

**RAPPORT D'ETUDE  
EN ANGLAIS**

*L. N. B. T. P.*

REPUBLIQUE TOGOLAISE  
Travail-Liberté-Patrie

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LABORATOIRE NATIONAL DU BATIMENT  
ET DES TRAVAUX PUBLICS

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**HOSPITABLE ACADEMIC CENTER  
OF LOME - TOKOIN**

**NEW CENTER  
EXTERNAL CONSULTATION**

**STUDY OF THE SOILS FOUNDATION**

## INTRODUCTION

To the asks Japanese AZUSA SEKKEI of the company and for the amount of this company, the National Laboratory of Building and some Public Works (LNBTP) of Lomé achieved the survey geotechnical of the soils of foundation of the buildings some New Center of External Conference to the CHU of Lomé-Tokoin.

The whole is a building to two levels (R+ 1). A reservoir of water will be constructed on the improved tile above of the staircase West side. The building will have a way occupied to the soil of about 5000 m<sup>2</sup>.

### ***FIRST PART : RECOGNITION OF THE SOILS FOUNDATION***

#### I/ GEOLOGICAL VIEW AND TOPOGRAPHY

The acknowledged lot is located in the formations clayey-sand of continental terminal (earth of rod) who evolves generally in depth toward some sandier formations, some metric veins of clays densely superconsolidated being susceptible of being met in depth.

#### II/ PROGRAM OF GEOTECHNICAL RECOGNITION

The number and the type of tests in situ was imposed by the customer.

So, he was wanted:

- 4 tests of dynamic penetration to 15 m of depth
- 4 polls by manual well to 2 m of depth with some of intact samples and remodeled for some tests in laboratories.

Amount held of the too big scattering obtained in the results of the tests of dynamic penetration, we achieved a fifth test of penetration in order to assure of the heterogeneity of the results. A plan of implantation of all these tests thus that their result under shape of cuts of poll and of penetrogram is given in annexes of present relationship.

#### III/ RESULTS OF THE TESTS

##### III/ 1- Results of the tests in-situ

##### III/ 1-1 Tests of dynamic penetration

The five tests of dynamic done penetration indicate some resistors dim on the first meters outside of the test PD3 who indicates some improved resistors to 5 MPa on all its height and same practically improved to 10 MPa starting from two meters of depth.

The tests PD1 and PD2 indicate some securities understood between 1,5 and 5 MPa until 8 m of depth while the tests PD4 and PD5 give some securities understood between 1,00 and 5 MPa until 4 m of depth. The refusal to the dynamic penetration is obtained to 8 m, 10 m and 11 m respectively for the tests PD5, PD3 and PD4.

The tests PD1 and PD2 are descended to 15 m of depth. However starting from 9 m of depth their resistors grow progressively and stay included between 10 MPa and 30 MPa.

### III/ 1-2 Poll to the auger to hand and manual well and tests of identification

The manual wells were prolonged starting from 2 m by the auger to hand. So the polls was descended between 3 and 5,50 m of depth.

The different identifications make clayey sand or sandy clay on the materials which the appellation covers in makes some soils to the very neighboring features thus that shows it the blackboard hereafter.

Sounding Number	Depth	Nature	W%	% < 1 mm	% < 80 $\mu$	L.L	IP	$\gamma_d$ OPM	W% OPM
P1	4,50	sandy red Clay	15	98	43	29	14	1,97	10,4
P2	4,50	sandy red Clay	14	98	45	32	15	1,97	9,30
P3	2,00	clayey red Sand	16	98	32	27	12	1,96	9,70
P4	3,00	clayey red Sand	14	98	37	28	14	2,01	8,80

He was about some clayey sands to sandy clays little plastics having less 1% of superior elements to 2 mm and of 32% to 45% some inferior elements to 80 microns. The limit of liquidity (L.L.) is included between 27 and 32 with the indication of plasticity (IP) variable of 12 to 15.

One will note finally that the cover of plant earth to carry away varies according to the points of poll between 0 and 25 cm of thickness.

### III/ 1-2 Result of the tests on intact samples

Some intact samples made the object of direct shearings to the box of Casagrande and of compressibility to the odometer. The intrinsic features are the following.

Sounding Number	Cu	$\phi_{11}$	$e_0$	$\sigma'_c$	Cc	$\gamma_s$
P1	0,1	16	0,605	0,95	0,163	2,70
P2	0,12	14	0,6200	0,85	0,16	2,70
P3	0,25	21	0,6295	1,00	0,16	2,72
P4	0,18	18	0,6200	0,70	0,142	2,72

## SECOND PART : STUDY OF FOUNDATION

### I/ COUNT OF THE ADMISSIBLE CONSTRAINTS SINCE SOME TESTS IN-SITU

The admissible valued constraint since some results of the tests of dynamic penetration are data by the formula

$$\sigma_a = \frac{R_d}{F_s} \quad \text{with}$$

$\sigma_a$  = admissible Constraint in bars or MPa

$R_d$  = dynamic Resistor of dawns in bars or MPa

$F_s$  = Coefficient of security took in equal general to 20.

In the case of site destined to the construction some new center of external conference to the CHU of Lomé-Tokoin, the admissible constraints obtained to different depths is summarized in the blackboard hereunder.

Depth (meters)	Admissible Constraint in bars					Observation
	PD1	PD2	PD3	PD4	PD5	
1,00	0,75	1,00	4,85	1,25	0,50	$\sigma_a = \frac{R_d}{F_s}$  $F_s = 20$
2,00	1,00	1,00	5,1	1,50	0,75	
3,00	1,25	1,25	14,15	1,8	1,25	
4,00	1,5	1,25	8,55	5,75	10,25	

### II/ COUNT ADMISSIBLE CONSTRAINT SINCE THE TESTS OF LABORATORY

Since some tests of laboratory and more specially some tests of direct shearing, a determination of the admissible constraint could be made.

The used formula is the following:

$$\sigma_a = \gamma h D + \frac{\rho \gamma h N \gamma + \gamma h D (N_q - 1) + 1,3 C N_c}{3}$$

with  $r = \frac{B}{2(1 + \frac{B}{L})}$  middle radius of the sole: relationship of the surface to the perimeter of the fondation for an oblong sole of L length and of L length and of L width B.

$\gamma_h =$  humid density = 1,80

D = depth of anchorage of the sole

c = cohesion of soil = 0,12

$\phi = 14^\circ$   $N_\gamma, N_q, N_c = f(Q)$ : dependent term of the angle of abrasion of soil:

$F_s =$  coefficient of security took in equal general to 3.

So we have:

r = 0,25 m for	B = L = 1,00 m
r = 0,27 m for	B = 0,80 m L = 1,60 m
r = 0,28 m for	B = 0,85 L = 1,70 m
r = 0,33 m for	B = L = 1,30 m
r = 0,28 m for	B = L = 1,10 m
r = 0,37 m for	B = L = 1,50 m
r = 0,41 m for	B = L = 1,65 m
r = 0,45 m for	B = L = 1,80 m
r = 0,50 m for	B = L = 2,00 m

For an anchorage  $dD = 2,00$  m of depth, and for some extreme securities of ( $r = 0,25$  and  $r = 0,5$ ), the admissible constraints are neighbors:

$$D = 2,00 \text{ m and } r = 0,25 \quad \Rightarrow \sigma_a = 1,24 \text{ bars}$$

$$D = 2,00 \text{ m and } r = 0,5 \quad \Rightarrow \sigma_a = 1,27 \text{ bars}$$

These securities are near of the admissible calculated constraint since some results of the tests penetration system found in PD1, PD2, PD5 to 3 meters of depth ( $\sigma_a = 1,25$ ).

According to the news of client, the constraint transmitted by the work to each some soles would be of the command 1 bars, therefore inferior to the admissible constraint of soil who is 1,2 bars starting from 2 meters of depth.

In these conditions, one will admit some soles of:

$$S1 = 1,00 \text{ m} \times 1,00 \text{ m}$$

$$S2 = 0,80 \text{ m} \times 1,60 \text{ m}$$

$$S3 = 0,85 \text{ m} \times 1,70 \text{ m}$$

$$S4 = 1,10 \text{ m} \times 1,10 \text{ m}$$

$$S5 = 1,50 \text{ m} \times 1,50 \text{ m}$$

$$S6 = 1,65 \text{ m} \times 1,65 \text{ m}$$

$$S7 = 1,80 \text{ m} \times 1,80 \text{ m}$$

$$S8 = 2,00 \text{ m} \times 2,00 \text{ m}$$

anchored between 1,50 and 2,00 meters of depth with regard to the natural lot and solliciting the soil under a constraint 1,2 bars.

On the other hand one will also keep some continuous soles under walling; they could be descended 1,5 m of depth for a constraint 1,1 bars this who duct to a width 1,1 m.

### III/ VALUING OF THE SETTLEMENTS

The calculated settlements since some results oedometrical and in taking in counts the measurements of the soles suggested to knowledge:

S1 =	1,00 m x 1,00 m
S2 =	0,80 m x 1,60 m
S3 =	0,85 m x 1,70 m
S4 =	1,10 m x 1,10 m
S5 =	1,50 m x 1,50 m
S6 =	1,65 m x 1,65 m
S7 =	1,80 m x 1,80 m
S8 =	2,00 m x 2,00 m

are of the command 1,6 cm and 1,25 cm is a differential settling 0,35 cm; are 22% to the maximum of global tassement: this who is admissible.

It is necessary to specify that during of the recognition geotechnical in the second fifteen of month of July 1997, he was not met of tablecloth water table in the polls. The tests have however executed right summer in end of season of the rains.

Indeed the existence of a possible underground tablecloth who would go up again until in the level of the soils of foundation would modify more or minus the amplitude of the valued settlements.

The studied soils having a dim cohesion risks putting a problem when the buildings is constructed near the pockets of water (important moat of sanitation, important looks and sumps of big measurements).

Of same the shocks like the vibrations are susceptible of entailing some settlements provoking an of it reduction of the indications of the emptiness in the soils slack (that lost cohesion) or little cohesive.

### CONCLUSION

The presents survey geotechnical of site some new center of conference to the CHU of Lomé-Tokoin allowed to put clayey sand to sandy clay of very dim resistors on the first 4 meters in evidence of the soils of nature.

The results of the tests of laboratory confirmed it by the securities of the indications of dim plasticity characterizing thus some soils little plastic.

One will be able to to find on superficial freestanding soles descended between 1,5 and 2,00 meters of depth. The admissible constraint would be then 1,2 bars or again on some falling soles 1,1 m of width anchored to 1,5 m of depth and soliciting the soil under 1,1 bars.

Amount held of the dim cohesion of soil, the settlements are relatively dim and the differential settling is of the command of 22% of global tassement.

However if the vertical loads to take came to be elevated, it would be necessary to make a new squaring of greatly tighter tests. The distance between the tests done in the angles of building passes the 50 meters.

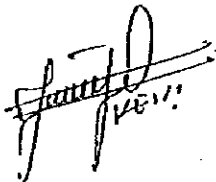
Indeed a new squaring of tests appears us important. This would allow us to cover all the surface of building and of keeping a constraint admissible function of the test of nearest penetration.

The findingses of present relationship are datas under reserve of the remarks and important observations hereafter.

