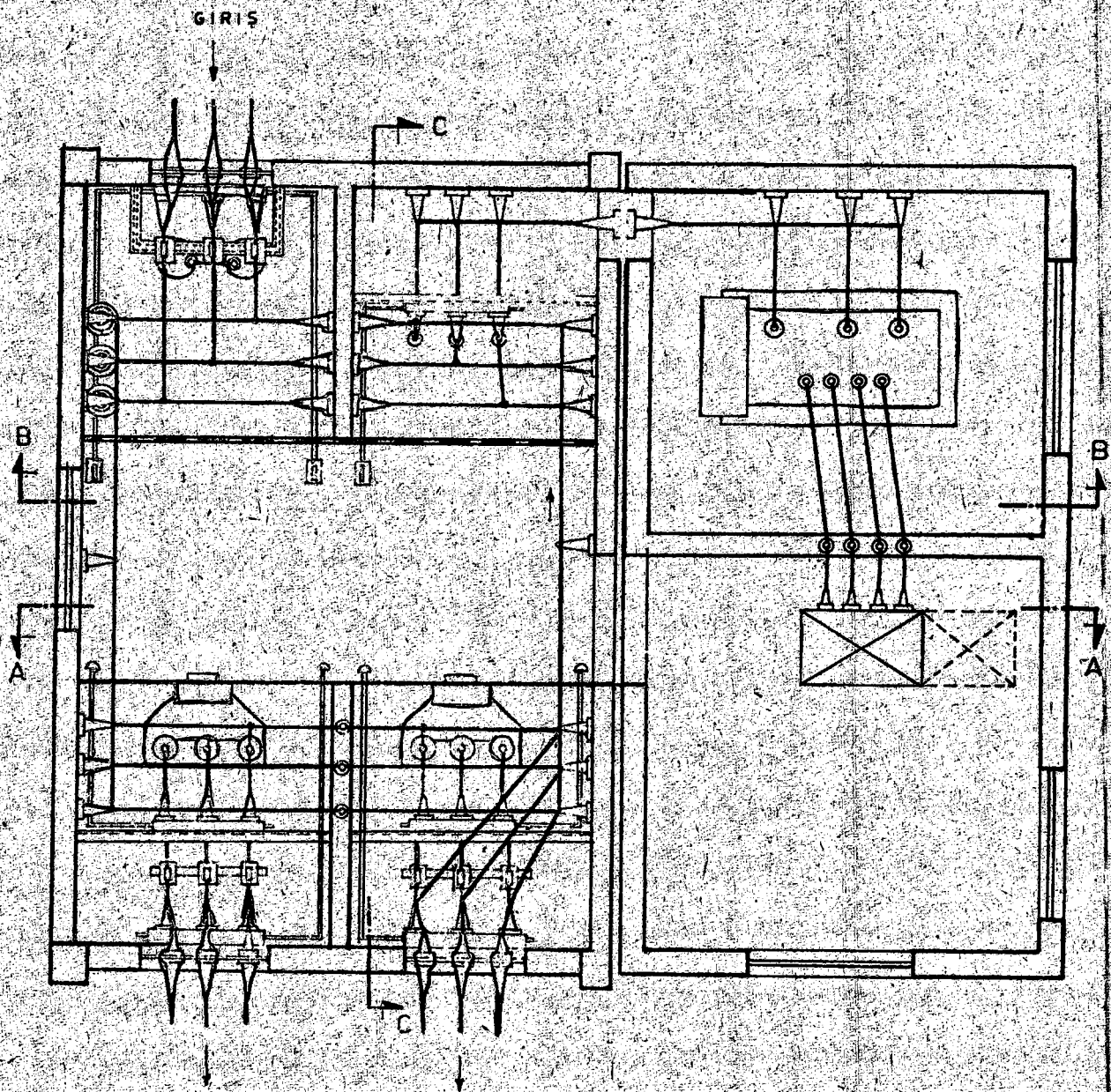
ÇİZEN: ZAFER YUMRUKLU

0.55 m²

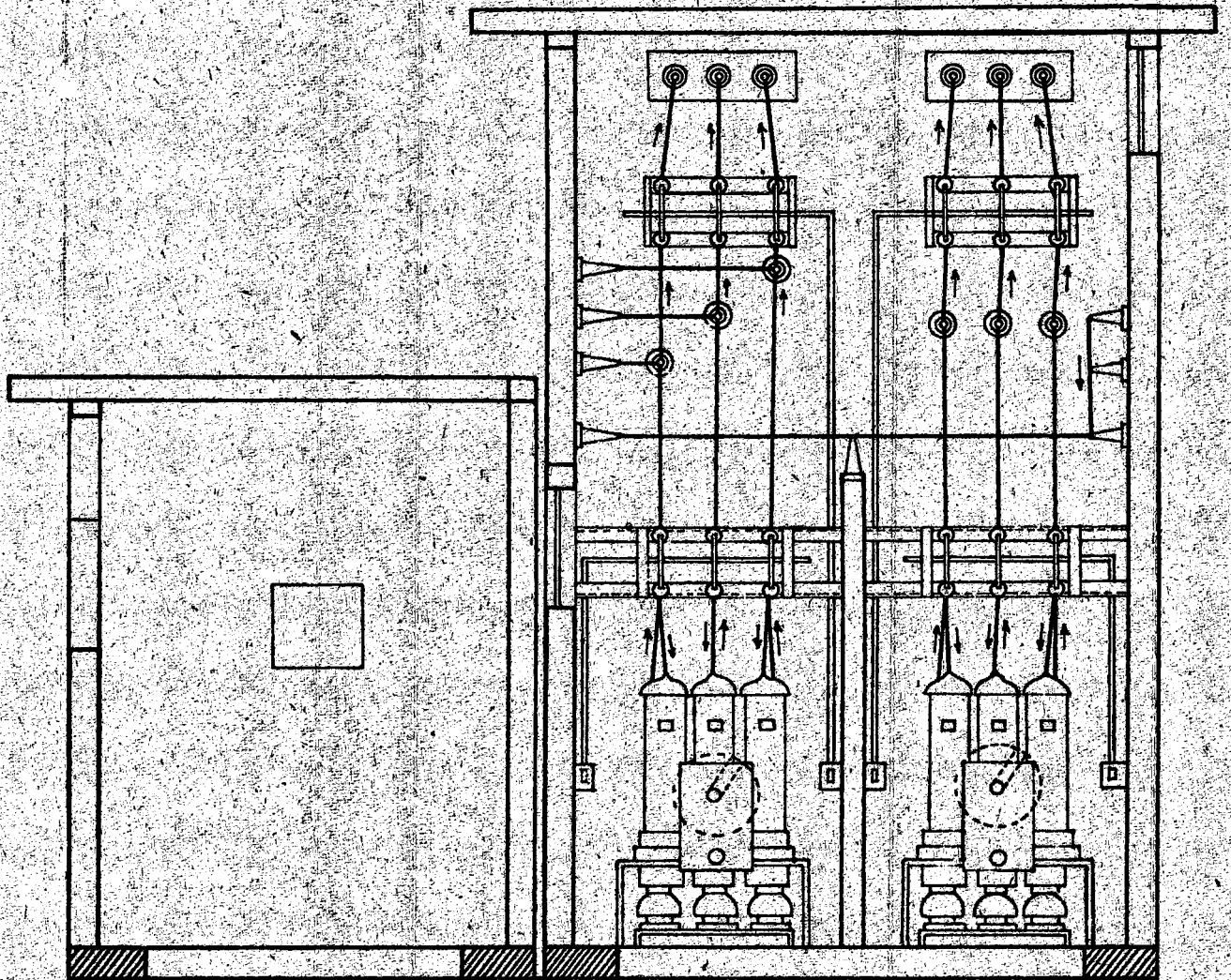




PLÂN Ölçek: 1/50

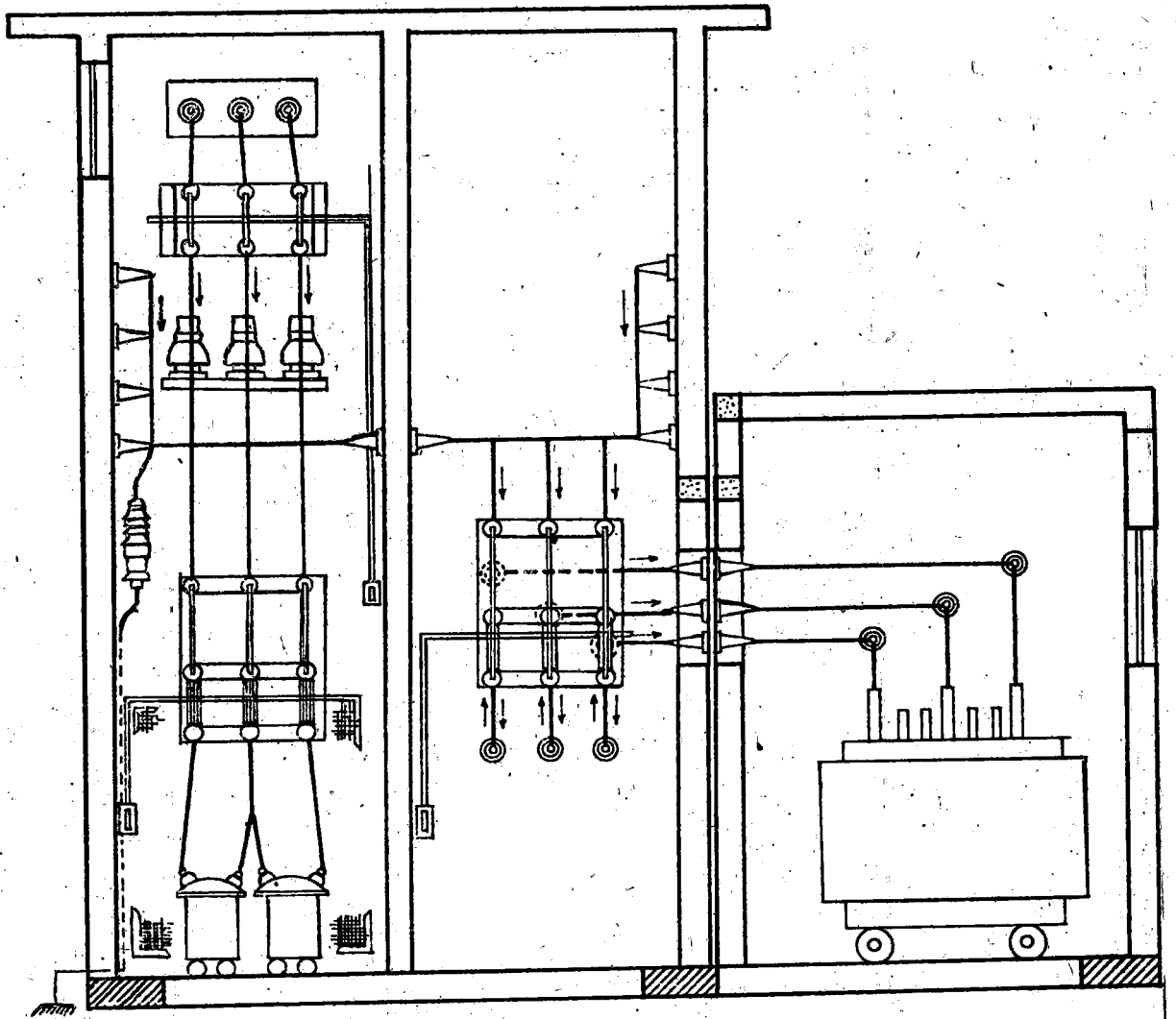


PLÂN Ölçek 1/50



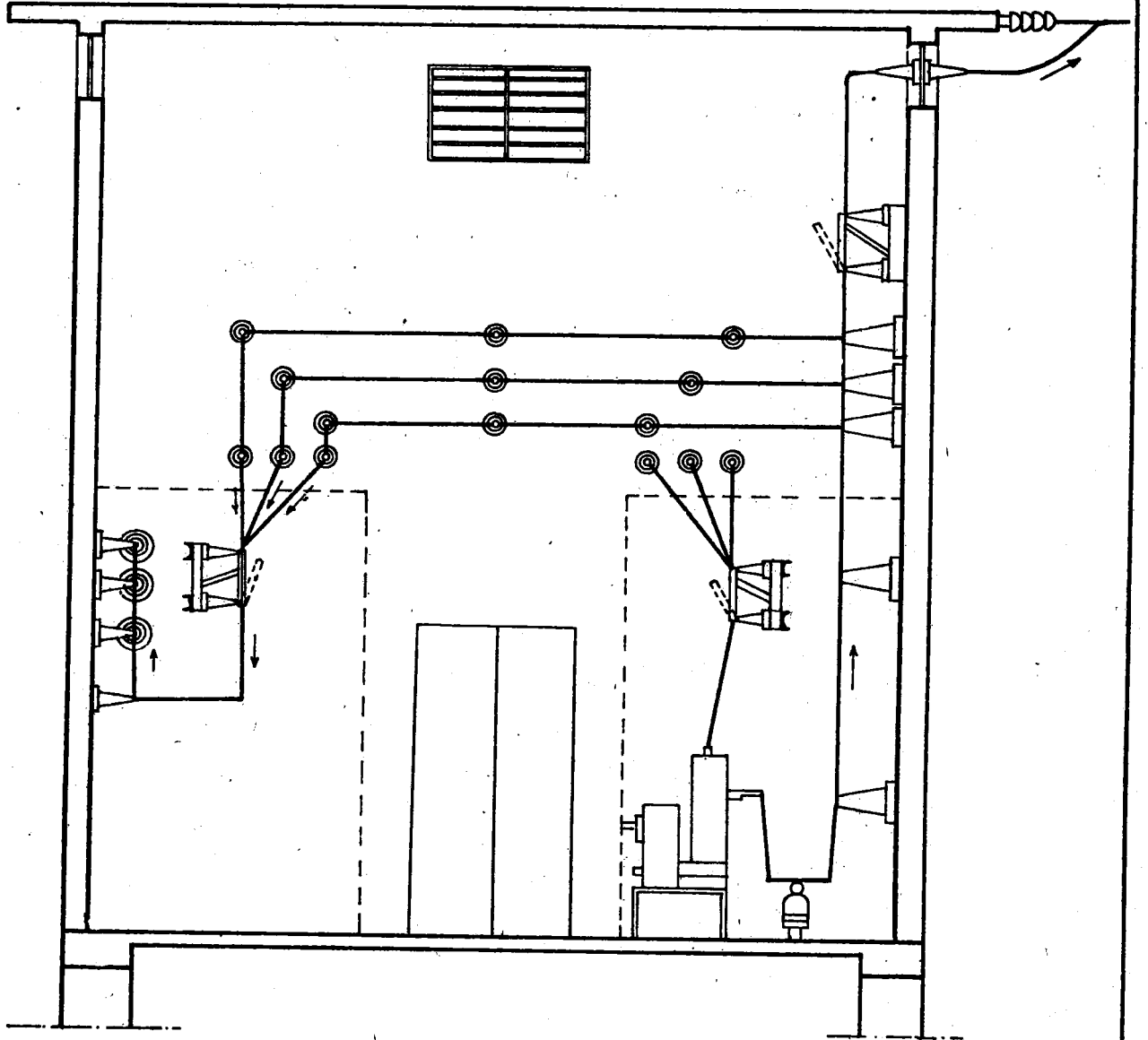
