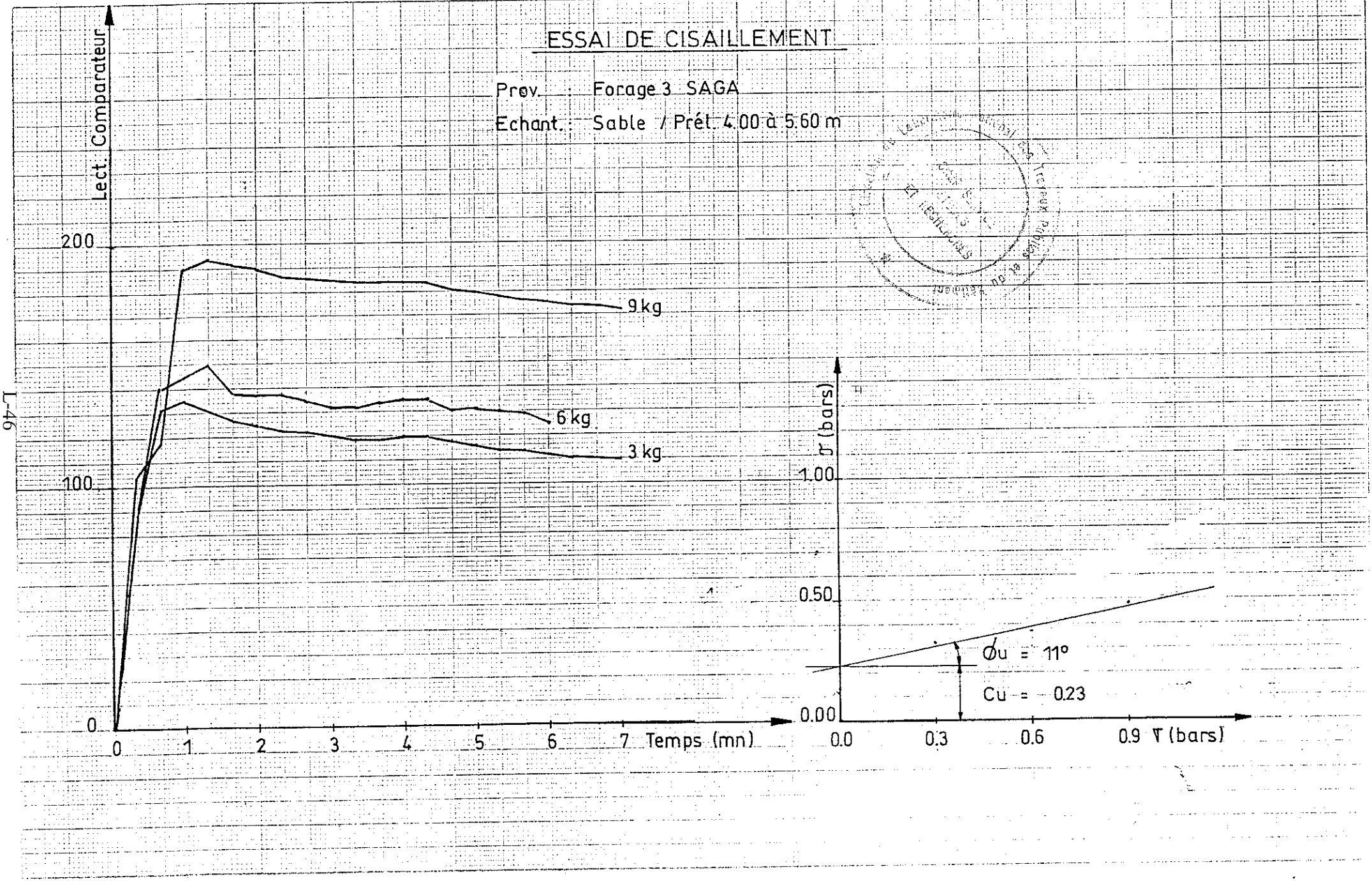
APPENDIX 3: FORAGE N°3/SAGA

ESSAI DE CISAILLEMENT

Prov. : Forage 3 SAGA

Echant. : Sable / Prél. 4.00 à 5.60 m



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B.P 464 Tel:73 - 25 - 62 Niamey

ESSAIS DE PERMEABILITE

PROVENANCE: Assainissement de la ville de niamey — DATE :

FORAGE N° 3 SAGA — DEMANDEUR SENAGHRY

PROFONDEUR : 4,00 m - 5,60 m — OPERATEUR: LABARAN

NATURE DU SOL : SABLE

TEMPERATURE DE L'ESSAI: θ = 28,5 °C

SECTION DU TUBE DE MESURE: a = 3,14 mm2

SECTION DE L'ECHANTILLON: A = 78,54 cm2

HAUTEUR DE L'ECHANTILLON: L = 18,8 mm

ESSAIS N°	1	2	3
H o	70	90	80
H 1	10	20	10
Temps : t (s)	3	8	12
Kθ (cm/s)	$10,7 * 10^{-4}$	$3,2 * 10^{-4}$	$2,8 * 10^{-4}$
Kθ moy. (cm/s)			
K 20 (cm/s)		$2,8 * 10^{-5}$	

OBSERVATIONS:

W% = 3 γd = 1,70 Durée de saturation: immédiatement

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B.P. 464 NIAMEY Prov. : ASSAINISSEMENT VILLE NY.

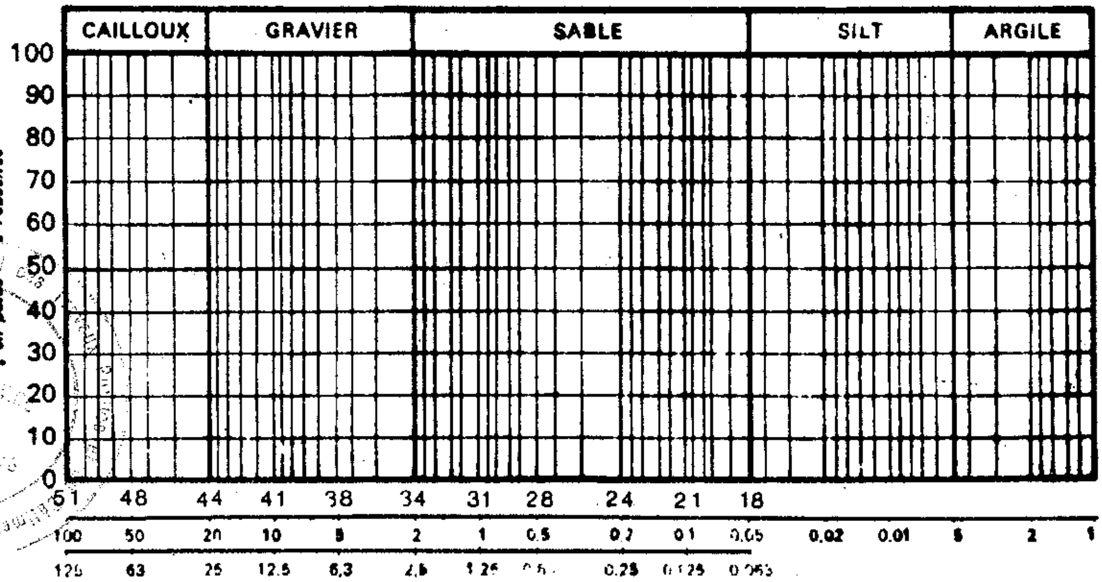
N° ECH.	PROF.	PROFIL	NATURE
F 3	6.80 à 8.20 m		Argile

ESSAIS D'IDENTIFICATION

Ech.	Limites d'Atterberg LL	LP	IP	Poids spécifique	m · IP	Classification US HRB
	30.2	15.5	14.7			

m éléments du mortier passant au tamis de 0,42 (module 27)

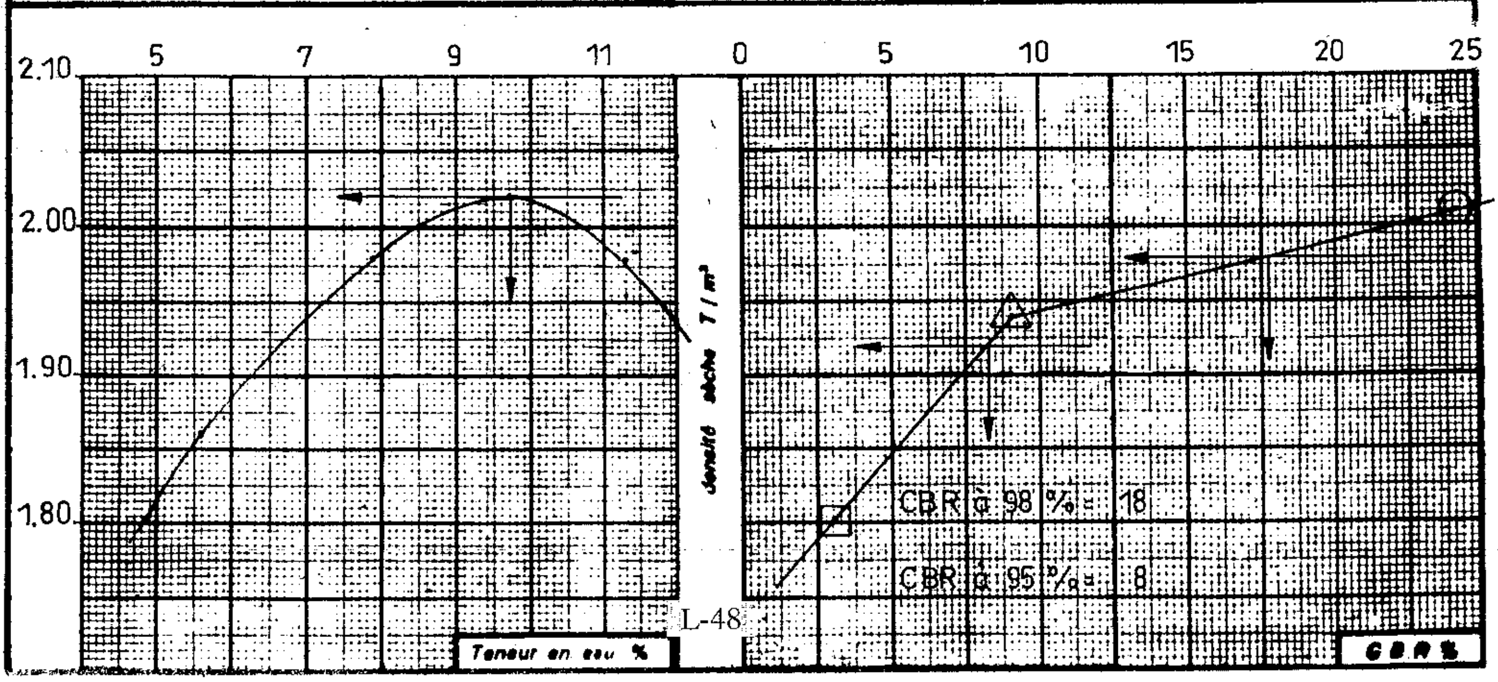
GRANULOMÉTRIE



ESSAI PROCTOR	
Densité sèche max.	2.02 T/m³
Teneur en eau opt.	9.7 %

ESSAI CBR — W % optimale — 95 % ...

N coups	γd T/m³	W % moulage	% après imbib	gonflement %
○ 55	2.01	8.8		
△ 25	1.94	8.8		
□ 10	1.80	8.8		



DIRECTION
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B. P. 464 — NIAMEY

ANALYSES GRANULOMETRIQUES

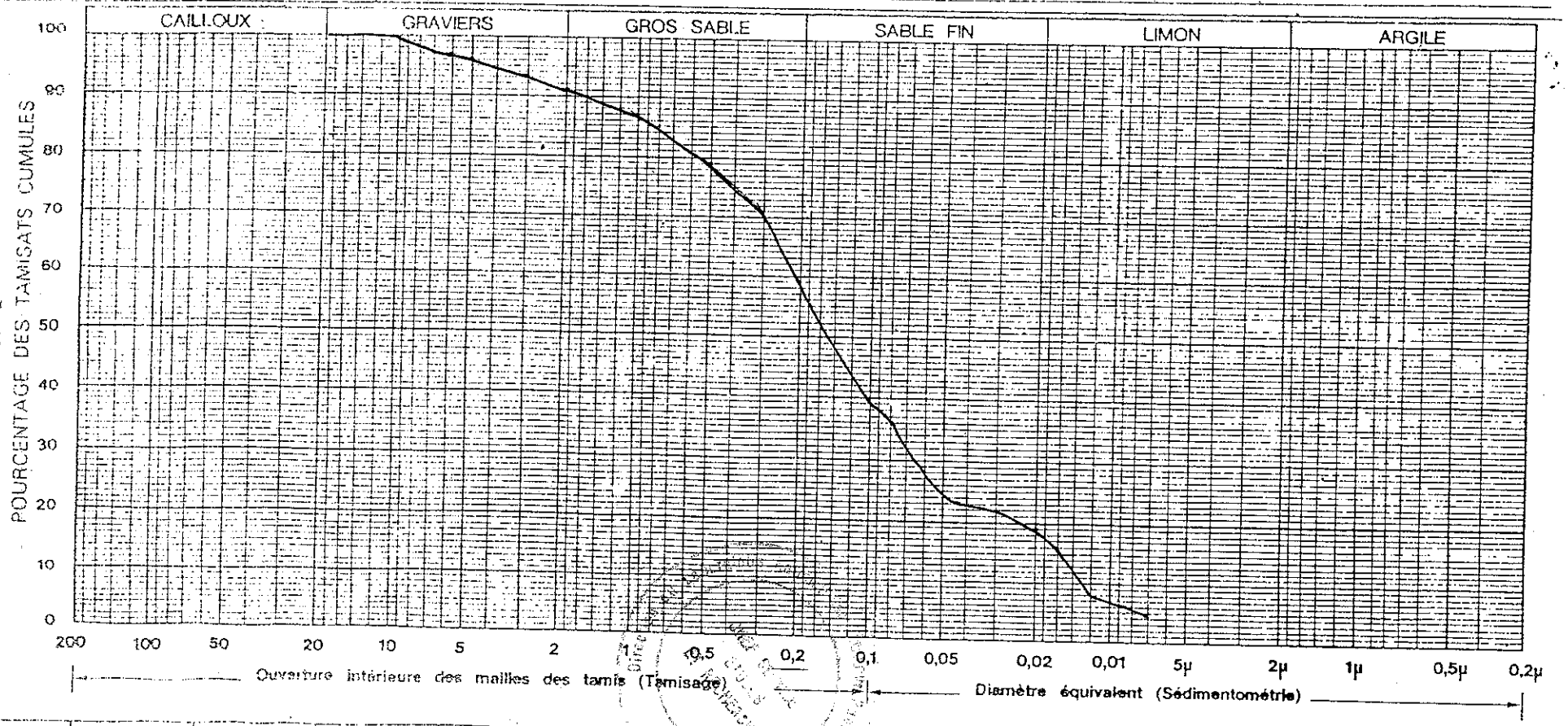
Opérateur : _____

Désignation des échantillons ____ N° _____

Provenance : ASSAINISS. VILLE NY.

Echantillon : Argile

N° F3 / Prél. 6.80 à 8.20 m



N°	L.L.	I.P.	< 0,08	HRB	F.P.	G	γ_s	α opt.	CBR	Gonfl.	ds situ.	comp.rel.
	30.2	14.7	37 %	A6(1)			2.58					

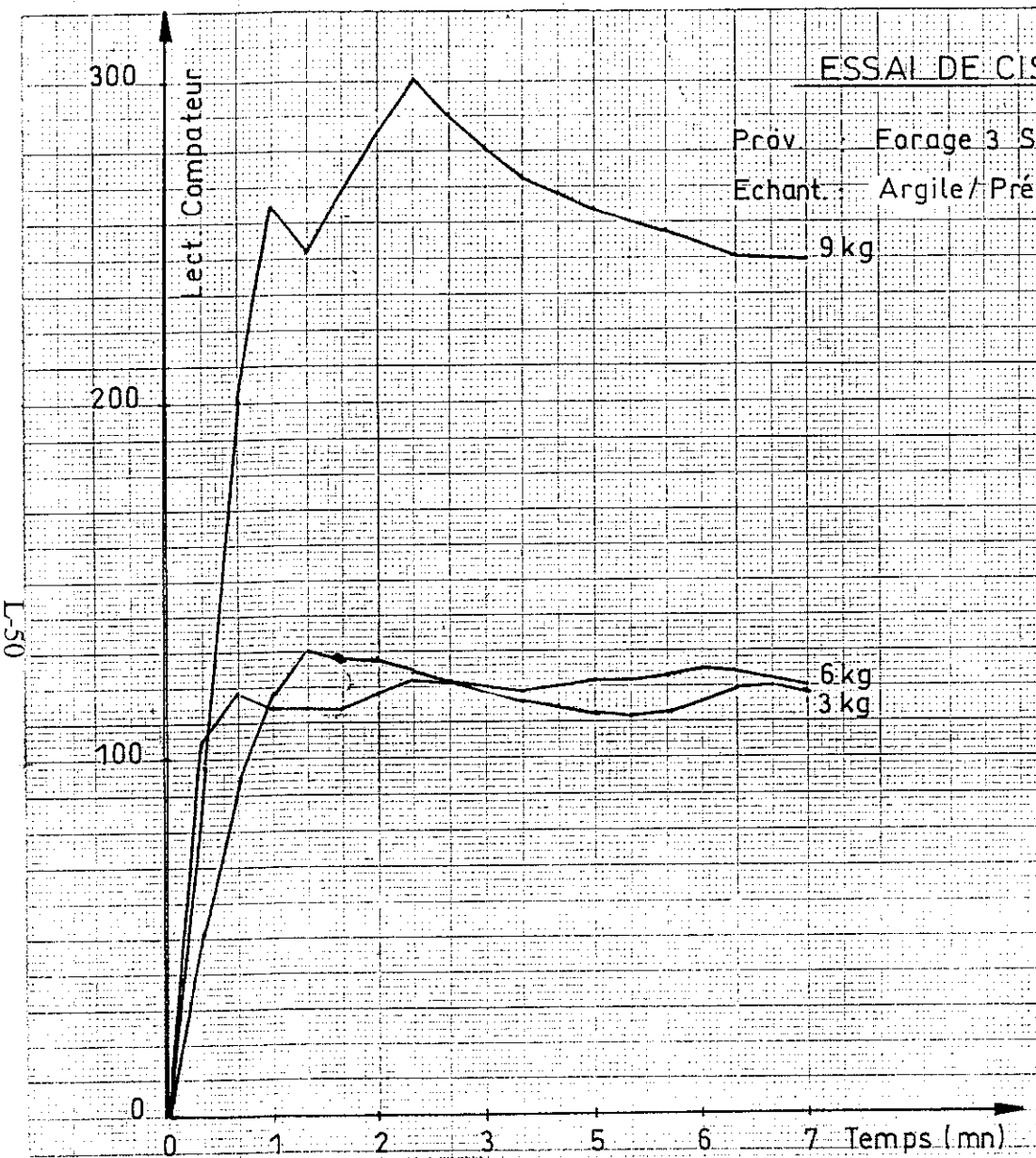
L-49

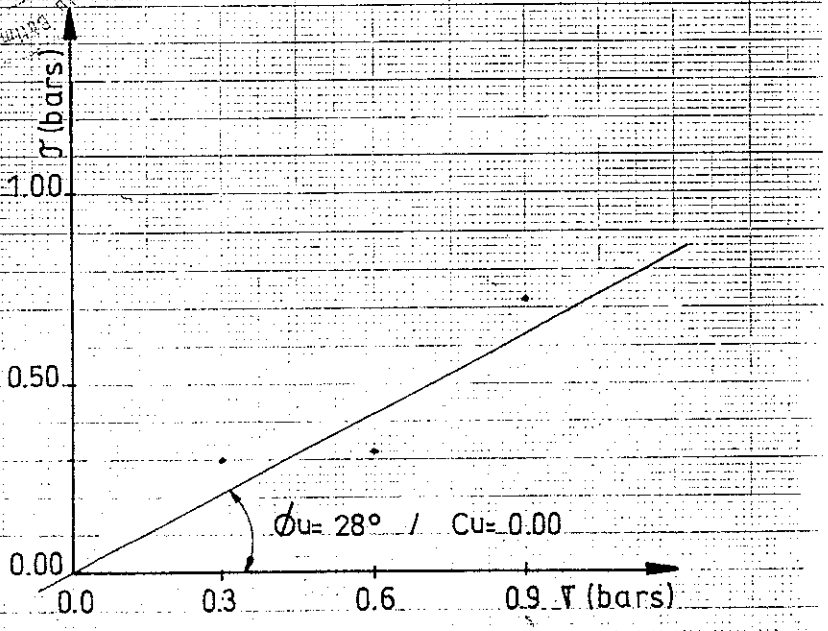
L-50

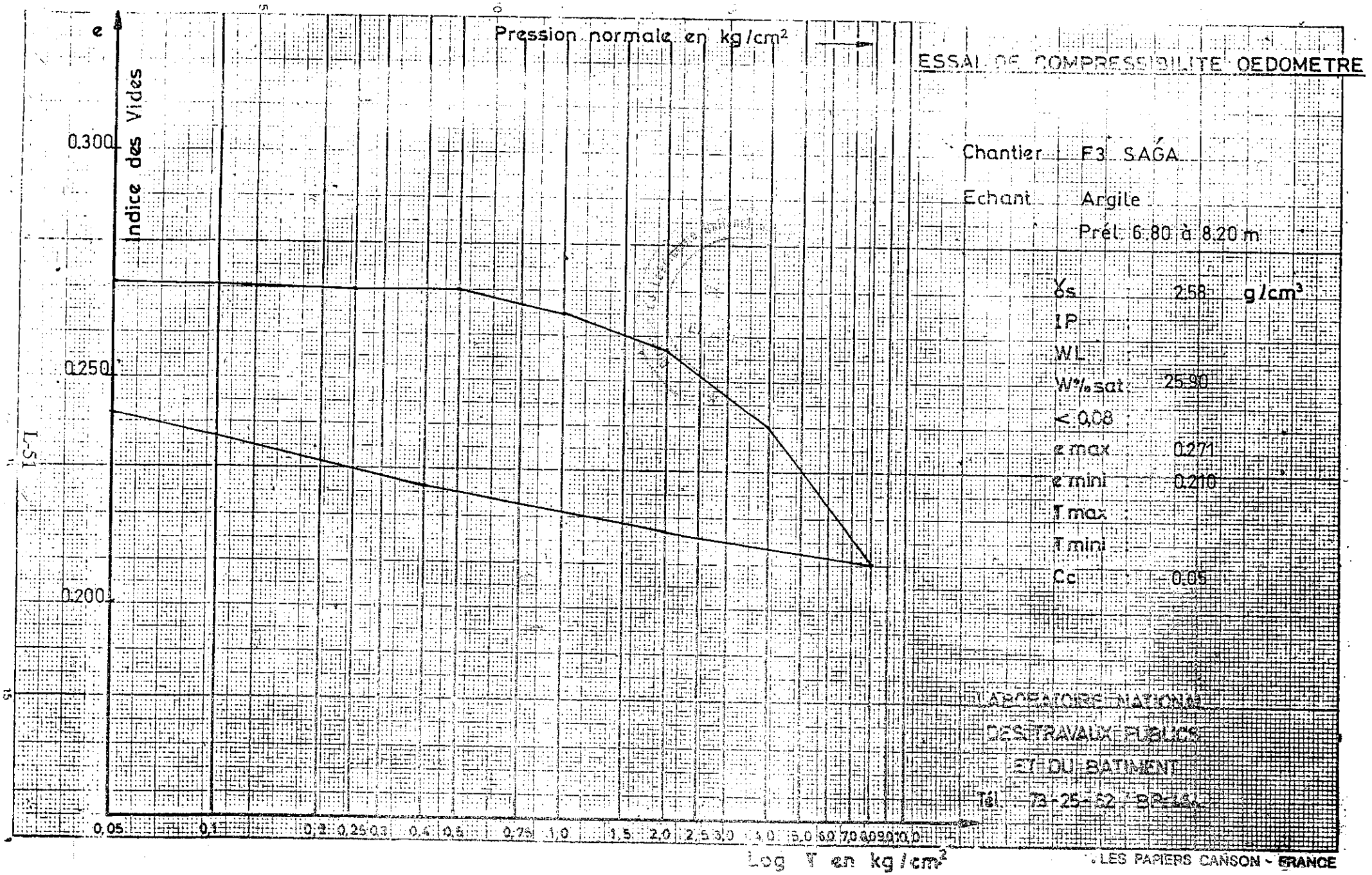
ESSAI DE CISAILLEMENT

Prov. : Forage 3 SAGA

Echant. : Argile / Prél. 6.80 à 8.20 m






e
Indice des Vides
0.300
0.250
0.200
Pression normale en kg/cm²
Log T en kg/cm²
0,05 0,1 0,2 0,25 0,3 0,4 0,5 0,75 1,0 1,5 2,0 2,5 3,0 4,0 5,0 6,0 7,0 8,0 9,0 10,0
ESSAI DE COMPRESSIBILITE OEDOMETRE
Chantier F3 SAGA
Echant Argile
Prél 6.80 à 8.20 m
γs 2.58 g/cm³
IP
WL
W% sat 25.90
< 0,08
e max 0.271
e mini 0.210
T max
T mini
Cc 0.05
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ESSAIS DE PERMEABILITE

PROVENANCE: Assainissement de la ville de niamey — DATE :

FORAGE N° 3 SAGA — DEMANDEUR SENAGHRY

PROFONDEUR : 6,20 m - 8,20 m — OPERATEUR: LABARAN

NATURE DU SOL : ARGILE

TEMPERATURE DE L'ESSAI: θ = 28,5 °C

SECTION DU TUBE DE MESURE: a = 3,14 mm2

SECTION DE L'ECHANTILLON: A = 78,54 cm2

HAUTEUR DE L'ECHANTILLON: L = 18,8 mm

ESSAIS N°	1	2	3
H o	94	88	84
H 1	89	85	80
Temps : t (s)	339	253	362
Kθ (cm/s)	$5,2 * 10^{-6}$	$6,9 * 10^{-6}$	$4,9 * 10^{-6}$
Kθ moy. (cm/s)		$5,6 * 10^{-6}$	
K 20 (cm/s)		$2,8 * 10^{-7}$	

OBSERVATIONS:

W% = 9,7 γ_d = 2,02 Durée de saturation 96 heures

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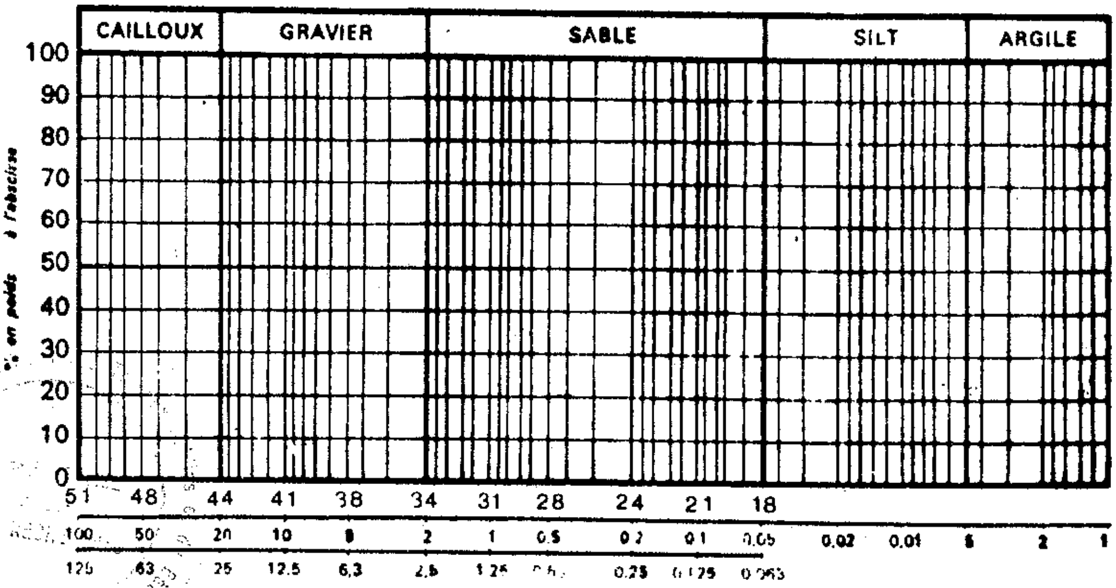
N° ECH.	PROF.	PROFIL	NATURE
F3	8.2 à 16.4 m		Schiste

ESSAIS D'IDENTIFICATION

Ech.	Limites d'Atterberg LL	LP	IP	Poids spécifique	m - IP	Classification US HRB
	27.8	14.6	13.2			

m éléments du mortier passant au tamis de 0,42 (module 27)

GRANULOMÉTRIE



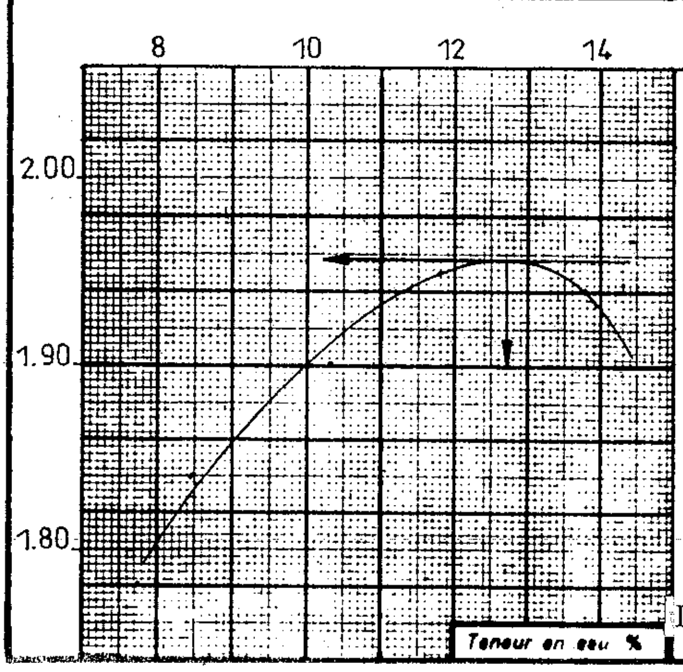
module A.F.N.O.R.

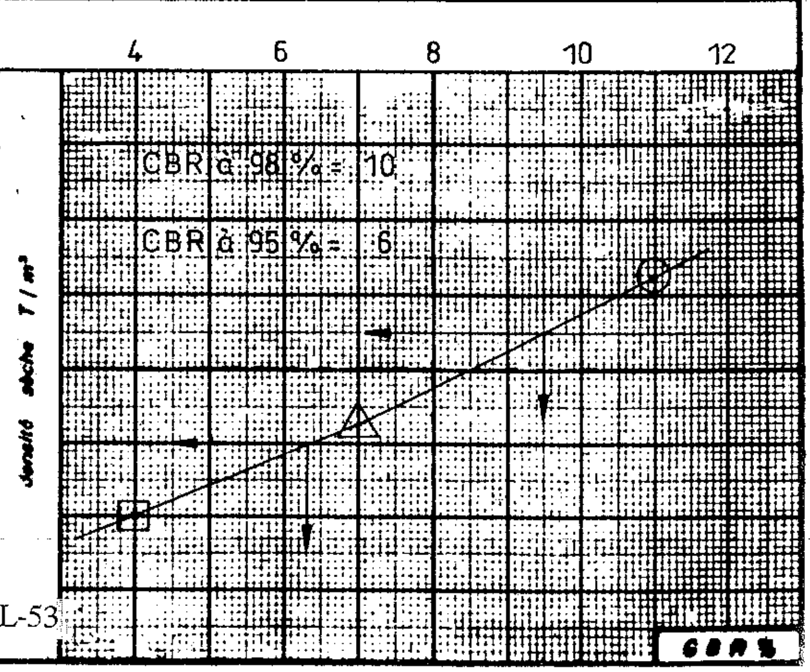
dimensions en mm

ESSAI PROCTOR	
Densité sèche max.	1.96 T/m³
Teneur en eau opt.	12.7 %

ESSAI CBR — W % optimale / Sb ...

N coups	γ d T/m³	W % moulage	% après imbib	gonflement %
○ 56	1.95	10.8		
△ 25	1.87	10.8		
□ 10	1.82	10.8		





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B. P 464 – NIAMEY

ANALYSES GRANULOMETRIQUES

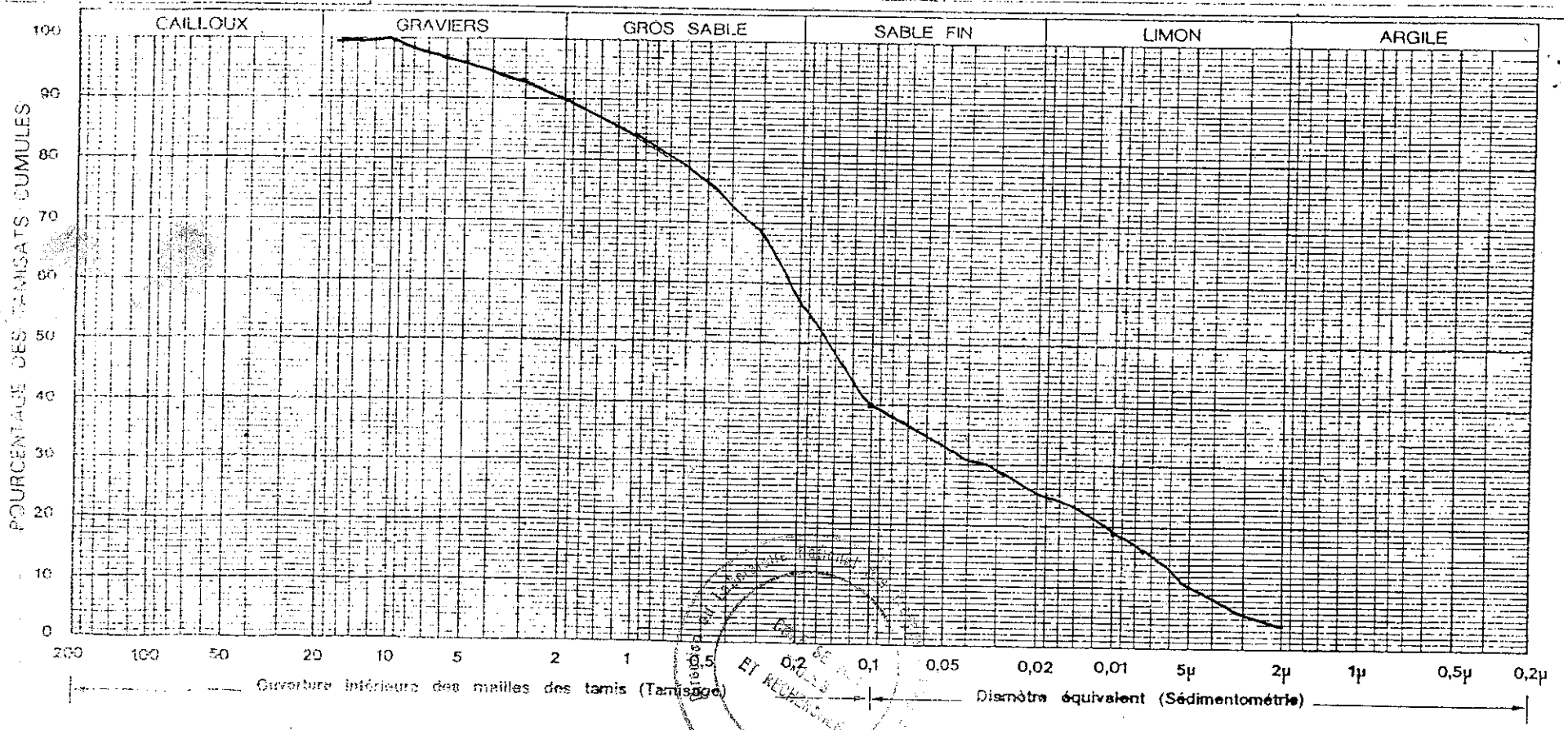
Opérateur :

Provenance : ASSAINISS. VILLE NY.