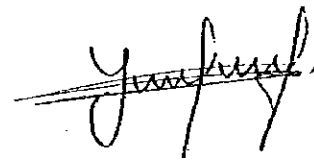
Lomé, August 13 1997

The Loaded of the survey,

The Chief Technical Services,

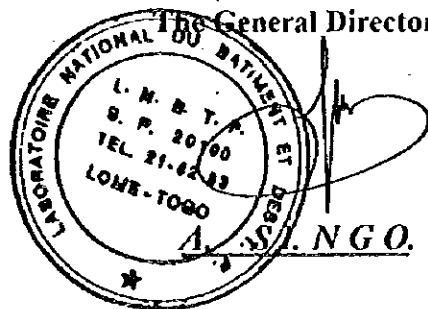


K. KETOGLO.



Y. ATIVON.

The General Director,



A. NGO.

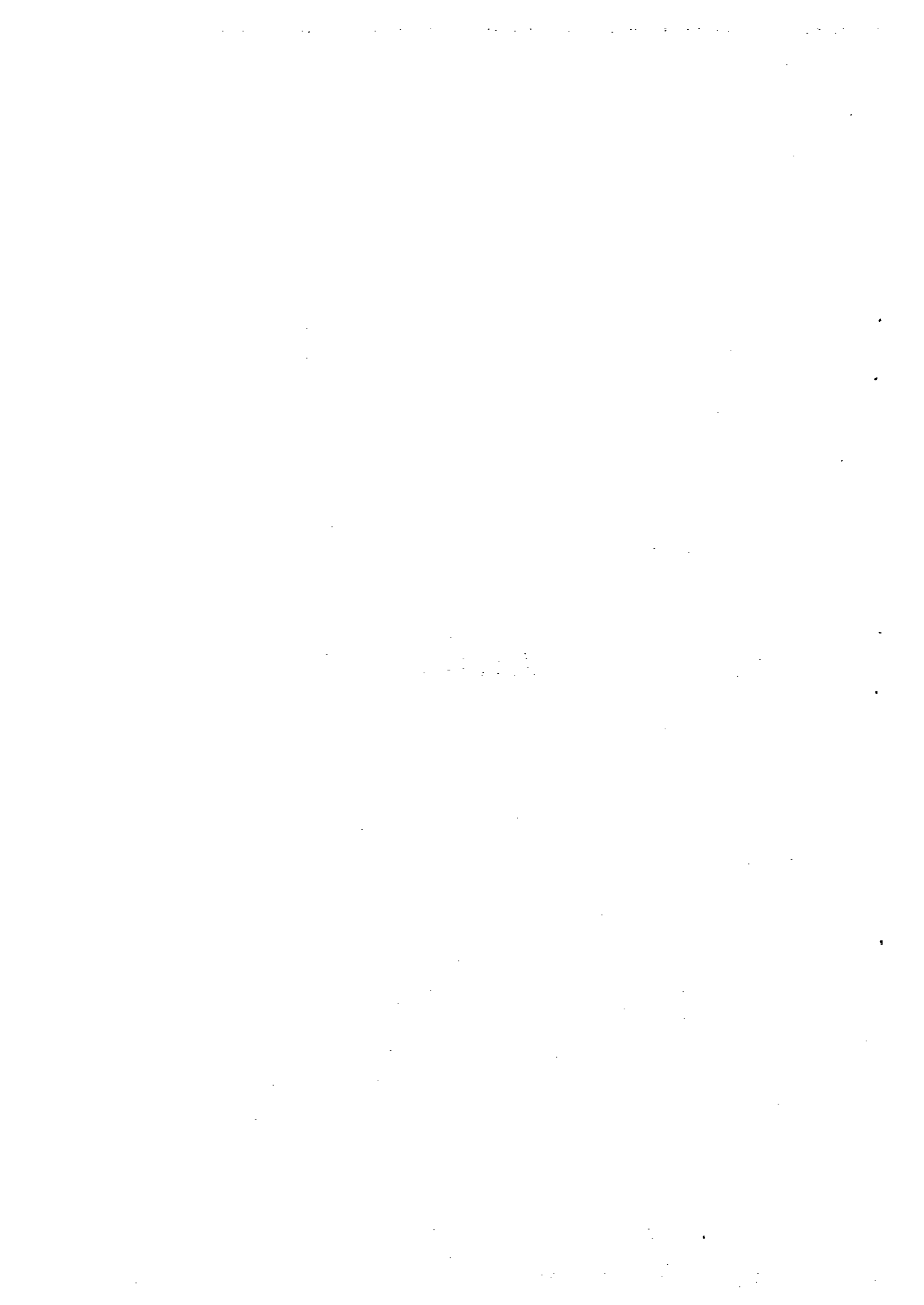


**W%** = **Content in water**

**IP** = **Indication of plasticity**

**LL** = **Limit of liquidity**

# ANNEXES

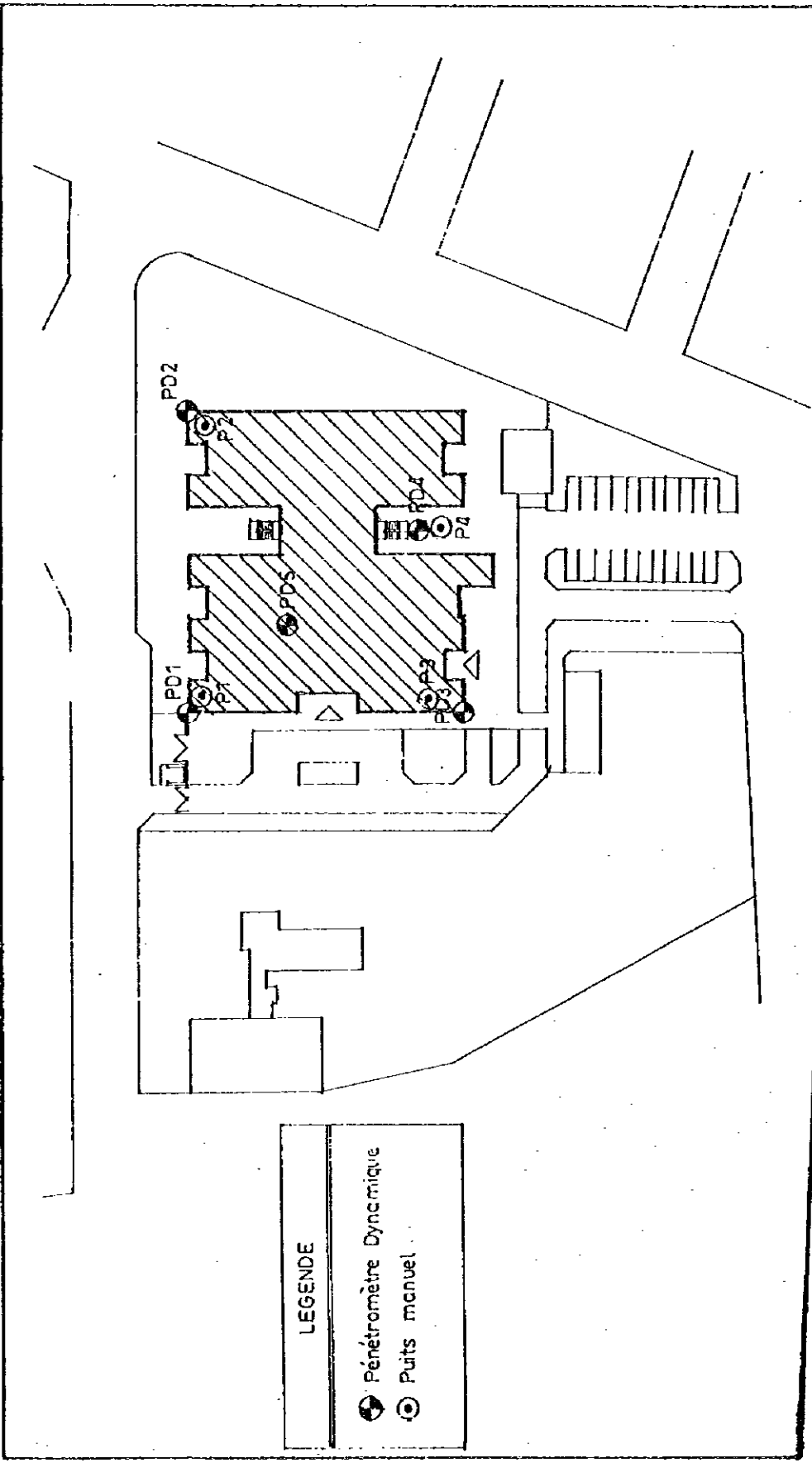


# APPENDICES

L N B T P - L O M E

CONSTRUCTION D'UN NOUVEAU CENTRE DE  
CONSULTATION EXTERNE AU C H U DE L O M E

PLAN D'IMPLANTATION DES ESSAIS DE  
PENETRATION DYNAMIQUE



LEGENDE

- Pénétrètre Dynamique
- ⊗ Puits manuel

SONDAGE



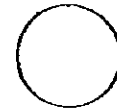
Type de sondage : Puits manuel • Tarière à main Côte du terrain naturel : Niveau de la nappe : Description du site :	N° P1
---	-------

COTE	Profond. en m	DESCRIPTION DES SOLS	Echan- tillons	W%	Classifi- cation U.S.C.S. L.P.C.	OBSERVATIONS
0.00						
0.20		Terre végétale				
		Argile sableuse	EI	15		
			ER			
5.00						

- EI Echantillon intact paraffiné
- ER Echantillon remanié en sac plastique
- W Echantillon en bocal pour teneur en eau
- W% Teneur en eau naturelle

L.N. B.T.P. BP 20100  
 LOME

SONDAGE



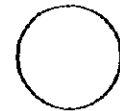
Type de sondage : Puits manuel + tarière à main Côte du terrain naturel : Niveau de la nappe : Description du site : Présence de végétation	N° P2
--	-------

COTE	Profond. en m	DESCRIPTION DES SOLS	Echantillons	W%	Classification U.S.C.S L.P.C.	OBSERVATIONS
0.00						
0.30		Terre gévétale				
		Argite sableuse	EI	14		
			ER			
5.50						Refus à la tarière à main

- EI Echantillon intact paraffiné
- ER Echantillon remanié en sac plastique
- W Echantillon en bocal pour teneur en eau
- W% Teneur en eau naturelle

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 LOME

SONDAGE



Type de sondage Puits manuel - Tarière à main	N° P3
Côte du terrain naturel	
Niveau de la nappe	
Description du site	

COTE	Profond. en m	DESCRIPTION DES SOLS	Echan- tillons	W%	Classifi- cation U.S.C.S. L.P.C.	OBSERVATIONS
0.00						
0.20		Sable silteux				
		Sable argileux rouge	EI ER		16	
3.50						Refus à la tarière à main

EI Echantillon intact paraffiné

ER Echantillon remanié en sac plastique

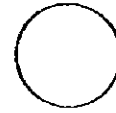
W Echantillon en bocal pour teneur en eau

W% Teneur en eau naturelle

L.N.B.T.P. BP 20100  
LOME



SONDAGE



Type de sondage Puits manuel • Tarière à main	N° P4
Côte du terrain naturel	
Niveau de la nappe	
Description du site	

COTE	Profond. en m	DESCRIPTION DES SOLS	Echantillons	W%	Classification U.S.C.S. L.P.C.	OBSERVATIONS
0.00						
0.25						
		Sable argileux rouge	E1  ER	14		
4.50						Refus à la tarière à main

- E1 Echantillon intact paraffiné
- ER Echantillon remanié en sac plastique
- W Echantillon en bocal pour teneur en eau
- W% Teneur en eau naturelle