A_A KESİTİ

Ölçek 1/50



B_B KESİTİ

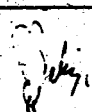
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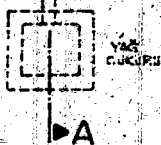
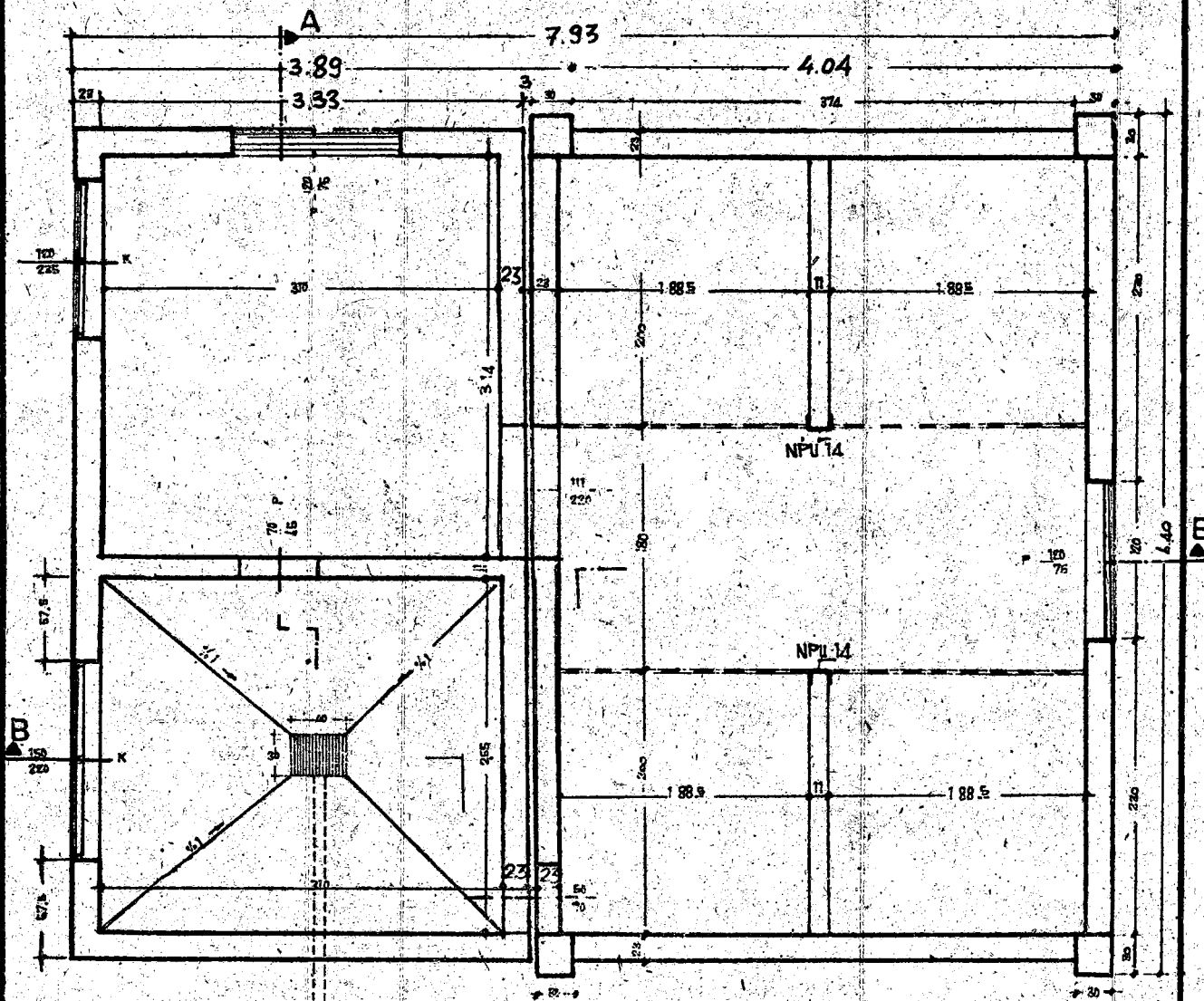