Echantillon : Schiste

Désignation des échantillons N° F 3 / Prél. 8.20 à 16.40m

N°



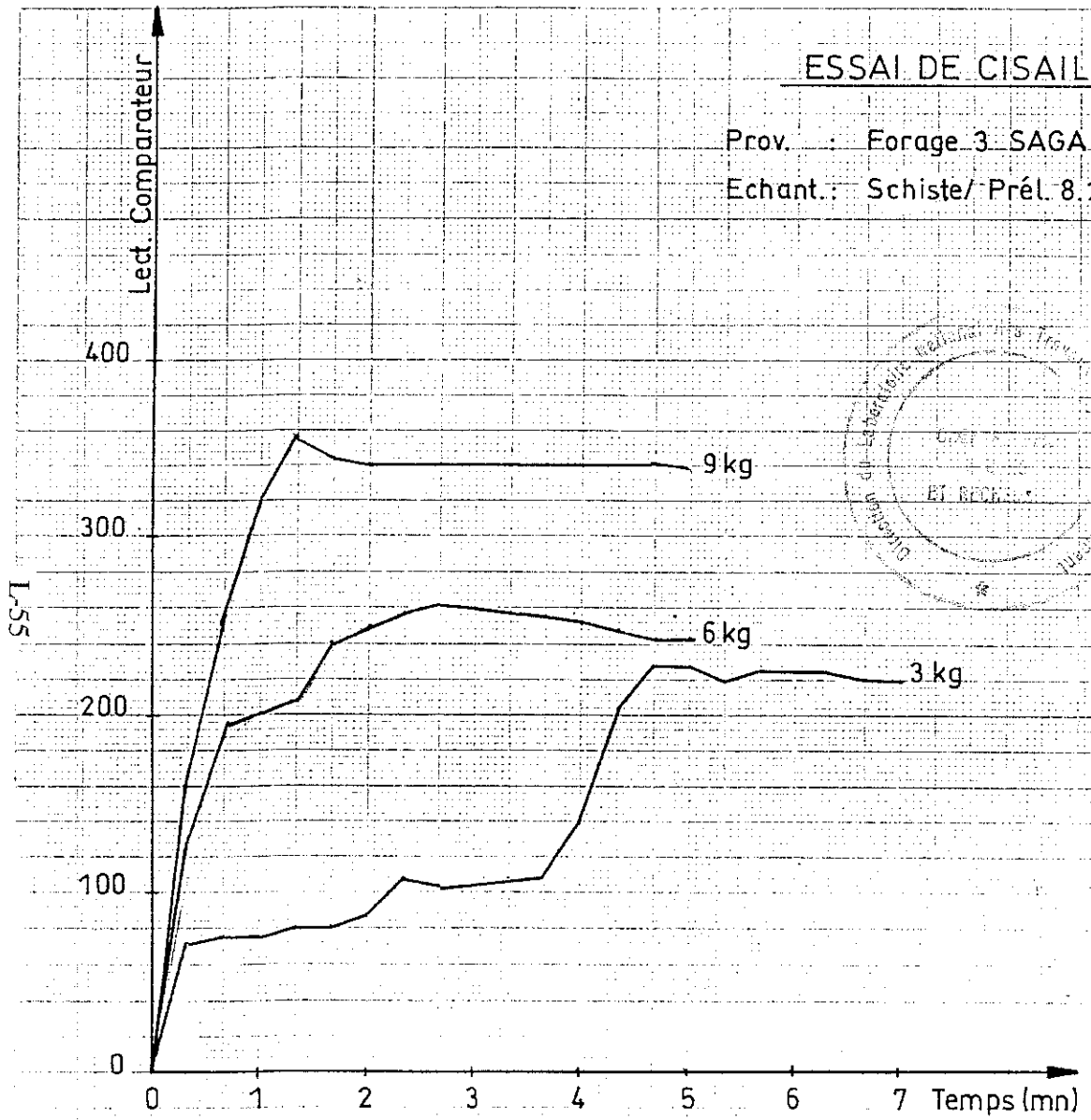
N°	L.L.	I.P.	< 0,08	HRB	F.P.	I.G.	γs	α opt.	CBR	Gonfl.	ds situ.	comp.rel.
	27.8	13.2	38%	A-6 (1)			2.78					

I-54

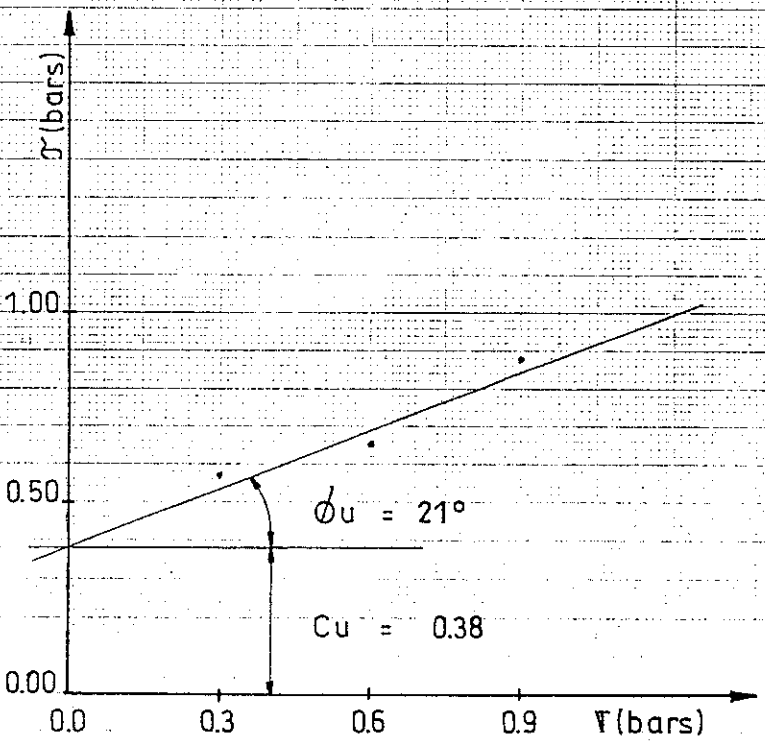
ESSAI DE CISAILLEMENT

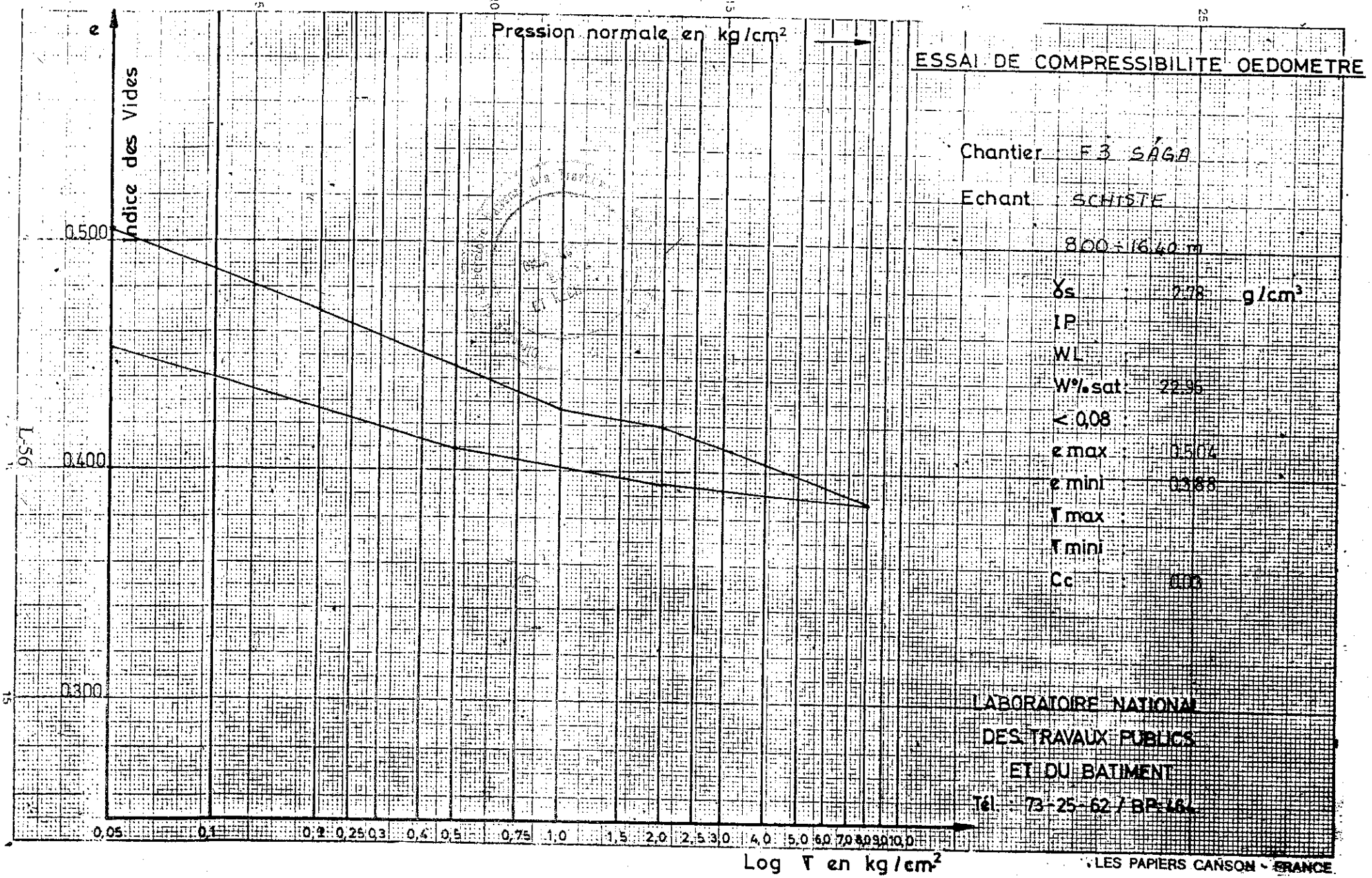
Prov. : Forage 3 SAGA

Echant. : Schiste/ Prél. 8.20 à 16.40m



L-55




e
Indice des Vides
0,500
0,400
0,300
Pression normale en kg/cm²
5
10
15
25
Log T en kg/cm²
0,05
0,1
0,2
0,25
0,3
0,4
0,5
0,75
1,0
1,5
2,0
2,5
3,0
4,0
5,0
6,0
7,0
8,0
9,0
10,0
ESSAI DE COMPRESSIBILITE OEDOMETRE
Chantier : F3 SAGA
Echant : SCHISTE
8,00 - 16,40 m
γs : 2,78 g/cm³
IP :
WL :
W% sat : 22,96
< 0,08 :
e max : 0,504
e mini : 0,368
T max :
T mini :
Cc : 0,06
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ESSAIS DE PERMEABILITE

PROVENANCE: Assainissement de la ville de niamey — DATE : 29/10/2000

FORAGE N° 3 SAGA — DEMANDEUR SENAGHRY

PROFONDEUR : 8,20 m - 16,40 m — OPERATEUR: LABARAN

NATURE DU SOL : SCHISTE

TEMPERATURE DE L'ESSAI: θ = 29 °C

SECTION DU TUBE DE MESURE: a = 3,14 mm2

SECTION DE L'ECHANTILLON: A = 78,54 cm2

HAUTEUR DE L'ECHANTILLON: L = 18,8 mm

ESSAIS N°	1	2	3
H o	90	82	70
H 1	85	72	59
Temps : t (s)	90	233	315
Kθ (cm/s)	$19,6 * 10^{-6}$	$7,7 * 10^{-6}$	$5,8 * 10^{-6}$
Kθ moy. (cm/s)		$11 * 10^{-6}$	
K 20 (cm/s)		$5,5 * 10^{-7}$	

OBSERVATIONS:

W% = 11,8 γ_d = 1,95 Durée de saturation 24 heures

LE CHEF SERVICE LABORATOIRE

APPENDIX 4: FORAGE N°4/DEIZEBON

DIRECTION
DU LABORATOIRE NATIONAL
DES TRAVAUX PUBLICS
ET DU BATIMENT
B. P. 464 — NIAMEY

ANALYSES GRANULOMETRIQUES

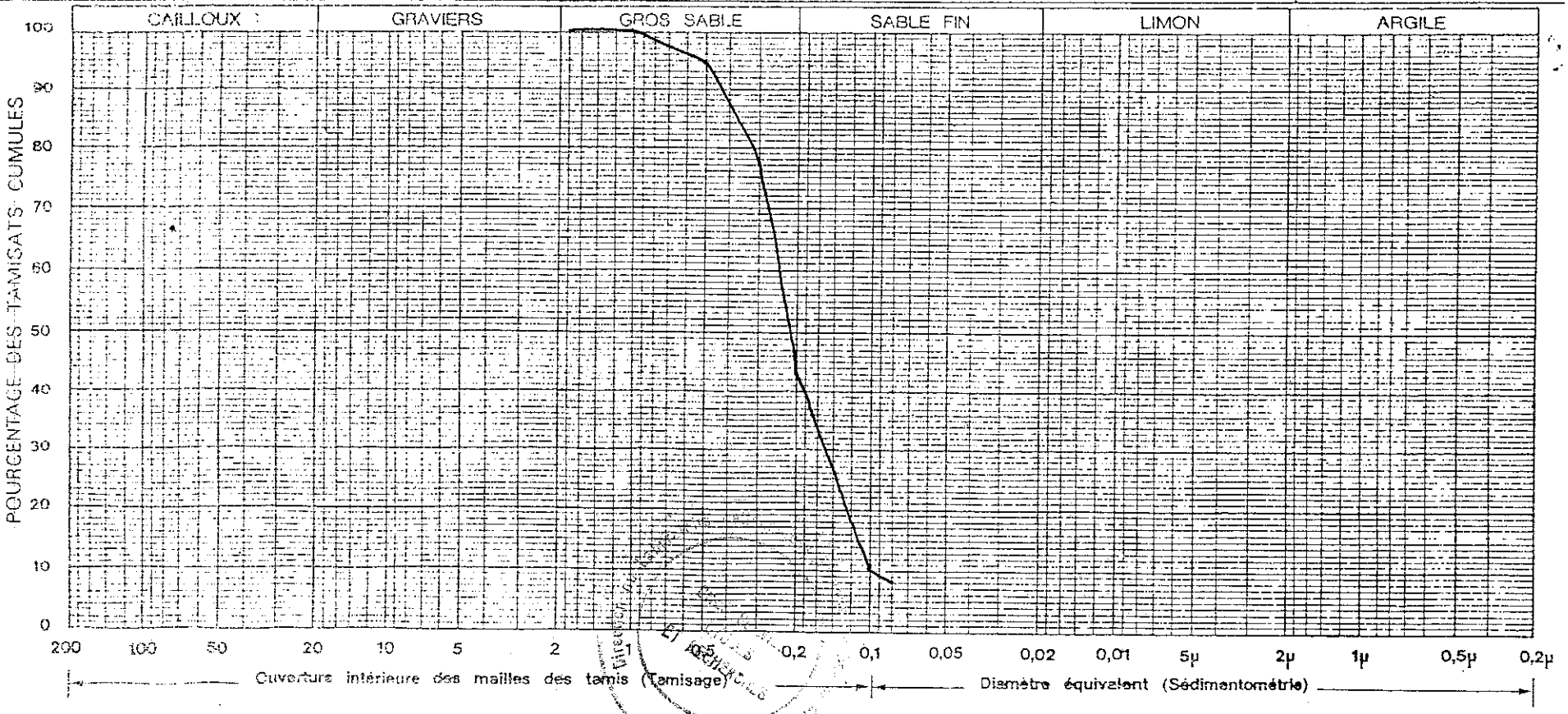
Opérateur : _____

Désignation des échantillons _____ N° _____

Provenance : ASSAINISS. VILLE NY.

Echantillon : Sable blanchâtre

N° F4 / Prél. 2.60 à 7.80 m



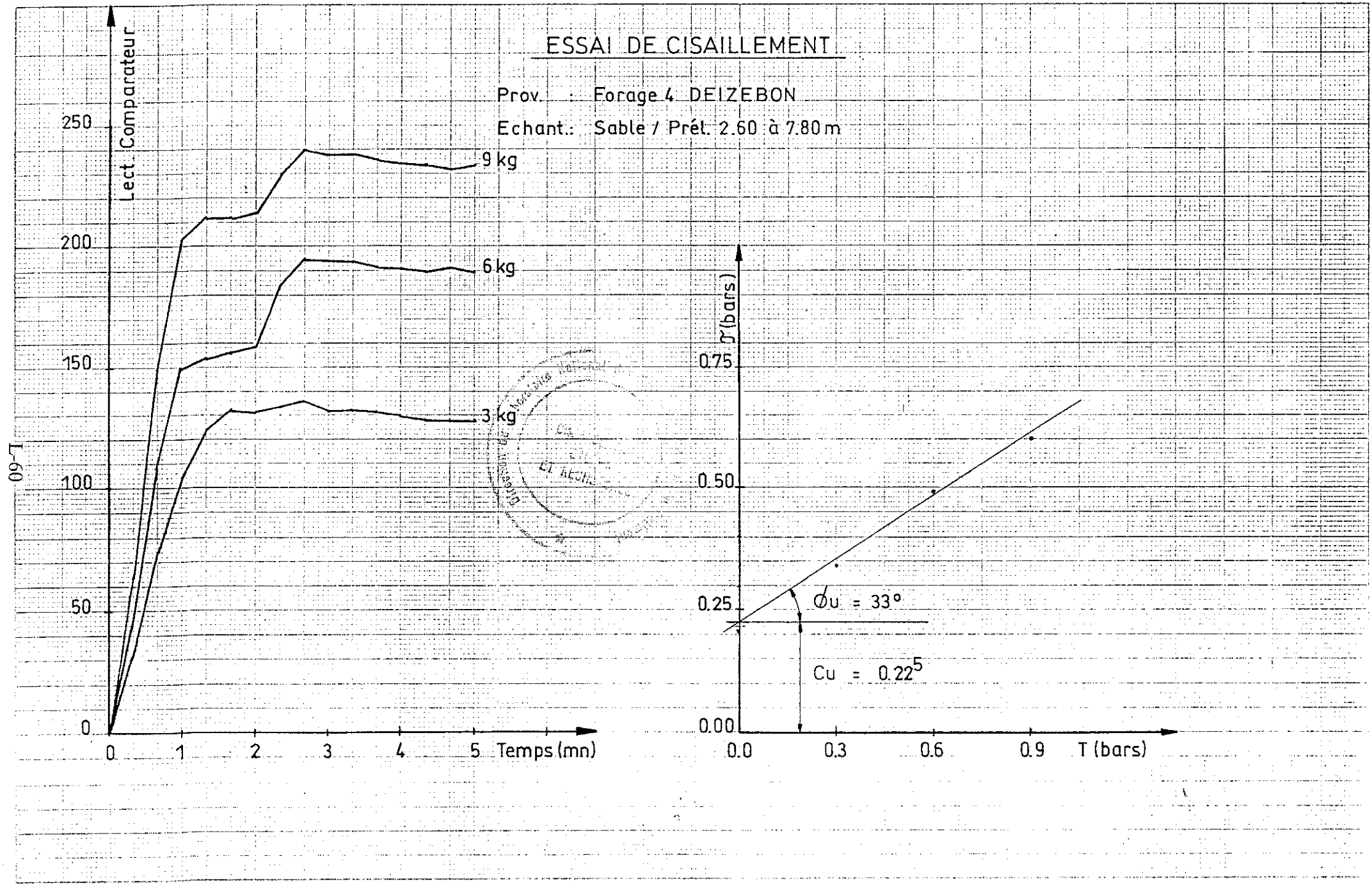
L-59

N°	L.L.	I.P.	< 0,08	HRB	ES	I.G.	ds max.	∝ opt.	CBR	Gonfl.	ds situ.	còmp.rel.
			8%	A3(0)	21%							

ESSAI DE CISAILLEMENT

Prov. : Forage 4 DEIZEBON

Echant.: Sable / Prél. 2.60 à 7.80 m



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B.P 464 Tel:73 - 25 - 62 Niamey

ESSAIS DE PERMEABILITE

PROVENANCE: Assainissement de la ville de niamey — DATE : 04/12/2000

FORAGE N° 4 DEIZEBON — DEMANDEUR SENAGHRY

PROFONDEUR : 2,60 m - 7,80 m — OPERATEUR: LABARAN

NATURE DU SOL : SABLE BLANCHATRE

TEMPERATURE DE L'ESSAI: θ = 26,8 °C

SECTION DU TUBE DE MESURE: a = 3,14 mm2

SECTION DE L'ECHANTILLON: A = 78,54 cm2

HAUTEUR DE L'ECHANTILLON: L = 18,8 mm

ESSAIS N°	1	2	3
H o	90	70	60
H 1	65	55	40
Temps : t (s)	15	10	12
Kθ (cm/s)	$1,2 * 10^{-4}$	$1,2 * 10^{-4}$	$1,6 * 10^{-4}$
Kθ moy. (cm/s)			
K 20 (cm/s)		$6,6 * 10^{-6}$	

OBSERVATIONS:

W % = 11,9 γd = 1,91 Durée de saturation: immédiatement

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B.P. 464 NIAMEY Prov.: ASSAINISSEMENT VILLE NY.

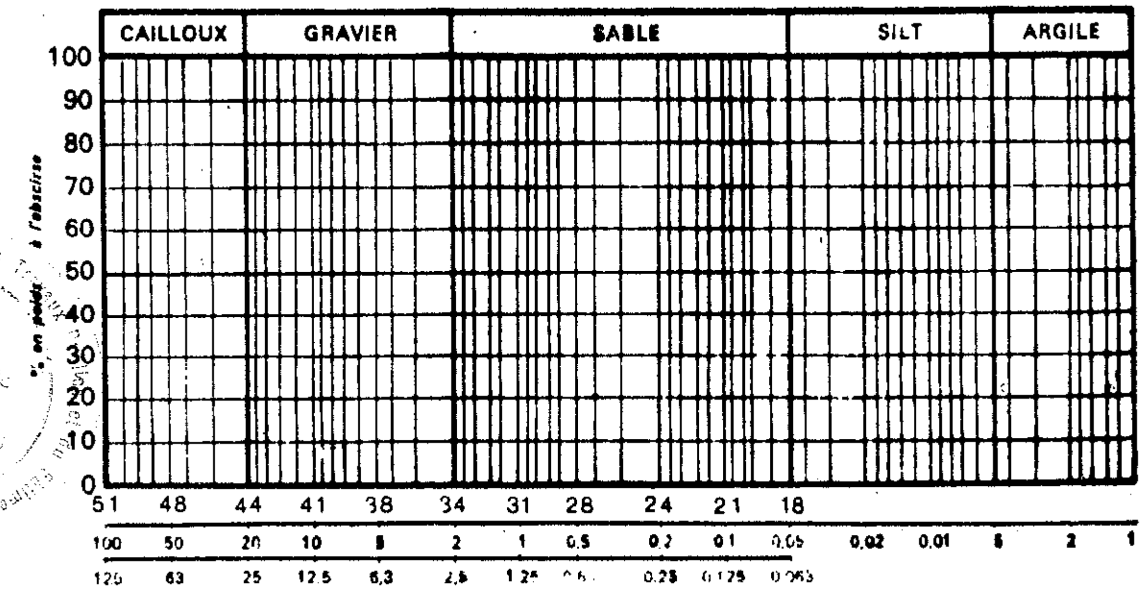
Nº ECH.	PROF.	PROFIL	NATURE
F4	7.80 à 9.00m		Sable argileux

ESSAIS D'IDENTIFICATION

Ech.	Limites d'Atterberg			Poids spécifique	m - IP	Classification US HRB
	LL	LP	IP			
	19.2	11.8	7.4			

m éléments du mortier passant au tamis de 0,42 (module 27)

GRANULOMÉTRIE



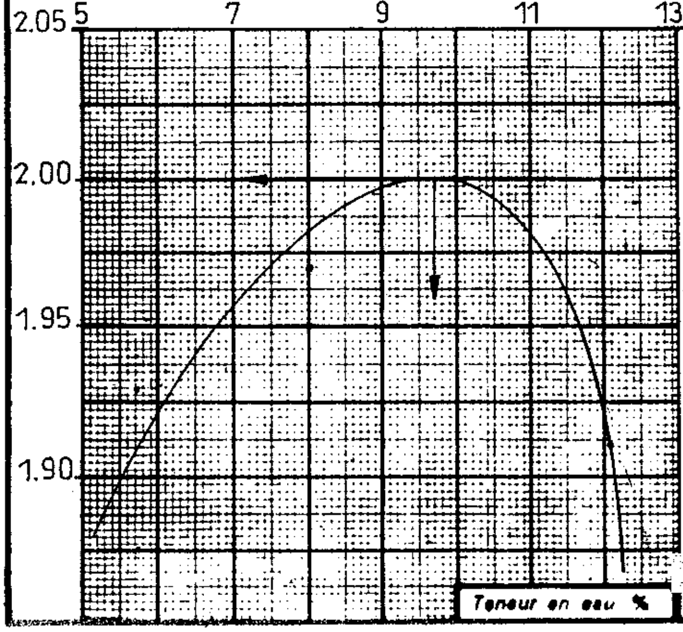
module A. F. N. O. R.

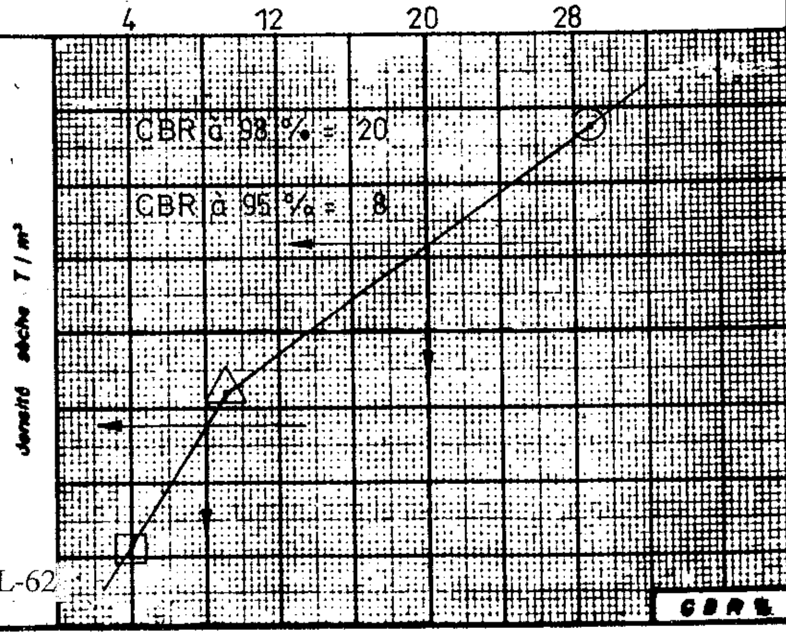
dimensions en mm □ ○

ESSAI PROCTOR	
Densité sèche max.	2.00 T/m³
Teneur en eau opt.	9.7 %

ESSAI CBR — W % optimale; 95 % ...

N coups		γ d T/m³	W % moulage	% après imbib	gonflement %
○	56	2.02	9.0		
△	26	1.93	9.0		
□	10	1.88	9.0		





DIRECTION
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B. P. 464 — NIAMEY

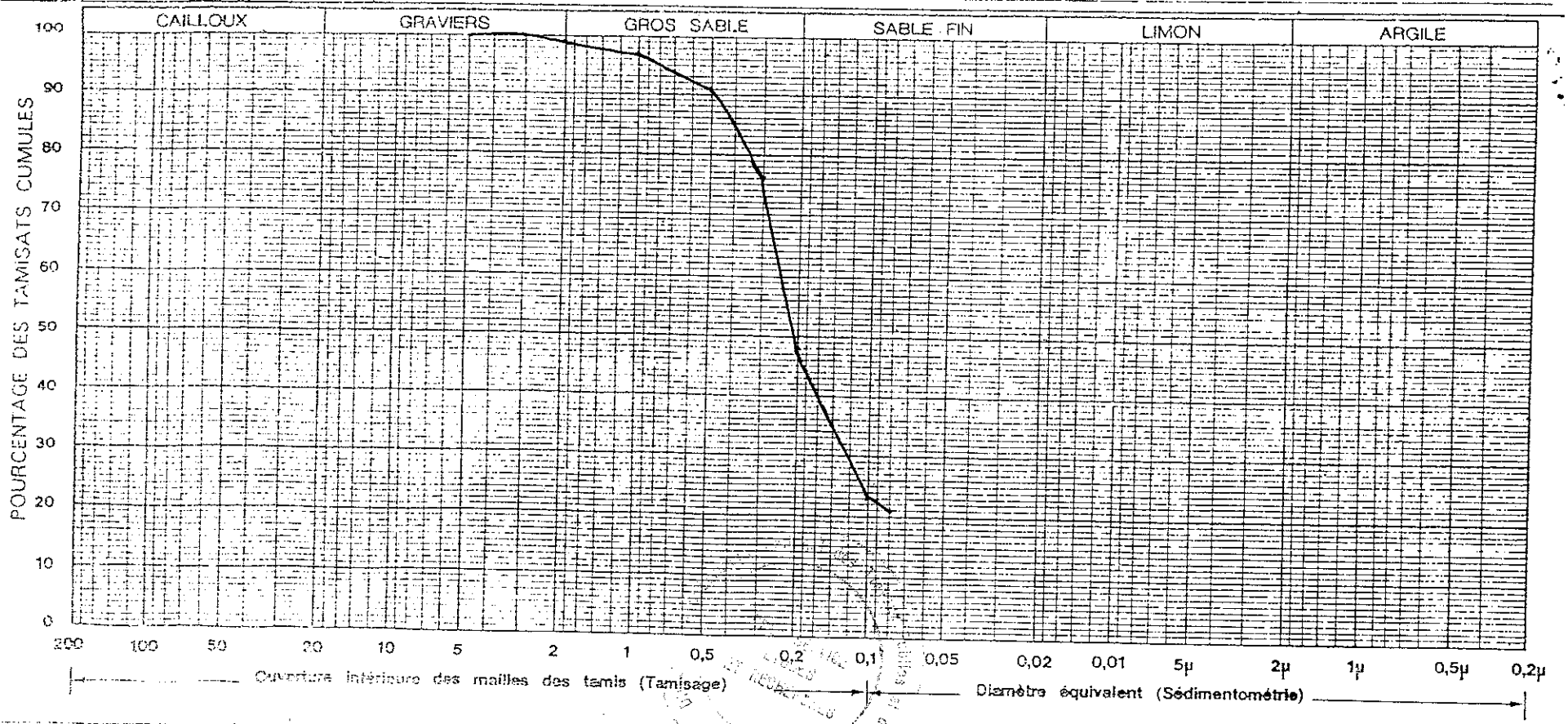
ANALYSES GRANULOMETRIQUES

Opérateur : _____

Provenance : ASSAIN. VILLE NY.