L.N.B.T.P. BP 20100  
 LOME

**PENETROMETRE DYNAMIQUE**

SONDAGE N°

**PD1**

DOSSIER N° 97/F/19

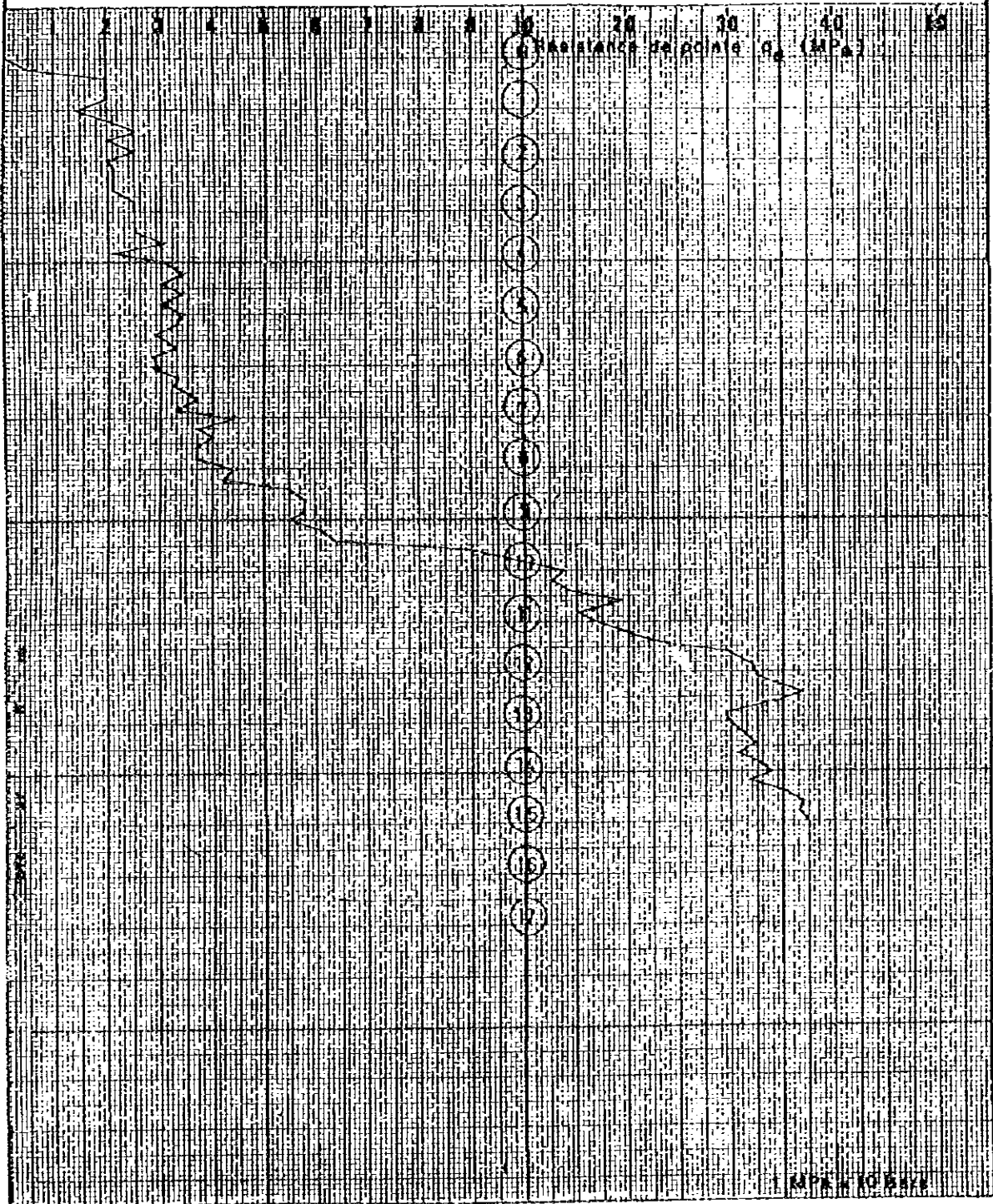
TYPE Borro

DATE 29/07/97

CHANTIER NOUVEAU CENTRE DE  
CONSULTATION EXTERNE AU  
CHU LOME - TOKOIN

SECTION DE LA POINTE EN  $cm^2$  20

COTE \_\_\_\_\_ NIVEAU DE L'EAU \_\_\_\_\_



**PENETROMETRE DYNAMIQUE**

SONDAGE N°

**PD2**

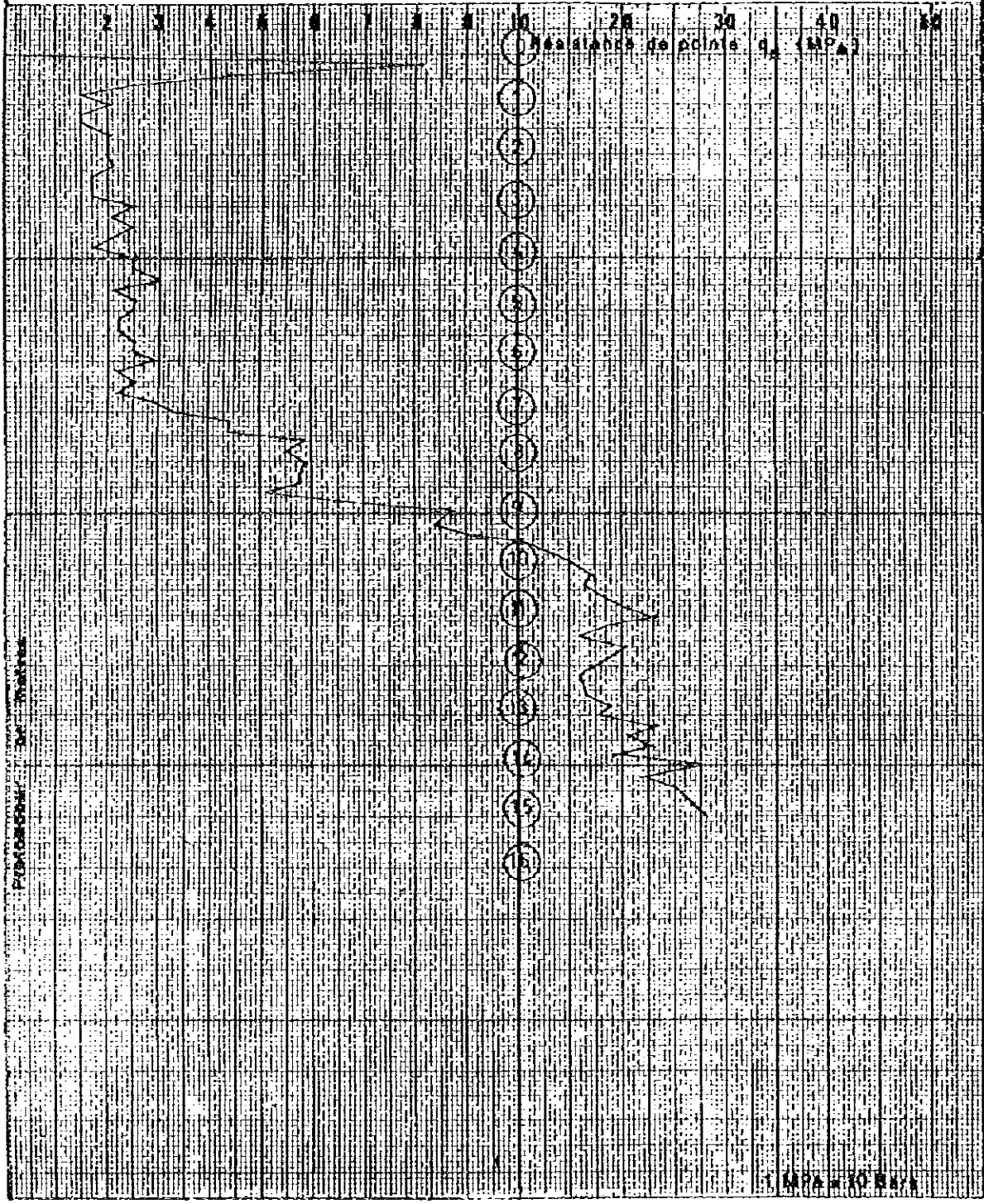
DOSSIER N° 97/F/19

TYPE Borro DATE 29/07/97

SECTION DE LA POINTE EN cm<sup>2</sup> 20

CHANTIER NOUVEAU CENTRE DE  
CONSULTATION EXTERNE AU  
CHU LOME-TOKOIN

COTE \_\_\_\_\_ NIVEAU DE L'EAU \_\_\_\_\_



**PENETROMETRE DYNAMIQUE**

SONDAGE N°

**PD3**

DOSSIER N° 97/F/19

TYPE Borro DATE 28/07/97

SECTION DE LA POINTE EN cm<sup>2</sup> 20

CHANTIER NOUVEAU CENTRE DE  
CONSULTATION EXTERNE AU  
CHU LOME - TOKOIN

COTE \_\_\_\_\_ NIVEAU DE L'EAU \_\_\_\_\_



**PENETROMETRE DYNAMIQUE**

SONDAGE N°

**PD4**

DOSSIER N° 97/F/19

TYPE Borro DATE 28/07/97

SECTION DE LA POINTE EN  $\text{cm}^2$  20

CHANTIER NOUVEAU CENTRE DE  
CONSULTATION EXTERNE AU  
CHU LOME-TOKON

COTE \_\_\_\_\_ NIVEAU DE L'EAU \_\_\_\_\_



**PENETROMETRE DYNAMIQUE**

SONDAGE N°

**PD5**

DOSSIER N° 97/F/19

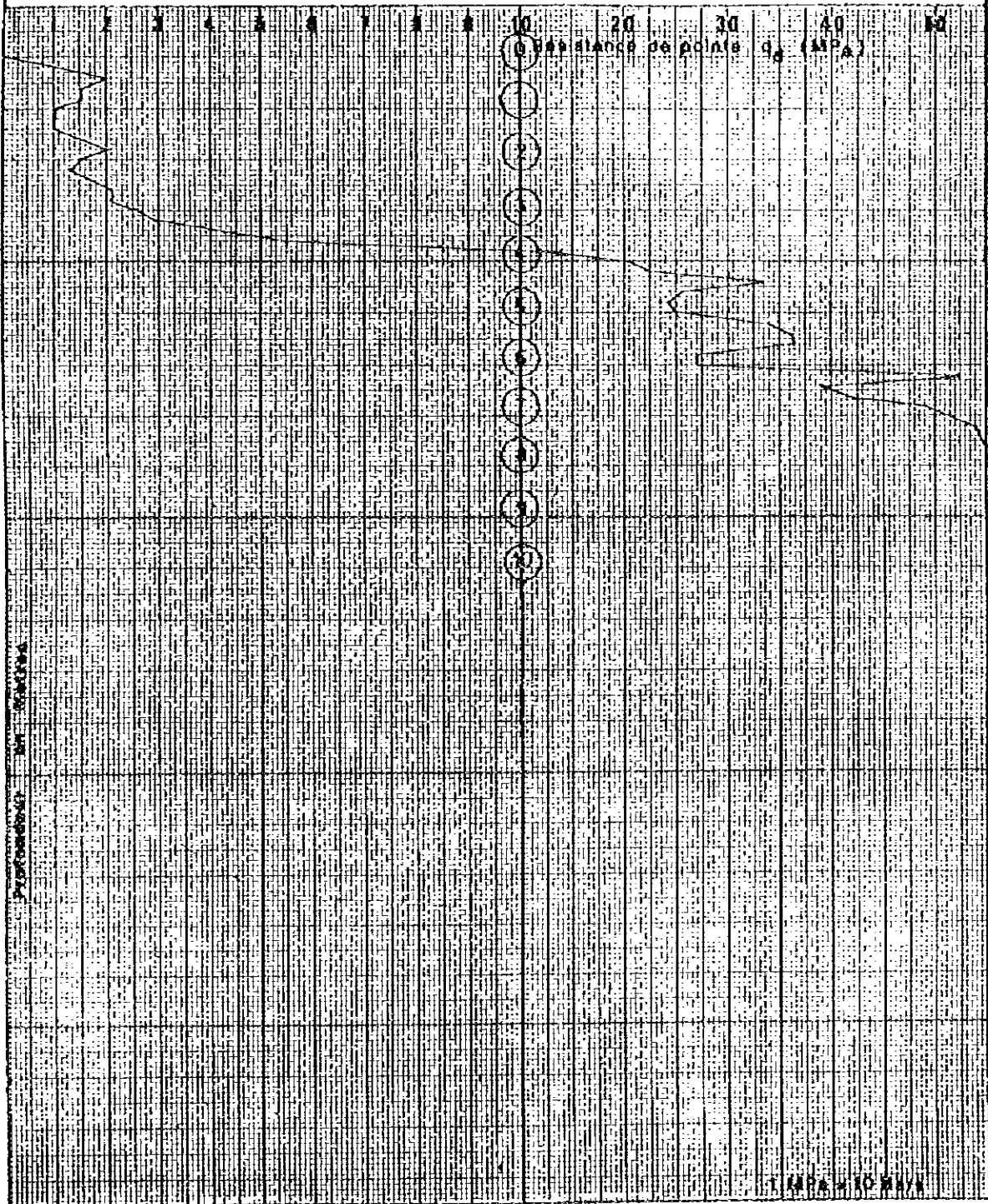
TYPE Borro DATE 31/07/97

SECTION DE LA POINTE EN cm<sup>2</sup> 20

CHANTIER NOUVEAU CENTRE DE  
CONSULTATION EXTERNE AU

COTE \_\_\_\_\_ NIVEAU DE L'EAU \_\_\_\_\_

CHU LOME-TOKOIN



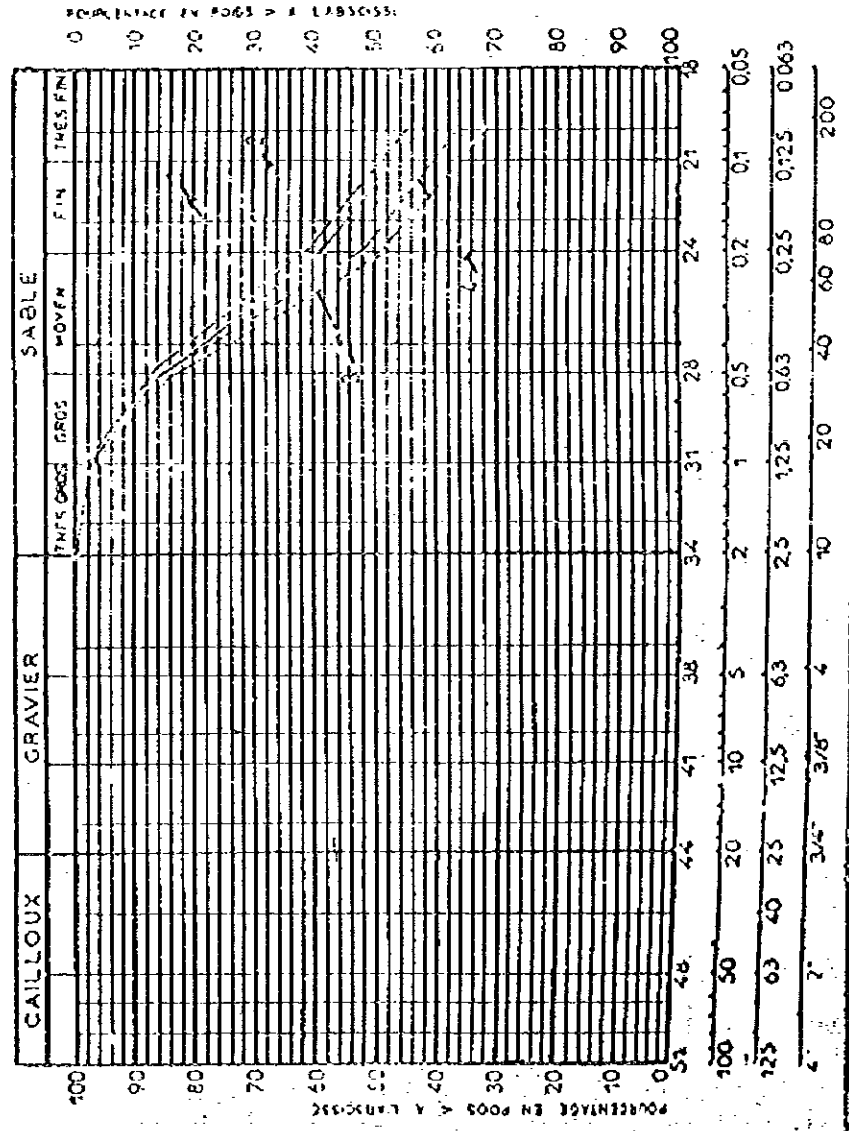
TRAVAUX : NOUVEAU CENTRE DE CONSTRUCTION D'EXTERIEUR  
AU CHU LOME - TOKOIN

LNBTP

Laboratoire National du  
Bâtiment et des TP