C-C KESİTİ

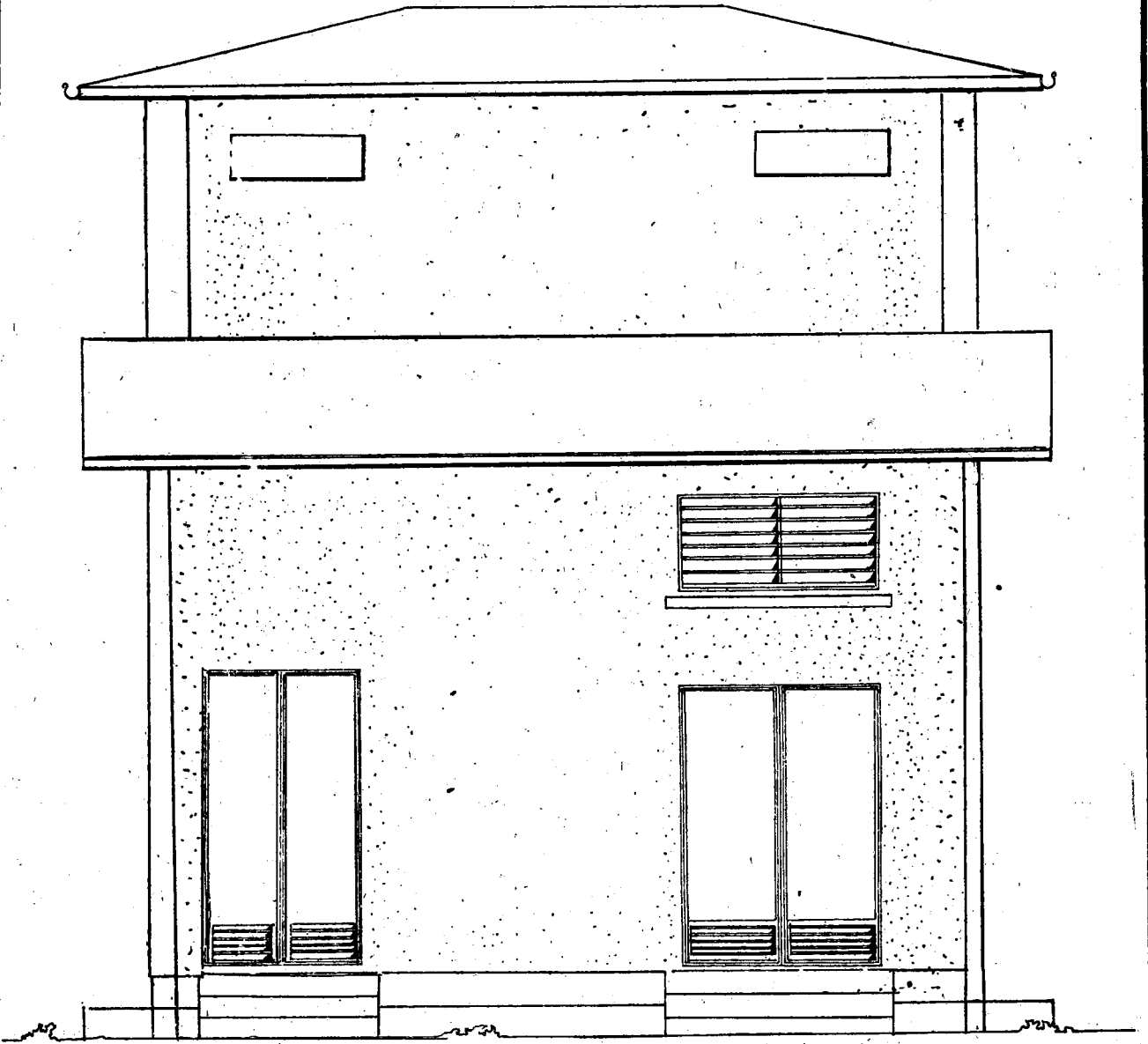
Ölçek : 1/50

72
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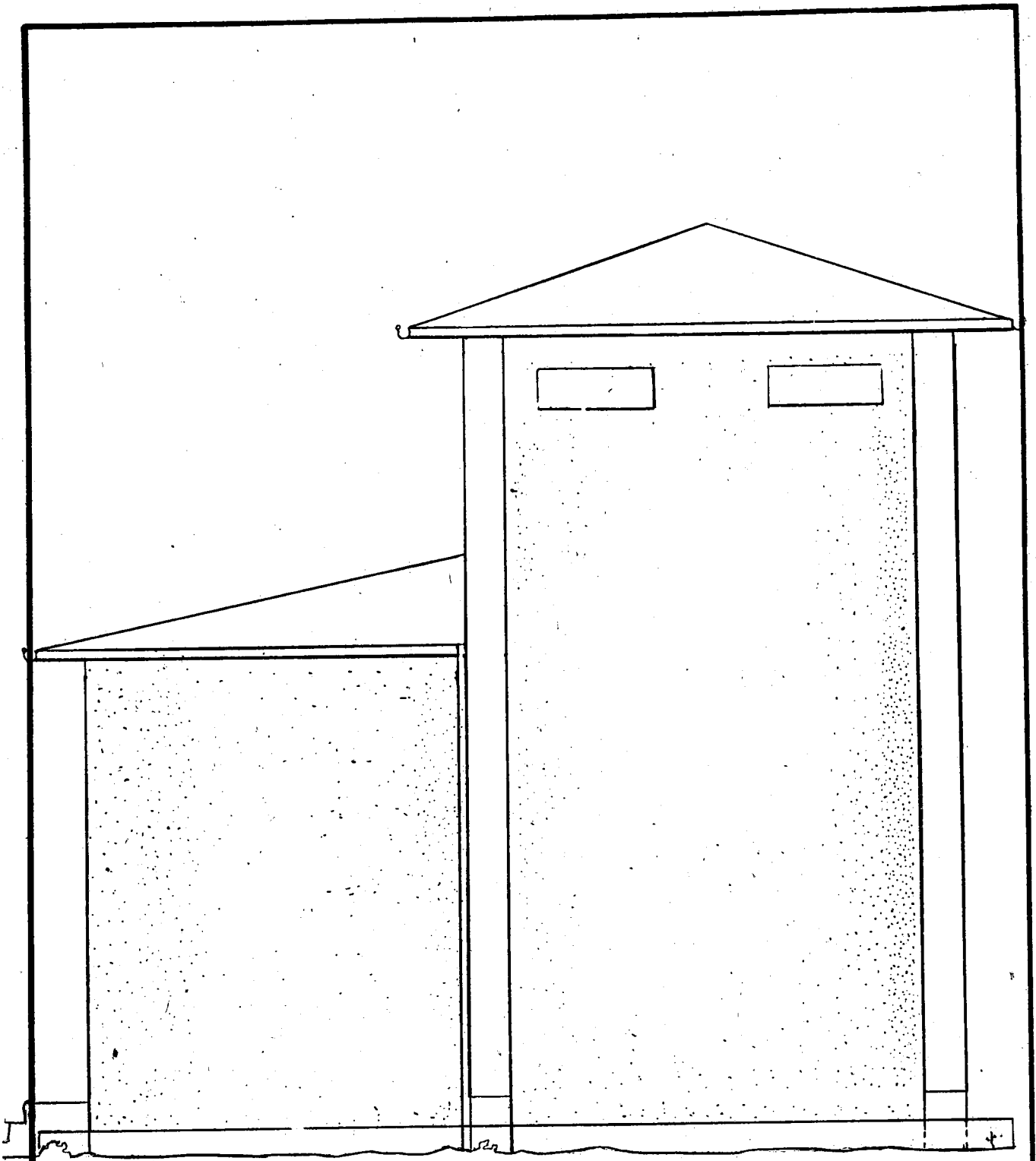
DEĞİŞİKLİK			TARİH	İMZA
			16.09.75	
30 - 34,5 kV 4 HÜCRELİ KULE ÇIKIŞLI TİP TRANSFORMATÖR BİNASI MİMARİ PROJESİ			ÖLÇEK	1/50
			NO.LU PLÂN İPTAL EDİLDİ	
			NO.LU PLÂN İPTAL EDİLDİ	
			PLÂN NO	n6 - 1/43
PROJESİ YAPANIN İMZA NO, İMVA, ADI, SOYADI	İMZA	İMZA TAKİM	ARŞİV KAYIT NO	
YÜK. İNŞ. MÜH. CETİN PEKİNER DPA NO: 8730-DIP. NO: 2415 TELEFON: 174761				
TARİH: 16.09.75				



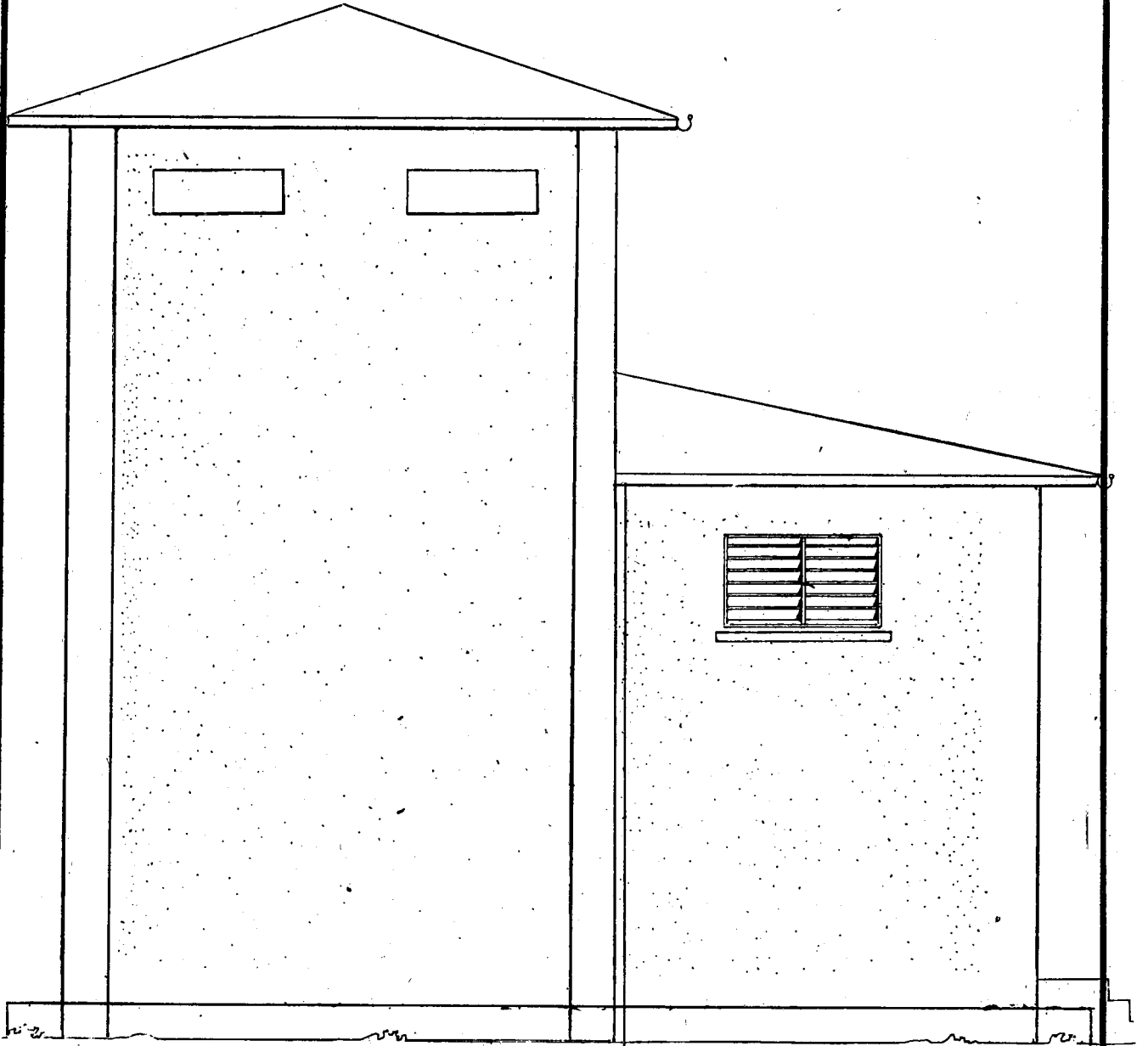
PLÂN



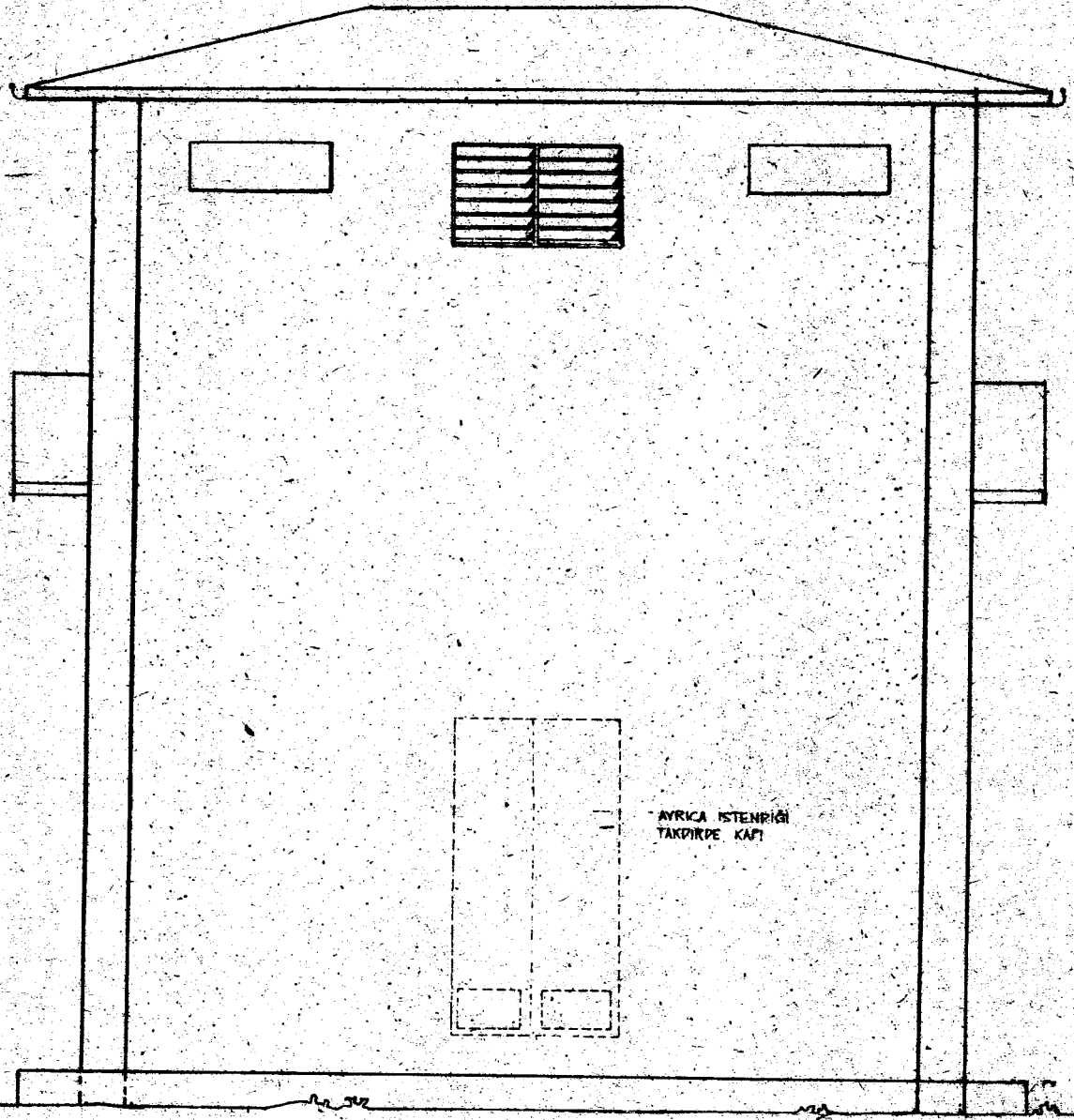
ÖN GÖRÜNÜŞ



SAĞ YAN CEPHE



SOL YAN CEPHE

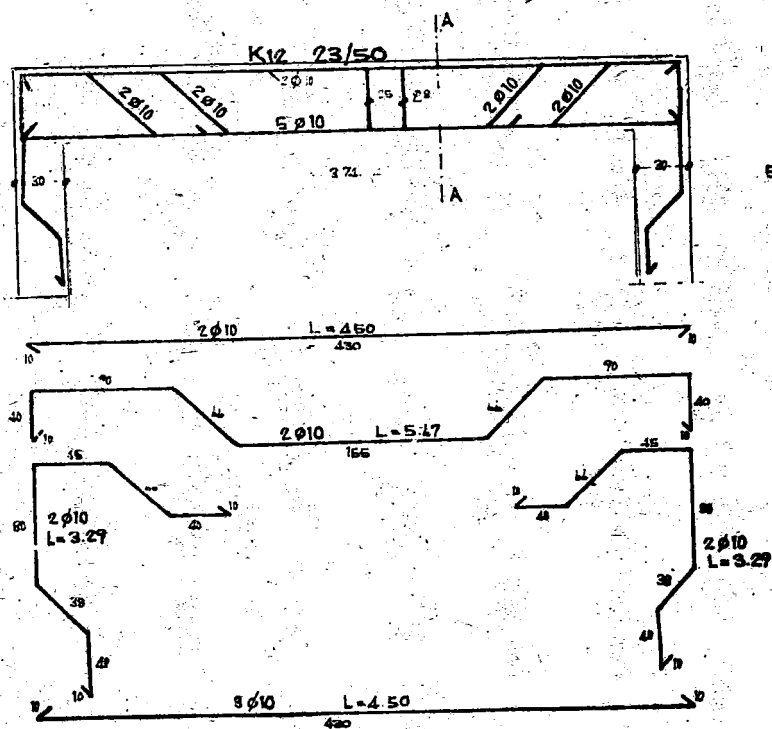


ARKA GÖRÜNÜŞ

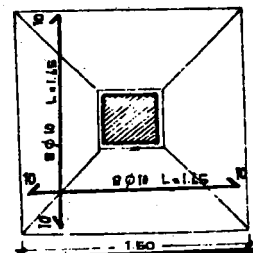
4H.K.
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73
56