Echantillon : Sable argileux

Désignation des échantillons N° _____ N° F4 / Prél. 7,80 à 9,00 m



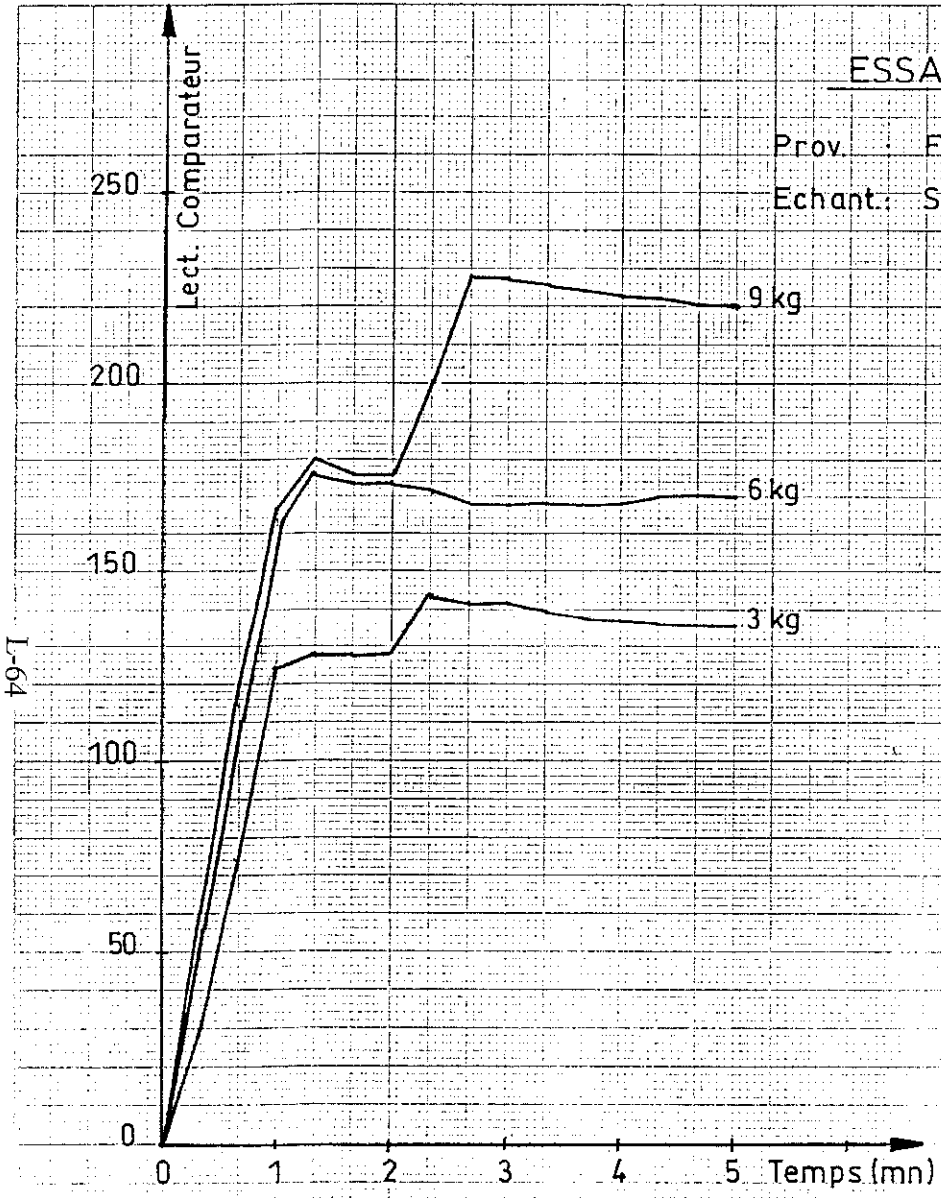
N°	L.L.	I.P.	< 0,08	HRB	F.P.	I.G.	ds max.	∝ opt.	CBR	Gonfl.	ds situ.	comp.rel.
	19.2	7.4	21 %	A2-4(0)								

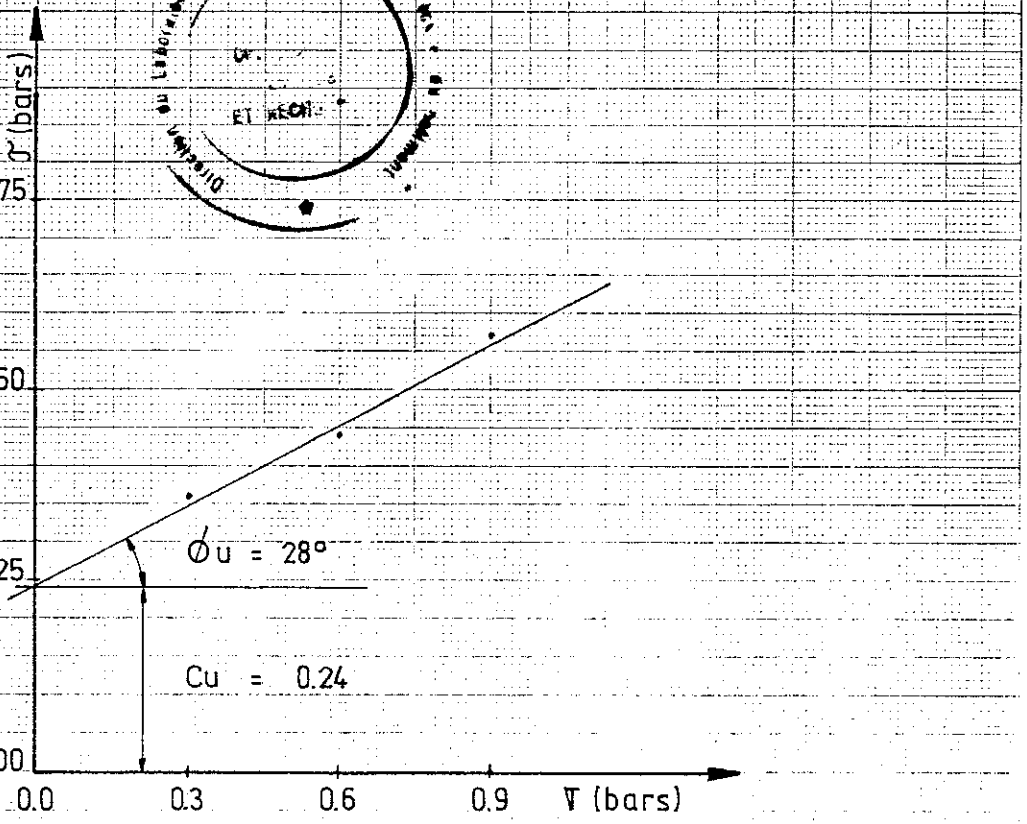
L-63

ESSAI DE CISAILLEMENT

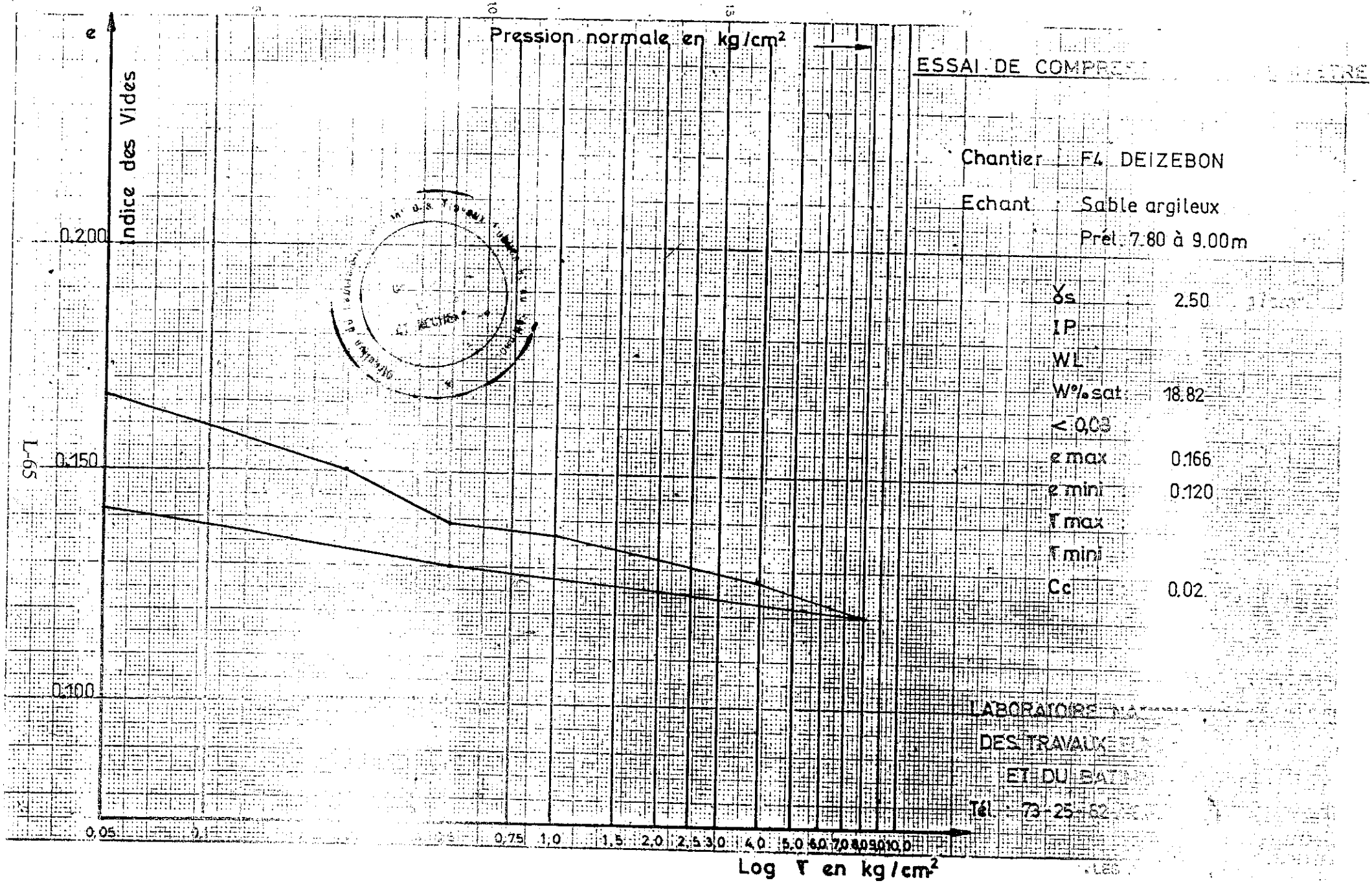
Prov. : Forage 4 DEIZEBON

Echant. : Sable argileux grisâtre / Prél. 7.80 à 9.00 m





L-64


e
Indice des Vides
0,200
0,150
0,100
Pression normale en kg/cm²
0,05
0,75
1,0
1,5
2,0
2,5
3,0
4,0
5,0
6,0
7,0
8,0
9,0
10,0
Log T en kg/cm²
L-65
ESSAI DE COMPRE
Chantier : F4 DEIZEBON
Echant : Sable argileux
Prél. 7.80 à 9.00m
γs : 2.50
IP :
WL :
W% sat : 18.82
< 0,08 :
e max : 0.166
e mini : 0.120
T max :
T mini :
Cc : 0.02
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ESSAIS DE PERMEABILITE

PROVENANCE: Assainissement de la ville de niamey — DATE : 04/12/2000

FORAGE N° 4 DEIZEBON — DEMANDEUR SENAGHRY

PROFONDEUR : 7,80 m - 9,00 m — OPERATEUR: LABARAN

NATURE DU SOL : SABLE ARGILEUX

TEMPERATURE DE L'ESSAI: θ = 26,8 °C

SECTION DU TUBE DE MESURE: a = 3,14 mm2

SECTION DE L'ECHANTILLON: A = 78,54 cm2

HAUTEUR DE L'ECHANTILLON: L = 18,8 mm

ESSAIS N°	1	2	3
H o	90	62	47
H 1	70	50	32
Temps : t (s)	27	20	22
Kθ (cm/s)	$6,8 * 10^{-5}$	$9,2 * 10^{-5}$	$8,8 * 10^{-5}$
Kθ moy. (cm/s)			
K 20 (cm/s)		$4,1 * 10^{-6}$	

OBSERVATIONS:

W % = 9,5 γd = 2,00

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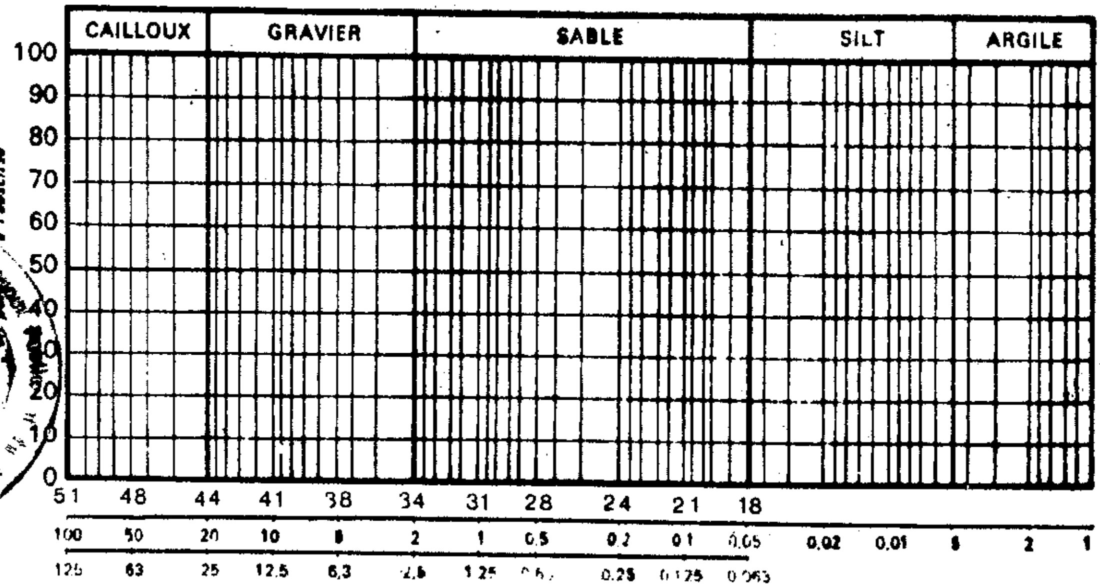
Nº ECH.	PROF.	PROFIL	NATURE
F4	14.3 à 23.5m		Argile graveleuse

ESSAIS D'IDENTIFICATION

Ech.	Limites d'Atterberg LL	LP	IP	Poids spécifique	m - IP	Classification US HRB
	72.9	38.6	34.3			

m éléments du mortier passant au tamis de 0,42 (module 27)

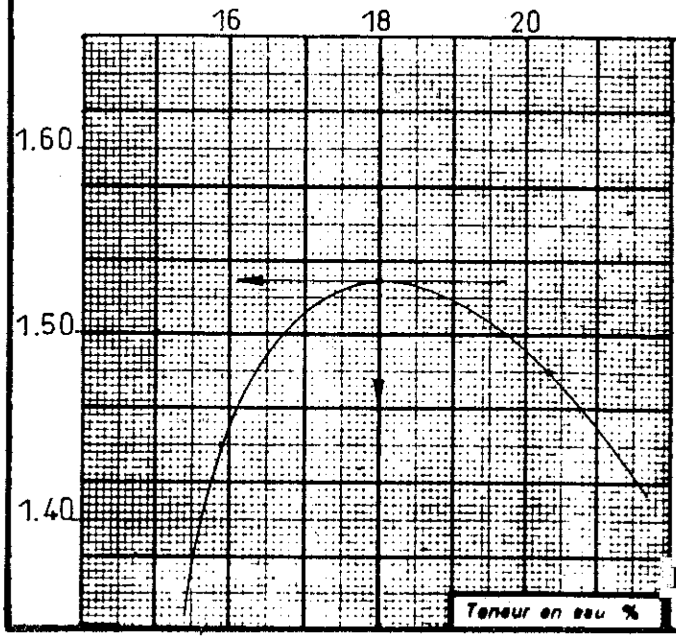
GRANULOMÉTRIE

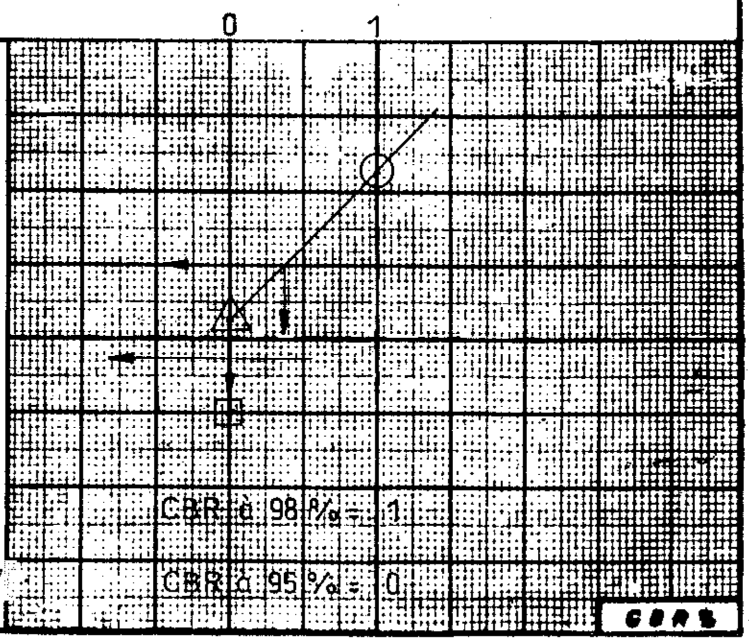


ESSAI PROCTOR	
Densité sèche max.	1.53 T/m³
Teneur en eau opt.	18.0 %

ESSAI CBR —— W % optimale; —— 5% ...

N coups	γd T/m³	W % moulage	% après imbib	gonflement %
○ 56	1.57	19.3		
△ 25	1.51	19.3		
□ 10	1.46	19.3		





DIRECTION
DU LABORATOIRE NATIONAL
DES TRAVAUX PUBLICS
ET DU BATIMENT
B. P. 464 — NIAMEY

ANALYSES GRANULOMETRIQUES

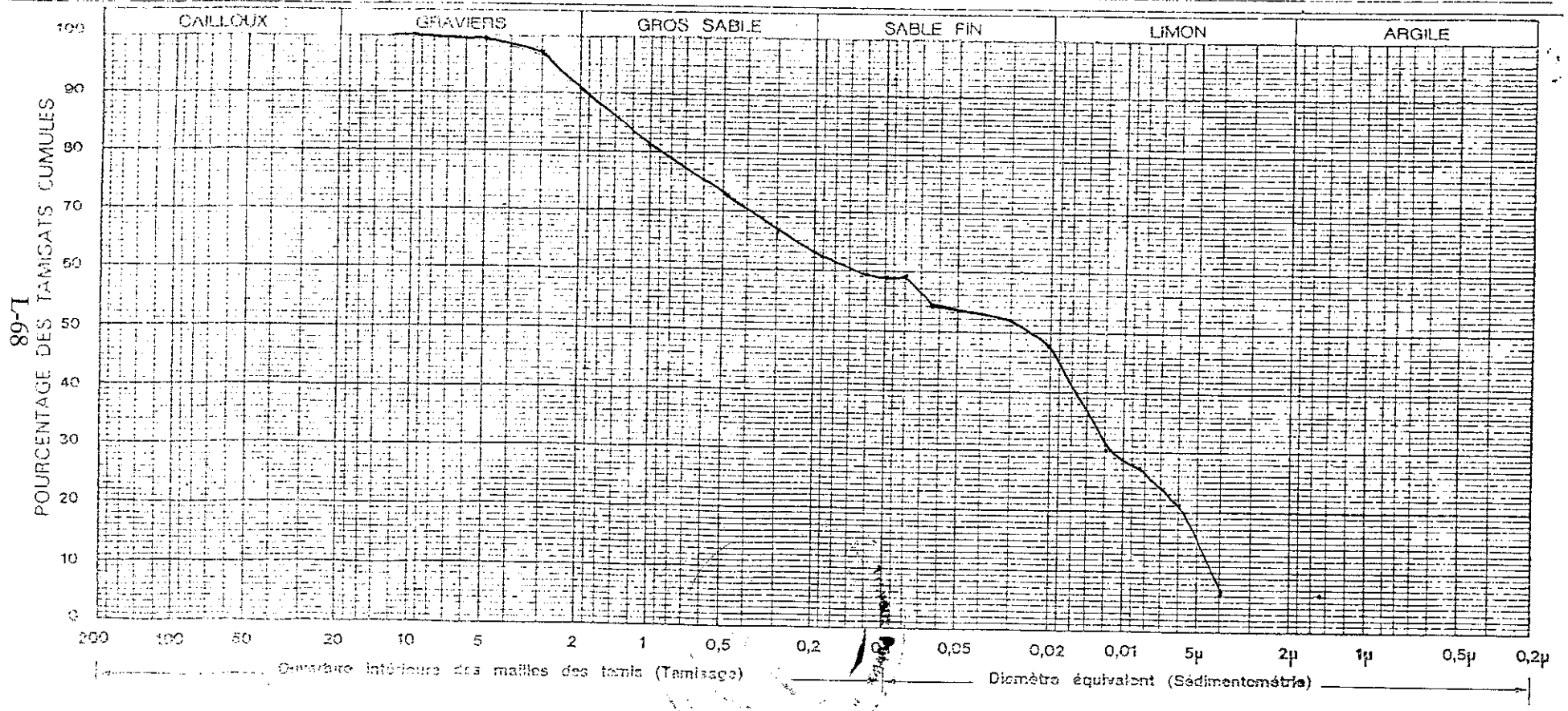
Opérateur : .....

Désignation des échantillons ..... N° .....

Provenance : ASSAINISS. VILLE NY.

Echantillon : Argile graveleuse

F 4 / Prél. 14.30 à 23.50m



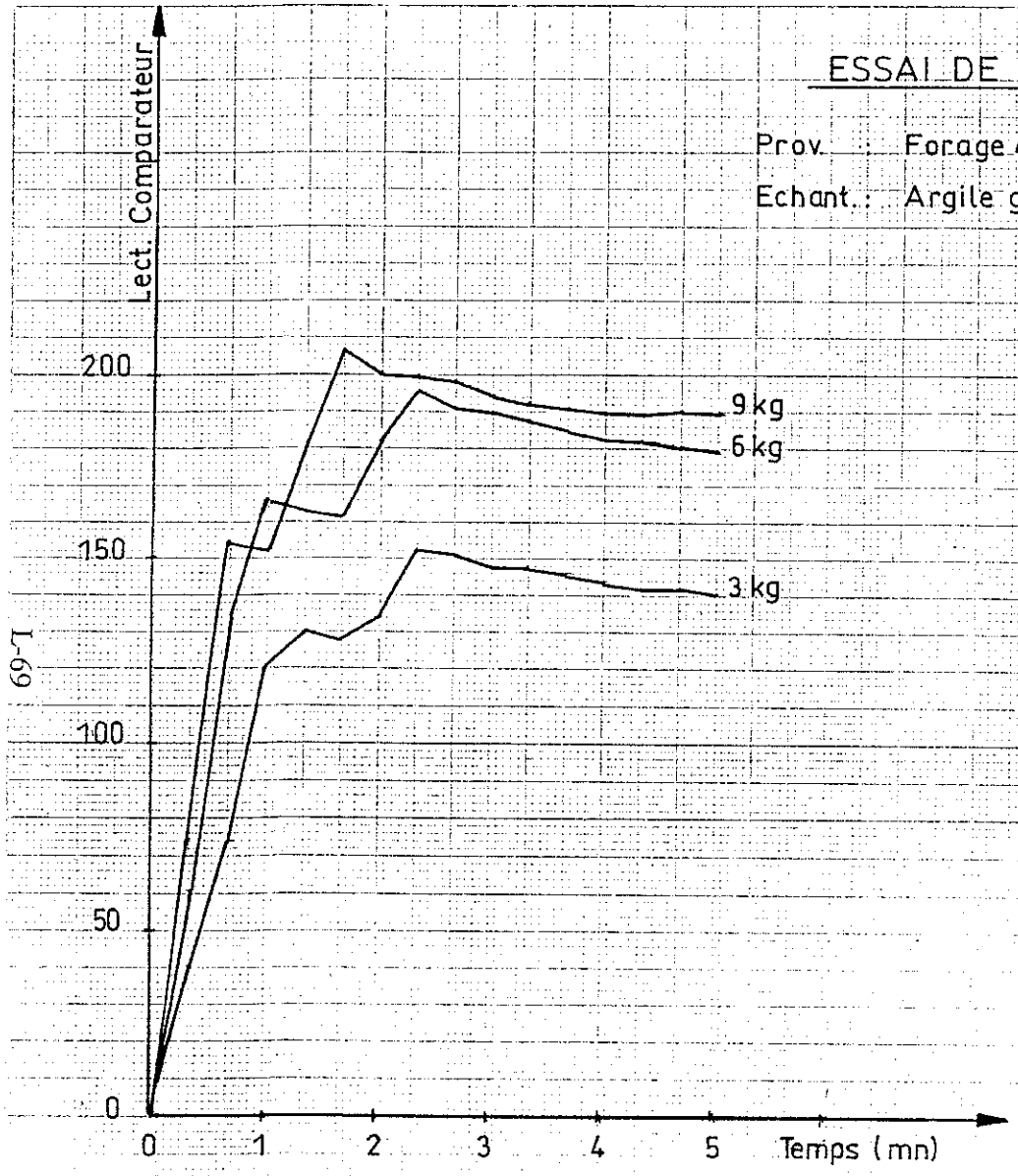
89-I

N°	L.L.	I.P.	< 0,08	HRB	F.P.	I.G.	ds max.	∝ opt.	CBR	Gonfl.	ds situ.	comp.rel.
	72.9	34.3	59%	A 7-5(15)								

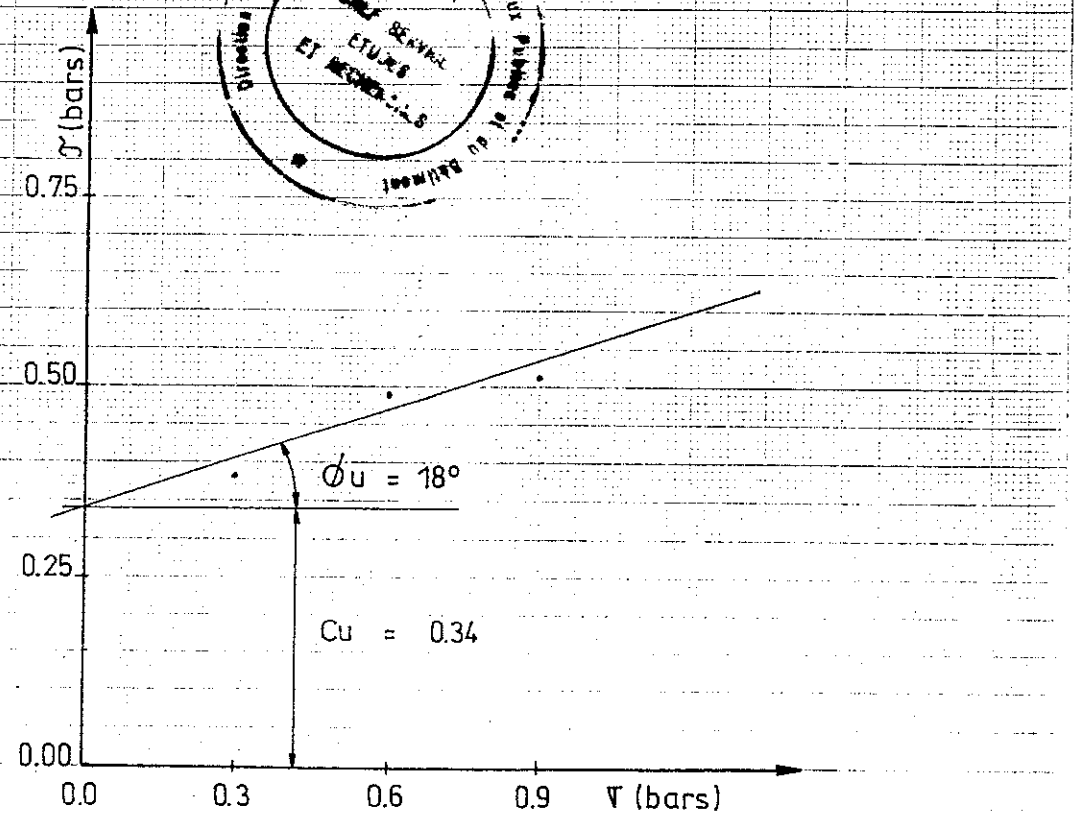
ESSAI DE CISAILLEMENT

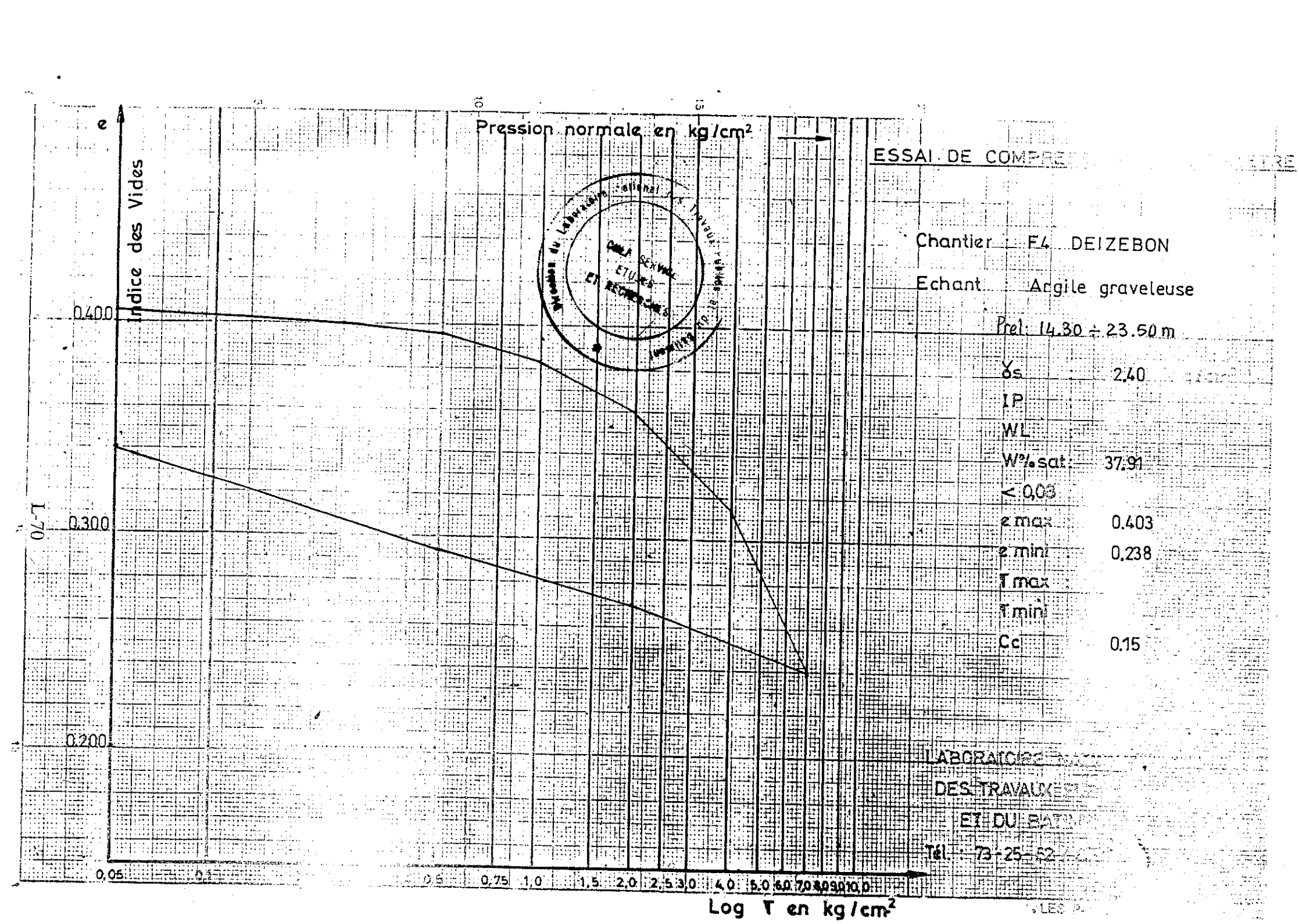
Prov. : Forage 4 DEIZEBON

Echant. : Argile graveleuse brunâtre / Prél. 14.30 à 23.50m



L-69




e
Indice des Vides
Pression normale en kg/cm²
0.400
0.300
0.200
0,05
0,1
0,5
0,75
1,0
1,5
2,0
2,5
3,0
4,0
5,0
6,0
7,0
8,0
9,0
10,0
Log T en kg/cm²
ESSAI DE COMPRE
Chantier : F4 DEIZEBON
Echant : Argile graveleuse
Prel 14.30 ÷ 23.50 m
γs : 2.40
IP :
WL :
W% sat : 37.91
< 0,08
e max 0.403
e mini 0.238
T max :
T mini :
Cc 0.15
LABORATOIRE
DES TRAVAUX
ET DU BAT
Tél. : 73-25-52

LABORATOIRE NATIONAL DES TRAVAUX PUBLICS

B.P. 464 NIAMEY Prov. : ASSAINISSEMENT VILLE NY.

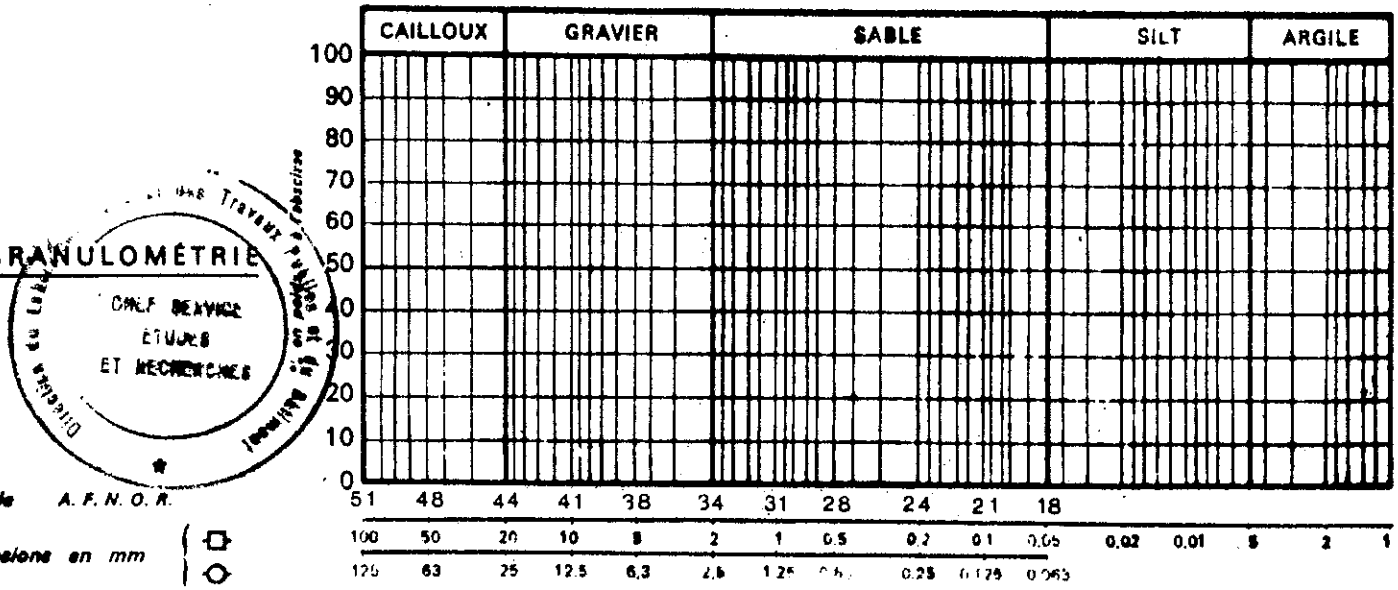
N° ECH.	PROF.	PROFIL	NATURE
F4	23.5 à 26.0m		Schiste

ESSAIS D'IDENTIFICATION

Ech.	Limites d'Atterberg LL	LP	IP	Poids spécifique	m - I P	Classification U S H R B
	62.1	33.2	28.9			

m éléments du mortier passant au tamis de 0,42 (module 27)

GRANULOMÉTRIE



module A. F. N. O. R.

dimensions en mm

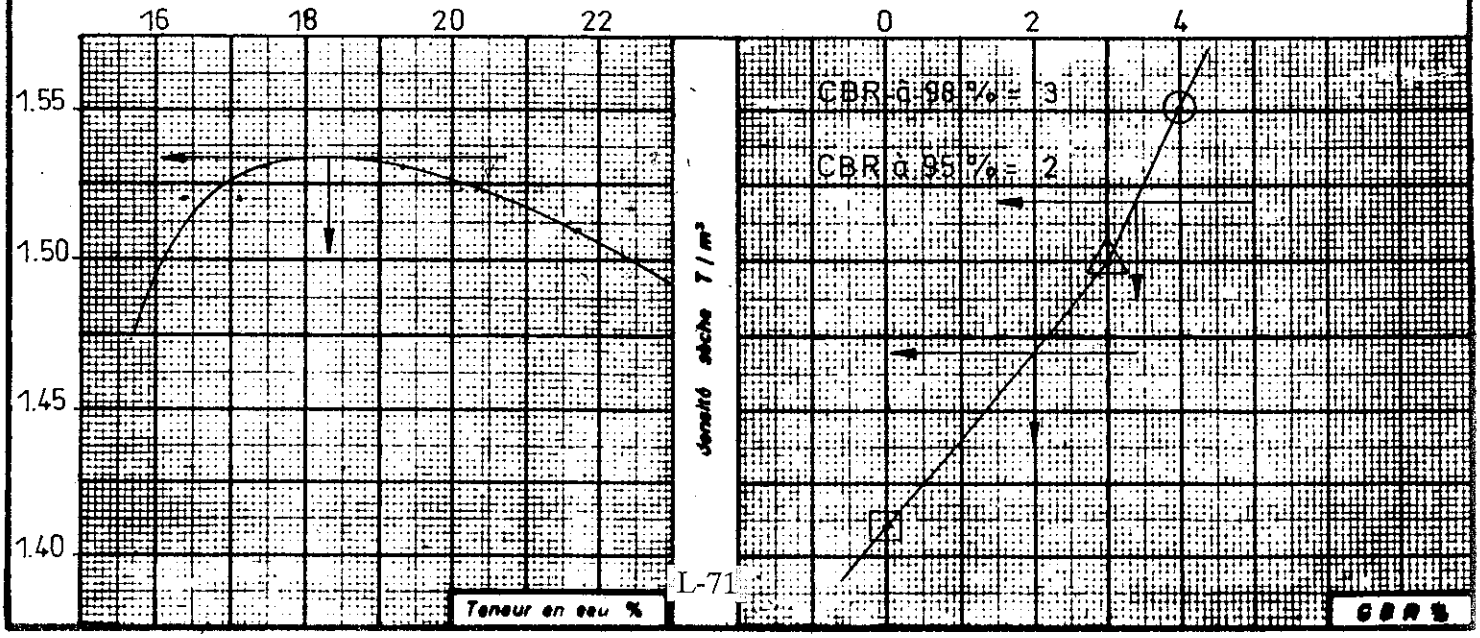
ESSAI PROCTOR

Densité sèche max. 1.53 T / m³

Teneur en eau opt. 18.3 %

ESSAI C B R — W % optimale — S % maxi

N coups		γd T / m³	W % Gonflement	% après imbib	gonflement %
○	56	1.55	19.3		
△	25	1.50	19.3		
□	10	1.41	19.3		



DIRECTION
DU LABORATOIRE NATIONAL
DES TRAVAUX PUBLICS
ET DU BATIMENT
B. P. 464 — NIAMEY

ANALYSES GRANULOMETRIQUES

Opérateur : .....