REPRESENTATION GRAPHIQUE	NUMEROS DES CHAMBRONS	PROFONDEURS DE PRELEVEMENT	LEUX DE PRELEVEMENT	DATES DE PRELEVEMENT	OBSERVATIONS
---	1	4.50	P 1	31/07/97	Argile sableuse Argile sableuse Sable argileux Sable argileux
---	2	4.40 m	P 2		
---	3	2.00 m	P 3		
---	4	3.00 m	P 4		

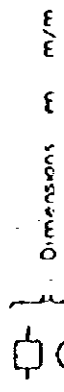
ANALYSES GRANULOMETRIQUES



LIMITES D'ATTERBERG  
EQUIVALENTS DE SABLE  
CLASSIFICATION H.R.B

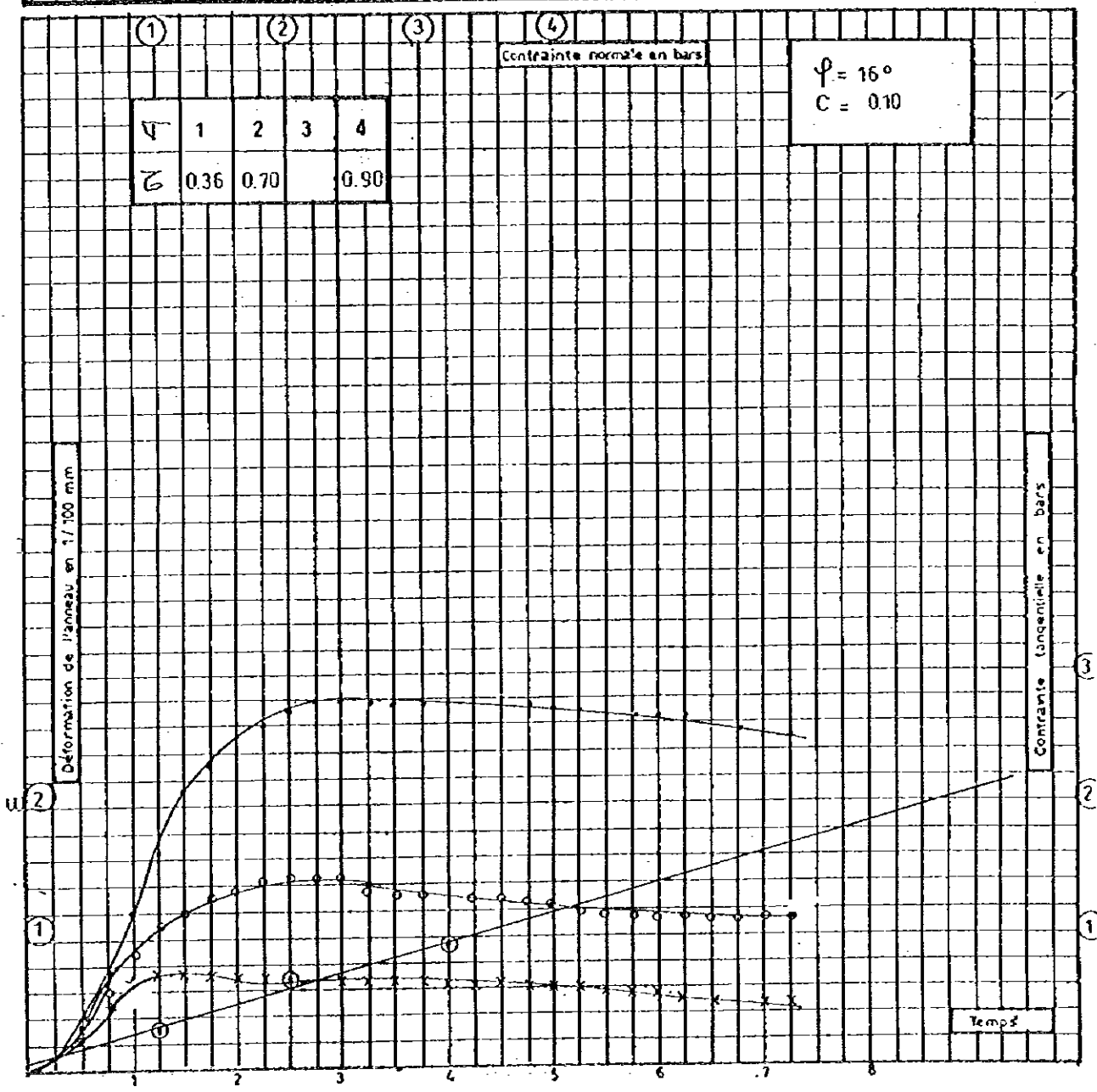
NR	Echantillon	P1	P2	P3	P4
LL.L.M	29	32	27	28	
LP.M	15	17	15	14	
IP	14	15	12	14	
E.S					
Groupe					
I.G.					

Module de la Série AFNOR



Designation des Tamis A.S.T.M

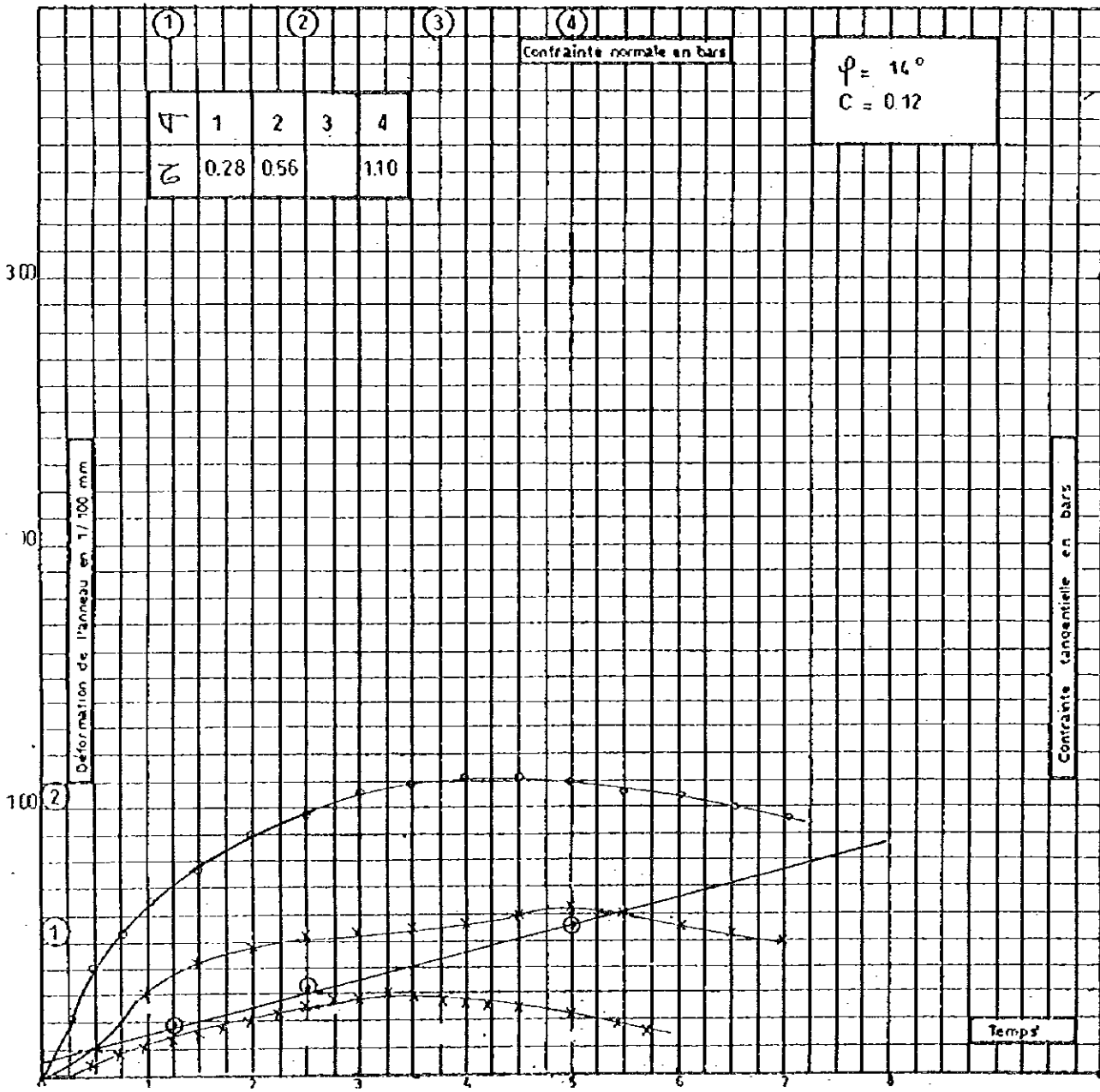
LNBT - LOME	<b>ESSAI DE CISAILLEMENT DIRECT</b>	Dossier N° _____															
Date <u>05/08/97</u>	UU ⊗      CU ○      CD ○	Echant. intact <u>Oui</u>															
Chantier <u>CHU-TOKOIN</u>	W { Initiale Finale γ { Initiale Finale	Echant. reconstitué <u>Non</u>															
Sondage N° <u>P 1</u>		Boîte <u>Ø 60</u>															
Profondeur <u>2.10/2.30 m</u>	<table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <tr><td>A</td><td>B</td><td>C</td></tr> <tr><td>11.46</td><td>11.90</td><td>11.73</td></tr> <tr><td>15.64</td><td>16.97</td><td>12.46</td></tr> <tr><td>1.64</td><td>1.62</td><td>1.78</td></tr> <tr><td>1.58</td><td>1.58</td><td>1.77</td></tr> </table>	A	B	C	11.46	11.90	11.73	15.64	16.97	12.46	1.64	1.62	1.78	1.58	1.58	1.77	Anneau <u>200 Kg</u>
A	B	C															
11.46	11.90	11.73															
15.64	16.97	12.46															
1.64	1.62	1.78															
1.58	1.58	1.77															
Nat. Echantillon _____ <u>Argile sableuse</u>	WL 29      WP 15      IP 14	Vitesse <u>1mm/mn</u>															