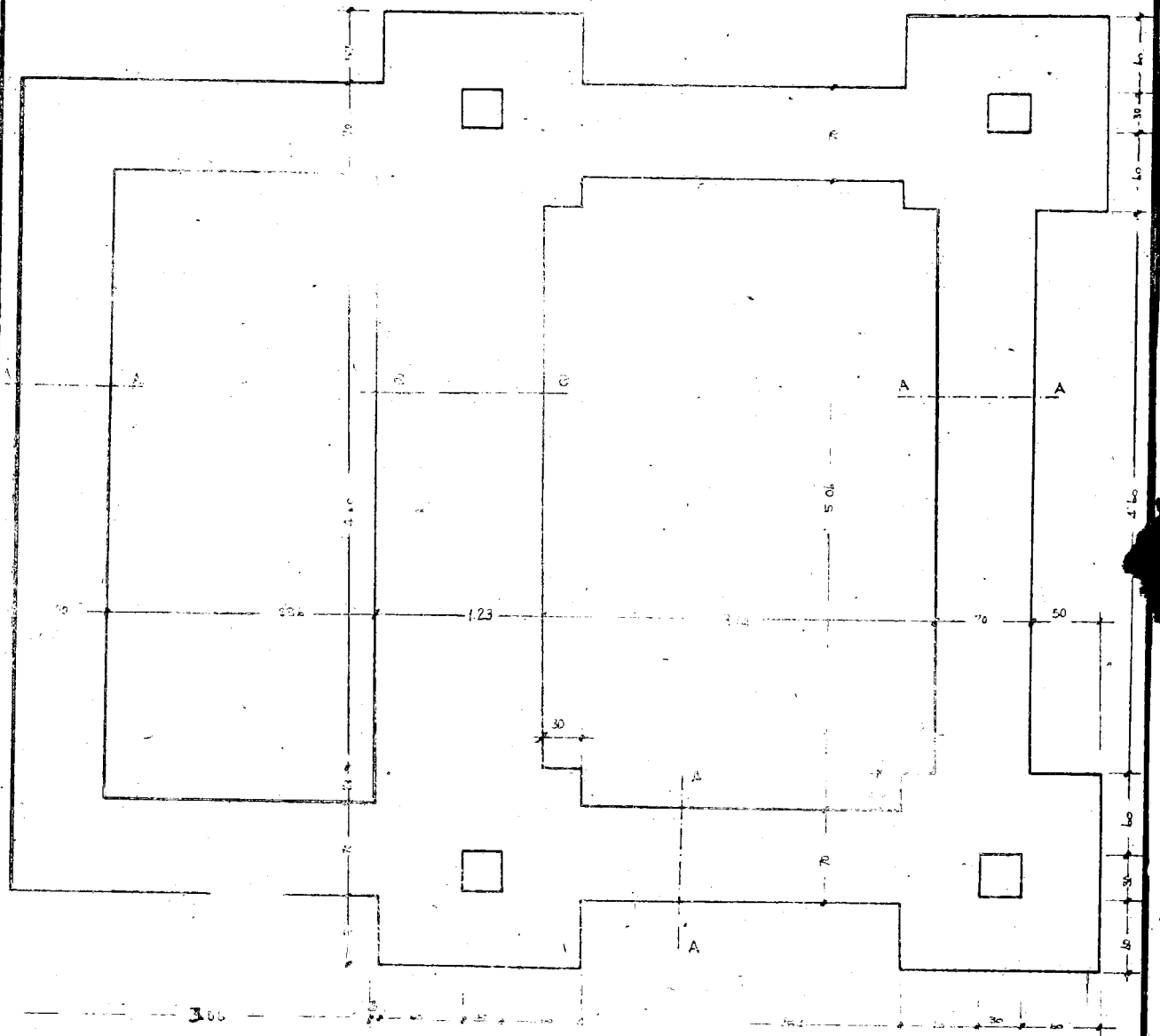
DEĞİŞİKLİK			TARİH	İMZA
a)			16.7.1973	
b)				
30-34.5 KV 4 HÜCRELİ 15KV 6 HÜCRELİ KULE ÇIKIŞLI TİP TRANSFORMATÖR BİNASI BETONARME RESİMLERİ			ÖLÇEK 1/50	
			NO.LU PLAN İPTAL EDİLDİ	
			NO.LU PLAN İPTAL EDİLDİ	
			PLAN NO 116.1/44	
PROJEYİ YAPANIN .DİPL. NO.ŞİRKETİ .ADI .SOYADI			İMZA	İMZA TARİHİ
YER. İNŞ. MÜH. CETİN PEKİNER OPR. NO : 19730 - Pİ. NO : 7453 TELEFON : 174701				
ÇİZEN : 				
			ARŞİN KAYIT NO	



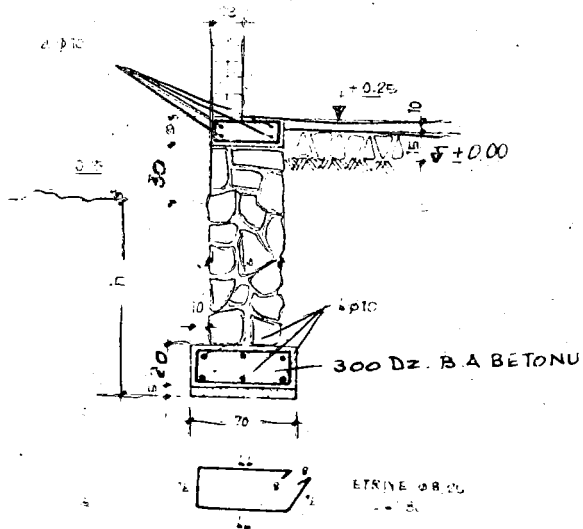
18



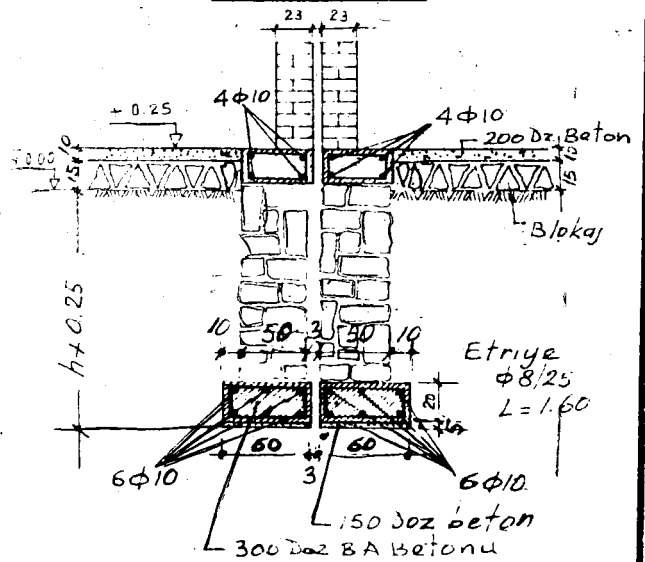
NOT : h=(1.00)m den AZ OLMAMAK ÜZERE
MAHALLİNDE KONTROLLUKÇA TESPİT
EDİLECEKTİR.



A-A KESİTİ

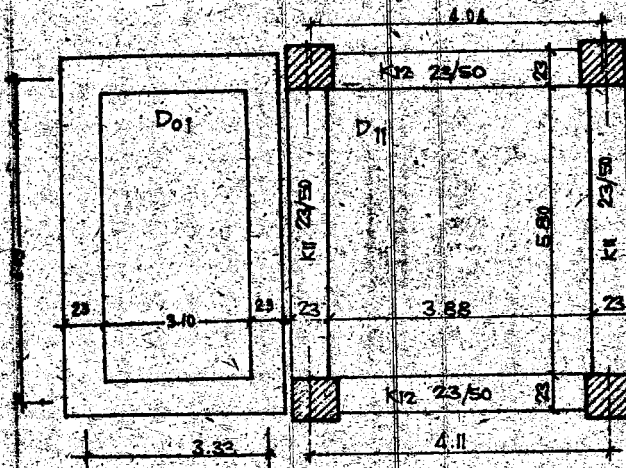


B-B KESİTİ



(B4.5KV - 4 HÜCRELİ) 15 KV - 6 HÜCRELİ KULELİ

TRANSFORMATOR BİNASI BETONARME HESAPLARI



St I B 140

$$\text{Yük: Döşeme zati} = 0.12 \times 2.4 = 0.288 \text{ t/m}^2$$

$$\text{Sna} = 0.057 \text{ t/m}^2$$

$$\text{catı} = 0.100 \text{ t/m}^2$$

$$\text{Kar} = 0.075 \text{ t/m}^2$$

$$P = 7 = 0.520 \text{ t/m}^2$$

D01 DÖŞEMESİ: $E = \frac{603}{233} = 1.81$ tek doğrultu

$$M = \frac{0.520 \times 3.33^2}{8} = 0.72 \text{ tm}$$

$$h = 10 \text{ cm} \quad Cb = 48 \text{ kg/cm}^2 \quad fe = 5.80 \text{ cm}^2$$

donatı $\phi 10/13^5$ (1 düz 1 plye)

diğer doğrultu terzi $\phi 8/25$

D11 DÖŞEMESİ:

$$E = \frac{603}{4.11} = 1.46$$

$$\alpha_L = 0.03050$$

$$\beta_L = 0.00671$$

$$\mu_L = 0.2176$$

$$\rho_L = 0.1804$$

$$\text{Max } M_x = 0.03050 \times 0.520 \times 4.11^2 = 0.248 \text{ tm}$$

$$\text{Max } M_y = 0.00671 \times 0.520 \times 4.11^2 = 0.127 \text{ tm}$$

$$X = -\frac{1}{12} \times 0.2176 \times 0.520 \times 4.11^2 = 0.404 \text{ tm}$$

$$Y = -\frac{1}{12} \times 0.1804 \times 0.520 \times 4.11^2 = 0.270 \text{ tm}$$

x doğrultusu $M_x = 24.8 \text{ tcm} \quad h = 10 \text{ cm} \quad Cb = 26 \text{ kg/cm}^2 \quad fe = 2.08 \text{ cm}^2$ donatı $\phi 8/18$ (1 düz 1 plye)

y doğrultusu $M_y = 12.7 \text{ tcm} \quad h = 7.5 \text{ cm} \quad Cb = 18 \text{ kg/cm}^2 \quad fe = 1.12 \text{ cm}^2$ donatı $\phi 8/18$ (1 düz 1 plye)

x Mesneti $x = 60.0 \text{ tcm} \quad h = 10 \text{ cm} \quad Cb = 42 \text{ kg/cm}^2 \quad fe = 4.8 \text{ cm}^2$ mercur $\phi 8/36$

ilave $\phi 8/14$

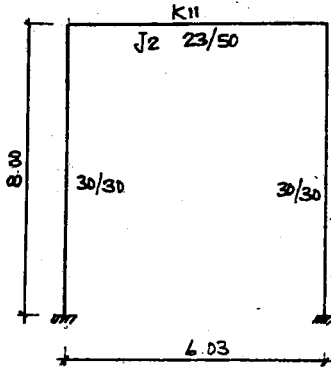
y Mesneti $y = 27.0 \text{ tcm} \quad h = 10 \text{ cm} \quad Cb = 28 \text{ kg/cm}^2 \quad fe = 2.3 \text{ cm}^2$ mercur $\phi 8/36$

ilave $\phi 8/26$

73
56

ÇERÇEVE HESABI:

Sistem her iki istikamette çerçeve olarak hesaplanacak



Kiriş atalet momenti $b = 2.25d + b_1 = 2.25 \times 12 + 23 = 50 \text{ cm}^2$

$$\frac{b}{d} = \frac{23}{50} = 0.46$$

$$\frac{d}{d_1} = \frac{12}{50} = 0.24$$

$$M = 18.7 \quad J_2 = \frac{50 \times 50^3}{18.7} = 33.42 \text{ dm}^4$$

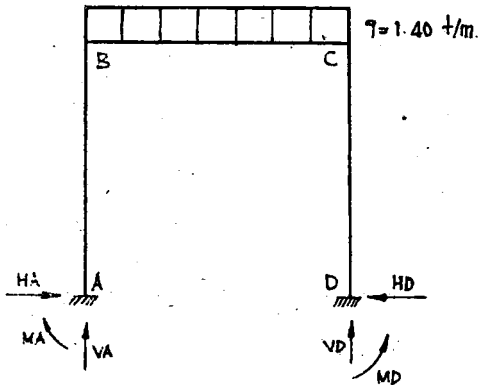
$$J_1 = \frac{3.0^4}{12} = 6.75 \text{ dm}^4$$

$$K = \frac{J_2}{J_1} \cdot \frac{h}{l} = \frac{33.42}{6.75} \cdot \frac{8.00}{6.03} = 6.6$$

$$N_1 = 6.6 + 2.0 = 8.6$$

$$N_2 = 6 \times 6.6 + 1 = 40.6$$

ZATI YÜK:



$$\begin{aligned} \text{Yük: döşemeden} &= 0.404 \times 0.520 \times 4.11 = 0.860 \text{ t/m} \\ \text{Sacadan} &= 0.50 \times 0.520 = 0.260 \text{ " } \\ \text{kiriş zati} &= 0.23 \times 0.50 \times 2.4 = 0.280 \text{ " } \\ &= 1.40 \text{ t/m} \end{aligned}$$

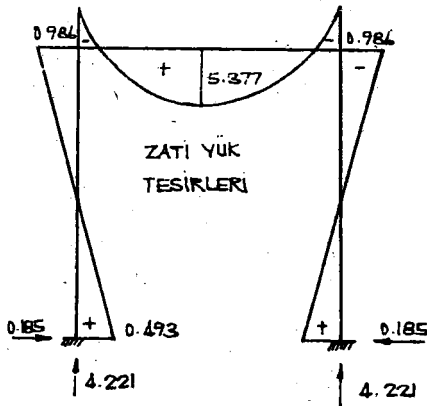
$$M_A = M_D = \frac{1.40 \times 6.03^2}{12 \times 8.6} = 0.493 \text{ tm}$$

$$M_B = M_C = \frac{1.40 \times 6.03^2}{6.86} = 0.986 \text{ tm}$$

$$\text{Max } M = \frac{1.40 \times 6.03^2}{8} - 0.986 = 5.377 \text{ tm}$$

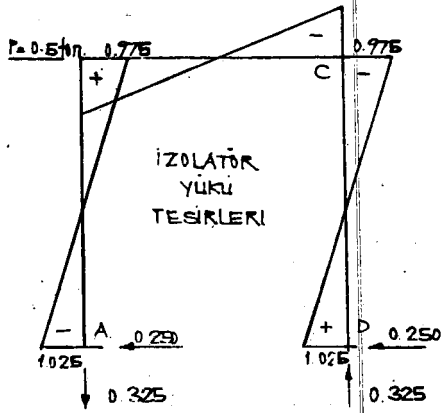
$$V_A = V_D = \frac{1.40 \times 6.03}{2} = 4.221 \text{ ton}$$

$$H_A = H_D = \frac{3 \times 0.493}{8.00} = 0.185 \text{ ton}$$



İZOLATÖR YÜKÜ :

$$P = 0.500 \text{ ton}$$



$$\begin{aligned} M_A &= -1.025 \\ M_D &= +1.025 \end{aligned}$$

$$\begin{aligned} M_B &= +0.975 \\ M_C &= -0.975 \end{aligned}$$

$$V_A = V_D = \frac{2 \times 0.975}{6.03} = 0.325$$

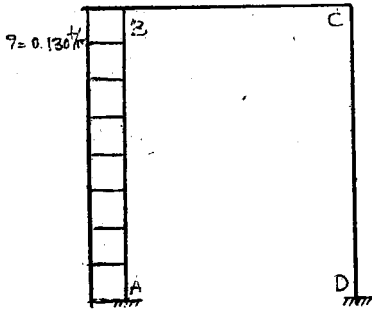
$$H_A = H_D = \frac{0.500}{2} = 0.250$$

TAM RÜZGÂR :

RÜZGÂR YÜKÜ :

$$W = 1.2 \times 50 = 60 \text{ kg/m}^2$$

$$q = 60 \times \frac{4.34}{2} = 130 \text{ kg/m}$$



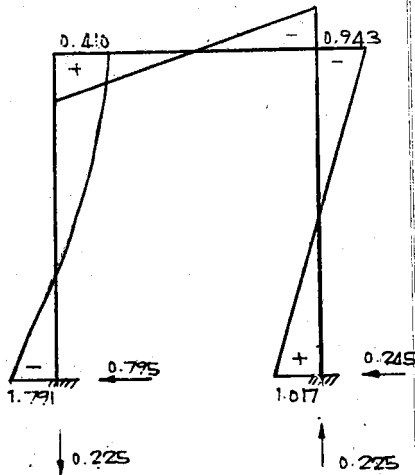
$$\begin{aligned} M_A &= -1.791 \text{ tm} \\ M_D &= +1.017 \text{ tm} \end{aligned}$$

$$\begin{aligned} M_B &= +0.410 \text{ tm} \\ M_C &= -0.943 \text{ tm} \end{aligned}$$

$$V_A = V_D = \frac{0.130 \times 6.6 \times 8.0}{6.03 \times 40.6} = 0.225 \text{ ton}$$

$$H_D = \frac{0.130 \times 8.00 (3 + 2 \times 6.6)}{8 \times 8.6} = 0.215 \text{ ton}$$

$$H_A = - (0.130 \times 8.00 - 0.215) = -0.795 \text{ ton}$$



K11- ÇERÇEVE KIRISI HESABI:

$$M_{\max} = 527,7 \text{ ton}$$

$$\varphi = \frac{d}{h} = \frac{12}{47} = 0,26$$

$$l_3 = 0,797 \quad l_4 = 137$$

$$G_b/G_e = 50/1400$$

$$b = \frac{137 \times 527,7}{47} = 33,3 \text{ cm} < b_{\max} = 4,5 \times 12 + 23 = 77 \text{ cm}$$

$$f_e = \frac{0,797 \times 527,7}{47} = 9,12 \text{ cm}^2$$

Donatı üstte 2φ10

Altta 5φ16 (3φ16) (10,05 cm²)

MESNET TAHKIKI: $X_{\max} = -98,6 - 97,5 - 94,3 = -290,4 \text{ ton}$

$$K_2 = 47 \sqrt{\frac{23}{290,4}} = 13,3 \rightarrow C_b = 41 \text{ Kg/cm}^2 \quad K_3 = 0,795$$

$$f_e = \frac{0,795 \times 290,4}{47} = 4,91 \text{ cm}^2$$

Donatı mevcut 2φ10 + 3φ16 (7,40 cm²)
kafi ilave istemez

KAYMA TAHKIKI:

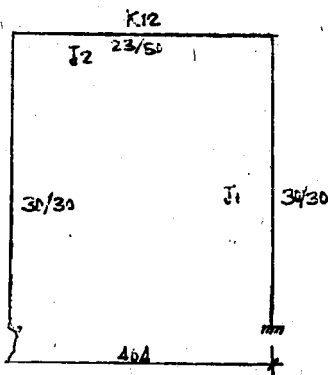
$$Q = 4,771 \text{ ton}$$

$$Z = 0,898 \times 47 \approx 42$$

$$C_v = \frac{4,771}{23 \times 42} = 4,94 \text{ Kg/cm}^2 < C_{em} = 6 \text{ Kg/cm}^2$$

dr. φ8/25

K12 ÇERÇEVESİ:



KIRIS ATALET MOMENTİ:

$$b = 2,25 \times 12 + 23 = 50 \text{ cm}$$

$$\frac{b_0}{b} = \frac{23}{50} = 0,46$$

$$\frac{d}{d_0} = \frac{12}{50} = 0,24$$

$$M = 18,7$$

$$J_2 = \frac{5 \times 5^3}{18,7} = 33,42$$

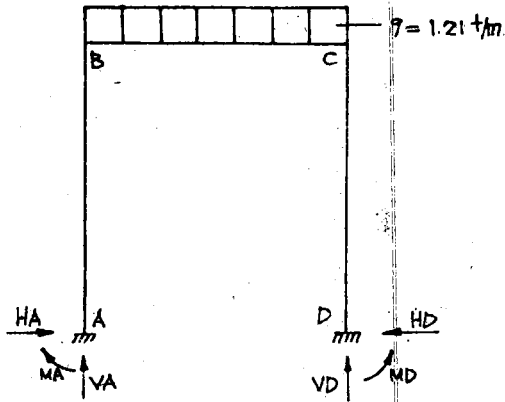
$$J_1 = \frac{3^4}{12} = 6,75$$

$$K = \frac{33,42}{6,75} \times \frac{8,00}{4,04} = 9,8$$

$$N_1 = 9,8 + 2,0 = 11,8$$

$$N_2 = 4 \times 9,8 + 1,0 = 57,8$$

ZATI YÜK:



$$\begin{aligned} \text{Yük: döşemeden} &= 0.313 \times 0.520 \times 4.11 = 0.67 \text{ t/m.} \\ \text{Sacak} &= 0.50 \times 0.520 = 0.26 \text{ t/m.} \\ \text{Kiris zati} &= 0.23 \times 0.50 \times 2.4 = 0.28 \text{ t/m.} \\ &= 1.21 \text{ t/m.} \end{aligned}$$

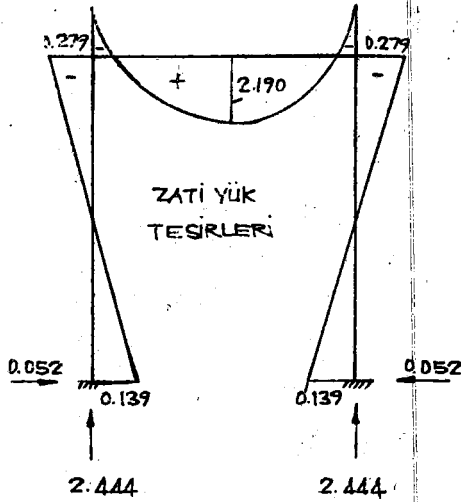
$$M_A = M_D = \frac{1.21 \times 4.04^2}{12 \times 11.8} = 0.137 \text{ t.m.}$$

$$M_B = M_C = \frac{1.21 \times 4.04^2}{6 \times 11.8} = 0.279 \text{ t.m.}$$

$$M_{\max} M = \frac{1.21 \times 4.04^2}{8} - 0.279 = 2.190 \text{ t.m.}$$

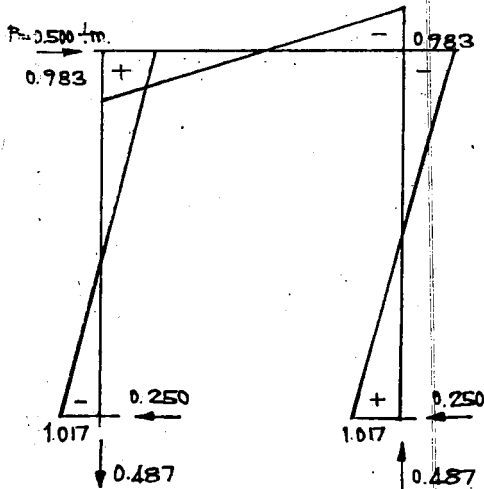
$$V_A = V_D = \frac{1.21 \times 4.04}{2} = 2.444 \text{ ton.}$$

$$H_A = H_D = \frac{3 \times 0.137}{8.00} = 0.052 \text{ ton.}$$



İZOLATÖR YÜKÜ:

$$P = 0.500 \text{ ton.}$$



$$\begin{aligned} M_A &= - \frac{0.5 \times 8.00}{2} \times \frac{1 + 3 \times 9.8}{59.8} = -1.017 \\ M_D &= + \frac{0.5 \times 8.00}{2} \times \frac{1 + 3 \times 9.8}{59.8} = +1.017 \end{aligned}$$