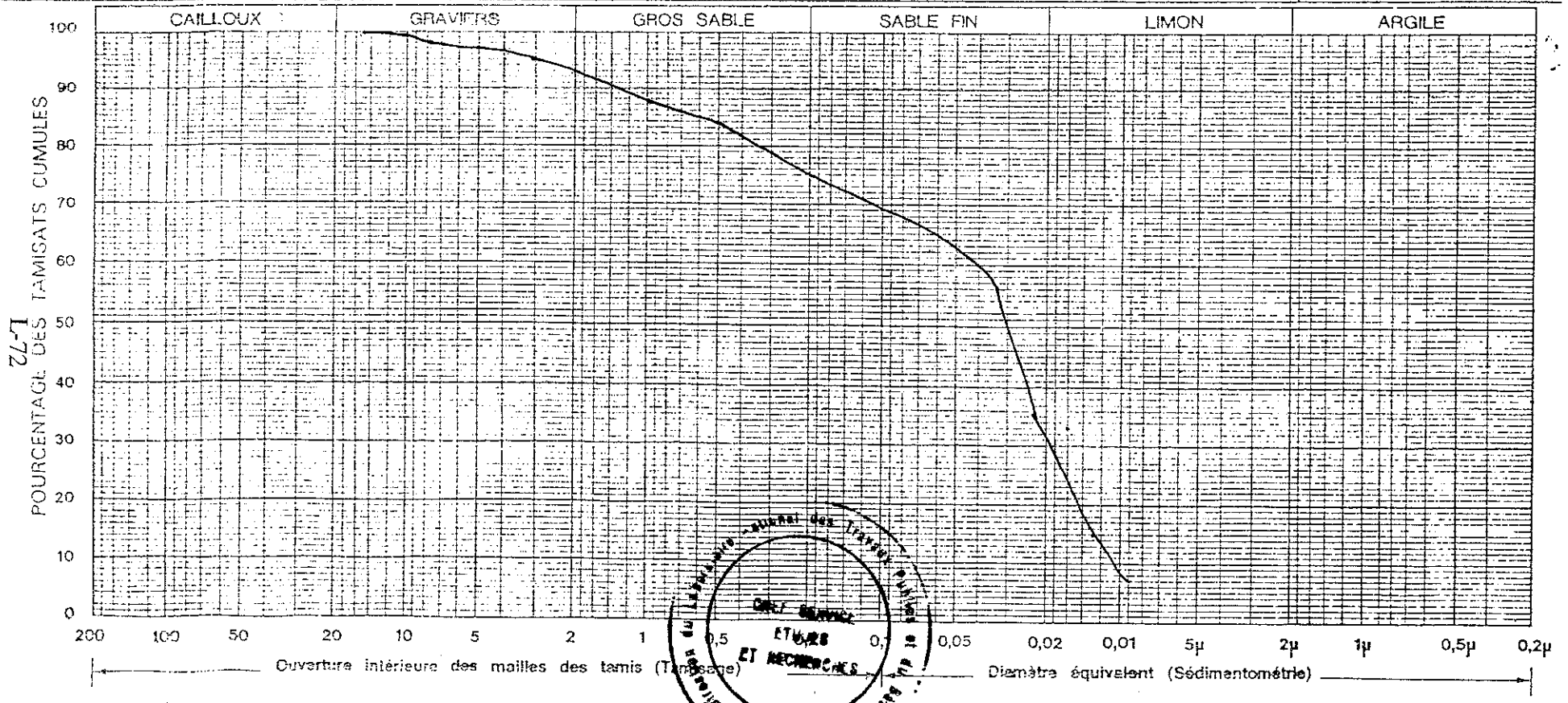
Provenance : ASSAINISS. VILLE NY.

Echantillon : Schiste

Désignation des échantillons N° .....

N° F4 / Prél. 23.50 à 26.00m

L-72

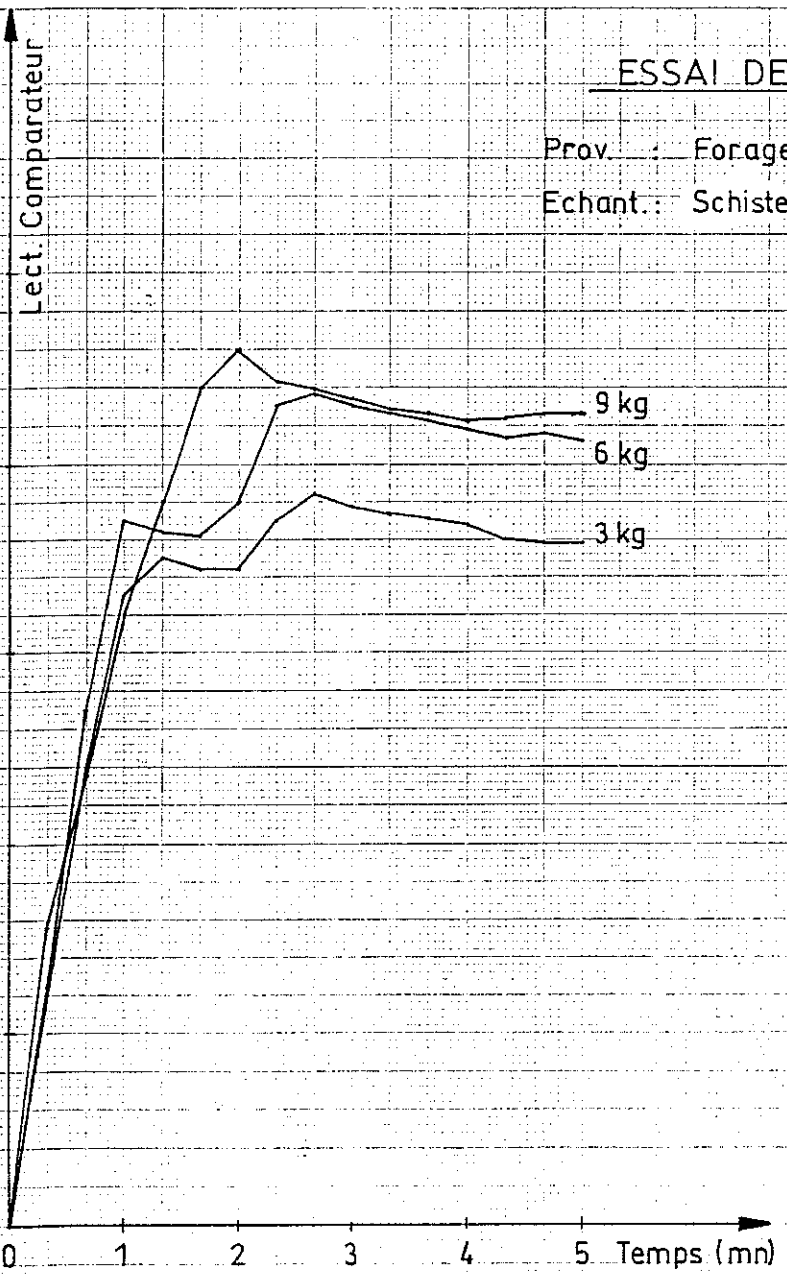


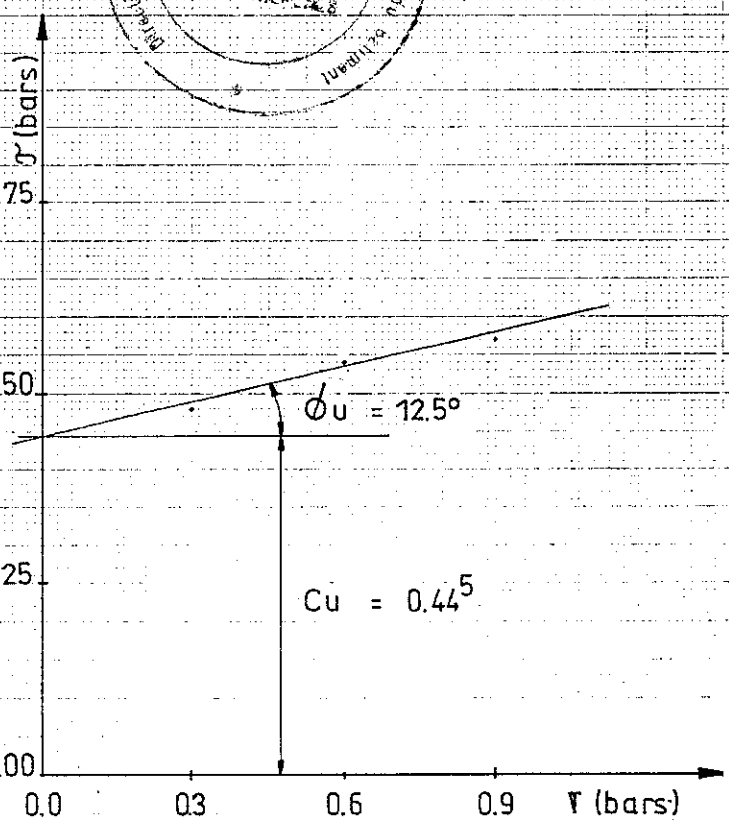
N°	L.L.	I.P.	< 0,08	HRB	F.P.	I.G.	ds max.	∝ opt.	CBR	Gonfl.	ds situ.	comp.rel.
	62.1	28.9	68 %	A7-5 (18)								

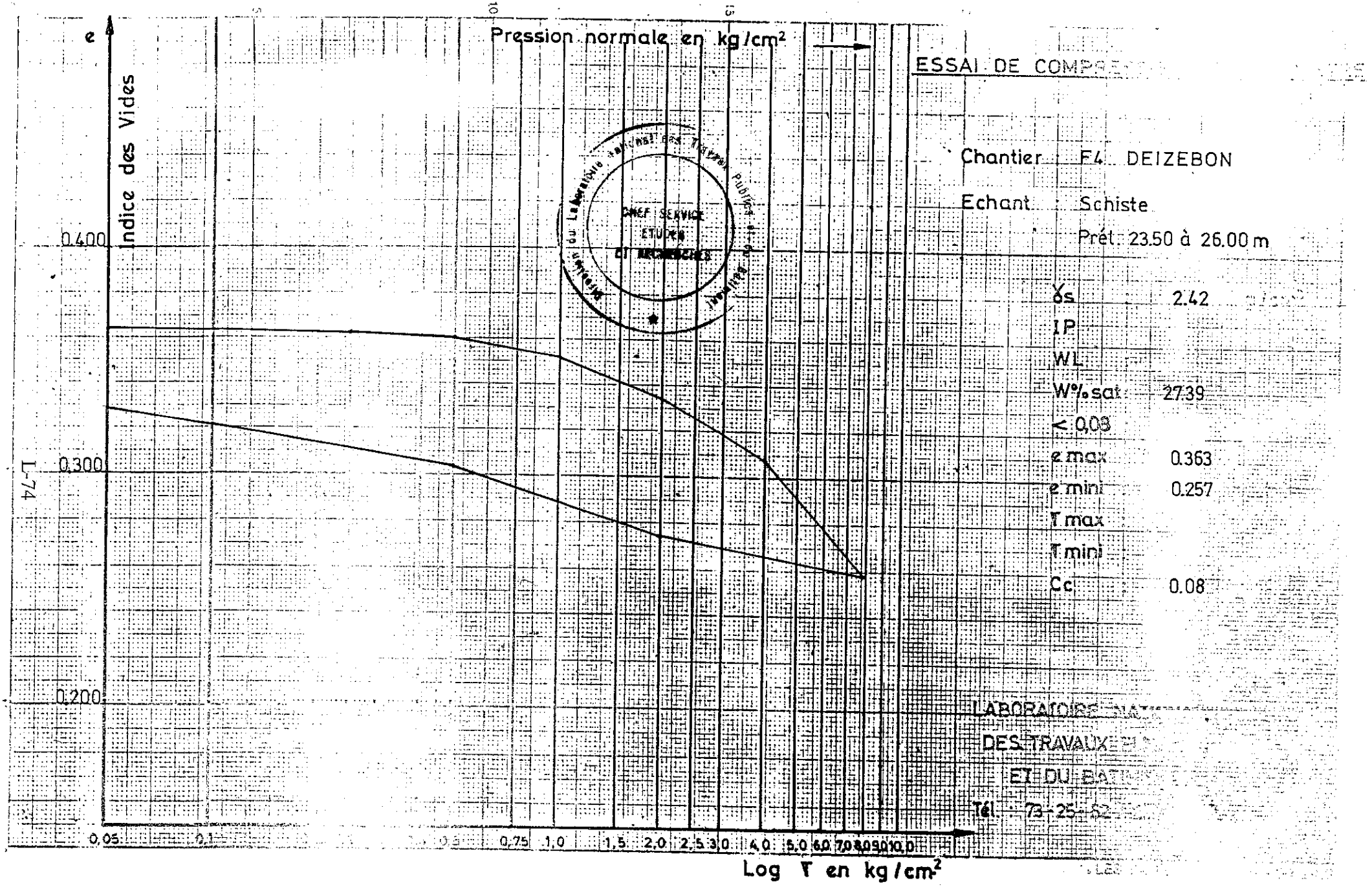
ESSAI DE CISAILLEMENT

Prov. : Forage 4 DEIZEBON

Echant. : Schiste / Prél. 23.50 à 26.00 m






e
Indice des Vides
0.400
0.300
0.200
Pression normale en kg/cm²
5
10
15
0,05
0,1
0,5
0,75
1,0
1,5
2,0
2,5
3,0
4,0
5,0
6,0
7,0
8,0
9,0
10,0
Log T en kg/cm²
L-74
ESSAI DE COMPR
Chantier F4 DEIZEBON
Echant Schiste
Prél 23.50 à 26.00 m
γs 2.42
IP
WL
W% sat 27.39
< 0,03
e max 0.363
e mini 0.257
T max
T mini
Cc 0.08
LABORATOIRE
DES TRAVAUX
ET DU BAT
Tél 73-25-52

APPENDIX 5: FORAGE N°5/DEIZEBON

DIRECTION
DU LABORATOIRE NATIONAL
DES TRAVAUX PUBLICS
ET DU BATIMENT
B. P. 464 – NIAMEY

ANALYSES GRANULOMETRIQUES

Opérateur : _____

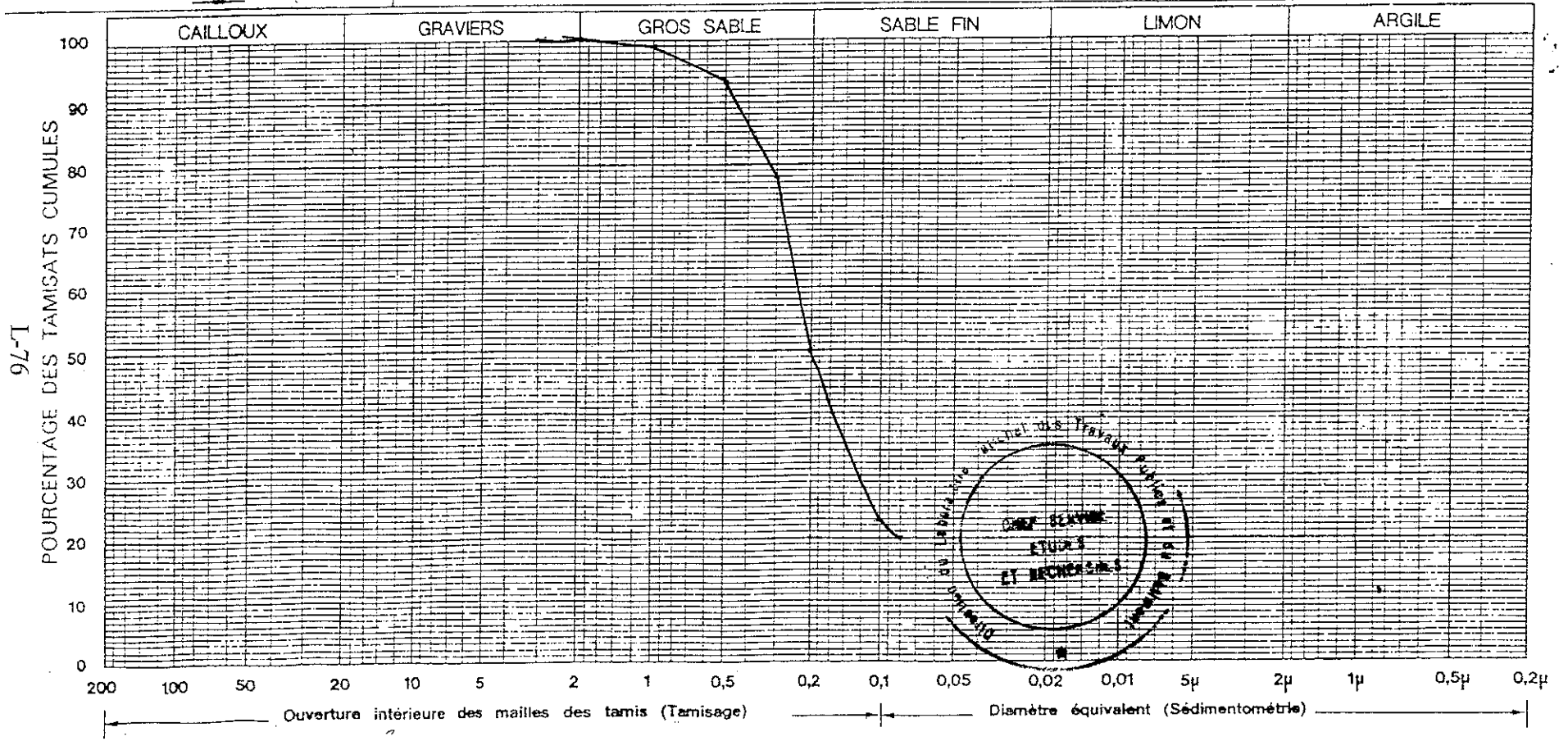
Désignation des échantillons _____ N° _____

Provenance : ASSAINISS. VILLE NY.

Echantillon : Sable blanchâtre

F 5 / Prél. 3.00 à 9.30m

L-76

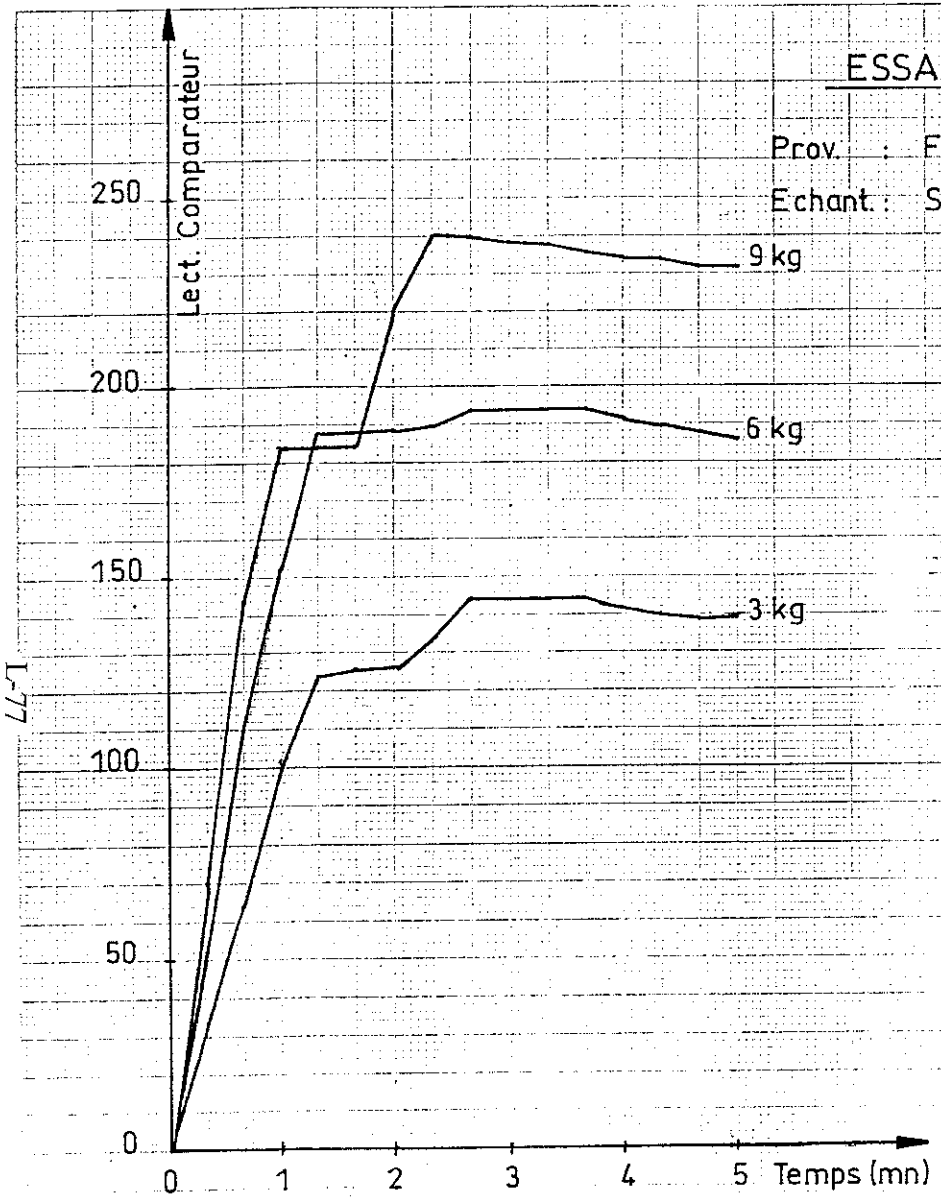


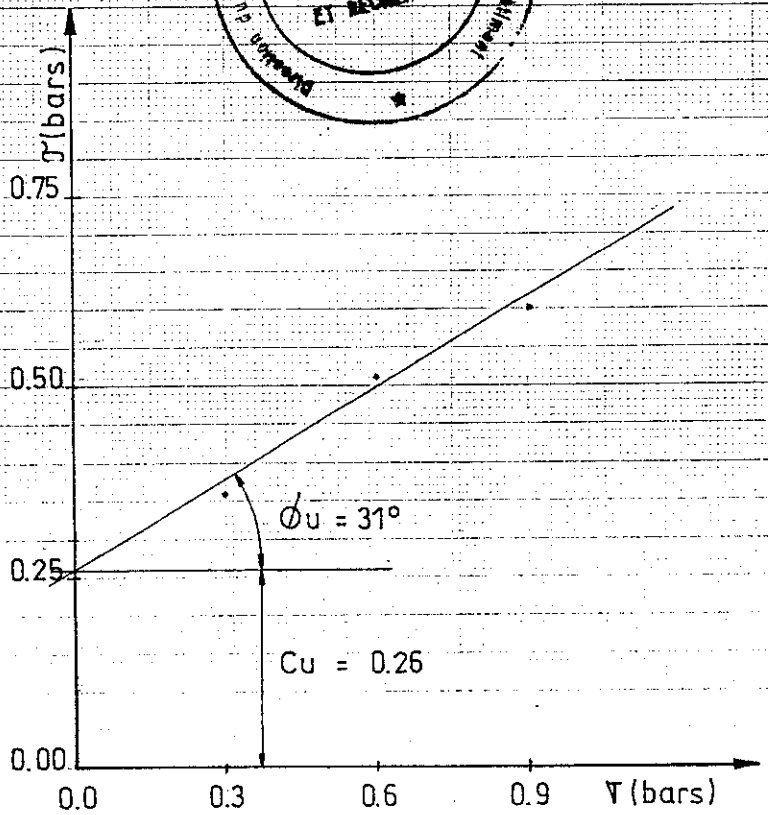
N°	L.L.	I.P.	< 0,08	HRB	ES	I.G.	ds max.	∝ opt.	CBR	Gonfl.	ds situ.	comp.rel.
			20 %	A-2	25%							

ESSAI DE CISAILLEMENT

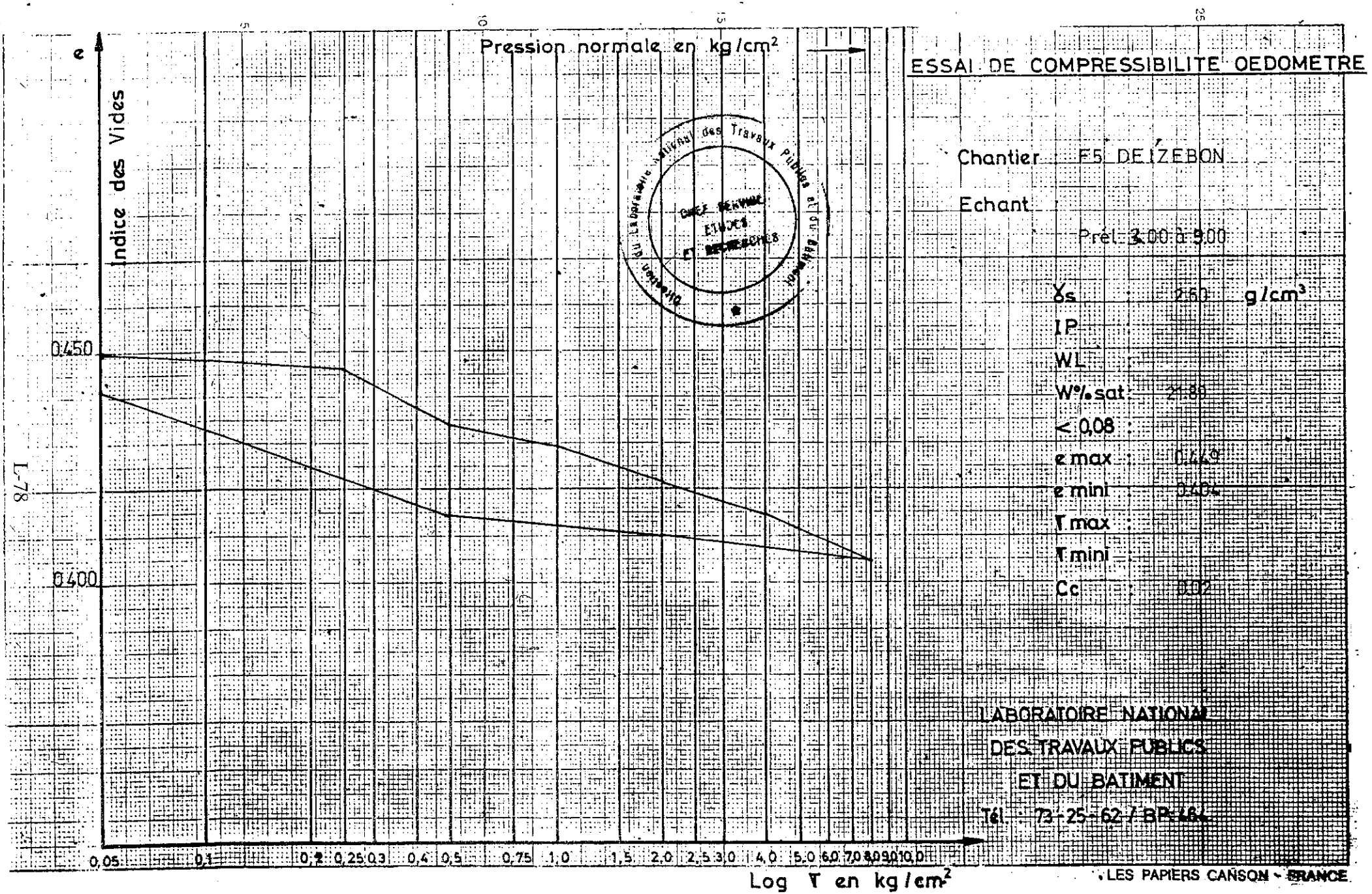
Prov. : Forage 5 DEIZEBON

Echant. : Sable / Prél. 3.00 à 9.30 m





L-77



ESSAI DE COMPRESSIBILITE OEDOMETRE

Chantier : F5 DE ZEBON

Echant :

Prél. 3,00 à 5,00

γ_s	:	2,60 g/cm³
IP		
WL		
W% sat	:	21,80
< 0,08	:	
e max	:	0,449
e mini		0,404
T max	:	
T mini		
Cc	:	0,02

LABORATOIRE NATIONAL
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ET DU BATIMENT
Tél. 73-25-62 / BP 66

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MINISTERE DE L'EQUIPEMENT ET DES TRANSPORTS
DIRECTION DU LABORATOIRE NATIONAL DES TRAVAUX PUBLICS ET DU BATIMENT
B.P 464 Tel:73 - 25 - 62 Niamey

ESSAIS DE PERMEABILITE

PROVENANCE: Assainissement de la ville de niamey — DATE : 04/12/2000

FORAGE N° 5 DEIZEBON — DEMANDEUR SENAGHRY

PROFONDEUR: 3,00 m - 9,30 m — OPERATEUR: LABARAN

NATURE DU SOL : SABLE BLANCHATRE

TEMPERATURE DE L'ESSAI: θ 26,8 °C

SECTION DU TUBE DE MESURE: a = 3,14 mm2

SECTION DE L'ECHANTILLON: A = 78,54 cm2

HAUTEUR DE L'ECHANTILLON: L = 18,8 mm

ESSAIS N°	1	2	3
H o	90	80	90
H 1	20	30	25
Temps : t (s)	11	8	10
Kθ (cm/s)	$2,4 * 10^{-4}$	$2,8 * 10^{-4}$	$2,4 * 10^{-4}$
Kθ moy. (cm/s)			
K 20 (cm/s)		$1,3 * 10^{-5}$	

OBSERVATIONS:

W % = 9,8 γd = 1,94

LE CHEF SERVICE LABORATOIRE

DIRECTION
DU LABORATOIRE NATIONAL
DES TRAVAUX PUBLICS
ET DU BATIMENT
B. P. 464 — **NIAMEY**

ANALYSES GRANULOMETRIQUES

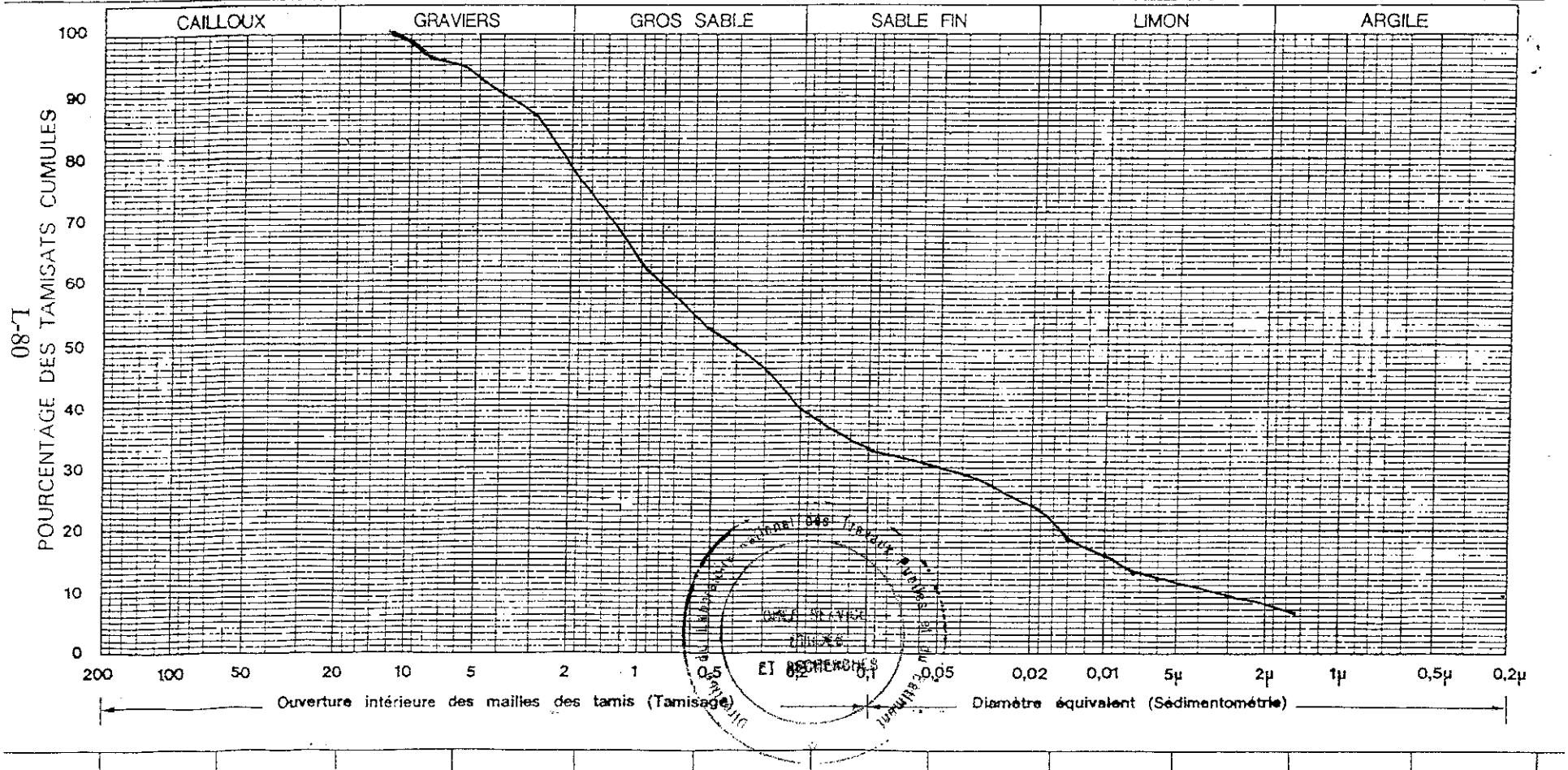
Opérateur : _____

Désignation des échantillons _____ N° _____

Provenance : ASSAINISS. VILLE NY.