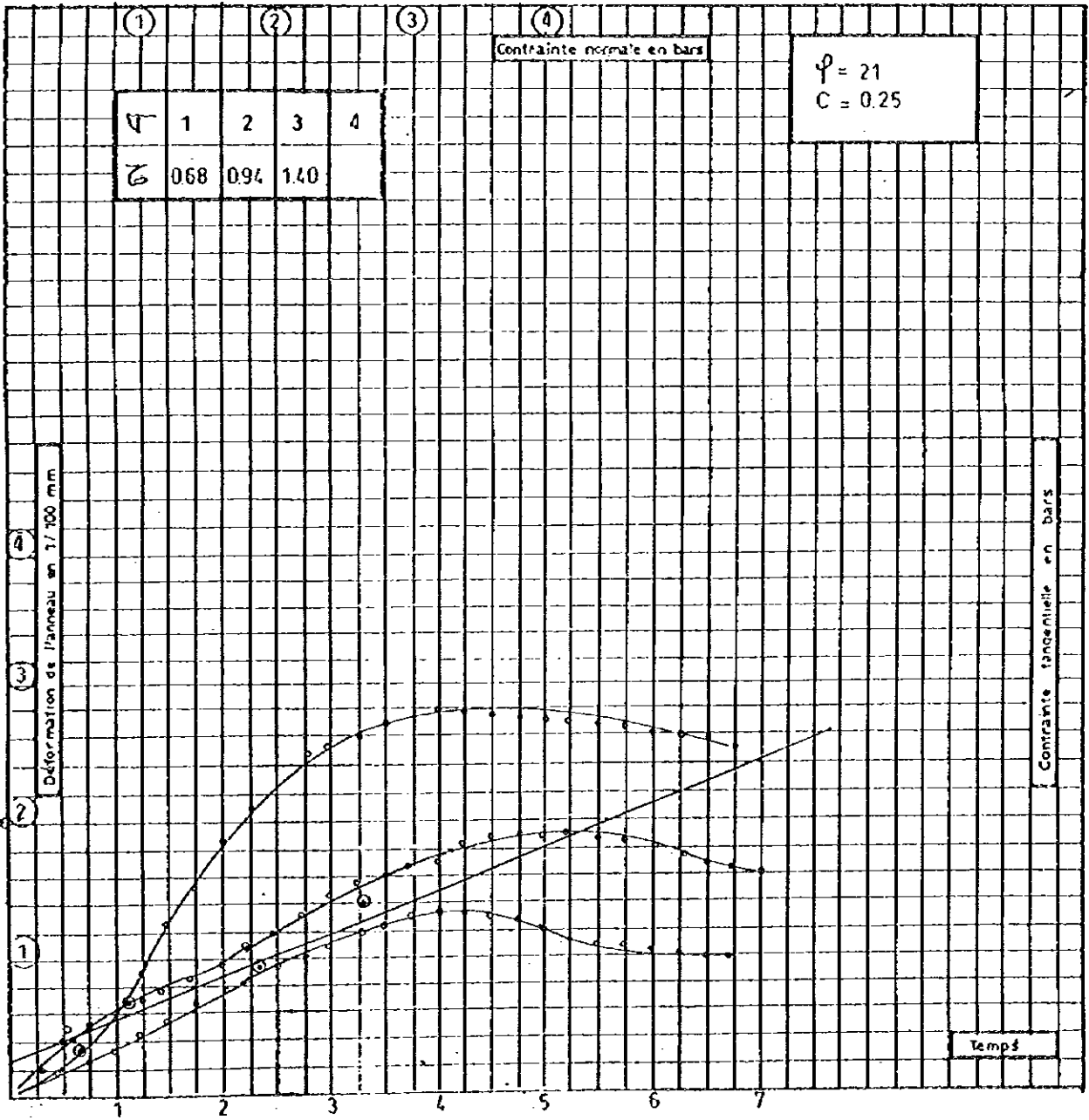


LNBT - LOME	<b>ESSAI DE CISAILLEMENT DIRECT</b>	Dossier N° _____
Date	03/08/97	UU ⊗      CU ○      CD ○
Chantier	CHU - TOKOIN	Echant. intact PEI 2
Sondage N°	P2	Echant. reconstitué _____
Profondeur	2.00/2.20 m	Boite Ø 60
Nat. Echantillon	Sable argileux rouge	Anneau _____
		Vitesse 1mm/mn
	WL 32      WP 17      IP 15	

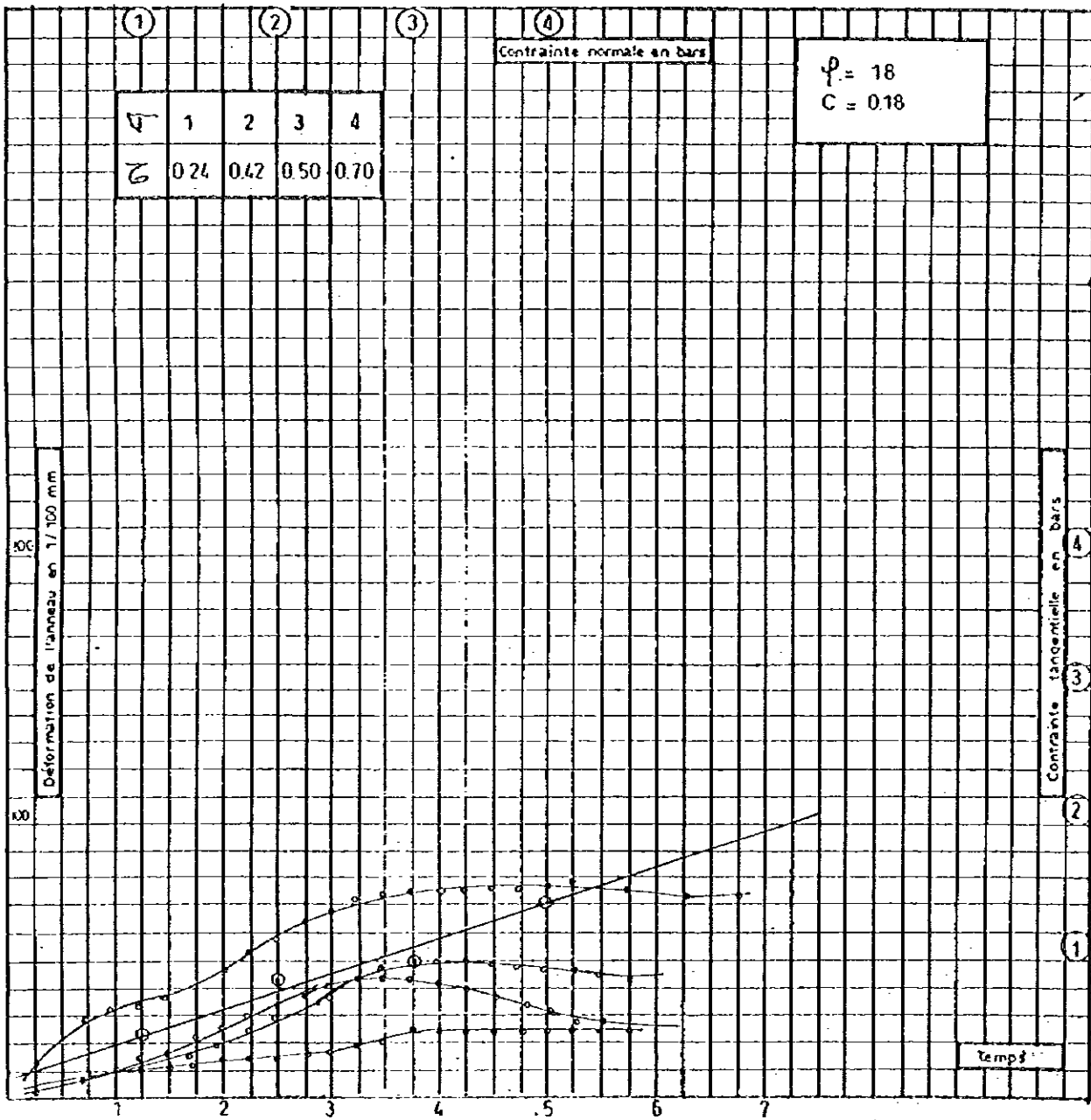
	A	B	C	
W {	Initiale	15.20	15.78	14.90
	Finale	18.00	18.75	17.00
γ {	Initiale	1.54	1.54	1.58
	Finale	1.50	1.50	1.55