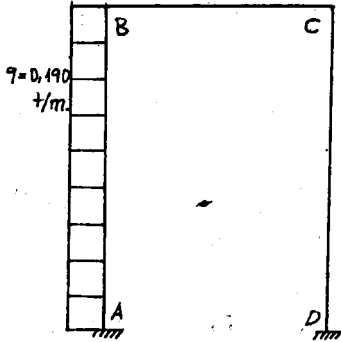
$$\begin{aligned} M_B &= + \frac{0.5 \times 8.00}{2} \times \frac{3 \times 9.8}{59.8} = +0.983 \\ M_C &= - \frac{0.5 \times 8.00}{2} \times \frac{3 \times 9.8}{59.8} = -0.983 \end{aligned}$$

$$V_A = V_D = \frac{2 \times 0.983}{4.04} = 0.487$$

$$H_A = H_D = \frac{0.500}{2} = 0.250 \text{ ton.}$$

TAM RÜZGAR:

RÜZGAR YÜKÜ:

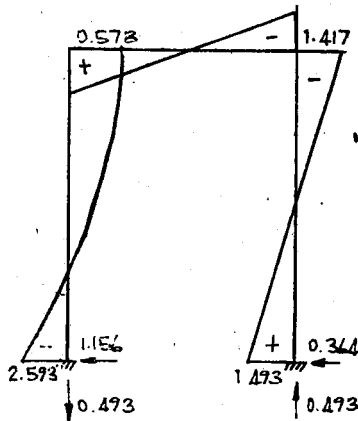


$$W = 1.2 \times 50 = 60 \text{ kg/m}^2$$

$$q = 60 \times \frac{6.26}{2} \approx 0.190 \text{ t/m}$$

$$\begin{matrix} M_A \\ M_D \end{matrix} > \frac{0.190 \times 8.0^2}{4} \left(-\frac{3 + 9.8}{6 \times 11.8} \mp \frac{1 + 4 \times 9.8}{59.8} \right) = \begin{matrix} -2.593 \\ +1.493 \end{matrix}$$

$$\begin{matrix} M_B \\ M_C \end{matrix} < \frac{0.190 \times 8.0^2}{4} \left(-\frac{9.8}{6 \times 11.8} \pm \frac{2 \times 9.8}{59.8} \right) = \begin{matrix} +0.578 \\ -1.417 \end{matrix}$$



$$V_A = -V_D = \frac{0.190 \times 9.8 \times 8.0}{4.04 \times 59.8} = 0.493$$

$$H_D = \frac{0.190 \times 8.00 (3 + 2 \times 9.8)}{8 \times 11.8} = 0.364$$

$$H_A = (0.190 \times 8.00 - 0.364) = 1.156$$

K/2 ÇERÇEVE KIRISI HESABI:

$$M_{max} = 219 \text{ cm} \quad \rho = \frac{d}{h} = \frac{12}{47} = 0.26 \rightarrow \frac{C_b}{C_e} = \frac{50}{1400} \quad i_2 = 0.797 \quad i_4 = 137$$

$$b = \frac{137 \times 219}{47^2} = 13.6 < b_{max} = 4.5 \times 12 + 23 = 77 \text{ cm}$$

$$f_e = \frac{0.797 \times 219}{47} = 3.71 \text{ cm}^2$$

darıti üstte 2 $\phi 10$

Altta 5 $\phi 10$ (2 Pilye); 3.93 cm²

MESNET TAHKIKI:

$$X_{max} = -27.9 - 98.3 - 141.7 = -267.9 \text{ t/cm}$$

$$K_2 = 47 \sqrt{\frac{23}{267.9}} = 13.7 \rightarrow C_b = 40 \quad K_3 = 0.794$$

$$f_e = \frac{0.794 \times 267.9}{47} = 4.53 \text{ cm}^2$$

Mesnet 2 $\phi 10$ + 2 $\phi 10$ = 3,14

ilave 2 $\phi 10$

$$= \frac{1.57}{4.71 \text{ cm}^2}$$

KAYMA TAHKIKI:

$$Q = 3.424 \text{ Ton}$$

$$Z = 0.900 \times 47 \approx 42$$

$$C_0 = \frac{3424}{23 \times 42} = 3.55 \text{ Kg/cm}^2 < C_{0em} = 6 \text{ Kg/cm}^2 \quad \text{etr: } \phi 8/25$$

KOLON HESABI:

$$N_{\text{zati}} = 4.221 + 2.444 = 6.665 \text{ ton}$$

$$M_{x \text{ zati}} = 0.493 \text{ tm}$$

$$M_y = 0.139$$

$$N_{\text{izolator}} = 0.325 + 0.487 = 0.812 \text{ "}$$

$$M_{\text{izolator}} = 1.025 \text{ "}$$

$$M_y = 1.017$$

$$N_{\text{rüzgâr}} = 0.493 \text{ "}$$

$$M_{\text{rüzgâr}} = \text{---}$$

$$M_y = 1.493$$

$$N_{\text{kolon zati}} = (0.32 \times 8.00) \times 2.4 = \frac{1.728}{9.678} \text{ ton}$$

$$M_{\text{max}} = 1.518 \text{ tm}$$

$$M_y \text{ max} = 2.447 \text{ tm}$$

$$C_0 = \frac{9.678}{30 \times 30} = 10.78 \text{ Kg/cm}^2$$

$$\frac{C_{bem}}{C_0} = \frac{70}{10.78} = 6.49$$

$$\gamma = \frac{M_x}{N.d} + \frac{M_y}{N.d}$$

$$\gamma = \frac{1.518}{9.678 \times 0.3} + \frac{2.449}{9.678 \times 0.3} = 1.43$$

$$\rightarrow \mu = \mu_0 = 0.004$$

$$F_e = F_e' = 0.004 \times 30 \times 30 = 3.6 \text{ cm}^2$$

$$F_e + F_e' = 3.6 + 3.6 = 7.2 \text{ cm}^2$$

$$\text{donat: } 4 \phi 16 \text{ (8.04 cm}^2\text{)}$$

$$\text{etr: } \phi 8/20$$

FLANBAJ TAHKIKI:

$$\rho = \frac{800}{30} = 27 \rightarrow W = 1.48$$

$$P_{em} = \frac{(K_b.F_b + C_s.F_e)}{3W}$$

$$K_b = 144$$

$$F_b = 30 \times 30 = 900 \text{ cm}^2$$

$$C_s = 2400$$

$$F_e = 8.04 \text{ cm}^2$$

$$P_{em} = \frac{144 \times 900 + 2400 \times 8.04}{3 \times 1.48} = 33.535 \text{ ton} > N = 9.678 \text{ ton}$$

TEMEL HESABI:

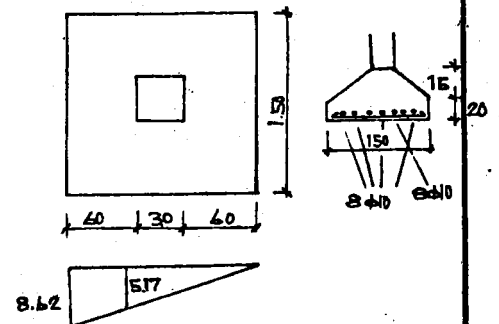
$$C_{zem} = 15 \text{ t/m}^2$$

$$e = \frac{M}{N} = \frac{2.449}{9.678} = 0.27$$

$$C_3 = \frac{9.678}{1.50 \times 1.50} \left(1 + \frac{6 \times 0.25}{1.50} \right) = \begin{cases} 8.62 \text{ t/m}^2 \\ 0.00 \end{cases}$$

$$C_3' = (15 - 2 \times 1.00) = 13 \text{ t/m}^2 > 8.62 \text{ t/m}^2$$

$$M = \frac{1}{2} \times 5.17 \times 0.60 \times \frac{0.60}{3} + \frac{1}{2} \times 8.62 \times 0.60 \times \frac{2}{3} \times 0.60 = 1.34 \text{ tm}$$



$$K_2 = 25 \sqrt{\frac{150}{134}} = 24,6$$

$$cl = 18$$

$$K_3 = 0.765$$

$$f_e = \frac{0.755 \times 134}{25} = 4.05 \text{ cm}^2$$

Donatı 8 # 10

Heriki istikamette

73
58

DEĞİŞİKLİK

DEĞİŞİKLİK SEBEBİ

DEĞİŞİKLİĞE AİT
PROJEYİ YAPANIN

ADI VE SOYADI

ÜNVANI

ODA NO.

TARİH

İMZA

TRAFO BİNALARI KAPI,PENCERE
PANCUR,KABLO KANALI,TEL KAFES
KAPI V.S DETAY PLÂNLARI

ÖLÇEK:

NOLU
PLÂN İPTÂL EDİLDİ

NOLU
PLÂN İPTÂL EDİLDİ

PROJEYİ YAPAN

İMZA

İMZA
TARİHİ

YÜK.MÜH.
HÜSEYİN BODUR
OLA NO: 343

8.10.1973

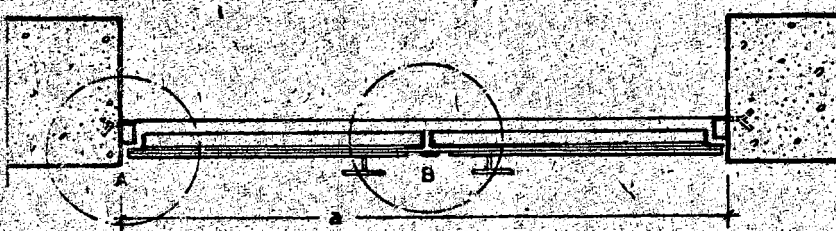
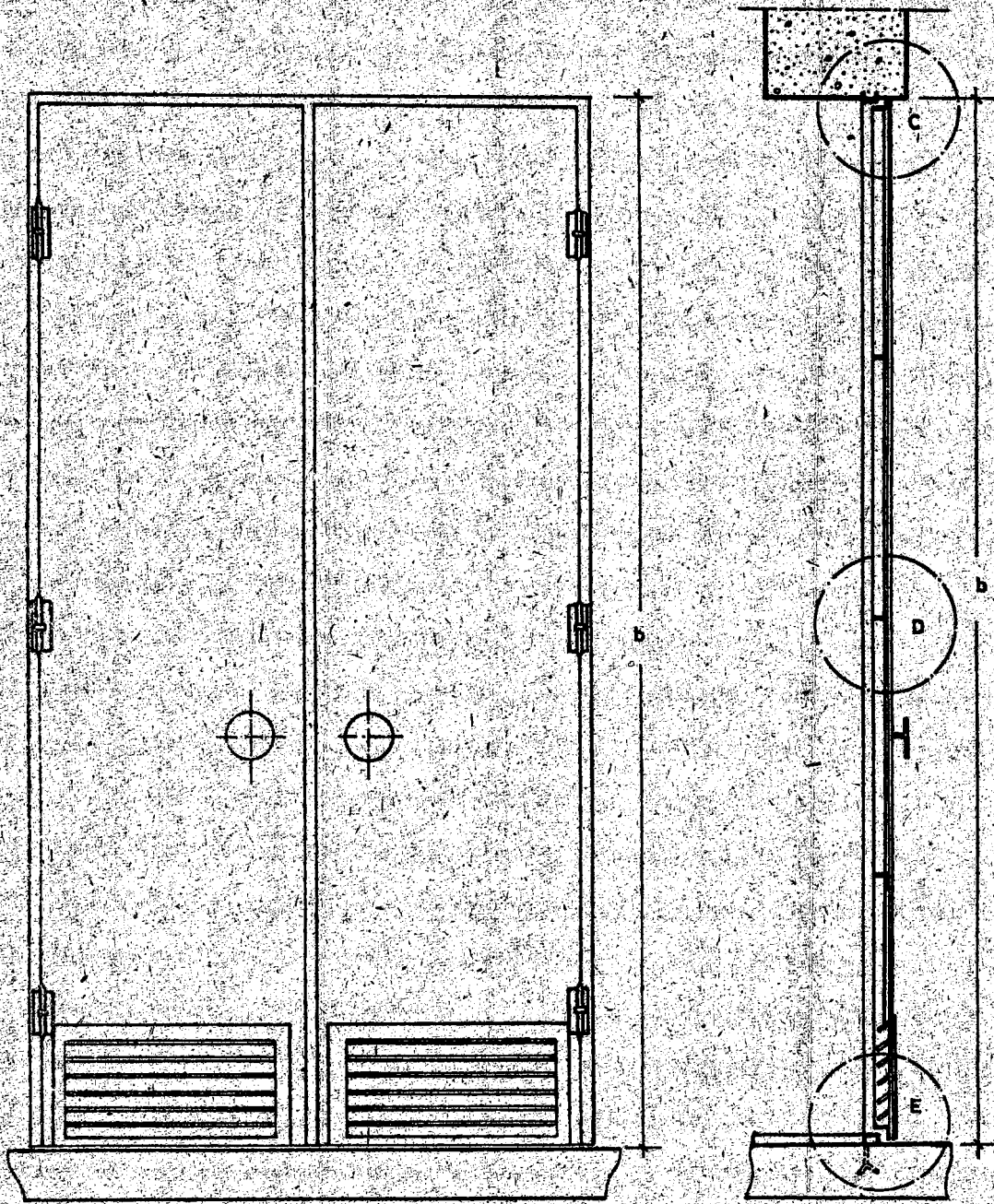
PLÂN NO:

1/60

ARŞİV KAYIT NO:

ÇİZEN: AKNUR ÇENİZ

C 10 m²

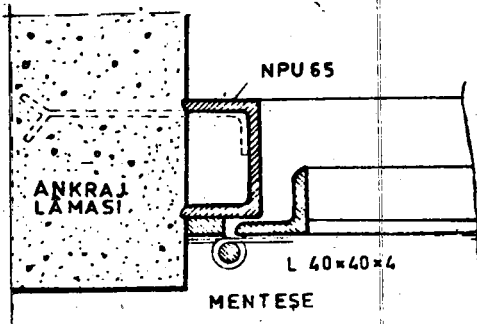


- SEBEKE TRAFO MERKEZLERİNDE VE TRAFO KAPISINDA
- SEBEKE TRAFOLARINDA VE GİRİŞ KAPISINDA
- TEVZİ MERKEZLERİNDE VE GİRİŞ KAPISINDA

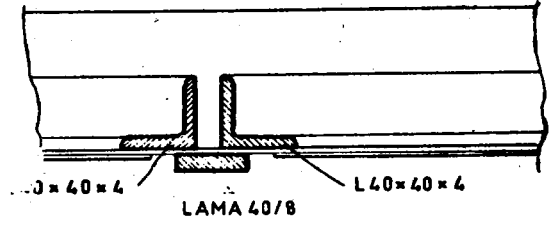
(a) cm.

(b) cm

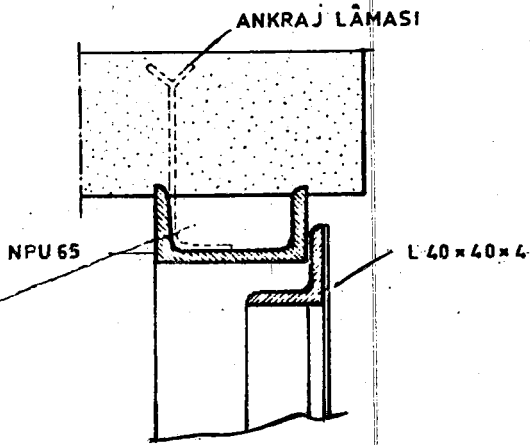
TRAFO KAPI PLÂNI
ÖLÇEK: 1/15



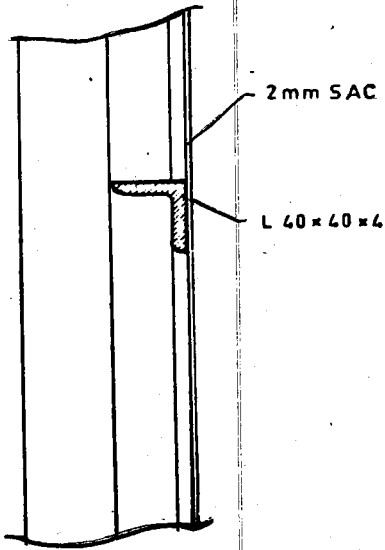
A DETAYI ÖLÇEK: 1/4



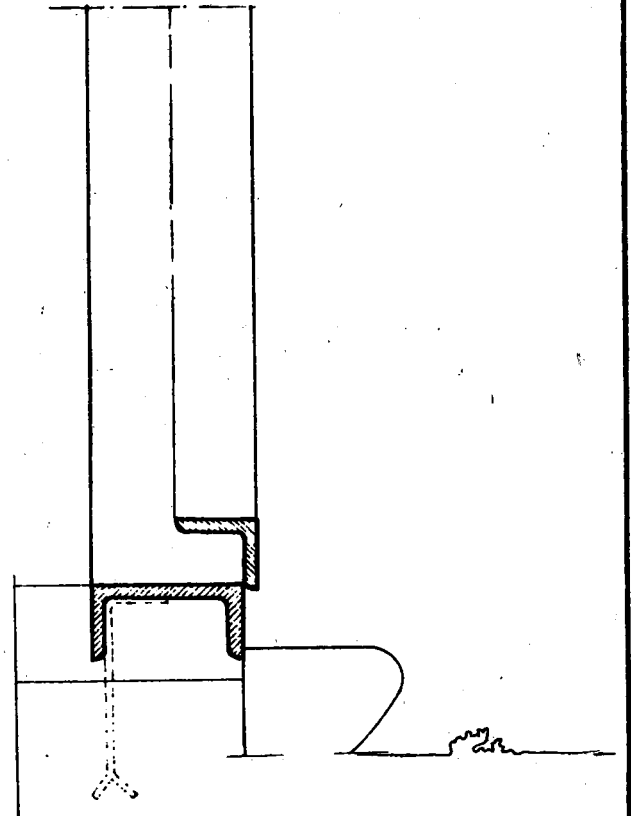
B DETAYI ÖLÇEK: 1/4



C DETAYI ÖLÇEK: 1/4

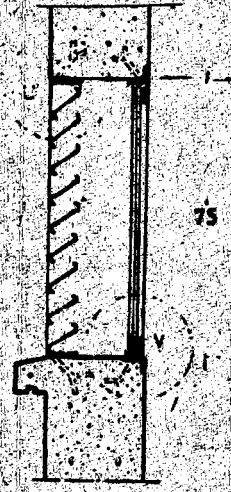
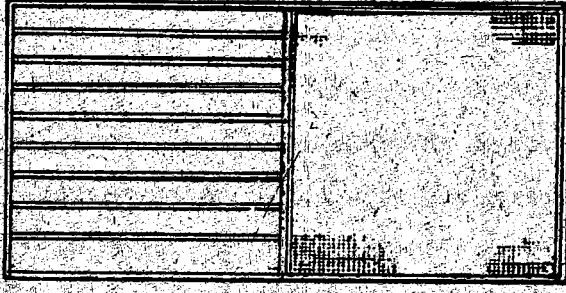


D DETAYI ÖLÇEK: 1/4



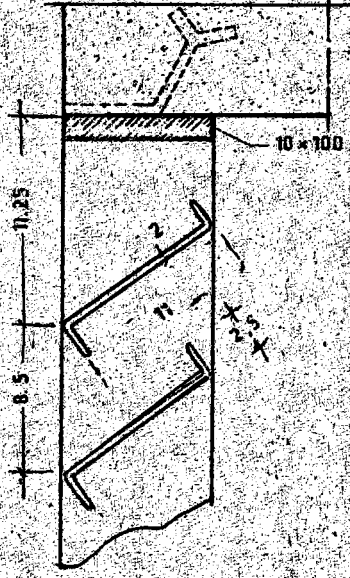
E DETAYI ÖLÇEK: 1/4

TRAFO KAPI DETAYLARI



150 x 75 TRAFO PENCERE TİPİ ÖLÇEK: 1/20

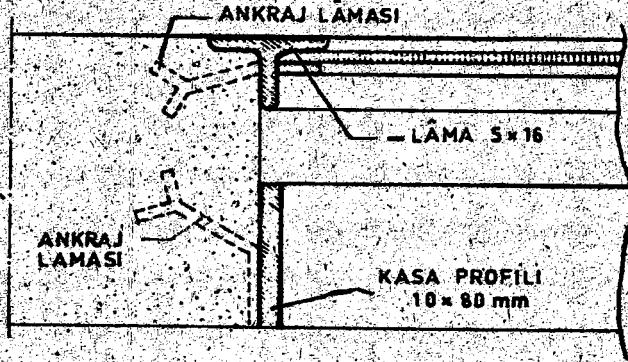
U DETAYI ÖLÇEK: 1/4



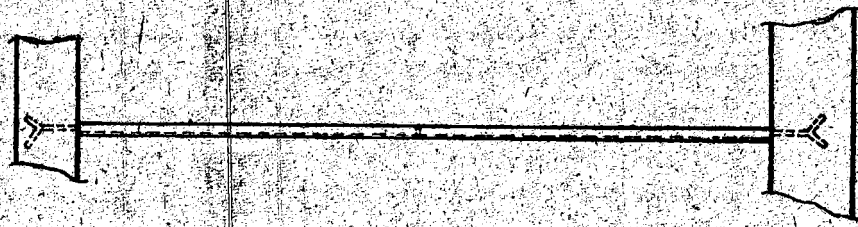
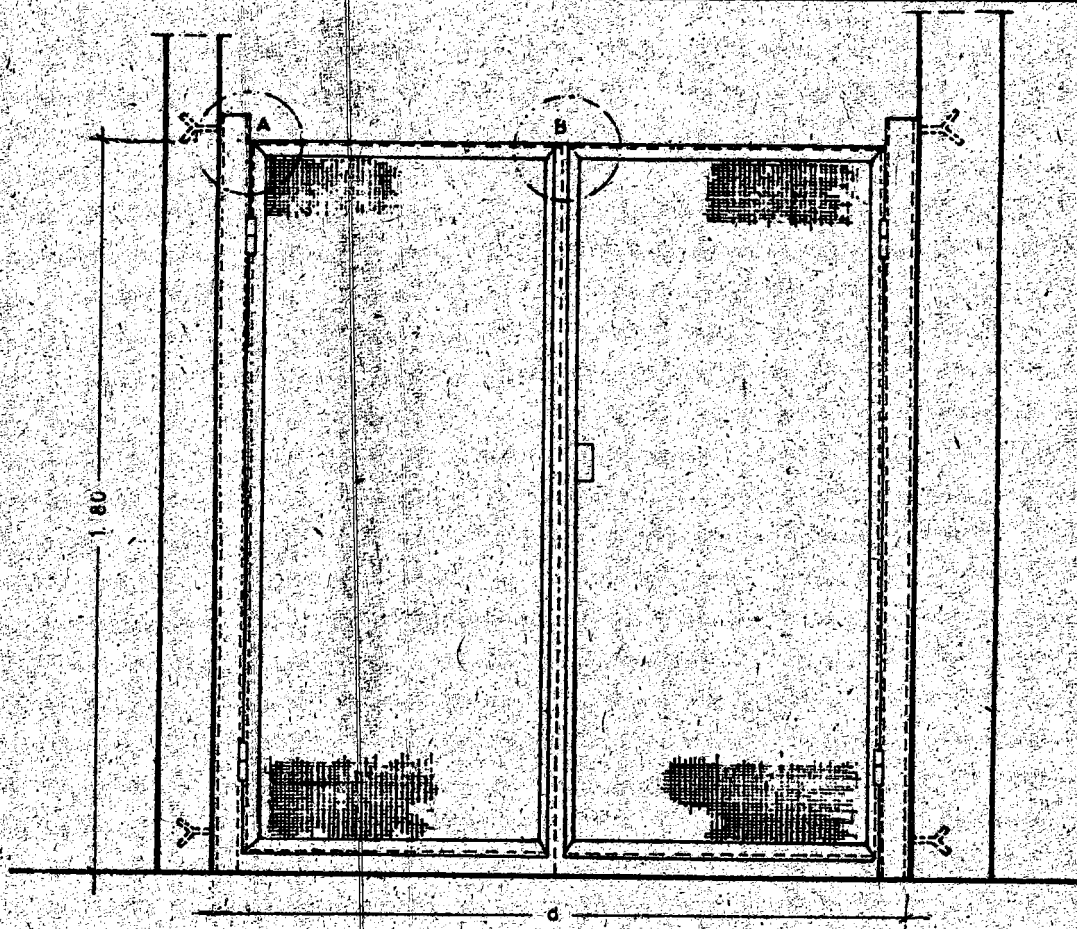
V DETAYI ÖLÇEK: 1/4