Echantillon : Latérite

F 5 / Prél. 10.00 à 11.50m



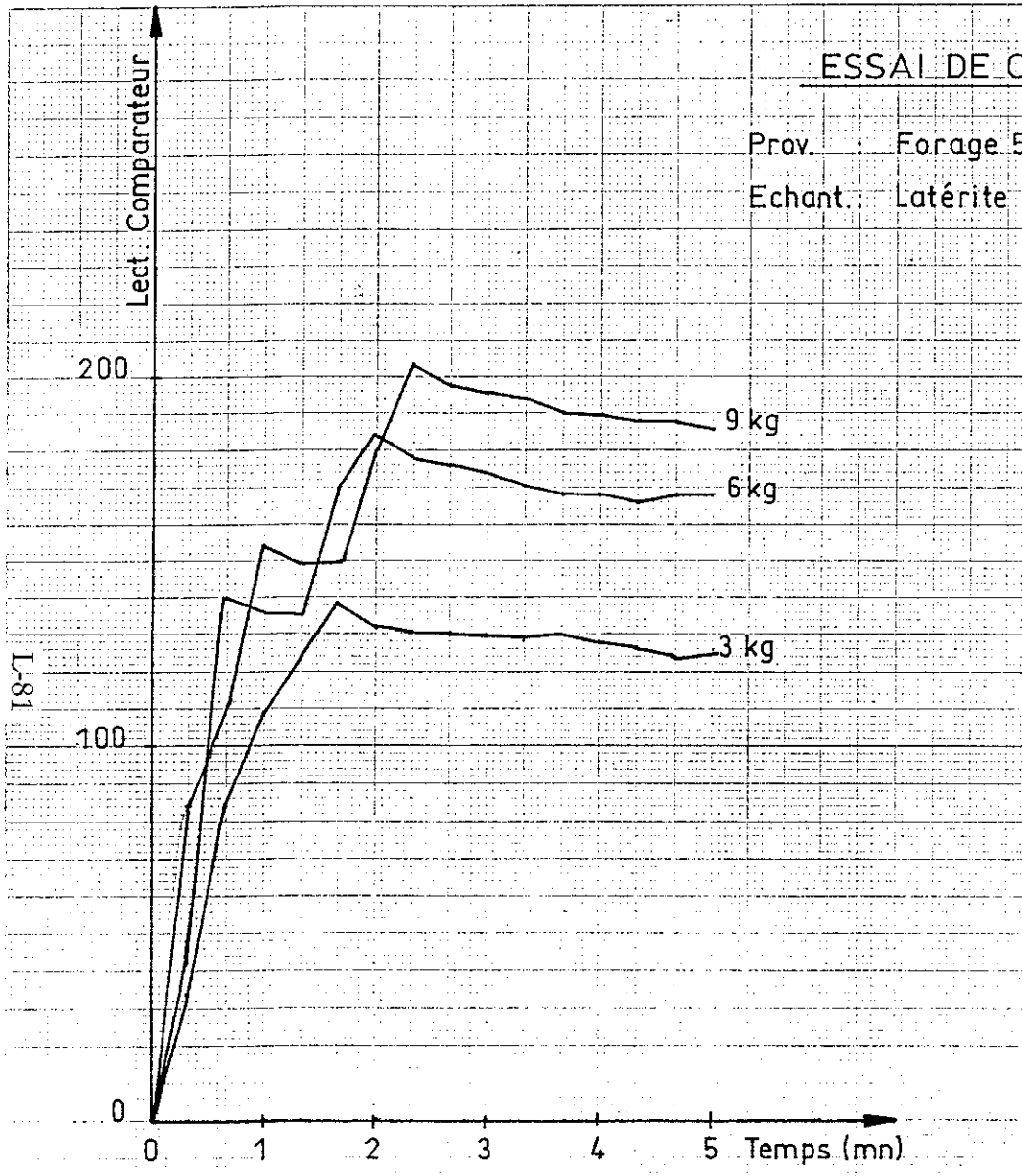
08-I

N°	L.L.	I.P.	< 0,08	HRB	F.P.	I.G.	ds max.	∝ opt.	CBR	Gonfl.	ds situ.	comp.rel.
	36.3	19.0	32%	A2-6 (2)								

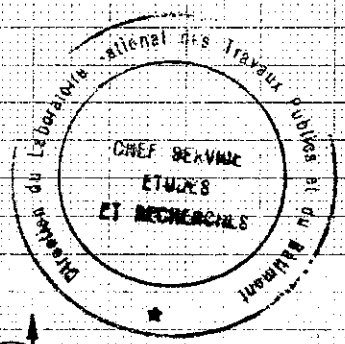
ESSAI DE CISAILLEMENT

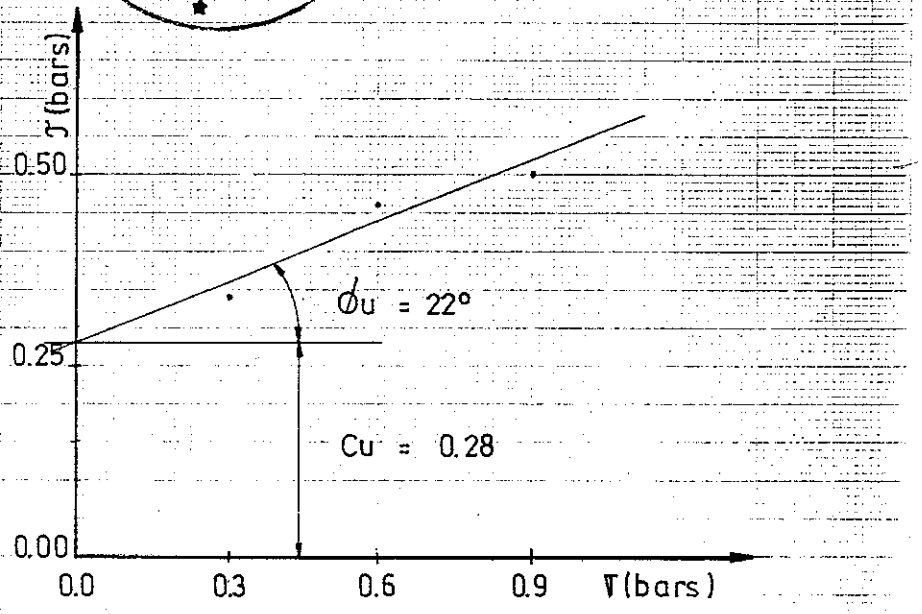
Prov. : Forage 5 DEIZEBON

Echant. : Latérite / Prél. 10.00 à 11.50 m



L-81





LABORATOIRE NATIONAL DES TRAVAUX PUBLICS

B.P. 464 NIAMEY Prov. : ASSAINISSEMENT VILLE NY.

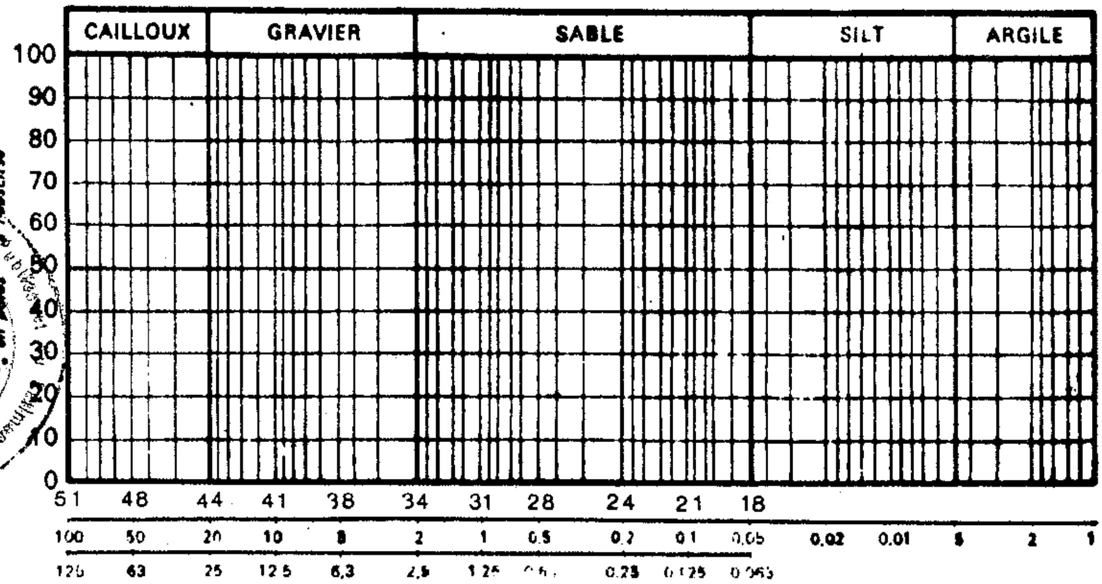
N° ECH.	PROF.	PROFIL	NATURE
F5	11.5 à 13.80m		Argile graveleuse

ESSAIS D'IDENTIFICATION

Ech.	Limites d'Atterberg LL	LP	IP	Poids spécifique	m - IP	Classification US HRB
	70	34.5	35.5			

m éléments du mortier passant au tamis de 0,42 (module 27)

GRANULOMÉTRIE



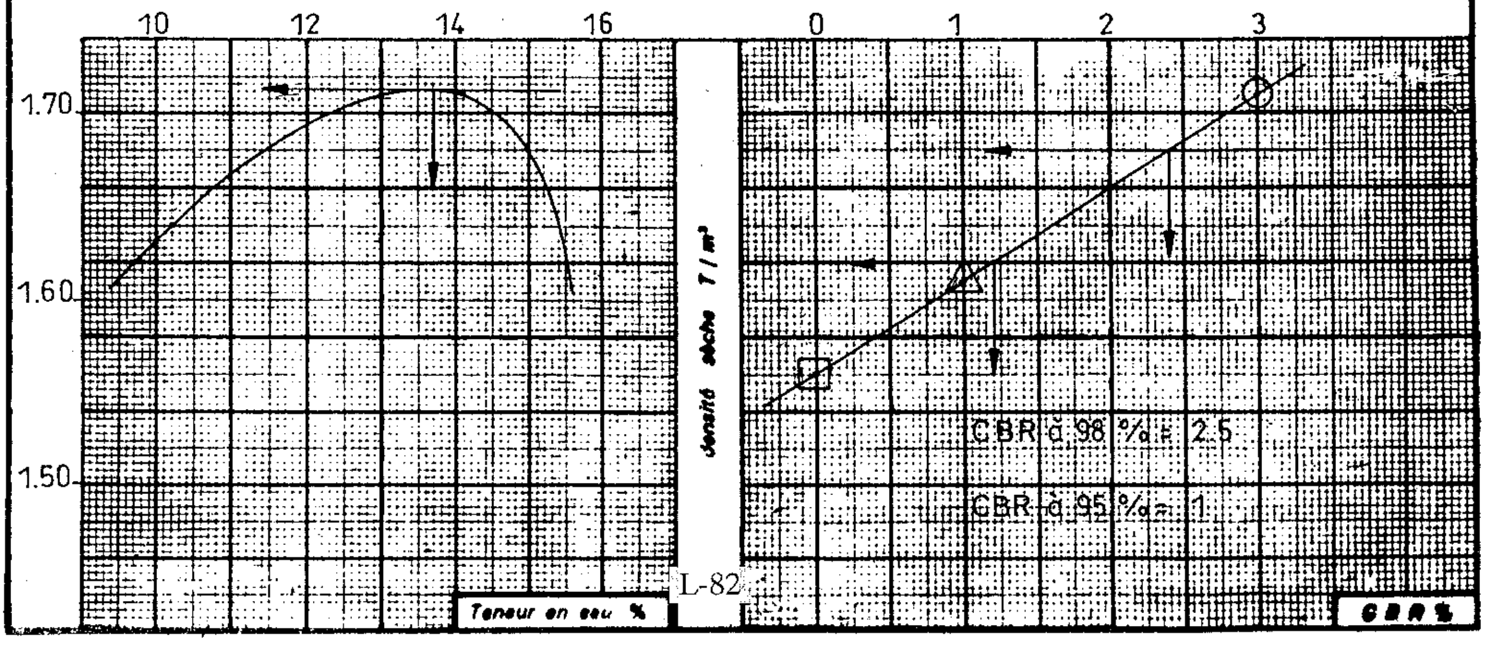
module A.F.N.O.R.

dimensions en mm □ ○

ESSAI PROCTOR	
Densité sèche max.	1.71 T/m³
Teneur en eau opt.	13.7 %

ESSAI CBR — W % optimale — 5% ...

N coups	γ_d T/m³	W % moulage	% après imbib	gonflement %
⊙ 55	1.71	14.8		
△ 26	1.61	14.8		
□ 10	1.56	14.8		



DIRECTION
DU LABORATOIRE NATIONAL
DES TRAVAUX PUBLICS
ET DU BATIMENT
B. P. 464 — NIAMEY

ANALYSES GRANULOMETRIQUES

Opérateur : _____

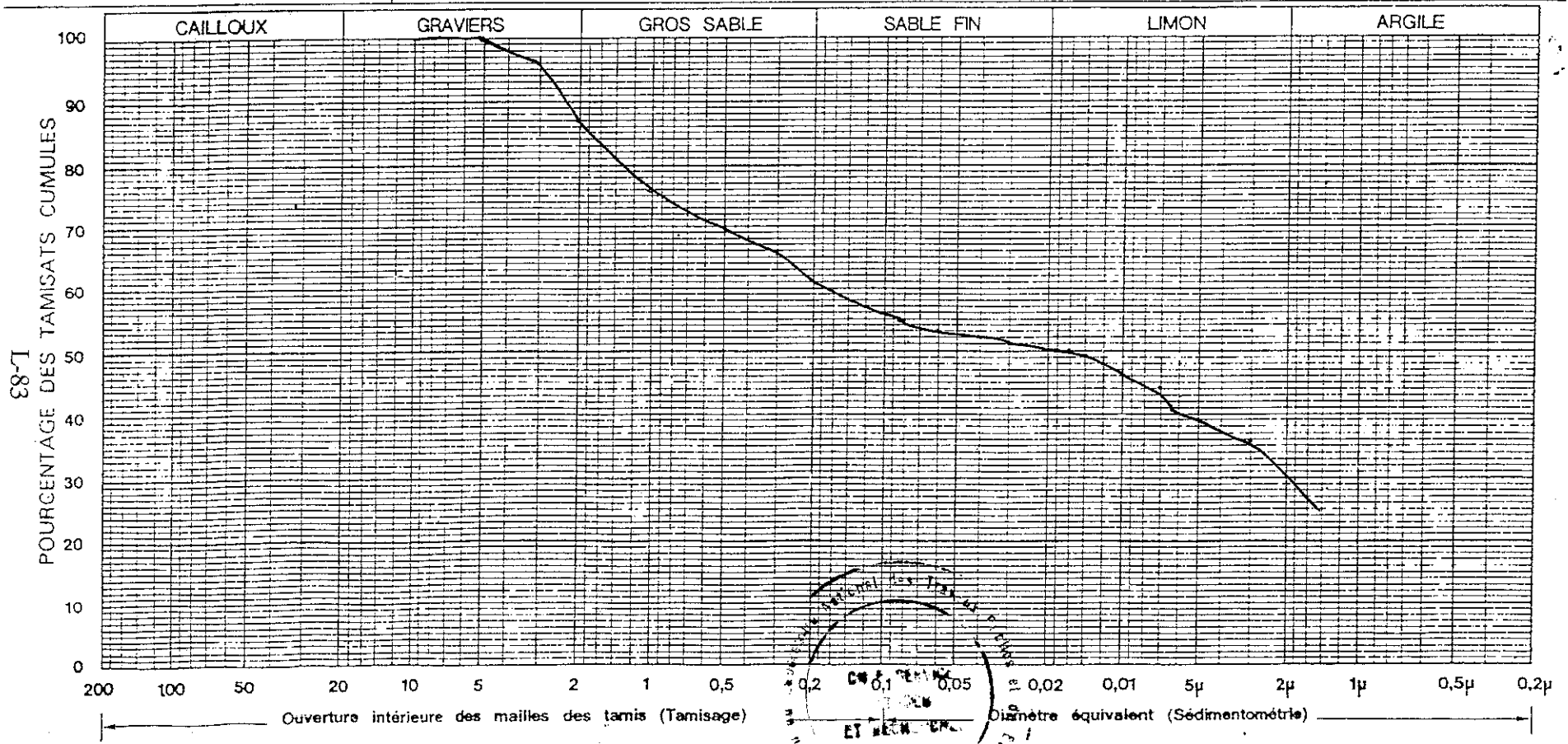
Provenance : ASSAIN. VILLE NY.

Echantillon : Argile graveleuse

Désignation des échantillons _____ N° F5 / Prél. 11.50 à 13.80m

_____ N° _____

L-83

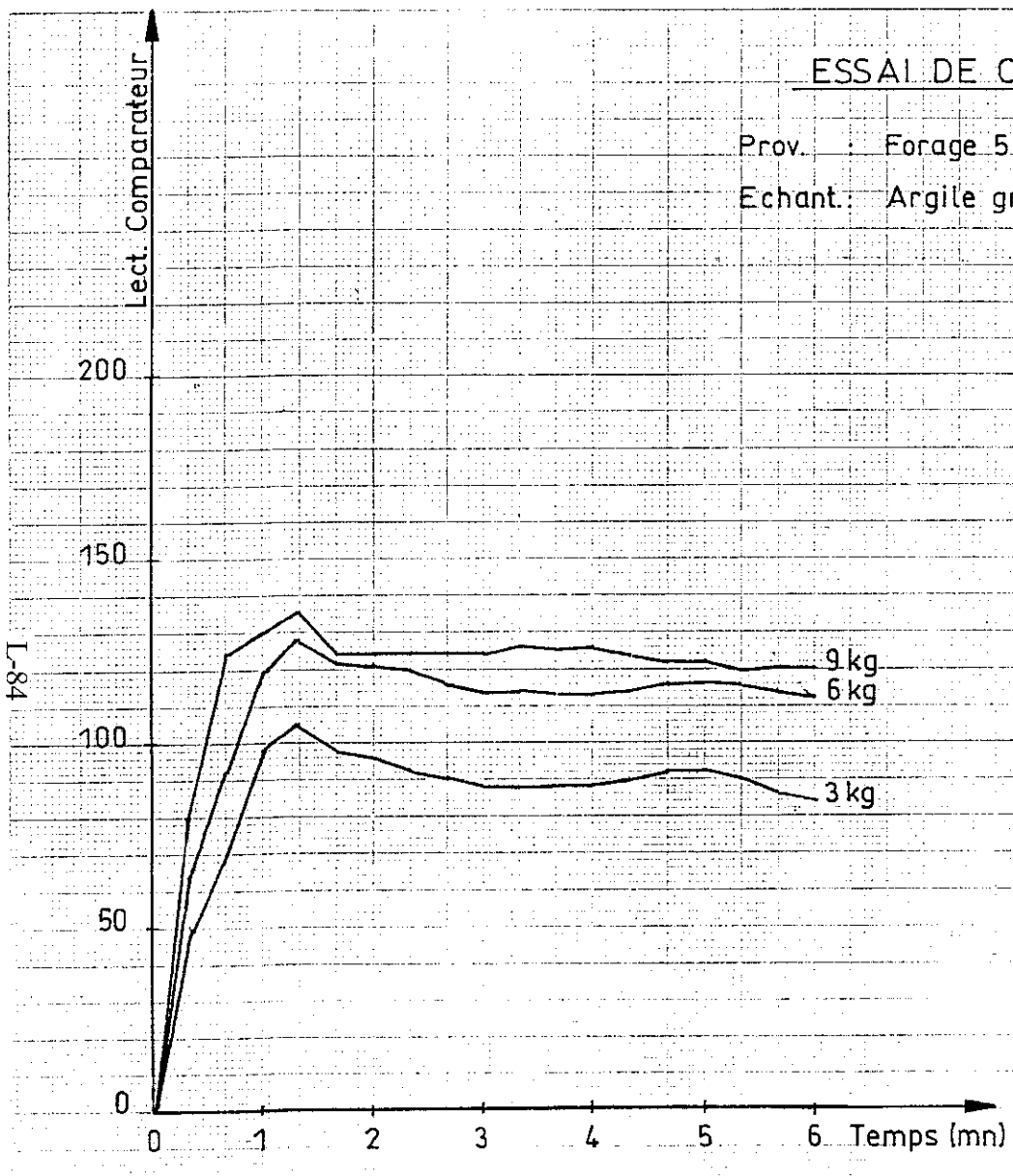


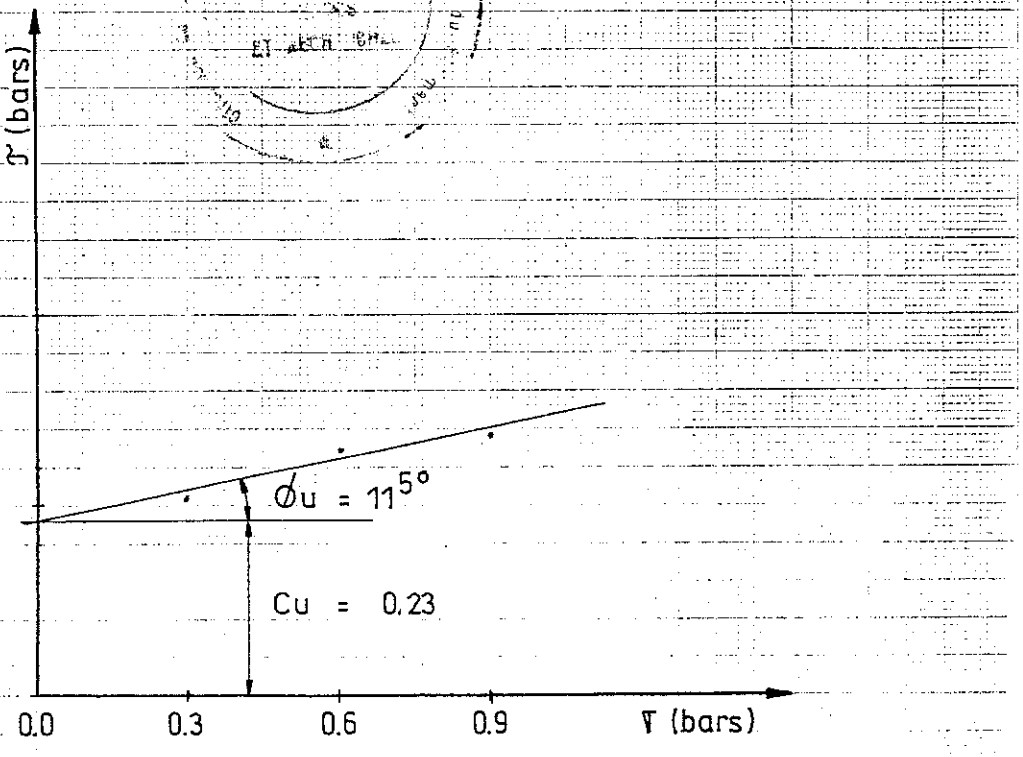
N°	L.L.	I.P.	< 0,08	HRB	F.P.	I.G.	ds max.	∝ opt.	CBR	Gonfl.	ds situ.	comp.rel.
	70	35.5	55%	A7-5(14)								

ESSAI DE CISAILLEMENT

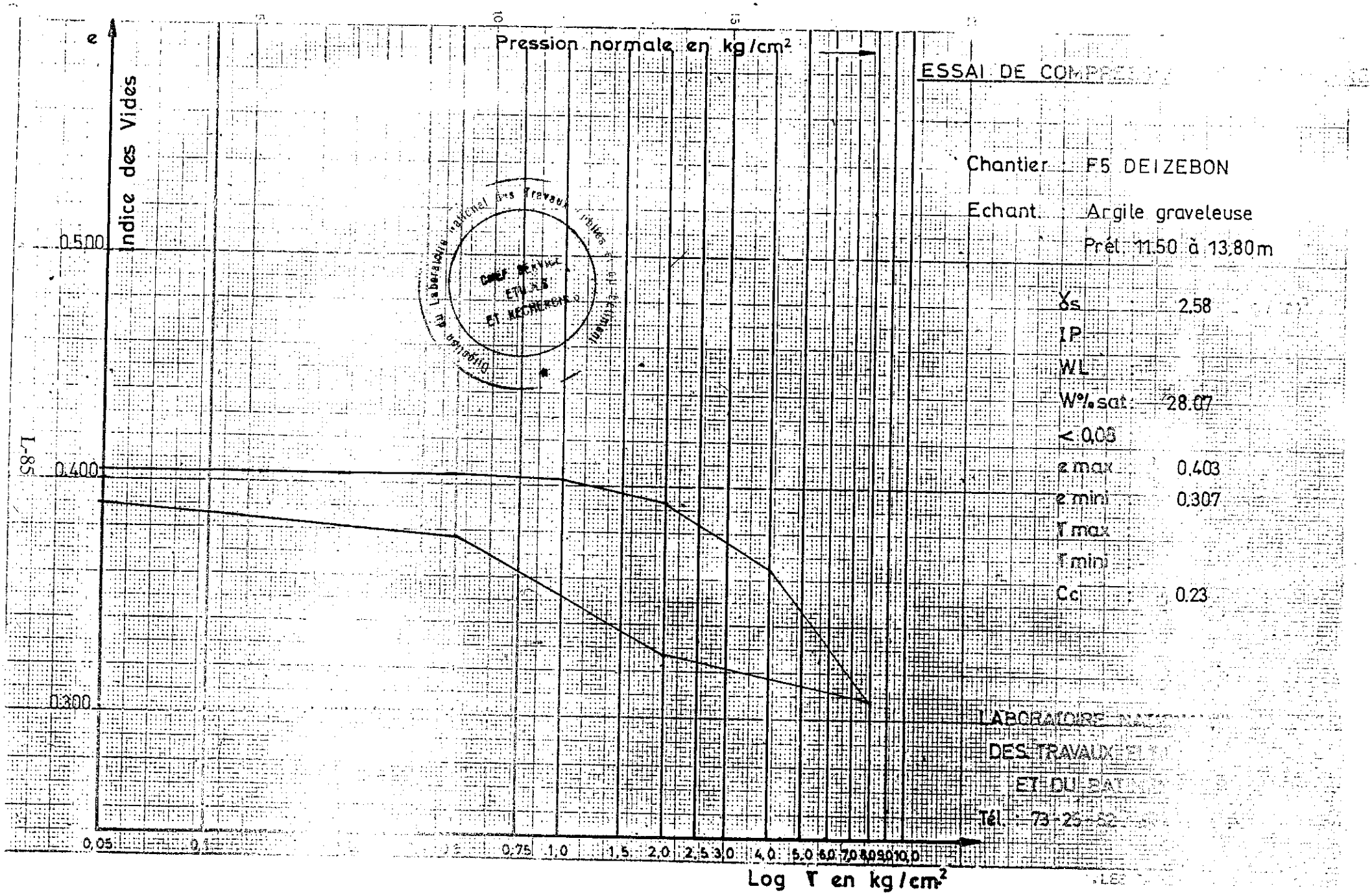
Prov. : Forage 5 DEIZEBON

Echant.: Argile graveleuse / Prél. 11.50 à 13.80 m





L-84


e
Indice des Vides
0.500
0.400
0.300
Pression normale en kg/cm²
10
15
ESSAI DE COMPRE
Chantier F5 DEIZEBON
Echant. Argile graveleuse
Prél. 11.50 à 13.80 m
γs 2.58
IP
WL
W% sat 28.07
< 0,08
e max 0.403
e mini 0.307
σ max
σ mini
Cc 0.23
L-85
LABORATOIRE
DES TRAVAUX
ET DU BA
Tél. 73-25-
0,05
0,1
0,75
1,0
1,5
2,0
2,5
3,0
4,0
5,0
6,0
7,0
8,0
9,0
10,0
Log σ en kg/cm²

LABORATOIRE NATIONAL DES TRAVAUX PUBLICS

B.P. 464 NIAMEY Prov. : ASSAIN. VILLE NY.

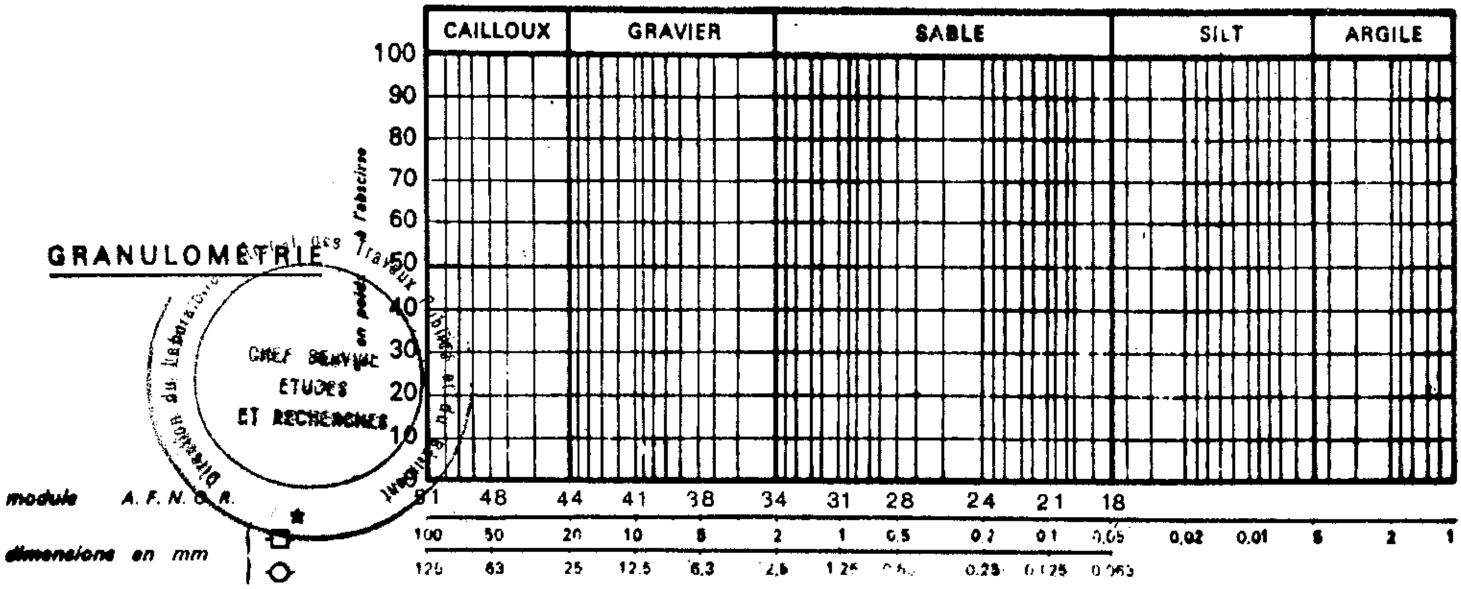
N° ECH.	PROF.	PROFIL	NATURE
F5	13.80 à 19.4m		Schiste

ESSAIS D'IDENTIFICATION

Ech.	Limites d'Atterberg LL	LP	IP	Poids spécifique	m · IP	Classification US HRB
	80.4	41.8	38.6			

m éléments du mortier passant au tamis de 0,42 (module 27)

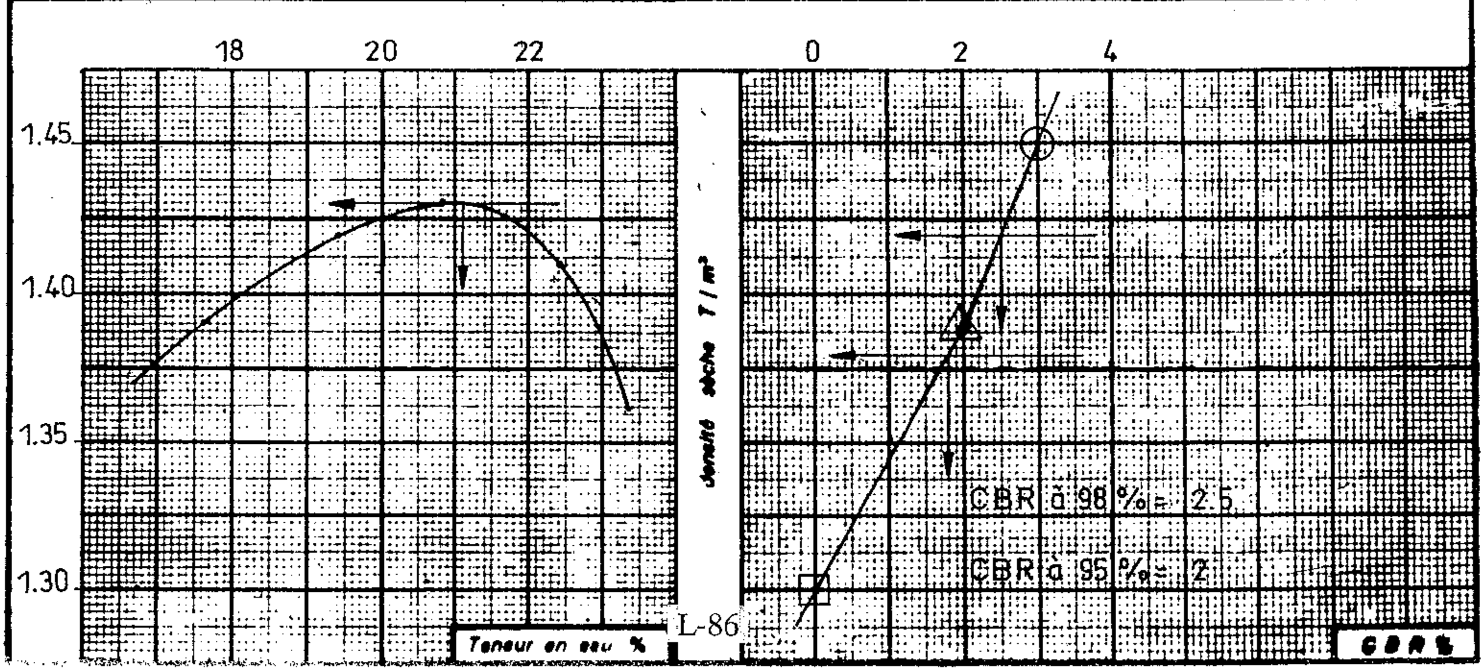
GRANULOMETRIE



ESSAI PROCTOR	
Densité sèche max.	1.43 T/m³
Teneur en eau opt.	21.1 %

ESSAI CBR — W % optimale, 95 % ...