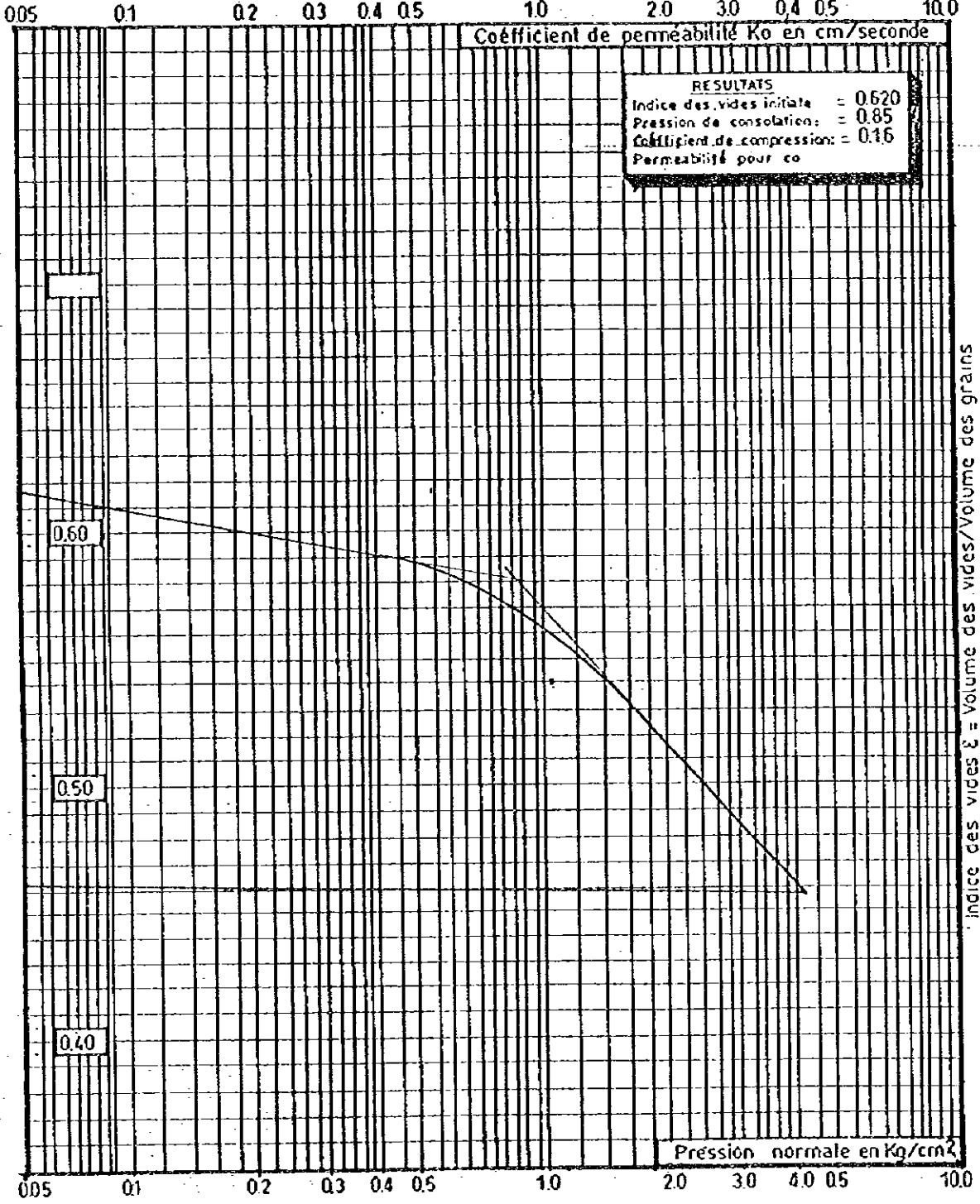
LNBTP - LOME	<b>ESSAI DE CISAILLEMENT DIRECT</b>	Dossier N° _____															
Date <u>03/08/97</u>	UU ○      CU ○      CD ○	Echant. intact <u>PE13</u>															
Chantier <u>CHU-TOKQIN</u>	$W$ { Initiale Finale $\delta$ { Initiale Finale	Echant. reconstitué _____															
Sondage N° <u>P 3</u>		Boîte <u>Ø 60</u>															
Profondeur <u>2.00/2.20 m</u>	<table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <tr><td>A</td><td>B</td><td>C</td></tr> <tr><td>14.75</td><td>13.90</td><td>15.20</td></tr> <tr><td>18.30</td><td>18.75</td><td>18.50</td></tr> <tr><td>1.70</td><td>1.74</td><td>1.70</td></tr> <tr><td>1.64</td><td>1.66</td><td>1.64</td></tr> </table>	A	B	C	14.75	13.90	15.20	18.30	18.75	18.50	1.70	1.74	1.70	1.64	1.66	1.64	Anneau <u>200 Kg</u>
A	B	C															
14.75	13.90	15.20															
18.30	18.75	18.50															
1.70	1.74	1.70															
1.64	1.66	1.64															
Nat. Echantillon _____ <u>Sable argileux</u>	WL 27      WP 15      IP 12	Vitesse <u>1mm/mn</u>															



LNBTP - LOME	<b>ESSAI DE CISAILLEMENT DIRECT</b>	Dossier N° _____																				
Date <u>02/08/97</u>	UU ○      CU ○      CD ○	Echant. intact <u>PEI 4</u>																				
Chantier <u>CHU-TOKOIN</u>	W { Initiale Finale X { Initiale Finale	Echant. reconstitué _____																				
Sondage N° <u>P4</u>		Boîte <u>Ø 60</u>																				
Prébndeur <u>2.00/2.20 m</u>	<table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <tr><td>A</td><td>B</td><td>C</td><td>D</td></tr> <tr><td>11.04</td><td>13.70</td><td>10.90</td><td>1.24</td></tr> <tr><td>16.90</td><td>17.70</td><td>16.90</td><td>1.74</td></tr> <tr><td>1.50</td><td>1.52</td><td>1.50</td><td>1.54</td></tr> <tr><td>1.42</td><td>1.46</td><td>1.42</td><td>1.47</td></tr> </table>	A	B	C	D	11.04	13.70	10.90	1.24	16.90	17.70	16.90	1.74	1.50	1.52	1.50	1.54	1.42	1.46	1.42	1.47	Anneau <u>200Kg</u>
A	B	C	D																			
11.04	13.70	10.90	1.24																			
16.90	17.70	16.90	1.74																			
1.50	1.52	1.50	1.54																			
1.42	1.46	1.42	1.47																			
Nat. Echantillon _____ <u>Sable argileux</u>	WL 28      WP 14      IP 14	Vitesse <u>1mm/mn</u>																				



L.N.B.T.P. - LOME	Dossier N° _____	Sondage : P 2
ESSAI DE COMPRESSIBILITE PERMEABILITE		Echantillon: Sable argileux (PEI 2)
		Profondeur : 2.00/2.20 m



L.N.B.T.P. - LOME

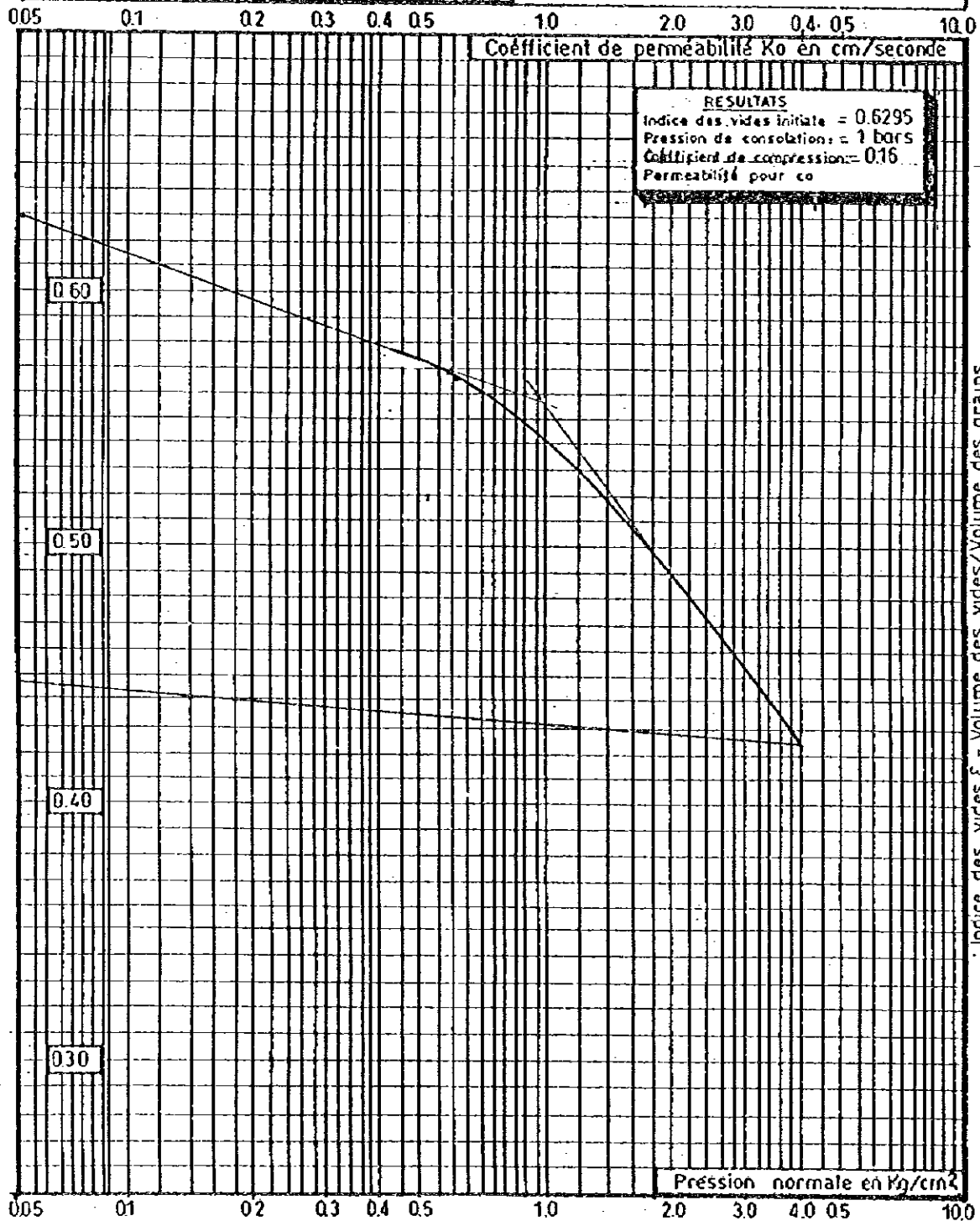
Dossier-N° \_\_\_\_\_

Sondage : P3

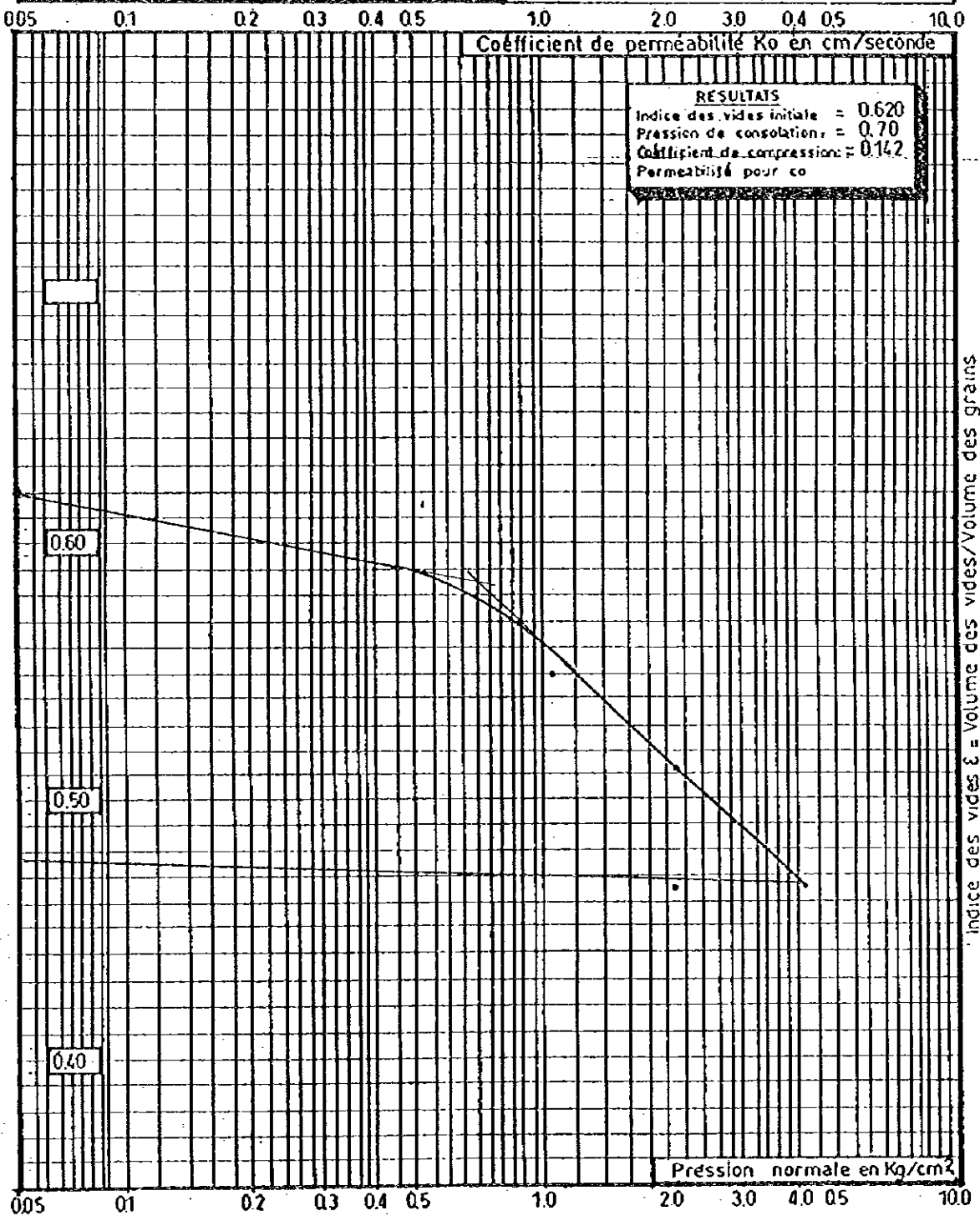
# ESSAI DE COMPRESSIBILITE PERMEABILITE

Echantillon: Sable argileux (PEI 3)