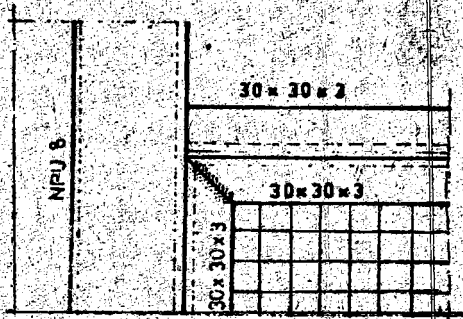
N DETAYI ÖLÇEK: 1/4



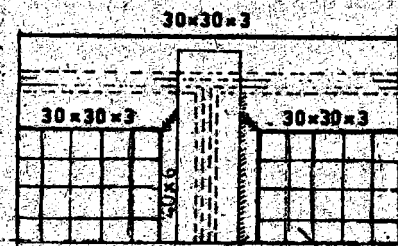
TRAFO PANCUR PLÂNI VE DETAYLARI



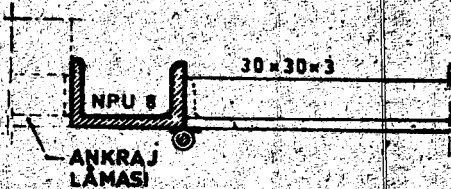
SEBEKE TRAFOLARINDA VE	30 KV LUK HÜCRELERDE	180 İLA 197
"	15 KV LUK	" 120 İLA 131
ANA TRAFÖ MERKEZLERİ VE	30 KV LUK	" cm.
"	15 KV LUK	" cm.



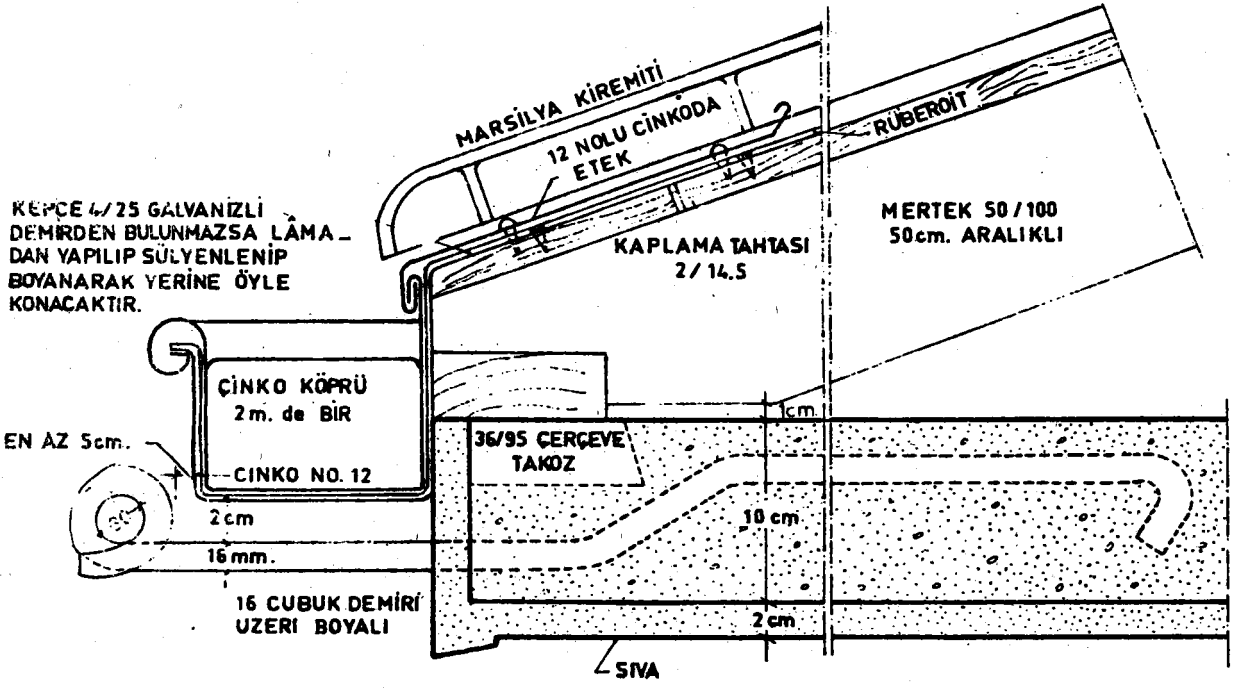
A DETAYI ÖLÇEK 1/5



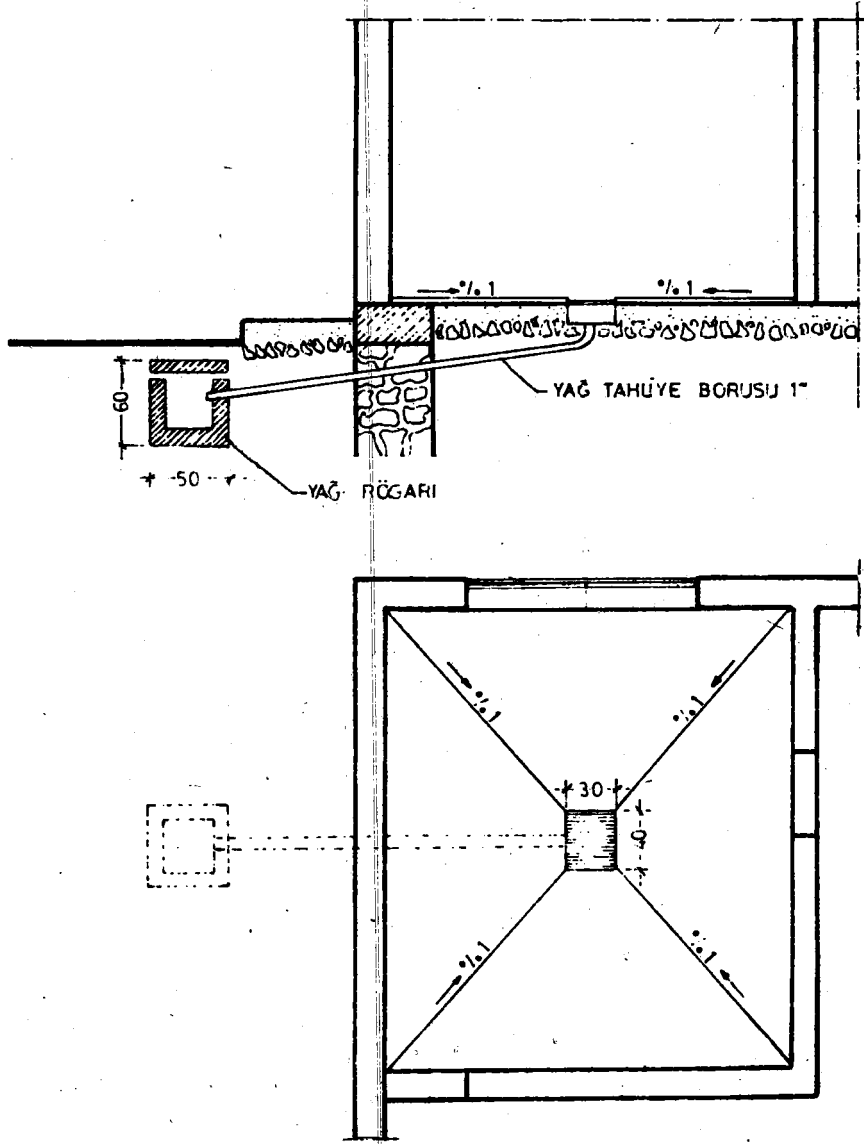
B DETAYI ÖLÇEK 1/5



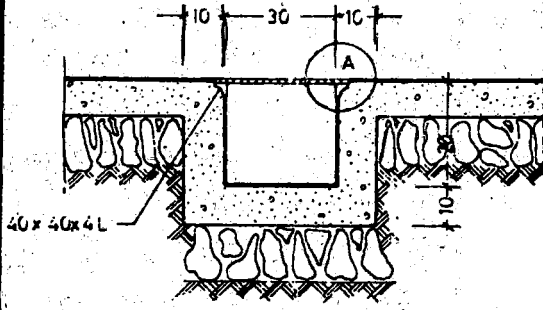
TEL KAFES KAPILARI VE DETAYLARI



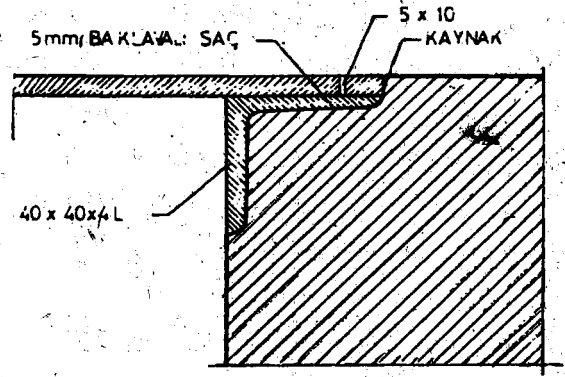
ÇATI DETAYI
ÖLÇEK: 1/4



TRAFO YAĞ ÇUKURU DETAYI
ÖLÇEK:1/50

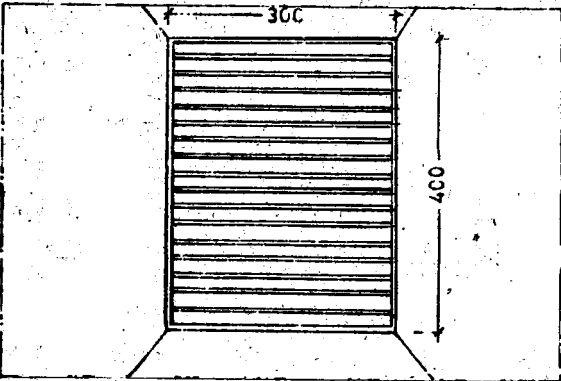
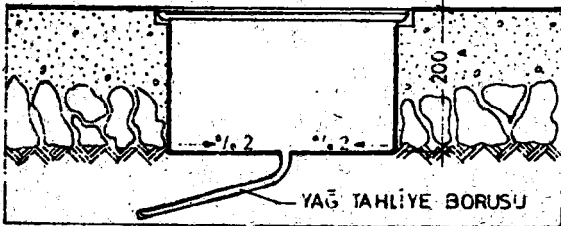


KABLO KANALI DETAYI

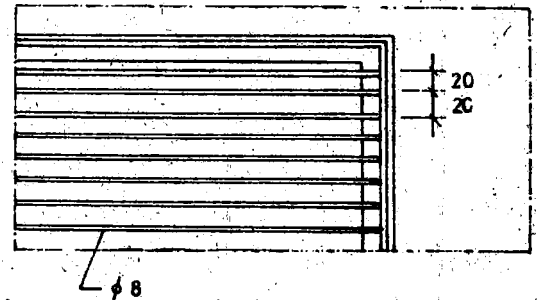
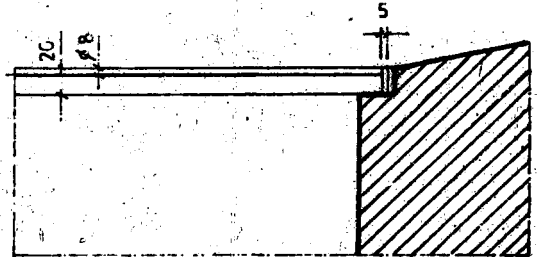


A DETAYI ÖLÇEK: 1/2,5

KABLO KANALI DETAYI



YAĞ ÇUKURU DETAYI ÖLÇEK: 1/10



IZGARA DETAYI ÖLÇEK: 1/5

YAĞ ÇUKURU DETAYI