N coups	γd T/m³	W % moulage	% après imbib	gonflement %
⊙ 55	1.45	21.0		
△ 26	1.39	21.0		
□ 10	1.30	21.0		



DIRECTION
DU LABORATOIRE NATIONAL
DES TRAVAUX PUBLICS
ET DU BATIMENT
B. P. 464 — NIAMEY

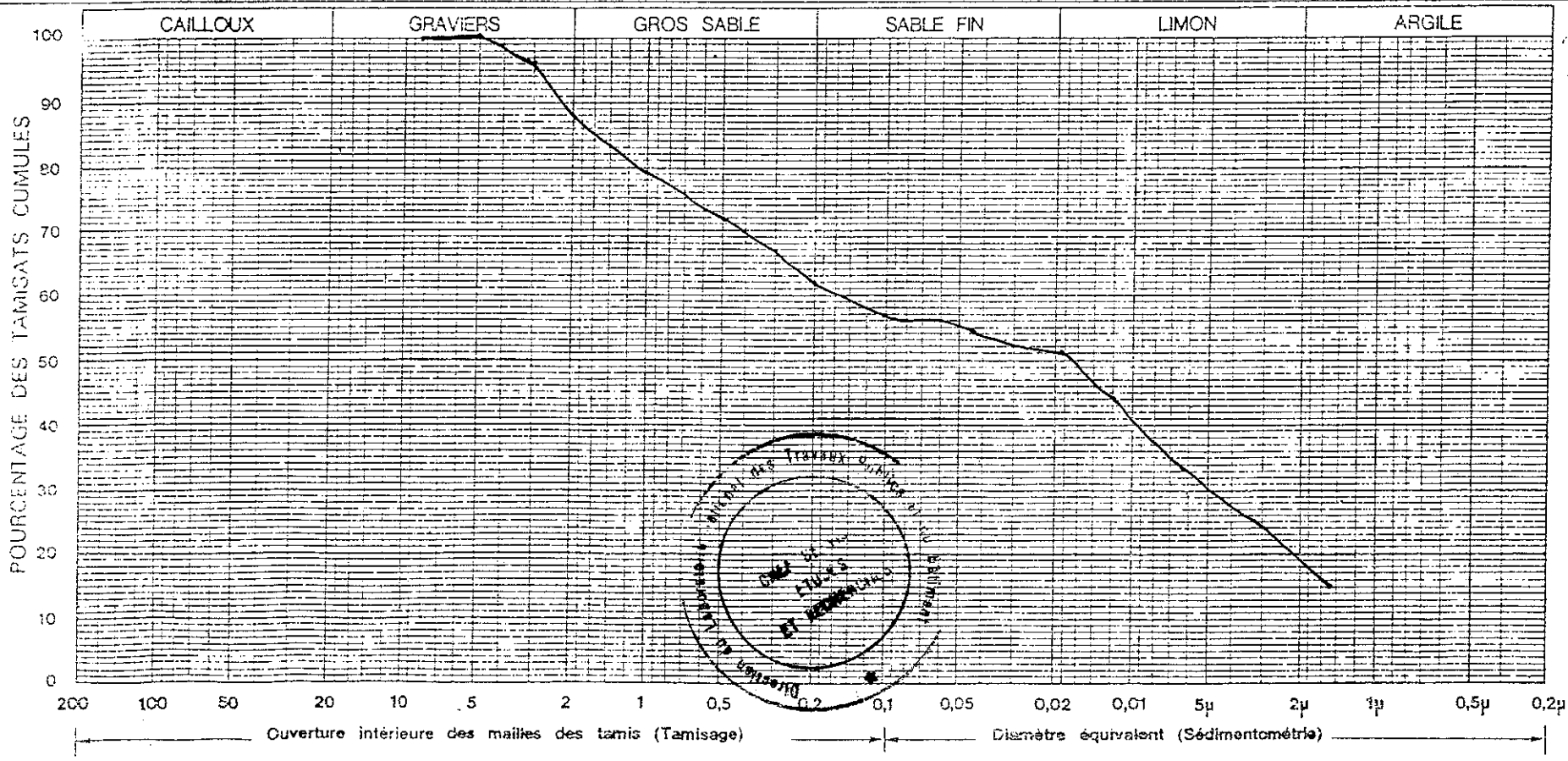
ANALYSES GRANULOMETRIQUES

Opérateur : _____

Provenance : ASSAIN. VILLE NY.

Echantillon : Schiste

Désignation des échantillons ____ N° _____ F5 / Prél. 13.80 à 19.40 m



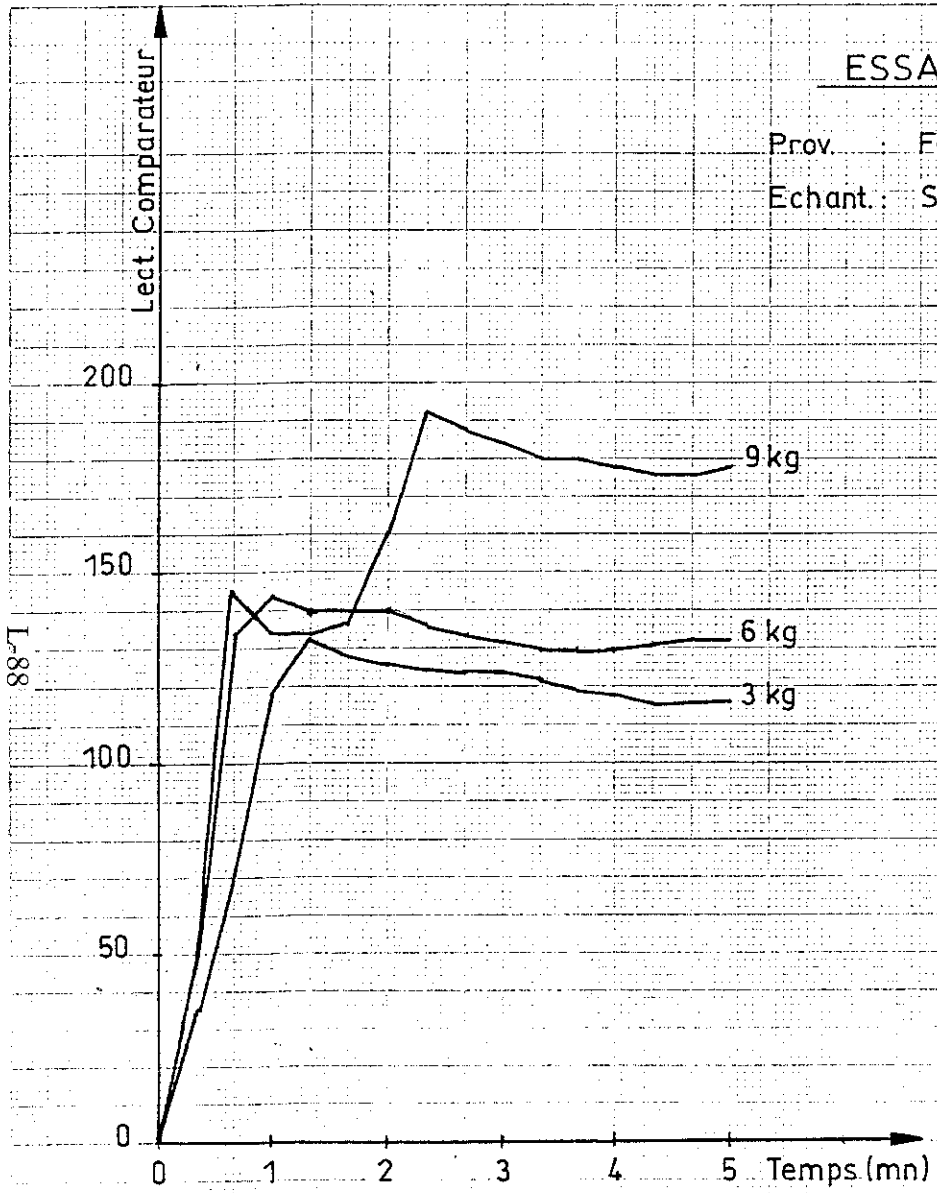
N°	L.L.	I.P.	< 0,08	HRB	F.P.	I.G.	ds max.	ω opt.	CBR	Gonfl.	ds situ.	comp.rel.
	80.4	38.6	56%	A7-5(15)								

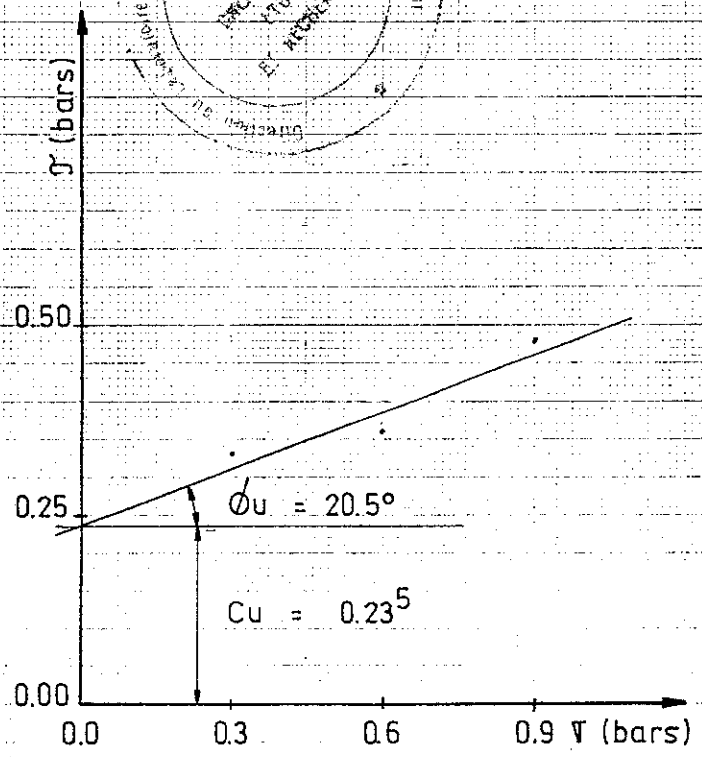
L-87

ESSAI DE CISAILLEMENT

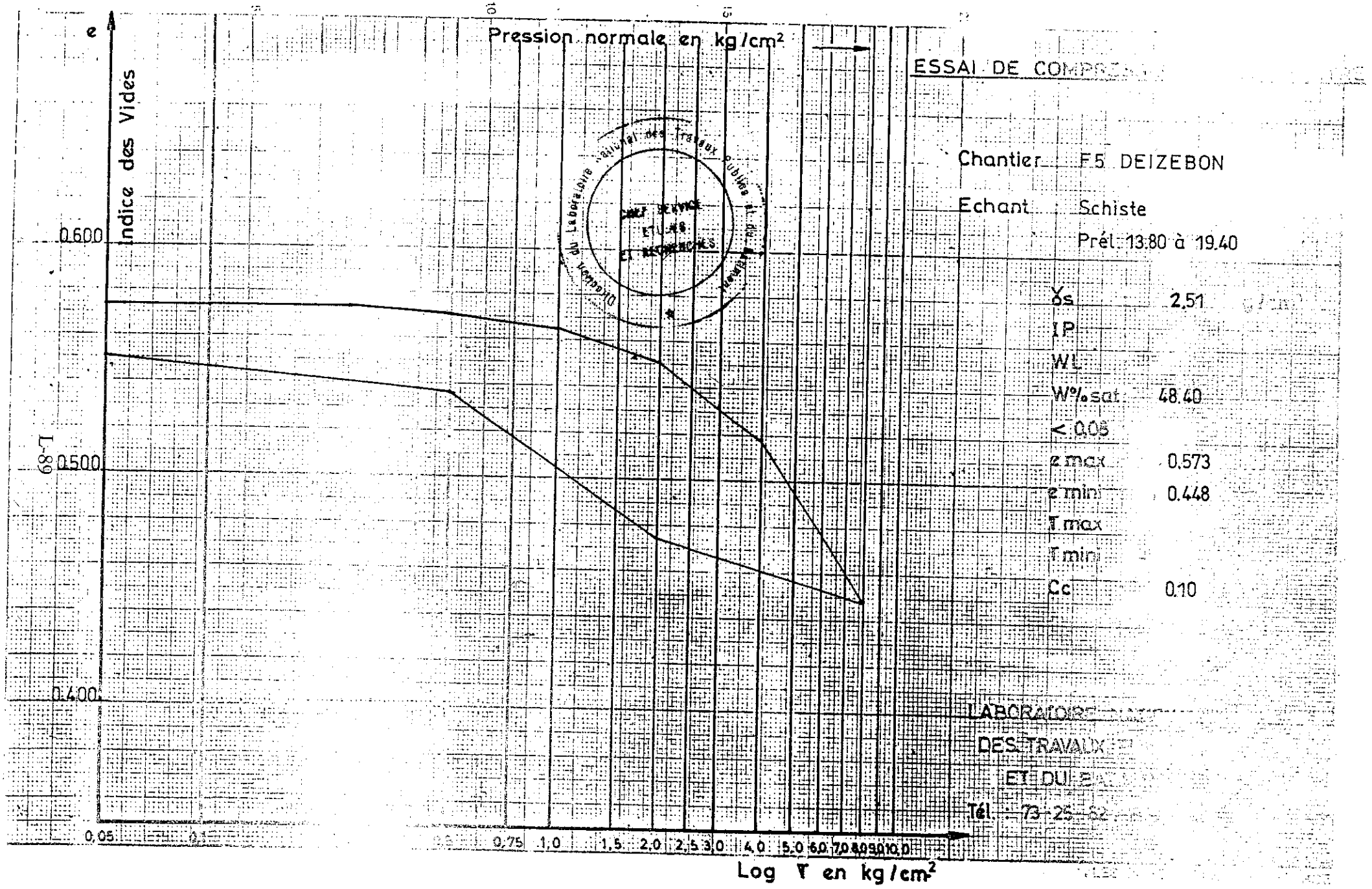
Prov. : Forage 5 DEIZEBON

Echant. : Schiste / Prél. 13.80 à 19.40 m





L-88


e
Indice des Vides
0.600
0.500
0.400
Pression normale en kg/cm²
Log σ en kg/cm²
0,05
0,1
0,75
1,0
1,5
2,0
2,5
3,0
4,0
5,0
6,0
7,0
8,0
9,0
10,0
ESSAI DE COMPRE
Chantier F5 DEIZEBON
Echant Schiste
Prél 13.80 à 19.40
γs 2,51
IP
WL
W%sat 48.40
< 0,08
e max 0,573
e min 0.448
γ max
γ min
Cc 0.10
LABORATOIRE
DES TRAVAUX
ET DU S
Tél. 73-25-82
T-89

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MINISTERE DE L'EQUIPEMENT ET DES TRANSPORTS
DIRECTION DU LABORATOIRE NATIONAL DES TRAVAUX PUBLICS ET DU BATIMENT
B.P 464 Tel:73 - 25 - 62 Niamey

ESSAIS DE PERMEABILITE

PROVENANCE: Assainissement de la ville de niamey — DATE : 20/11/2000

FORAGE N° 5 DEIZEBON — DEMANDEUR SENAGHRY

PROFONDEUR: 13,80 m - 19,40 m — OPERATEUR: LABARAN

NATURE DU SOL : SCHISTE

TEMPERATURE DE L'ESSAI: θ = 27,1 °C

SECTION DU TUBE DE MESURE: a = 3,14 mm2

SECTION DE L'ECHANTILLON: A = 78,54 cm2

HAUTEUR DE L'ECHANTILLON: L = 18,8 mm

ESSAIS N°	1	2	3
H o	65	70	30
H 1	40	50	10
Temps : t (s)	14	16	15
Kθ (cm/s)	$1,4 * 10^{-4}$	$1,2 * 10^{-4}$	$1,7 * 10^{-4}$
Kθ moy. (cm/s)			
K 20 (cm/s)		$7,2 * 10^{-6}$	

OBSERVATIONS:

W % = 21,00 γd = 1,53

LE CHEF SERVICE LABORATOIRE

LABORATOIRE NATIONAL DES TRAVAUX PUBLICS

B.P. 464 NIAMEY Prov. : ASSAINISSEMENT VILLE NY.

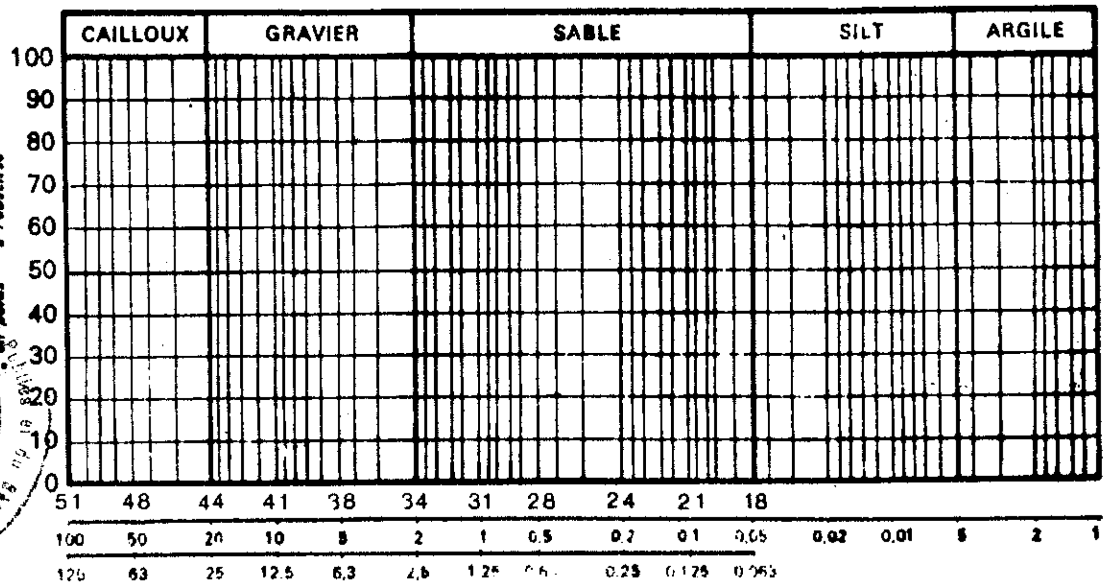
Nº ECH.	PROF.	PROFIL	NATURE
F5	19.4 à 24.2m		Argile graveleuse

ESSAIS D'IDENTIFICATION

Ech.	Limites d'Atterberg LL	LP	IP	Poids spécifique	m - IP	Classification US HRB
	54.6	29.0	25.6			

m éléments du mortier passant au tamis de 0,42 (module 27)

GRANULOMÉTRIE



CHEF SERVICE ETUDES ET RECHERCHES

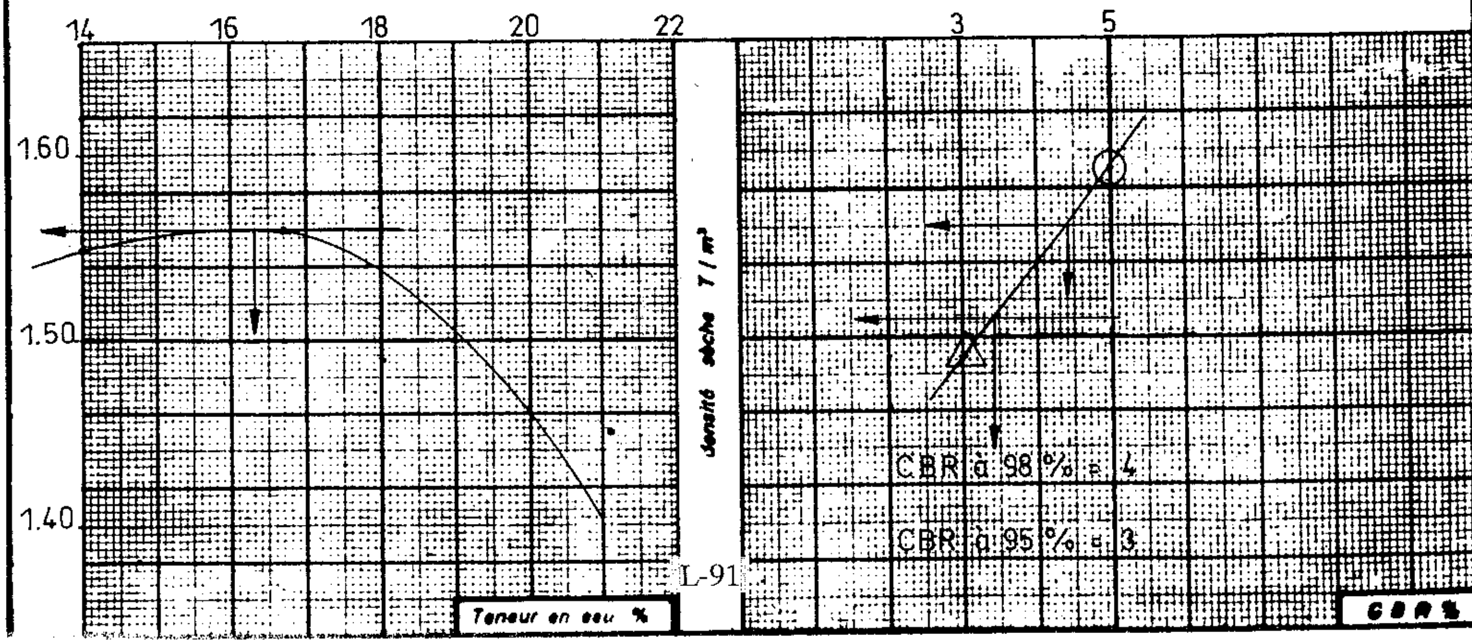
ESSAI PROCTOR

Densité sèche max. 1.56 T/m³

Teneur en eau opt. 16.3 %

ESSAI CBR

N coups	γd T/m³	W % moulage	% après imbib.	gonflement %
⊙ 55	1.59	14.4		
△ 25	1.49	14.4		
□ 10				



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DIRECTION
DU LABORATOIRE NATIONAL
DES TRAVAUX PUBLICS
ET DU BATIMENT
B. P. 464 — **NIAMEY**

ANALYSES GRANULOMETRIQUES

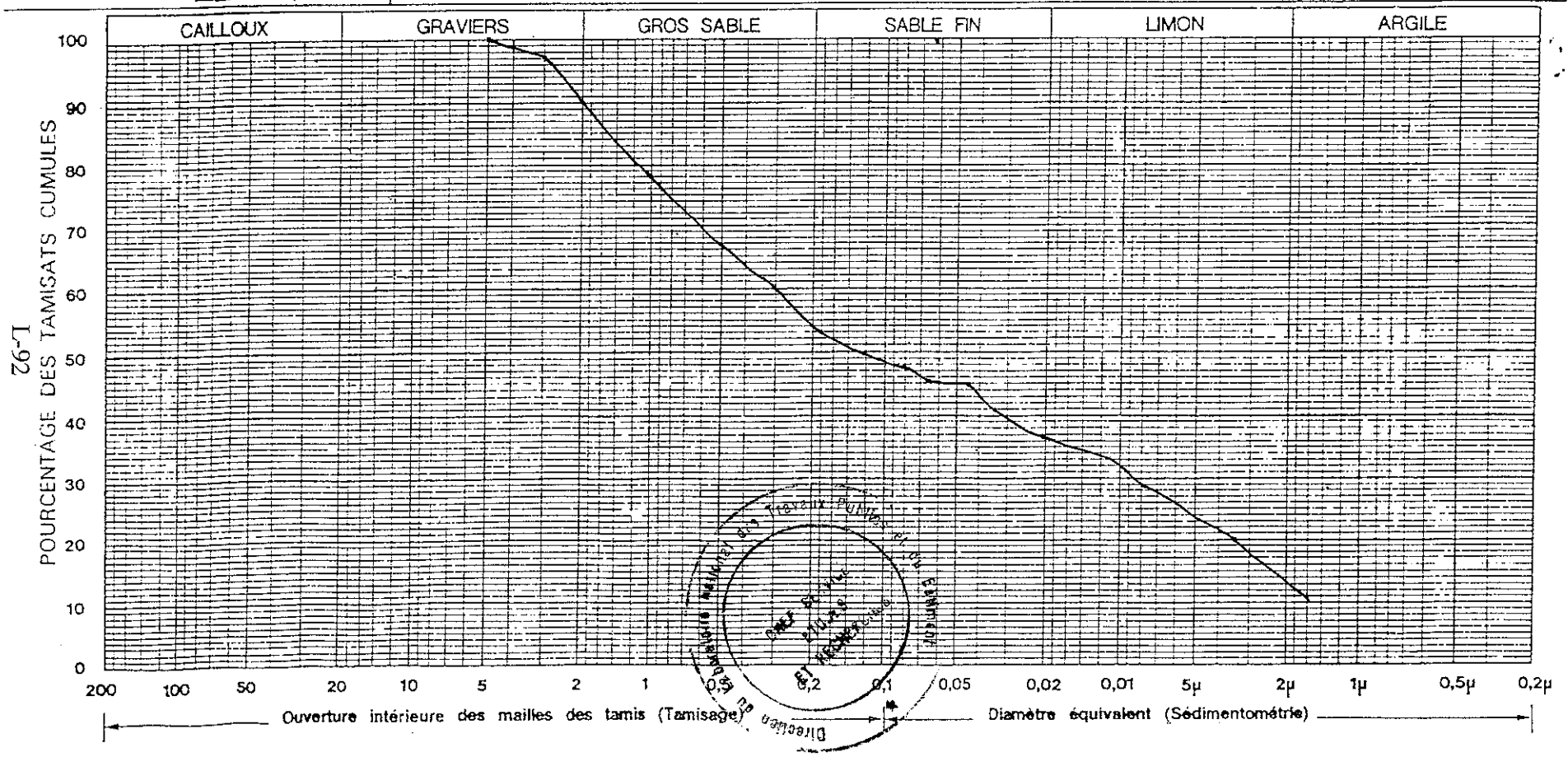
Opérateur : _____

Désignation des échantillons ____ **N°** _____

Provenance : ASSAIN. VILLE NY.

Echantillon : Argile graveleuse

F 5 / Prél. 19.40 à 24.20 m



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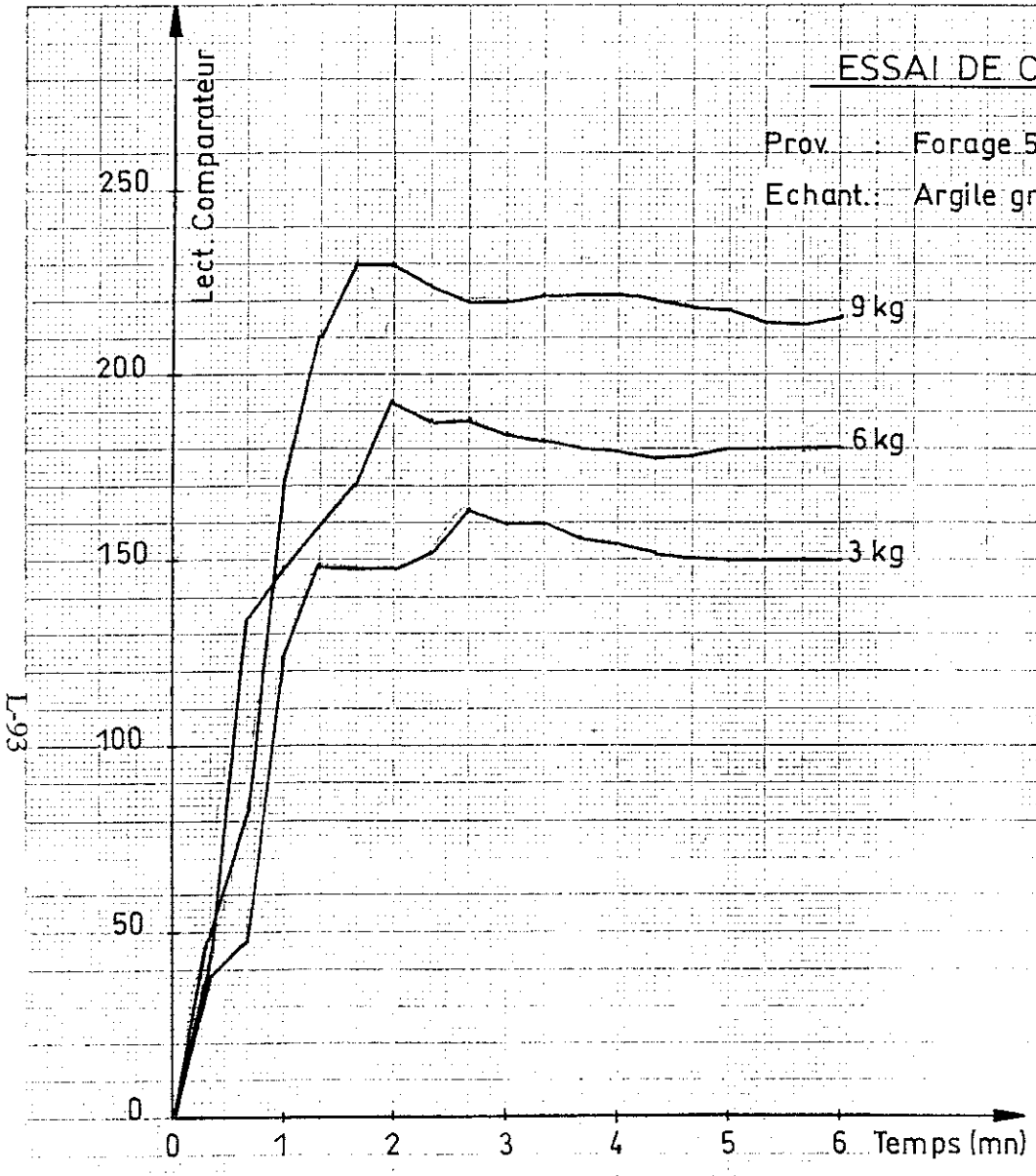
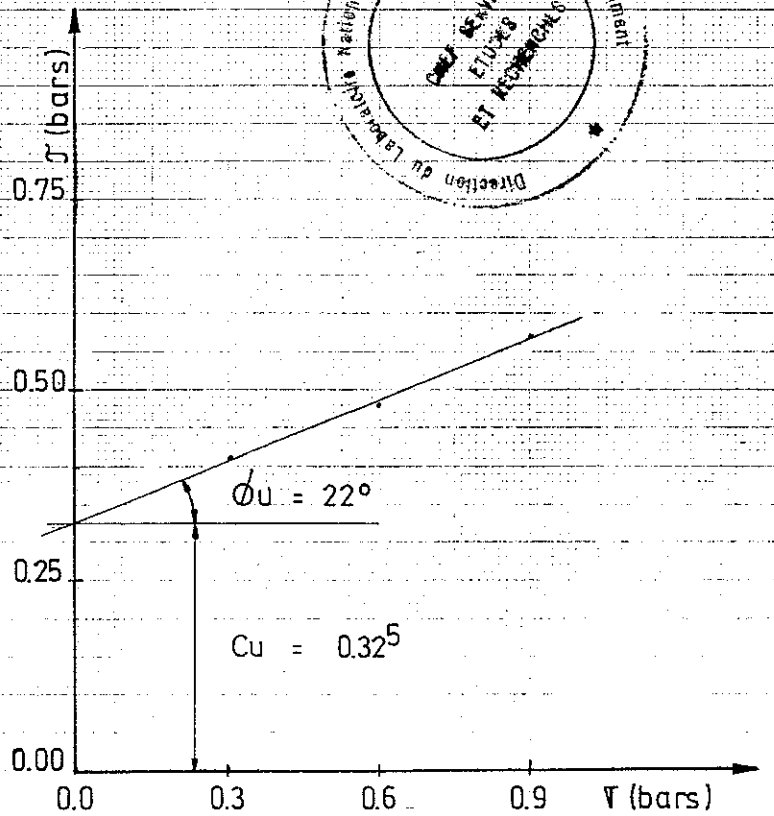
N°	L.L.	I.P.	< 0,08	HRB	F.P.	I.G.	ds max.	α opt.	CBR	Gonfl.	ds situ.	comp.rel.
	54.6	25.6	48%	A7-6 (7)								