Profondeur : 2.00 / 2.20 m



L.N.B.T.P. - LOME	Dossier.N° _____	Sondage : P4
ESSAI DE COMPRESSIBILITE PERMEABILITE		Echantillon: Sable argileux (PE14)
		Profondeur : 2.00/2.20 m



**RESULTATS**  
 Indice des vides initiale = 0.620  
 Pression de consolidation = 0.70  
 Coefficient de compression = 0.142  
 Permeabilité pour  $e_0$

L.N.B.T.P - LOME

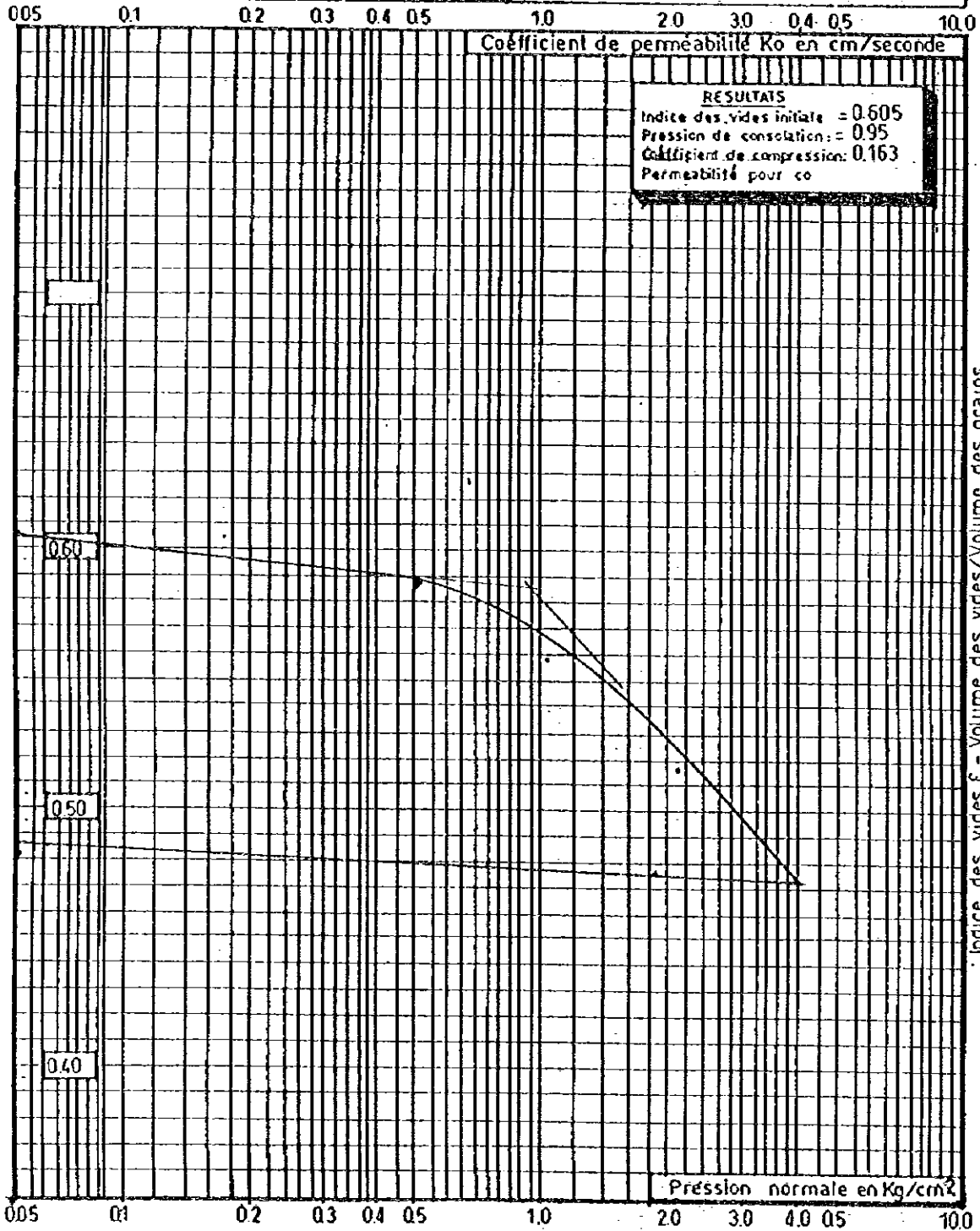
Dossier N°

Sondage : P1

# ESSAI DE COMPRESSIBILITE PERMEABILITE

Echantillon : Sable argileux (PE11)

Profondeur : 200/220 m



LABORATOIRE NATIONAL  
DU BATIMENT ET DES TRAVAUX PUBLICS  
L.N.B.T.P. B.P. 20100 TEL. 25-62-83

TRAVAUX NOUVEAU CENTRE DE CONSULTATION EXTERNE  
AU CHU LOME-TOKON  
P1-4.50 m Argile sableuse

DOSSIER: 97/F/19

UBL TO ISE  
Travailleur-Partie

# ESSAI C.B.R.

COMPACTAGE EN 5 COUCHES AVEC DAME DE 4.500 Kg  
SURCHARGE D'IMBIBITION ET DE PENETRATION

Laboratoire

# ESSAI PROCTOR

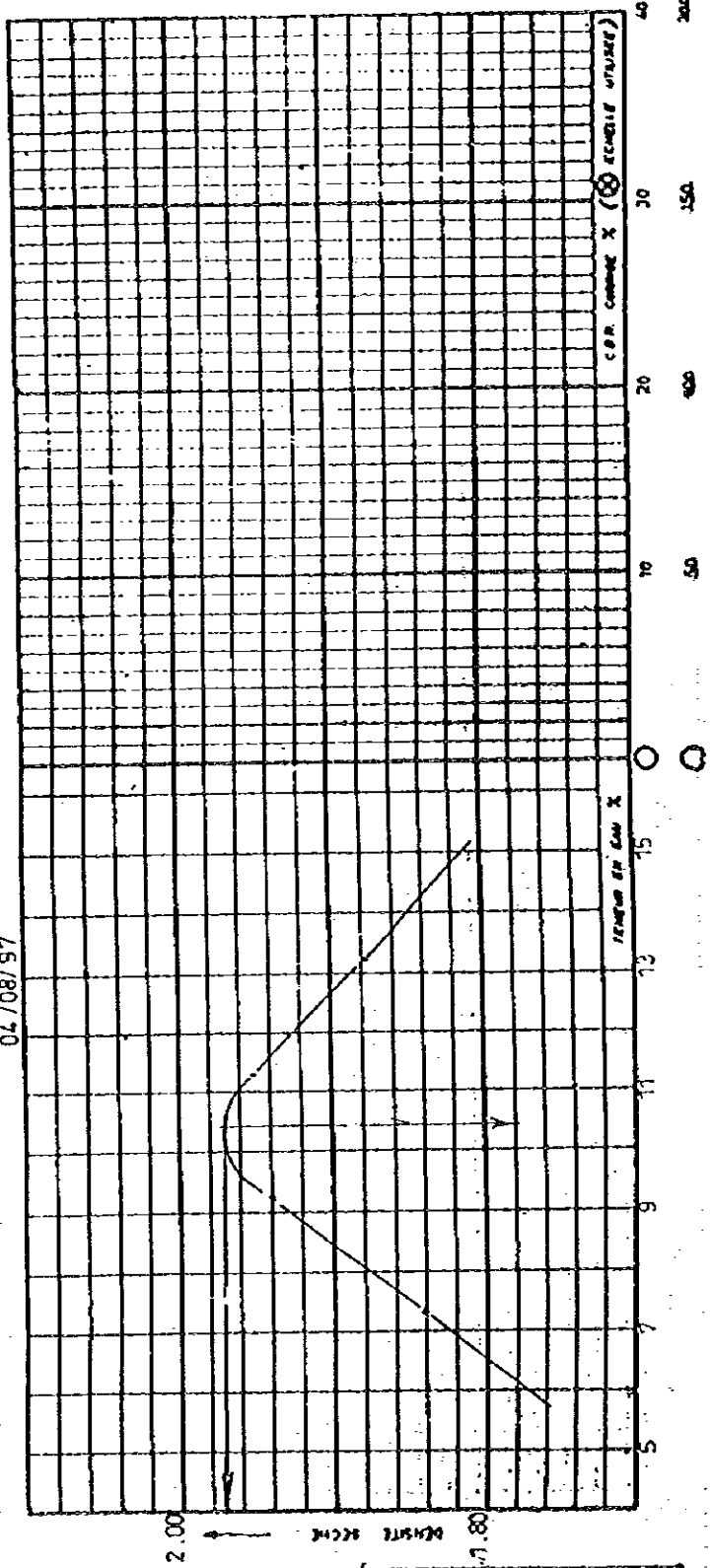
Densité sèche maximum 1.97

Teneur en eau optimum 10.40 %

Poids spécifique \_\_\_\_\_

01/08/97

DUREE D'IMBIBITION	NO DE COUPS PAR COUCHE	% X DE MOULA DE	% X APRES IMBIBITION PAR 75 cm sup. sur mat. tierce	COMPACTEMENT %
0	55			
15	25			
30	10			
45	55			
60	25			
75	10			
90	55			
105	25			
120	10			