ESSAI DE CISAILLEMENT

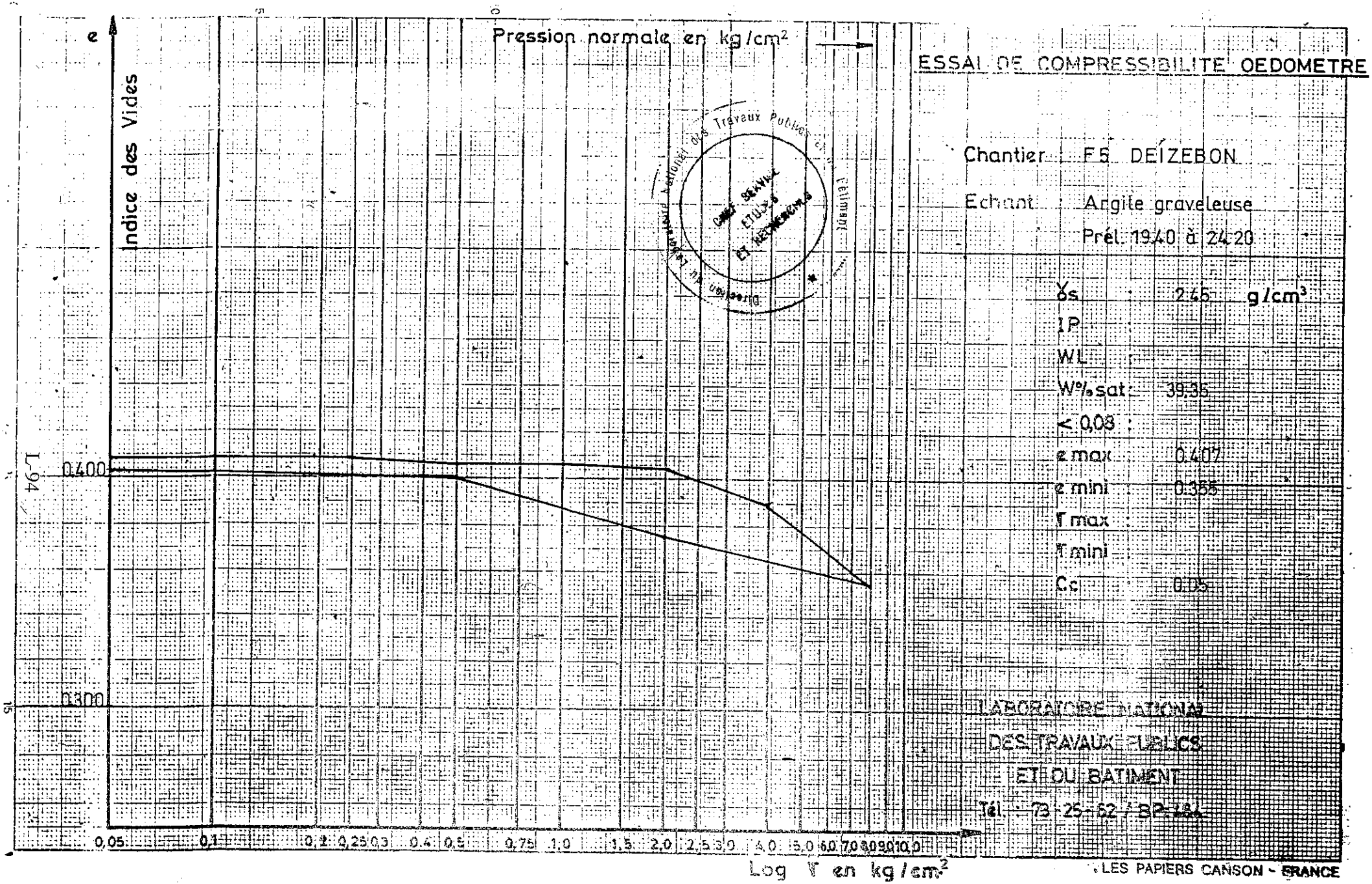
Prov. : Forage 5 DEIZEBON

Echant. : Argile graveleuse / Prél. 19.40 à 24.20 m





L-93



ESSAI DE COMPRESSIBILITE OEDOMETRE

Chantier : F 5 DEIZEBON

Echant : Argile graveleuse

Prél. 19.40 à 24.20

γs	2.65	g/cm³
IP		
WL		
W% sat	39.35	
< 0,08		
e max	0.407	
e mini	0.355	
γ max		
γ mini		
Cc	0.05	

LABORATOIRE NATIONAL
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ET DU BATIMENT
Tél. : 73-25-62 / BP 248

REPUBLIQUE DU NIGER
MINISTERE DE L'EQUIPEMENT ET DES TRANSPORTS
DIRECTION DU LABORATOIRE NATIONAL DES TRAVAUX PUBLICS ET DU BATIMENT
B.P 464 Tel:73 - 25 - 62 Niamey

ESSAIS DE PERMEABILITE

PROVENANCE: Assainissement de la ville de niamey — DATE : 22/11/2000

FORAGE N ° 5 DEIZEBON — DEMANDEUR SENAGHRY

PROFONDEUR : 19,40 m - 24,20 m — OPERATEUR: LABARAN

NATURE DU SOL : ARGILE

TEMPERATURE DE L'ESSAI: θ = 27 °C

SECTION DU TUBE DE MESURE: a = 3,14 mm2

SECTION DE L'ECHANTILLON: A = 78,54 cm2

HAUTEUR DE L'ECHANTILLON: L = 18,8 mm

ESSAIS N°	1	2	3
H o	90	78	68
H 1	80	70	60
Temps : t (s)	161	158	167
Kθ (cm/s)	$1,1 * 10^{-5}$	$1,1 * 10^{-5}$	$1,1 * 10^{-5}$
Kθ moy. (cm/s)			
K 20 (cm/s)		$5,5 * 10^{-7}$	

OBSERVATIONS:

W % = 15,5 γd = 1,58

LE CHEF SERVICE LABORATOIRE

LABORATOIRE NATIONAL DES TRAVAUX PUBLICS

B.P. 464 NIAMEY Prov. : ASSAINISSEMENT VILLE NY.

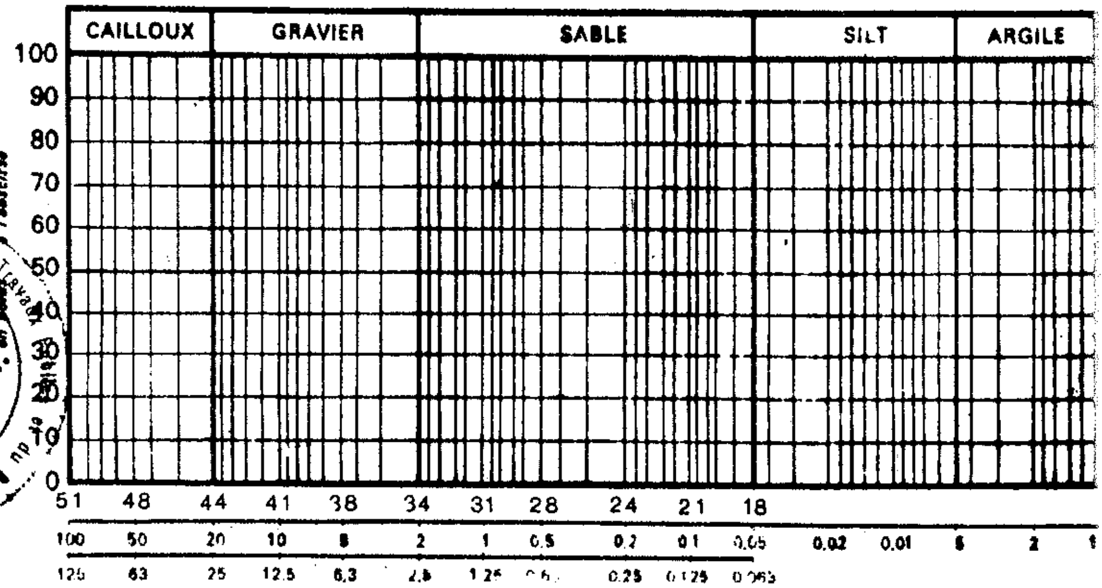
N° ECH.	PROF.	PROFIL	NATURE
F5	24.2 à 26.0m		Argile

ESSAIS D'IDENTIFICATION

Ech.	Limites d'Atterberg			Poids spécifique	m - IP	Classification US HRB
	LL	LP	IP			
	59.3	30.3	29.0			

m éléments du mortier passant au tamis de 0,42 (module 27)

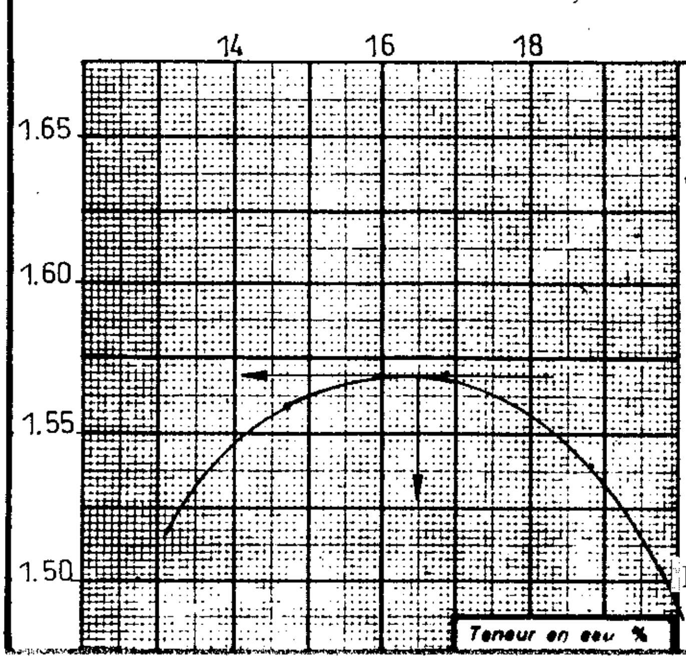
GRANULOMÉTRIE

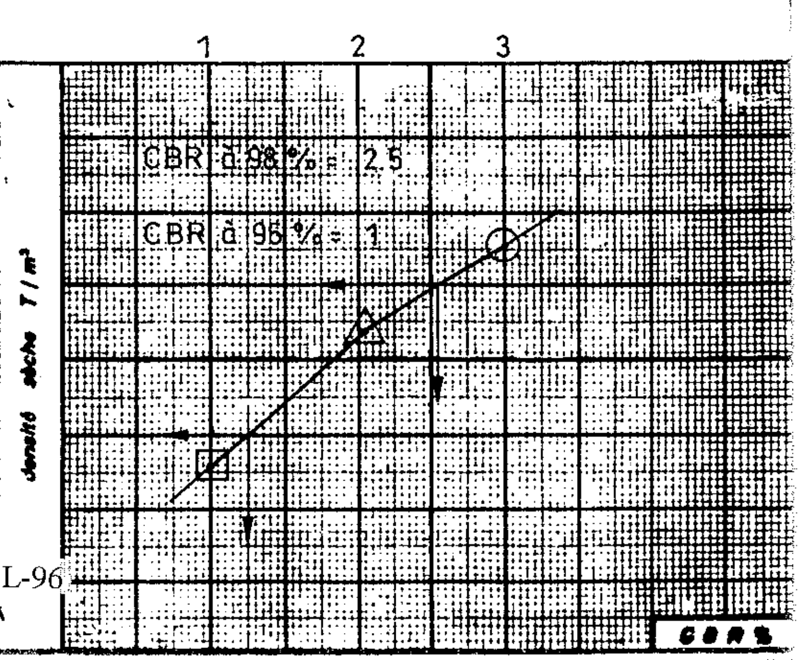


ESSAI PROCTOR	
Densité sèche max.	1.57 T/m³
Teneur en eau opt.	16.5 %

ESSAI CBR —— W % optimale; —— 95 % [illegible]

N coups	γd T/m³	W % moulage	% après imbib	gonflement %
○ 55	1.63	16.6		
△ 25	1.57	16.6		
□ 10	1.48	16.6		





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DIRECTION
DU LABORATOIRE NATIONAL
DES TRAVAUX PUBLICS
ET DU BATIMENT
B. P. 464 – **NIAMEY**

ANALYSES GRANULOMETRIQUES

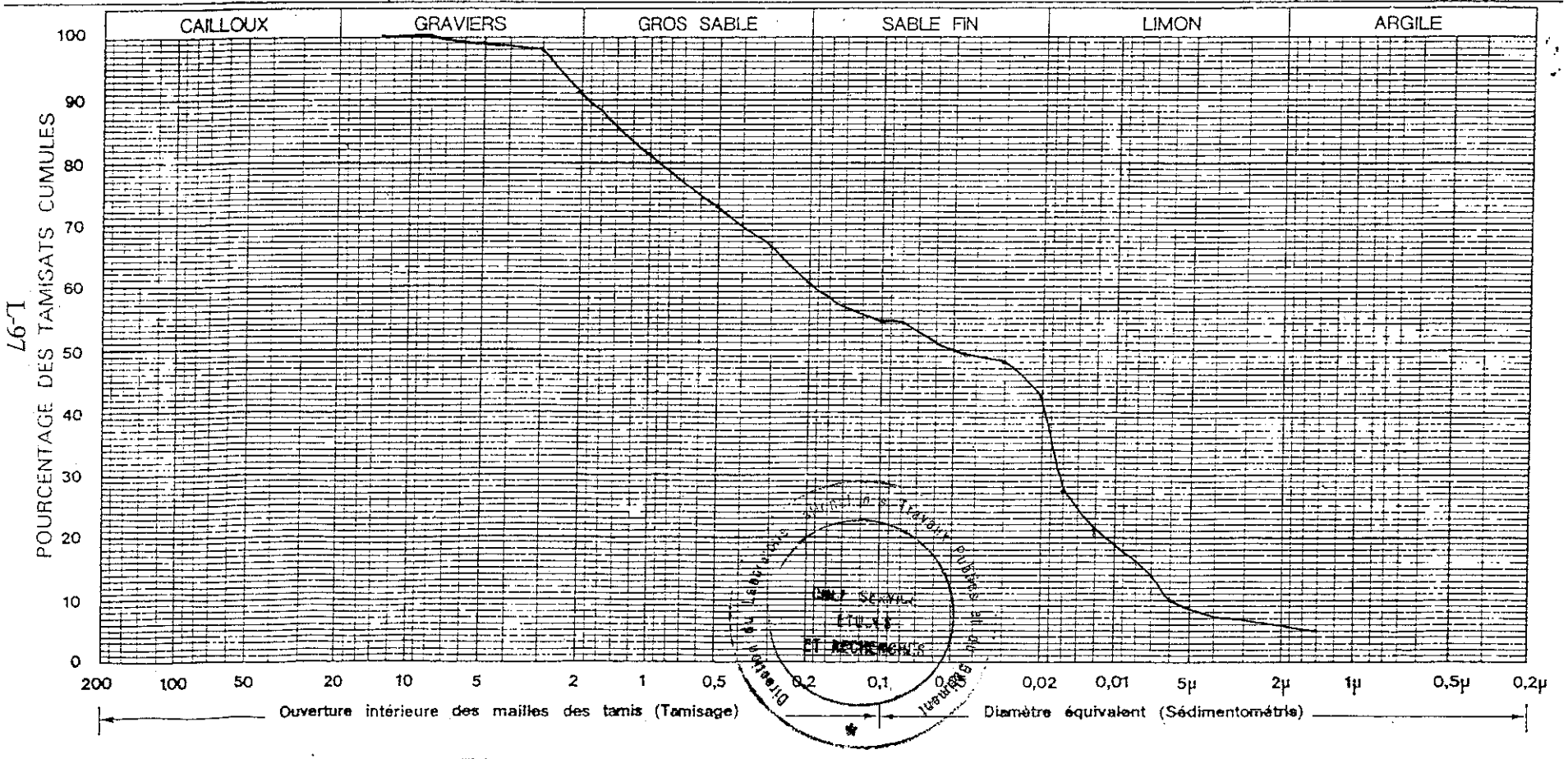
Opérateur : _____

Désignation des échantillons _____ **N°** _____

Provenance : ASSAIN. VILLE NY.

Echantillon : Argile graveleuse

F 5 / Prél. 24.20 à 26.00 m

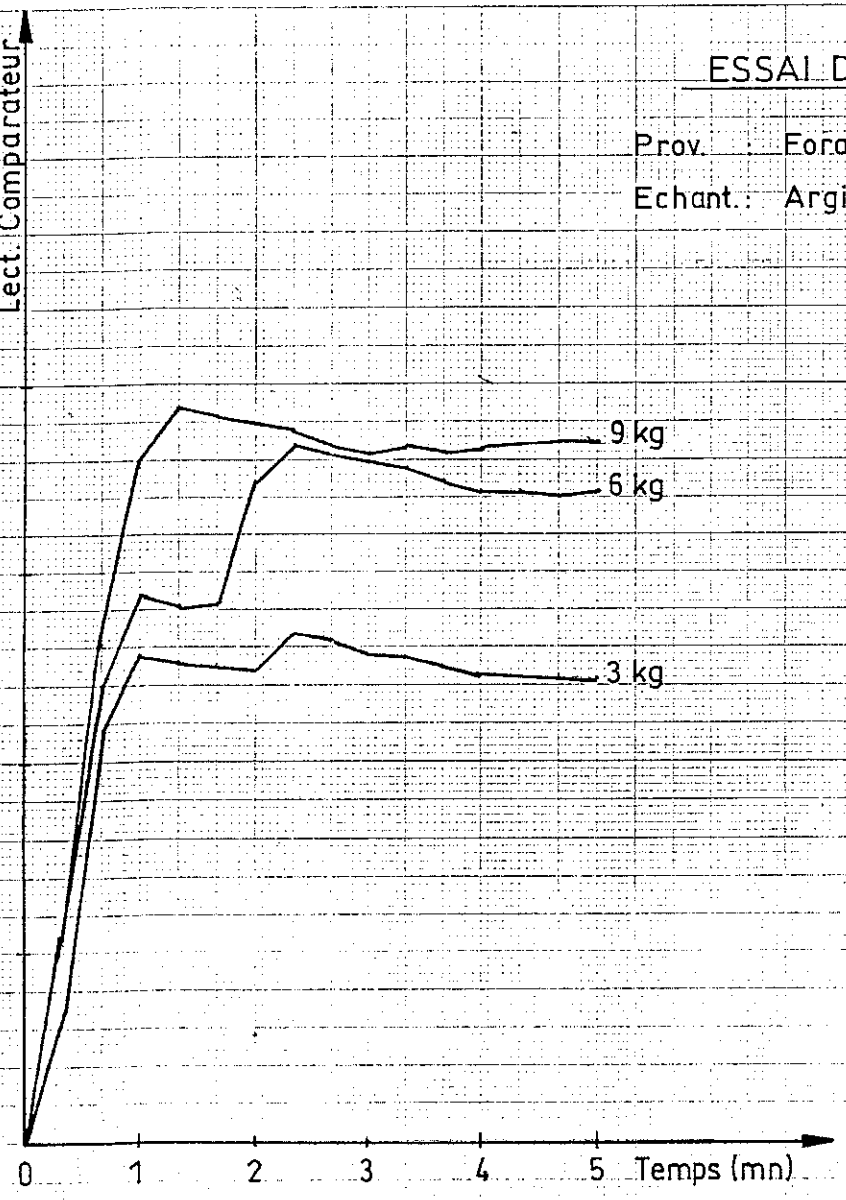


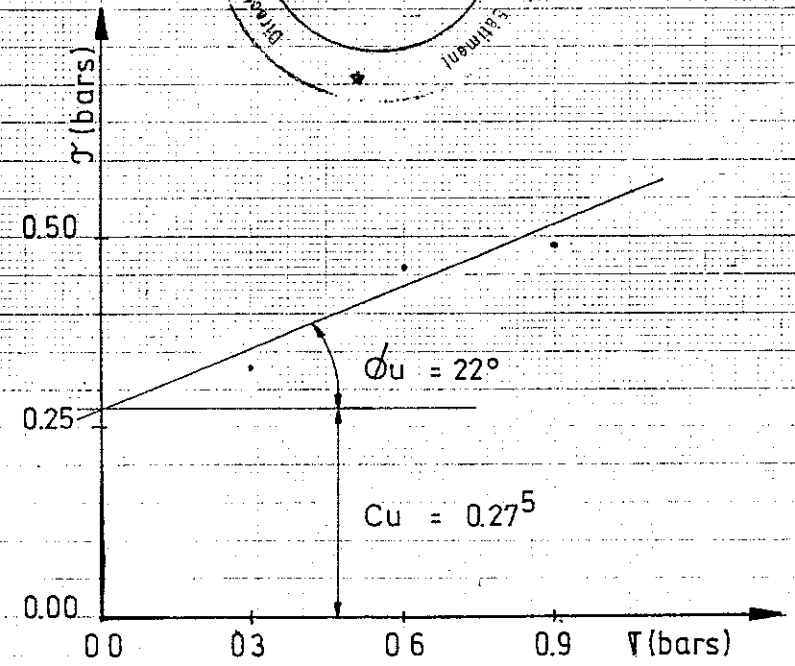
N°	L.L.	I.P.	< 0,08	HRB	F.P.	I.G.	ds max.	∝ opt.	CBR	Gonfl.	ds situ.	comp.rel.
	59.3	29.0	54 %	A7-5 (12)								

ESSAI DE CISAILLEMENT

Prov. : Forage 5 DEIZEBON

Echant. : Argile graveleuse / Prél. 24.20 à 26.00 m





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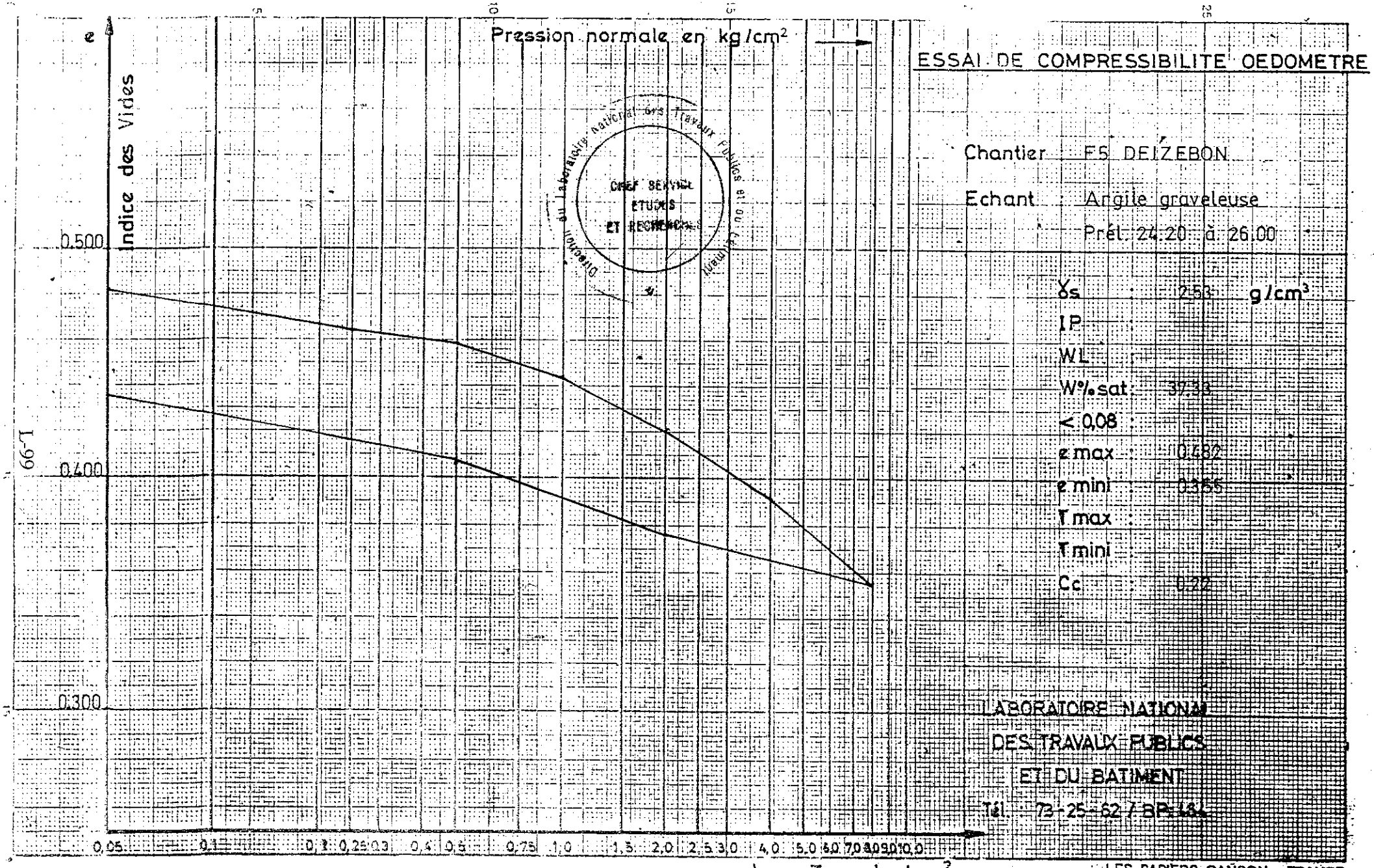
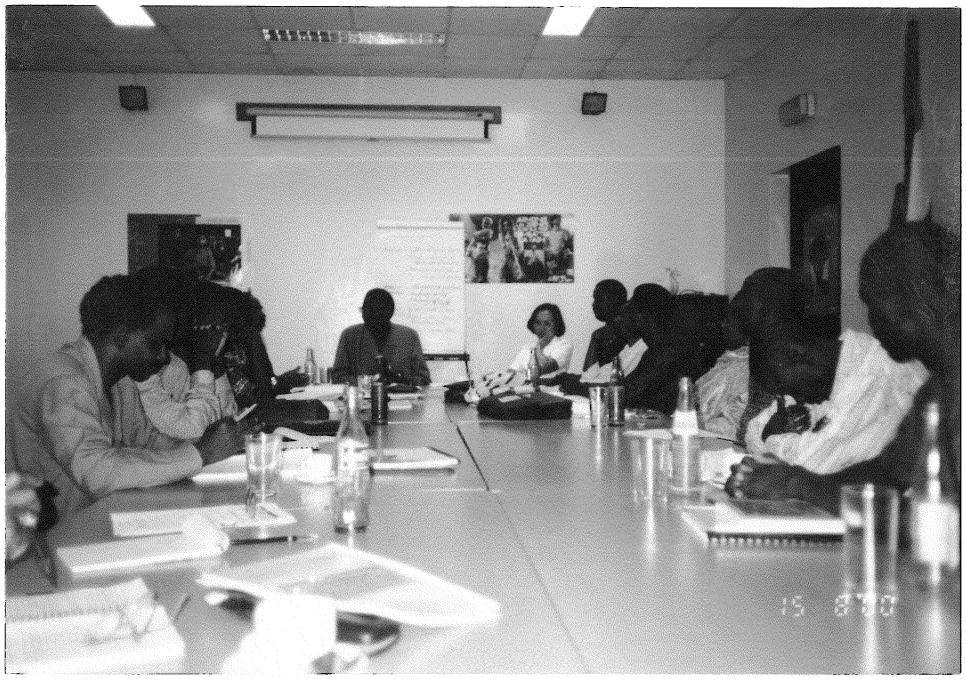

e
Indice des Vides
0.500
0.400
0.300
Pression normale en kg/cm²
5
10
15
25
Log T en kg/cm²
0,05
0,1
0,2
0,25
0,3
0,4
0,5
0,75
1,0
1,5
2,0
2,5
3,0
4,0
5,0
6,0
7,0
8,0
9,0
10,0
L-96
ESSAI DE COMPRESSIBILITE OEDOMETRE
Chantier : F5 DEIZEBON
Echant : Argile graveleuse
Prél. 24.20 à 26.00
γs : 2.53 g/cm³
IP :
WL :
W% sat : 37.38
< 0,08 :
e max : 0.482
e mini : 0.366
T max :
T mini :
Cc : 0.22
LABORATOIRE NATIONAL
DES TRAVAUX PUBLICS
ET DU BATIMENT
Tél. 73-25-62 / BP 461
LES PAPIERS CANSON - FRANCE

APPENDIX M: ANALYTIC SUMMARY OF THE PRIU REPORT



APPENDIX M.1 HOUSEHOLDS PRACTICES IN THE FIELD OF URBAN SANITATION AND HOUSEHOLDS SURVEY ABOUT BEHAVIOUR AND EXPECTATIONS

The objective of this study is to understand practices and behaviour of the people in Niamey, and their expectations and willingness to improve present conditions in the field of sanitation. In sanitation are included the disposal patterns of excreta, solid waste and waste water, and problems related to flooding and drainage of water runoff. The study is based on: a) a demographic analysis (from present to 2020) and b) a questionnaire survey.

Summary here is organised according to the following items:

1. Sampling procedure
2. Socio-economic characteristics of the target population
3. Education aspects of the target population
4. Health survey results
5. Conditions of sanitation facilities
6. Reported effects of existing sanitation conditions (focusing on flooding)
7. Perception and practices for sanitation
8. Public awareness heightening aspects
9. Perception of sanitation services, costs and willingness to pay
10. Recommendations
11. Conclusion from the report as regards to the perception of urban environment and potential objectives of public awareness heightening
12. Items not reviewed by the survey but expected for JICA team

Sampling Procedure

The study is based on a double questionnaire:

1) One general questionnaire, in which targets are chiefs of households (but in practice half the interviewed persons were women). The number of households surveyed in the first questionnaire has been 805. The survey has been made from February to March (2 months).
2) One specific questionnaire (willingness to pay), in which targets are a) People without latrine or with traditional type latrine; b) Cases of dust bin without cover, waste are disposed of outside the "concession", and urban quarters without collection system; c) No evacuation of rain water, areas without gutters nor paving stone street. This second questionnaire has been made following the first questionnaire. The number of households surveyed in the second questionnaire is 189. However adjustment is made to ensure that at least 10 households are surveyed in each commune for each category of habitation, which gives finally 211 samples.

Criteria for the selection of households to be surveyed (sampling) for the general survey:

1. Selecting among the municipalities

   - Relative population weight per municipality (allocation of samples). Based on population census of 1988.
   - 1/3 of sample in each municipality is selected from areas recognised as areas liable to flooding (267 among the 805).

2. Selecting among the households

There are 3 types of habitations which have been covered: a) traditional, made in *banco* material; b) modern "*celibatérium*" (collective habitation); c) modern houses. In each commune, samples have been distributed in accordance with the relative % of these types of habitations (data base is population census). Municipalities are composed of sections, blocks, and plots. Sections have been classified according to the type of habitat, following the predominant type of habitation: Corresponding to the types of quarters (traditional, modern, mixed). The sampling rule adopted is as follows: The number of concessions to be surveyed per section should be up to 50 units, which gives an average selection of 1 concession among 5 in each section. Within this rule, selection was made on random. In the second survey, distribution is proportional to types of habitats in each commune for each of the 3 target population, based on first survey. At least 1household per "concession" is a rule.

Socio-economic Characteristics of the Target Population

1. On average, there are 3 households per compound, equivalent to 16 persons. However in 41% of the cases, one household occupies one compound. In 35% of cases, the compound is made of 2 to 4 households, and in 23% of cases, 5 households or more. As a result, there are compounds with more than 20 persons (one fourth of compounds), while 32% of compounds have less than 11 persons.
2. 53% of the households are owners of their home.
3. About 70% of the households have a child under 5 years old.
4. High proportion of officials and shopkeepers among the surveyed households
5. High proportion of 30 - 44 years old adults
6. One third of households surveyed have 10 members or more
7. Only 62% of households have answered to the question on income.
8. More than 2 thirds of households have electricity, mainly used for light
9. One fourth of households have a vehicle (?) and only 3% have a chariot
10. Households having a floor in cement in their houses represent 74% of total, and 15% use tiles or wall to wall carpet. Only 10% of households are living in houses where the floor is made of earth or sand.
11. On average, there are 3 persons sleeping in the same room, and the predominant number of bedrooms is 2 per household.

Education Aspects of the Target Population

1. High proportion of people who have not received school education: 52% of women and 45% of men.
2. As regards to the access to information, 80% of households have a radio and 54% a TV set.

3. There is a clear relationship between the proportion of compounds showing the presence of waste litter inside and all around the compound, and the level of education. There are 44% of compounds with litter for the non educated interviewed people against 17% for those having a high level of education.

Health Survey Results

1. 60% of households have declared to have at least one sick person during the last 30 days preceding the survey. But on average 2 sick persons are declared. The corresponding medical expenses per sick person is estimated at about 6500 FCFA according to the persons interviewed.
2. 85% of households have declared malaria as a frequent disease, against 14% for eye sickness which is the second disease declared as frequent by surveyed people. Other diseases are bilharziasis, diarrhoea and scabies.
3. Those households that have declared malaria disease during the last 30 days are those that have waste water inside or outside the compound and those that feel some disturbance in rain water.
4. Surprisingly, the link between diseases frequency and sanitation conditions is not perceived in 73% of cases for excreta, 49% for garbage, and 24% for waste water and stagnant rain water. The later shows that the public awareness campaigns against malaria have been fruitful since 3 fourth of the households understand the link between disease and sanitation conditions. However, while about 64% of households know the health risk inherent to waste water, only 11% take care.
5. During the flooding season, all the household have experimented an upsurge of malaria, and secondarily for other diseases like diarrhoea and eyes sickness (20% of households each). Expenses generated are equivalent to 20,586CFA per household on average.

Conditions of Sanitation Facilities

1. For the collection of excreta, one fourth of the households have good facilities, while 67% are using traditional latrines. There are only 6% of households which have no any latrines. The sceptic tank with water is used by about 15% of households.
2. As expected, the use of improved latrines or septic tanks is higher in modern residential habitat (63% of households) than in traditional habitat (13%).
3. The construction of latrines is made without consideration of the number of users in the house or compound. There is no permitting rule nor guidelines to control the dimensions of the latrines. The only constraint is a minimal distance between latrines and a water well used for drinking water, generally recommended to be 10m. More than 56% of latrines are constructed at less than 10m from the water source, which is however in principle not used for drinking water.
4. Emptying of latrines and septic tanks is not regulated and the criteria to decide emptying are mainly the overflowing in the yard for about 40% of households and the return of water in the pan for about 27% of households. Emptying is generally made by private collectors.
5. Households waste water and especially shower waste water are collected in a sink or septic tank with periodical emptying. Waste water from washing-up and laundry washing are directly discharged in the yard or street.

6. Only 13% of households live in an area equipped with gutters.
7. Only half the households know or have heard about improved latrines, in most cases through direct conversation with friends and family. The second source of such information is radio, but is far behind the later.
8. Only 30% of the households are living in an area with a waste collection service in operation. In areas with public containers, one third of households say to be dissatisfied of the emptying service of containers. The majority of households lacking collection service wants an improvement of the collection service. There are 20% of households which pay a fee to private companies for the collection of their waste at the concession, the average payment being 500CFA per month.
9. Half the households (47%) are supplied with drinking water from public tap water facilities, wells, and water vendors. 77% of households keep water in "canaris" recipients, 12% in bottles, and 6% in barrel. An other half of the households (54%) are directly supplied with tap water inside the compound.
10. Drinking water is felt to be of bad quality by 4% of households

Reported Effects of Existing Sanitation Conditions (Focusing on Flooding)

1. Flooding induces serious damages to housing and sometimes loss of life, as well as upsurge of diseases, which finally represents a financial charge for the people. During the 1998 flooding, the average expenses spent by surveyed households living in the flooding prone areas has reached 404,674CFA.
2. The rate of households having experienced flooding amount 26%, of which half is annual flooding. Among the households experimenting flooding, one third is without any resource to protect themselves because of the extension of flooding. There are 80% of households concerned which did make an investment of 35,145CFA on average in order to protect themselves, without good efficiency however. Three fourth of these households have been damaged in the compound and have spent on average 229,529CFA in order to repair damages.