# ESSAI C.B.R.

COMPACTAGE EN 5 COUCHES AVEC DAME DE 4.500 K9  
SURCHARGE D'IMBIBITION ET DE PENETRATION

LABORATOIRE ...  
DU BATIMENT ET DES TRAVAUX PUBLICS  
L. N. B. T. e B.P. 20100 Tel. 25-62-81

TRAVAUX NOUVEAU CENTRE DE CONSULTATION EXTERNE  
AU CHU LOME-TOKOIN  
P.2 - 4.40 m Argile sableuse

DOSSIER: 971 F / 19

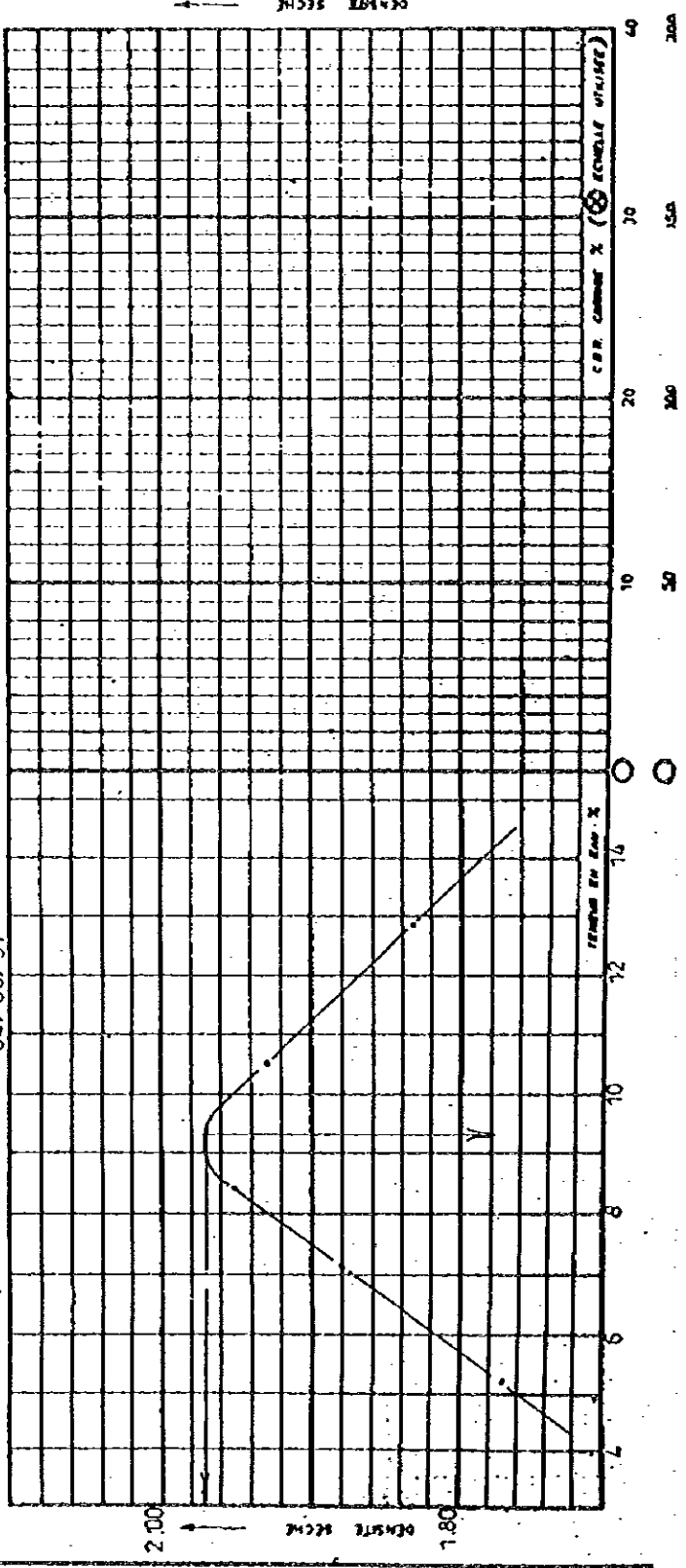
Laboratoire

## ESSAI PROCTOR

Densité sèche maximum 1.97  
Teneur en eau optimum 9.30 %  
Poids spécifique

01/08/97

DUREE D'IMBIBITION	NO DE COUPS PAR COUCHE	% X DE MOULAGE	% X APRES IMBIBITION (sur 2.5 cm. max. sur moe. total)	COMPLEMENT %
	55			
	25			
	10			
	55			
	25			
	10			
	55			
	25			
	10			



# ESSAI C.B.R.

COMPACTAGE EN 5 COUCHES AVEC DAME DE 4.500 Kg  
SURCHARGE D'IMBIBITION ET DE PENETRATION

LABO... DIRE ...ONA...  
OU BATIMENT ET DES TRAVAUX PUBLICS  
L.N. 8. T. P. B.P. 20100 TEL. 25-02-83

TRAVAUX NOUVEAU CENTRE DE CONSULTATION EXTERNE  
AU CHU LOME-TOKOIN  
P. 3 - 2.00m Sable argileux

DOSSIER: 97/E/19

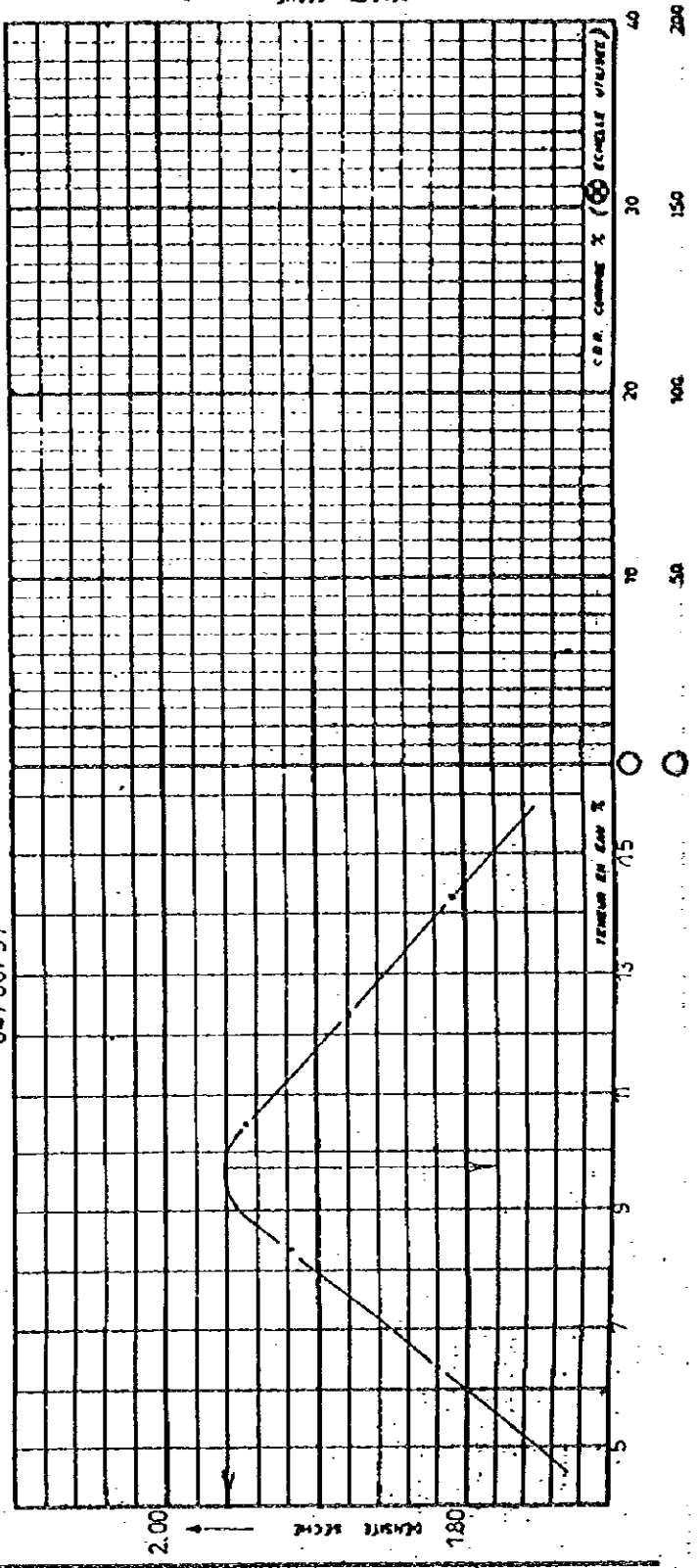
Laboratoire

## ESSAI PROCTOR

Densité sèche maximum 1.96  
Teneur en eau optimum 9.70 %  
Poids spécifique

04/08/97

COURSE D'IMBIBITION	NB DE COUPS PAR COUCHE	% DE MOULAGE	% APRES IMBIBITION sur 25 cm sup. sur mat. total	DONDLEMENT %
	55			
	25			
	10			
	5			
	25			
	10			
	55			
	25			
	10			



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 OU BATIMENT ET DES TRAVAUX PUBLICS  
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TRAVAUX NOUVEAU CENTRE DE CONSULTATION EXTERNE  
 AU CHU LOME - TOKON  
 P.4 - 3.00 m Sable argileux

DOSSIER: 97/F/19

REPUBLIQUE TOGOLAISE  
 Travail-Liberte-Paix

# ESSAI C.B.R.

COMPACTAGE EN 5 COUCHES AVEC DAME DE 4.500 KG  
 SURCHARGE D'IMBIBITION ET DE PENETRATION

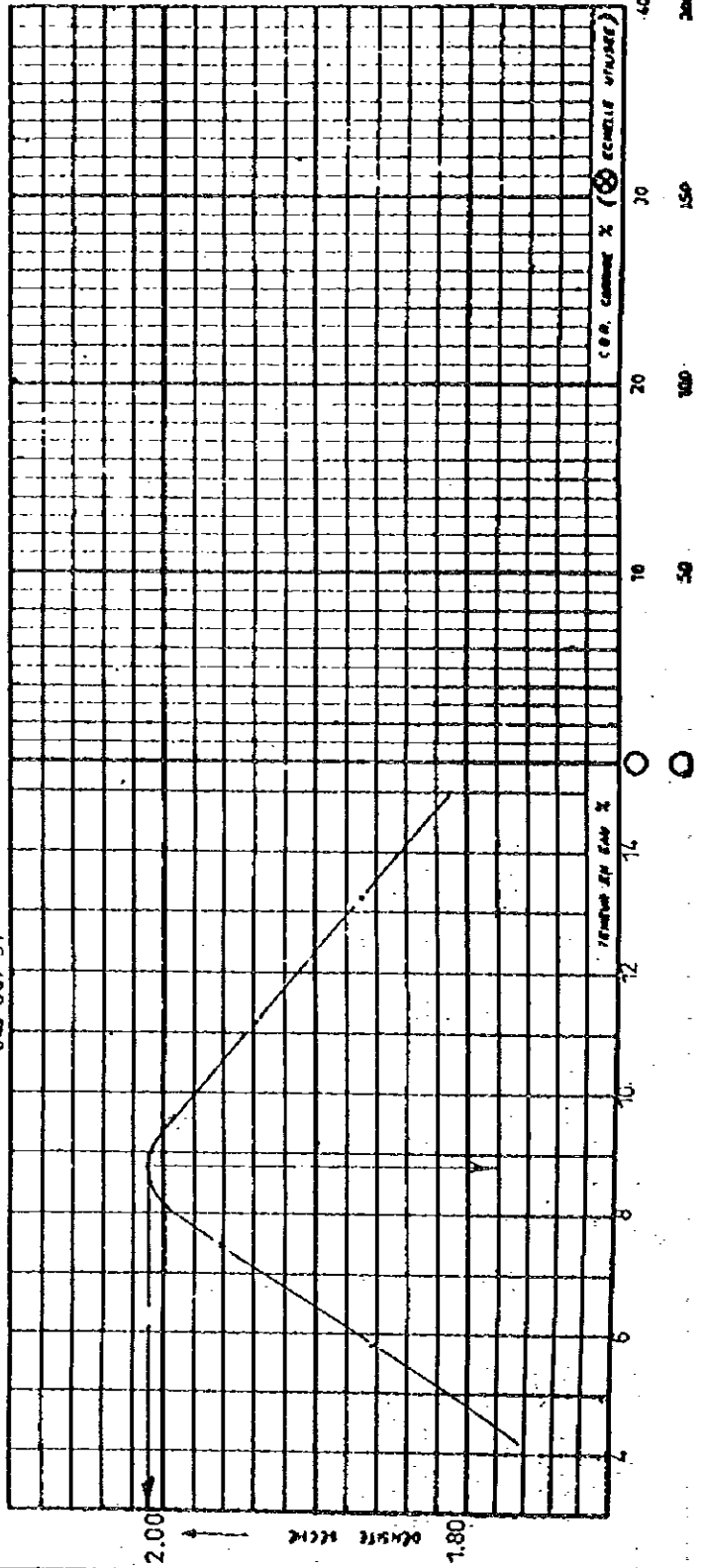
Laboratoire

## ESSAI PROCTOR

Densité sèche maximum 2.01  
 Teneur en eau optimum 8.80 %  
 Poids spécifique

06/08/97

DUREE D'IMBIBITION	NB DE COUPS PAR COUCHE	% DE MOULAGE	% APRES IMBIBITION SUR 2.5 cm sup. sur mod. 10001	COMPLEMENT %
○ 55	○ 55			
△ 25	△ 25			
□ 10	□ 10			
○ 55	○ 55			
△ 25	△ 25			
□ 10	□ 10			
○ 55	○ 55			
△ 25	△ 25			
□ 10	□ 10			









JICA