Perception and Practices for Sanitation

1. More than half of compounds have shown waste litters all around and 36% had litter also inside the compound. 81% of households which have litter inside the compound and 84% of those which have litter around the compound have declared that they feel some discomfort from such situation. 19% of surveyed households did not feel any discomfort in such situation.
2. The observation of interviewers has shown that one compound of 10 have excreta around and one of 25 have excreta inside. In most of these cases, there is no latrine or only traditional type latrine, conditions which are felt as a discomfort for 84% of households of concern. However, at the same time, about 77% of households having traditional latrines say to be satisfied with it.
3. The usage rate of latrines in compounds is estimated to be around 93% for adults and 86% for children, which means that 7% and 14% of them respectively practice defecation outside. In the case of adults, defecation outside means somewhere near the concession for almost 70% of them, while the use of public latrines is very limited (little more than 7%). The outside defecation practice is the highest for those families that are living in the compound free of charge (32%). In

the case of excreta of babies, 31% of households throw them away in the surroundings, namely streets, gutters or waste deposits.

4. In the case of compounds with traditional latrines, the defecation place of adults is not declared by 81% of households, and is declared to be in waste deposit place or "in the bush". Specially in the most traditional urban quarters, latrines are often directly emptied in the streets.
5. As regards to the level of discomfort generated by these conditions of excreta disposal, only 12% of households feel it as a problem. Link between excreta in the environment and disease is perceived by less than 27% of households. However 85% of housewives are aware of the health risk related to children excreta in streets.
6. The willingness to improve conditions is expressed by about 45% of households, but only less than 45% of families without latrine and only 54% of those with traditional latrines feel the necessity to improve conditions.
7. Cleaning of traditional latrines is made at best once per week in 3 fourth of cases, and cleansing is almost always done by the housewives.
8. In 85% of compounds, garbage is disposed of outside the compound, at a daily frequency in most of the cases.
9. Waste bin is used by 90% of households, but are generally in bad conditions and without top cover. Less than 20% of households use a dust bin with cover, while most of them use an aluminium bucket. However, almost 90% of households would prefer a covered dust bin (compared to garbage bags in the submitted questionnaire). More than 90% of households dispose of their waste outside the compound, while the others burn the waste inside. Only 45% of households put the garbage in authorised deposit places. However in areas covered by municipal collection of waste, this rate is higher than 80%. Half of the households do discharge their solid waste in the surroundings (and 28% of them do the same for waste water). Almost two thirds of the households use the same bucket for the transportation of their waste to the waste disposal site, but there are one third of households, particularly in modern residential areas, which use a wheelbarrow. Garbage is the most generally disposed of every day, but there are one third of households which do dispose of only once per week.
10. In more than 45 of households, waste bin is disposed of by the children, against less than 20% by the adults belonging to the family. There are however also less than 30% of households where waste is disposed of by housekeeping men or women.
11. More than one fourth of the compounds have shown waste water all around and one of 7 have shown it inside.
12. About 73% of households are discharging waste water in the street. 65% of households feel waste water as being a source of discomfort in urban quarters.
13. 11.4% of households do discharge solid waste and waste water in gutters / street.
14. For 56% of the households, rain water stagnation is regarded as a nuisance, in terms of flooding and malaria disease. 76% of them do perceive its relationship with malaria, and 13% have been damaged by flooding. Half of households which do never experience flooding perceive rain water as a problem, while the rate is higher in flooding prone areas. 63% of the households have constructed the equipment for evacuation of water runoff by themselves, with consequences like the inappropriate capacity of drainage and the flooding of compounds.

Public Awareness Heightening Aspects

1. The large majority of households (98%) is ready to contribute to sanitation improvement of their area, either by participating in hygiene heightening campaigns (less than 70%), or by financial contribution (30%).
2. The work of NGO already made for improving sanitation conditions can be recognised by the preference of households to entrust the NGO with the task of improving dust bins, collecting garbage, and also cleansing, together with urban quarters associations.

Perception of Sanitation Services, Costs and Willingness to Pay

1. 98% of households want to be equipped with waste water sewerage installation.
2. Most of the households are favourable to the development of private sanitation services.
3. More than 50% of household could not answer to the questions of cost of sanitation equipment. In most cases construction is made by a craftsman (74% of cases). The use of a private company is higher in modern habitat than in traditional one, with a rate of 21% of households concerned.
4. The cost for emptying a latrine and septic tank amounts 9900CFA and 13500CFA respectively (at an average rate of 1 per 2 years).
5. The main constraint toward improvement of the latrines lies in the high cost and the limited capacity of payment of the households. However there is also the fact that house renting families do not feel any responsibility about sanitary equipment of the compound.
6. The most expected systems of sanitation equipment by the families are both the improved latrines (VIP) or the latrine with 2 dried pits. These installations require a separated collection of waste water and their discharge in a pit for example. For those families that use septic tanks, waste water from washing are generally not discharged in the septic tank together with excreta and shower used water. About 70% of these families have the willingness to improve the efficiency of the septic tank by collecting all waste water to it.
7. The willingness to pay in cash or in nature for getting better equipment concerns 92% of households. This willingness to pay represents 13 to 47% of the real cost of equipment, showing an important gap. Families are generally not prone to contract a loan for required expenses.
8. For improving waste collection, about 70% of households are ready to pay a fee of 743CFA on average, within a margin between 25 and 15000CFA, and approximately the same rate would be ready to pay about 1600CFA on average for getting an improved dust bin, within a margin between 50 and 15000CFA.
9. A large rate of households (68%), outside the case of Commune III, wants to contract with private collection services if they can agree on payment conditions.
10. As regards to the preference of households to improve waste management conditions through sorting out of materials at source, namely the separation of sand and plastics, about 70% of them are ready to make the effort.

Recommendations

1. To develop an appropriate regulatory network for the collection and disposal of solid waste, and make clear the standards for the design and maintenance of facilities. The preparation of guidelines with description of sanitation facilities, design criteria, conditions of installation, and maintenance plan should be a prerequisite. The facilities of concern are those for disposal of waste water and excreta, and for drainage of rain water.
2. Craftsmen and constructors of sanitation facilities must be trained so they will have capability of advising clients about the most appropriate equipment.
3. To transform the traditional latrines into ventilated latrines.
4. To establish the system of sorting out plastics waste from garbage at source.
5. To develop public awareness in order to improve practices in sanitation field.
6. To increase participation of people and make them aware of their responsibilities for improving sanitation conditions. On this concern, the report recommends to refer to the PHAST initiative in Burkina Faso (Participatory Hygiene and Sanitation Transformation).
7. To develop the research and development sector for producing prefabricated latrines and improved waste bins with filtering of sand.
8. To promote equipment and service, based on the participation of citizens.

Conclusion from the Report as Regards to the Perception of Urban Environment and Potential Objectives of Public Awareness Heightening

1. An important proportion of people do not perceive the health effects of their practice as regards to the disposal of garbage and more specifically excreta. Accordingly, making people aware of such link should be the main justification for any public awareness heightening program. As regards to the disposal of waste water, it seems that people do not know how to improve their disposal method and do not know the available technologies.
2. The survey shows that there are sometimes contradiction between the good level of awareness of problems and the bad practices of households. This shows that the quality of sanitation equipment and their maintenance level also contribute to the observed practice. In the case of latrine, the high level of satisfaction for traditional type latrines by the households shows that people lack the knowledge of more appropriate and more comfortable equipment and role of such equipment for improving sanitary conditions. The low rate of willingness to improve sanitation conditions among families without latrines or with traditional latrines shows the level of lack of awareness about the role of proper sanitation equipment and practice and the related health risk.
3. The case of solid waste, with a better participation of people to put the waste in authorised places, in areas having municipal collection service, shows that people are able to contribute to proper sanitation and get their responsibility if the same is done on the municipal side.

Items not Reviewed by the Study but Expected for JICA Team

1. Perception of solid waste by citizens
2. Taking into account the presence of herd cattle

3. Hygiene education and perception of public awareness activities
4. Citizens perception of the role of officials in awareness heightening
5. Participation to cleansing campaigns
6. Role of women, young, children and men in this awareness heightening process
7. Perception of the priority problems of the living environment

APPENDIX N: HOUSEHOLD SURVEY REPORT

N.1 SUMMARY OF DATA OF THE JICA HOUSEHOLDS SURVEY

The following tables summarise the results of the JICA households survey according to urban quarters surveyed and items of the questionnaire. Numbers in the first column refer to the type of response given by the households. In this column, 0 means the absence of response to the question. Numbers in bold in the first line of each table refer to the question number, as recorded in the questionnaire. Results in the tables are the number of responses in % of the total number of responses given for the question.

Remarks:
1. When several responses were available for the same question, the % of each type of response takes into account the additional number of responses, overlapping each others. These cases are shown below in grey.
2. For convenience, the categories of responses having systematically 0% in results for all the questions are not mentioned in the tables. This is why the number of categories (lines) in tables can be different with the number of alternative responses given in the questionnaire. The absence of such category means that there was no any answer to it.
3. The questions that have involved specific quantitative answers are not considered below. There are basically 3 such questions in A. General information. Comments on these questions are given in O.2.

1) Results of the survey for each urban quarter surveyed

A. GENERAL INFORMATION

LAMORDE	**3**	**4**	**5**	**7**	**8**	**9**	**10**	**11**
0	2	0	0	0	0	44	2	0
1	17	2	10	37	44	23	27	46
2	21	4	19	31	56	21	8	19
3	40	2	27	25	0	2	21	31
4	19	48	44	4	0	2	42	4
5	0	6	0	4	0	40	0	0
6	0	0	0	0	0	0	0	0
7	0	38	0	0	0	0	0	0
Total	100	100	100	100	100		100	100

YANTALA	**3**	**4**	**5**	**7**	**8**	**9**	**10**	**11**
0	0	0	0	0	0	89	0	0
1	12	0	2	25	89	2	37	51
2	42	0	61	44	11	2	25	30
3	44	12	28	0	0	2	28	16
4	2	11	9	4	0	0	11	4
5	0	4	0	28	0	5	0	0
6	0	0	0	0	0	0	0	0
7	0	74	0	0	0	0	0	0
Total	100	100	100	100	100	100	100	100

LACOUROUSSOU	**3**	**4**	**5**	**7**	**8**	**9**	**10**	**11**
0	0	0	0	0	0	95	0	2
1	40	9	7	29	95	0	67	64
2	36	3	66	40	5	2	12	21
3	16	12	21	3	0	2	7	12
4	9	10	7	0	0	0	14	2
5	0	5	0	28	0	2	0	0
6	0	0	0	0	0	0	0	0
7	0	60	0	0	0	0	0	0
Total	100	100	100	100	100	100	100	100

KOUARAKANO	**3**	**4**	**5**	**7**	**8**	**9**	**10**	**11**
0	0	0	0	0	0	79	0	0
1	4	6	0	31	79	2	2	15
2	8	0	19	25	21	0	15	27
3	10	15	35	6	0	12	37	44
4	79	58	46	4	0	0	46	13
5	0	0	0	35	0	10	0	0
6	0	2	0	0	0	0	0	0
7	0	19	0	0	0	0	0	0
Total	100	100	100	100	100		100	100

BANDABARI	**3**	**4**	**5**	**7**	**8**	**9**	**10**	**11**
0	0	0	0	0	0	69	4	6
1	30	24	4	30	69	2	52	61
2	31	0	54	41	31	9	13	7
3	26	0	28	4	0	0	13	19
4	13	15	15	7	0	0	19	7
5	0	6	0	19	0	24	0	0
6	0	2	0	0	0	0	0	0
7	0	54	0	0	0	0	0	0
Total	100	100	100	100	100		100	100

GAWEYE	**3**	**4**	**5**	**7**	**8**		**10**	**11**
0	6	0	0	0	0	84	0	4
1	37	8	4	12	84	0	41	45
2	29	12	78	63	16	8	22	25
3	20	10	18	12	0	4	14	20
4	8	24	0	4	0	4	24	6
5	0	12	0	10	0	4	0	0
6	0	4	0	0	0	0	0	0
7	0	31	0	0	0	0	0	0
Total	100	100	100	100	100		100	100

B. PRACTICES AND AWARENESS

BANDABARI	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0	0	100	0	0	0	0	0	17	0	0	93	0	0	85	0	0	2	0	98	2
1	98	0	100	72	0	59	2	0	0	93	0	81	85	7	56	93	7	98	0	72
2	0	0	0	0	100	9	83	35	100	7	7	19	15	7	2	6	81	2	0	26
3	2	0	0	0	0	31	15	48	0	0	0	0	0	0	28	2	4	0	2	0
4	0	0	0	17	0	0	0	0	0	0	0	0	0	0	11	0	0	0	0	0
5	0	0	0	11	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	4	0	0	0
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

GAWEYE	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0	0	63	37	0	0	2	0	37	0	0	86	0	0	31	0	0	4	0	82	18
1	63	37	33	69	2	51	39	0	2	86	2	65	29	24	35	53	0	82	4	73
2	37	0	0	2	98	27	61	18	98	14	12	35	69	45	2	43	47	18	14	10
3	0	0	29	0	0	20	0	45	0	0	0	0	2	0	24	4	6	0	0	0
4	0	0	0	8	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0
5	0	0	0	18	0	0	0	0	0	0	0	0	0	0	20	0	2	0	0	0
6	0	0	0	4	0	0	0	0	0	0	0	0	0	0	8	0	41	0	0	0
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

KOUARAKANO	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0	0	48	54	0	0	0	0	73	0	0	98	0	0	17	0	94	0	0	79	21
1	46	52	0	35	0	0	71	0	0	98	0	60	17	56	8	0	92	88	10	35
2	52	0	0	2	100	31	27	25	100	2	2	40	83	27	2	0	62	12	14	42
3	2	0	46	2	0	0	2	2	0	0	0	0	0	0	33	0	65	0	2	2
4	0	0	0	62	0	69	0	0	0	0	0	0	0	0	15	4	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	2	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100		100		100

LACOUROUSSOU	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0	0	90	9	2	0	0	0	12	0	0	95	2	0	0	0	0	0	0	95	9
1	91	0	90	81	0	16	0	0	0	97	0	83	0	16	86	69	48	95	3	84
2	9	0	0	9	100	7	90	16	100	3	5	16	100	84	0	31	33	5	0	3
3	0	9	0	5	0	64	10	72	0	0	0	0	0	0	2	0	12	0	2	2
4	0	2	2	0	0	17	0	0	0	0	0	0	0	0	9	0	0	0	0	2
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	24	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	7	0	0	0
7	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	100	100	100	100	100		100	100	100	100	100	100	100	100	100	100		100	100	100

LAMORDE	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0	0	100	0	0	0	8	0	13	0	0	88	0	0	60	0	0	4	0	98	2
1	98	0	98	65	8	46	10	2	8	88	0	69	60	21	44	83	23	98	0	50
2	0	0	0	0	92	31	87	38	92	12	12	31	40	17	2	13	71	2	2	44
3	2	0	2	0	0	17	4	44	0	0	0	0	0	2	19	4	4	0	0	2
4	0	0	0	23	0	0	0	2	0	0	0	0	0	0	29	0	0	0	0	2
5	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	17	0	0	0
7	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
Total	100	100	100	100	100		100	100	100	100	100	100	100	100	100	100		100	100	100

YANTALA	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0	0	100	0	0	0	0	0	4	0	0	98	0	0	0	0	0	0	0	100	0
1	100	0	100	81	0	2	0	0	0	100	0	88	0	4	96	11	7	100	0	100
2	0	0	0	2	100	12	100	2	100	0	2	12	100	96	0	89	11	0	0	0
3	0	0	0	0	0	88	0	97	0	0	0	0	0	0	2	0	0	0	0	0
4	0	0	0	0	0	0	0	2	0	0	0	0	0	0	4	0	0	0	0	0
5	0	0	0	16	0	0	0	0	0	0	0	0	0	0	2	0	5	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	88	0	0	0
7	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	100	100	100	100	100		100		100	100	100	100	100	100		100		100	100	100

C. EDUCATION AND AWARENESS HEIGHTENING

BANDABARI	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
0	0	0	98	0	17	83	0	0	0	0	89	0	0	100	0
1	31	98	2	83	7	17	100	0	0	89	11	0	100	0	0
2	35	2	0	17	76	0	0	0	78	11	0	100	0	0	65
3	33	0	0	0	0	0	0	100	0	0	0	0	0	0	35
5	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

KOUARAKANO	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
0	4	0	88	0	62	38	0	38	13	35	67	0	0	100	0
1	2	81	0	38	0	52	100	0	0	33	0	0	98	0	0
2	87	12	10	62	38	6	0	56	58	33	31	100	2	0	100
3	8	8	2	0	0	6	0	6	13	0	2	0	0	0	0
4	0	0	0	0	0	6	0	0	15	0	2	0	0	0	0
5	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0
Total	100	100	100	100	100		100	100	100	100		100	100	100	100

LACOUROUSSOU	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**
0	0	0	52	0	45	55	2	0	0	0	79	0	0	86	0
1	2	52	24	55	10	34	64	7	0	72	14	0	88	10	5
2	71	48	24	45	45	5	31	19	24	21	5	100	12	2	76
3	28	0	6	0	0	5	3	71	2	7	0	0	0	2	19
4	0	0	0	0	0	12	0	33	9	0	0	0	0	0	0
5	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	65	0	2	0	0	0	0
Total	100	100		100	100		100		100	100	100	100	100	100	100

LAMORDE	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**
0	0	0	81	0	63	37	0	0	0	0	35	0	0	96	0
1	63	79	0	37	6	50	94	2	0	29	46	0	96	4	0
2	37	19	19	63	27	0	6	2	21	63	4	98	4	0	96
3	0	2	0	0	4	2	0	79	6	8	8	2	0	0	4
4	0	0	0	0	0	4	0	13	8	0	0	0	0	0	0
5	0	0	0	0	0	8	0	2	6	0	4	0	0	0	0
6	0	0	0	0	0	0	0	2	60	0	4	0	0	0	0
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

YANTALA	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**
0	0	0	89	0	26	74	2	0	0	0	67	0	0	96	0
1	9	89	5	74	0	23	56	2	2	67	26	2	96	4	2
2	74	11	5	26	74	0	42	0	42	33	7	98	4	0	54
3	18	0	0	0	0	2	0	98	0	0	2	0	0	0	44
4	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	21	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	54	0	0	0	0	0	0
Total	100	100	100	100	100		100	100		100		100	100	100	100

GAWEYE	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**
0	6	0	76	0	86	14	2	10	2	4	35	0	0	88	0
1	2	71	8	14	0	69	96	12	0	31	10	0	88	10	6
2	90	24	12	86	14	6	2	24	31	65	12	100	12	0	94
3	2	6	4	0	0	0	0	49	29	0	31	0	0	2	0
4	0	0	0	0	0	2	0	6	35	0	10	0	0	0	0
5	0	0	0	0	0	10	0	0	0	0	2	0	0	0	0
6	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

D. HEALTH

KOUARAKANO	47	48	49	50	51
0	0	0	0	0	100
1	0	0	0	70	0
2	100	100	100	12	0
3	0	0	0	2	0
4	0	0	0	0	0
5	0	0	0	29	0
Total	100	100	100		100

LACOUROUSSOU	47	48	49	50	51
0	0	0	0	0	100
1	0	0	0	100	0
2	100	100	100	0	0
Total	100	100	100	100	100

LAMORDE	47	48	49	50	51
0	0	0	0	0	100
1	0	0	0	8	0
2	100	100	100	0	0
3	0	0	0	88	0
4	0	0	0	0	0
5	0	0	0	4	0
Total	100	100	100	100	100

YANTALA	47	48	49	50	51
0	2	2	2	2	100
1	0	0	0	98	0
2	98	98	98	0	0
3	0	0	0	21	0
Total	100	100	100		100

BANDABARI	47	48	49	50	51
0	0	0	0	0	100
1	0	0	0	0	0
2	100	100	100	0	0
3	0	0	0	80	0
5	0	0	0	20	0
Total	100	100	100	100	100

GAWEYE	47	48	49	50	51
0	0	0	0	0	100
1	0	0	0	64	0
2	100	100	100	18	0
3	0	0	0	8	0
5	0	0	0	14	0
Total	100	100	100		100

2) Results of the survey for each item and whole area surveyed

A. GENERAL	**3**	**4**	**5**	**7**	**8**	**9**	**10**	**11**
0	1	0	0	0	0	77	1	2
1	23	8	4	27	77	5	38	48
2	28	3	50	40	23	7	16	22
3	26	9	26	8	0	3	20	23
4	21	27	20	4	0	1	25	6
5	0	5	0	21	0	14	0	0
6	0	1	0	0	0	0	0	0
7	0	47	0	0	0	0	0	0
Total	100	100	100	100	100		100	100

B. PRATIQUES	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**
0	0	84	16	0	0	2	0	25	0	0	93	0	0	31	0	15	2	0	92	8
1	83	14	71	68	2	28	19	0	2	94	0	75	31	21	56	51	30	94	3	70
2	16	0	0	2	98	19	75	22	98	6	6	25	69	48	1	31	50	6	5	20
3	1	2	12	1	0	38	5	53	0	0	0	0	0	0	17	2	15	0	1	1
4	0	0	0	18	0	14	0	1	0	0	0	0	0	0	13	1	0	0	0	1
5	0	0	0	9	0	0	0	0	0	0	0	0	0	0	10	0	6	0	0	0
6	0	0	0	1	0	0	0	0	0	0	0	0	0	0	3	0	27	0	0	0
7	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Total	100	100	100	100	100		100		100	100	100	100	100	100		100		100		100

C. EDUCATION	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**
0	2	0	81	0	49	99	1	8	2	6	63	0	0	94	0
1	18	78	7	51	4	0	84	4	0	54	18	0	94	5	2
2	65	19	12	49	46	0	14	16	42	37	10	99	6	0	80
3	15	2	2	0	1	1	1	68	8	2	7	0	0	1	18
4	0	0	0	0	0	0	0	9	11	0	2	0	0	0	0
5	0	0	0	0	0	0	0	0	5	0	1	0	0	0	0
6	0	0	0	0	0	0	0	0	34	0	1	0	0	0	0
Total	100	100		100	100		100			100		100	100	100	100

D. HEALTH	**47**	**48**	**49**	**50**	**51**
0	0	0	0	0	100
1	0	0	0	58	0
2	100	100	100	5	0
3	0	0	0	33	0
5	0	0	0	11	0
Total	100	100	100		100

N.2 REPORT OF SURVEY ON HOUSEHOLDS (FABA Association)

I – INTRODUCTION

In the frame work of improvement of sanitation in Niamey urbain community JICA team consultants have initiated studies. This is to understand the problematic of waste water and solid wastes generated in the city.

Households and Industries surveys, waste quantity survey and solid waste composition survey have been contracted to GIE-FABA.

Before the begining of the study of quantity and composition of waste generated in Niamey city, investigations questionnaires has been set up. This, in order to collect basic data regarding living conditions and residents behavior.

For this study, six (6) representative quarter areas have been targeted : they are : Lacouroussou, Gaweye, Lamordé, Banda-Bari, Kouara-Kano, Yantala.

Each step of investigation is followed by a 8 days campagin of waste collection using refuse-bags, solid waste quantity and composition are determined into quarters wich are concerned.

This report relates the progress and results of surveys from distributed families located in 6 quarters of the city.

II – OBJECTIVES OF HOUSEHOLD SURVEY

The objective of household survey is to collect basic data necessary for the study about solid wastes quantity and composition generated in Niamey urbain community (see on appendix 1 : reference terms of survey).

Questionnaires is set up in order to obtain basic data (see appendix 2). It relates to 4 principles themes :

- General informations
- Practices and awareness
- Education and awareness heightening
- Health

All of the subject are largely dealing with sanitation. Hence, it facilitates to understand the issue.

III – <u>PROGRESS OF HOUSEHOLD SURVEY</u>

III – 1. <u>Selection of quarters areas</u>

JICA study team has localised Urban Community 7 zones in Niamey Urban Community.

The consideration of this zoning is based on existing data (the realised study about Niamey urbain program edited by Harouna M. and Michiels P. in 1999).

In those zones, six (6) quarters have been selected and considered as survey site these are : Lacouroussou, Lamordé, Gaweye, Kouara-Kano, Yantala and Banda-Bari. Characteristics and distribution of differents quarters are realised according to zoning as indicated on table I.

Table I : Distribution and characteristics of six (6) quarters according to the zoning made by Harouna and al. (1999) completed by JICA team.

Differents Housing Zones	Characteristics of Quarters which have been choosen
Modern Quarter	**Kouara-Kano** Modern quarter where population density is low. Good facilities (water, electricity, telephone) and hygiene. The selected compounds for this survey are located at northern-west part in new quarter.
Urban Villages	**Yantala** There is the new and the former Yantala called « Yantala haut ». Yantala haut is considered as urban village where traditional houses are clay made. It has been retained for the survey. Concentration of people is high as collective housing predominates. Eventhough gutters have been recently constructed, significant hygiene problems exist. **Lamordé** This quarter is located on the right bank of Niger river, and provides types of housings : former urban village and new quarter. Selected compounds for survey are distributed into (2) zones. Lamordé urban village is one of the most traditional area wich exists in the capital. Houses are essentialy clay made. There is neither electricity nor water ; toilets are not construted. Among clay houses, the new quarter looks like modern quarter, cemented or semi permanent houses which are built among clay residences.
Traditional Quarter	**Lacouroussou** This is a traditional quarter, with bad sanitation, much concentration of people, similar as Yantala but located in the central part of city. Gutters and waste containers are settled in this area.
Periphery Quarters	**Banda-Bari** This quarter is located at the peripheral of northern part of Niamey city and characterised by the presence of many clay houses. Some of those houses have semi-permanent structure but collective houses are permanent. Banda-bari is the main quarter where many wild dumps are found. The presence of solid wastes on streets enhance a risk of pollution. **Gaweye** It is also a peripheral quarter located on the right bank of Niger river. Housing are collective and clay made. Population concentration is very high and most of houses are without of toilet.

Investigations have been realised in 2 phases of one week each :

- Lacouroussou, Lamorde and Gaweye are concerned by the 1st phase (from Monday, September 18th 2000 to Sunday, September 24th 2000)
- Yantala, Kouara-Kano and Banda-Bari are concerned by 2nd phase (from Monday, October 2nd 2000 to Sunday, October 2000)

III – 2. Materials used for the survey

For these investigations a questionnaire of 51 questions has been prepared by JICA team and used for interviewing households.

Markers have been used in order to identify the 323 census made households.

A vehicle has been used in order to drop and take investigators on the survey site after work.

III – 3. Staff employed for the survey

Six (6) surveyors talking (2) national language and French are employed for the realisation of interviews. They are divided into 3 teams of 2 persons. Each 2 surveyors team has been in charge of one quarter during one step. A general supervisor was responsible for going through the answered questionnaires.

IV – METHODOLOGY

Before starting the survey, 6 surveyors have been trained at FABA office getting, more details regarding the questionnaire. In order to communicate easily with households, surveyors should master houassa, djerma and French languages.

The progress of households investigation has been stated into 2 phases. Each phase concerns one block of 3 quarters. For achieving a good organisation and an efficient complementarity, surveyor are divided into 3 teams of 2 persons.

Before investigation, a preparation week has been given over to prospect and identify sampling compounds (from Tuesday, september 11th 2000 to Sunday, september 17th 2000). The following signs are used for identication of compounds and households :

- LAM : Lamordé (quarter) : LAM 1 : Compound 1 : LAM 1A : Family 1.
- LAC : Lacouroussou (quarter) LAC 1 : Compound 1 : LAC 1A : Family 1
- G : Gaweye (quarter) : G 1 : Compound 1 : G 1A : Family 1
- BD : Banda-Bari (quarter) : BD 1 : Compound 1 : BD 1A : Family 1
- YA : Yantala (quarter) : YA 1 : Compound 1 : YA 1A : Family 1
- KK : Kouara-Kano (quarter) : KK 1 : Compoud 1 : KK 1A : Family 1

Basic informations have been collected by each team in quarters through. Interviewing with the head of family (questions-answers). A total of 323 households composed of 2146 persons distributed among 176 compounds have been concerned by these investigations.

Appendix 4 contains results of investigation wich are gathered according to the theme.

V –ANALYSIS OF RESULTS

Family investigation results have been carried out into 6 targeted quarters. A table is drawn up and quarters are grouped together according to the theme. Four (4) themes are noticed : A – General Informations, B – Pratices and awaraness, C – Education and awareness heightening, D – Health.

In this report, results relating to A – General Informations are analysed into tables. We have carried out a general trend common to all quarters.

There remaining themes are concerned by this case.

V – 1. Analysis of General Information

Table II : General data in investigated quarters

General information / Quarters		Number of Compounds	Numbers of Households	Numbers of Housings	Average number of persons in Households	Average number of household/per/ compound
1	Lamordé	44	52	437	8,4	1,18
2	Gaweye	20	50	328	6,6	2,5
3	Lacouroussou	20	58	313	5,4	2,9
4	Banda-bari	25	54	366	6,8	2,16
5	Yantala	20	57	353	6,2	2,85
6	Kouara-kano	47	52	349	6,7	1,10
		176	**323**	**2146**		

One remarks that the average number of persons into households is more than 6,1 (RGP : Genaral Population Reportin 1988)

Hense, those households must be considered as large households. In Lamordé the number 8,4 shows a village characteristic where poligamy predominates. The lowest average number is found Lacouroussou (5,4). Exiguity of rooms in Lacouroussou could not allow a high number of people to live.

Familiy's average number in each compound is an indicator of high living condition in the area.

In Kouara-Kano, the number 1,10 shows a modern character of this quarter where one family lives in a compound.

Table III : Average monthly income in different households

Quarter / Income	Lamordé		Gaweye		Lacouroussou		Banda-Bari		Yantala		Kouara-kano	
(F CFA)	**Nb.**	**%**	**Nb.**	**%**	**Nb.**	**%**	**Nb.**	**%**	**Nb.**	**%**	**Nb.**	**%**
Less than 30.000	9	17,31	18	36	23	39,66	15	27,78	7	12,28	2	3,85
Between 30.000 & 50.000	11	21,15	15	30	22	37,93	18	33,33	25	43,86	4	7,69
Between 50.000 & 100.000	21	40,38	10	20	8	13,79	14	25,93	24	42,11	5	9,62
More than 100.000	10	19,23	4	8	5	8,62	7	19,93	1	1,75	41	78,85
No answer	1	1,92	3	6	0	0	0	0	0	0	0	0
Total	**52**	**100%**	**50**	**100%**	**58**	**100%**	**54**	**100%**	**57**	**100%**	**52**	**100%**

In most of quarters, the income is between 30.000 and 50.000 F CFA. That is a characteristic of poverty. Eventhough, Lamordé is considered as a poor quarter, people's income is high.

This is probably due to sampling method into modern and semi-modern compound. It has been considerably transformed as passing from urban village status to modern quarter.

Most of people's income in Kouara-kano is higher than 100.000 F CFA monthly. This was predictable as it shows modern characteristic.

Table IV : Socio-professional category of heads of family

Quarter / Socio-profes. category	Lamordé		Gaweye		Lacouroussou		Banda-Bari		Yantala		Kouara-kano	
	Nb.	**%**	**Nb.**	**%**	**Nb.**	**%**	**Nb.**	**%**	**Nb.**	**%**	**Nb.**	**%**
Un employ	1	1,92%	4	8	5	8,62%	13	24,07%	0	0	3	5,77%
Farmer	2	3,85%	5	10	2	3,45%	0	0	0	0	0	0
Trader	1	1,92%	5	10	8	13,79%	0	0	7	12,28%	8	15,38%
Employee	25	48,08%	12	24	5	8,62%	8	14,81%	6	10,53%	30	57,69%
Office worker	3	5,77%	6	12	3	5,17%	3	5,56%	2	3,51%	0	0
Firm employee	0	0	2	4	0	0	1	1,85%	0	0	1	1,92%
Others	20	38,46%	16	32	35	60,34%	29	53,70%	42	73,68%	10	19,23%
No answer	0	0	0	0	0	0	0	0	0	0	0	0
Total	**52**	**100%**	**50**	**100%**	**58**	**100%**	**54**	**100%**	**57**	**100%**	**52**	**100%**

This socio-professional category of heads of households justify table III's remarks. A high socio-economie category of the head of family corresponds to high income.

Table V : Number of rooms in different families in each quarter

Quarter / Number of rooms	Lamordé		Gaweye		Lacouroussou		Banda-Bari		Yantala		Kouara-kano	
	Nb.	**%**	**Nb.**	**%**	**Nb.**	**%**	**Nb.**	**%**	**Nb.**	**%**	**Nb.**	**%**
One room	5	9,62%	1	2	4	6,90%	2	3,70%	1	1,75%	0	0
Two rooms	10	19,23%	40	80	38	65,52%	29	53,70%	35	61,40%	10	19,23%
Three rooms	14	26,92%	9	18	12	20,69%	15	27,78%	16	28,07%	18	34,62%
More	23	44,23%	0	0	4	6,90%	8	14,81%	5	8,77%	24	46,15%
Total	**52**	**100%**	**50**	**100%**	**58**	**100%**	**54**	**100%**	**57**	**100%**	**52**	**100%**

More than 65% of households are living in exiguous rooms (two rooms) at Lacouroussou which is located in the central part of Niamey. One observes that a socio-professional category of the head of family is linked with the number of rooms in this family.

At Lamordé 44,23% of households are living in houses where we can find more than 3 rooms. It concerns the modern part of Lamordé where people live in good condition.

More than 80% of household live in 3 or more rooms at Kouara-kano.

Table VI : Dwelling period of the chiefs of households in their house

Quarter / Dwelling period	Lamordé		Gaweye		Lacouroussou		Banda-Bari		Yantala		Kouara-kano	
	Nb.	**%**	**Nb.**	**%**	**Nb.**	**%**	**Nb.**	**%**	**Nb.**	**%**	**Nb.**	**%**
Less than 1 year	0	0	0	0	0	0	0	0	8	14,04%	0	0
From 1 to 5 years	20	38,46%	29	58	23	39,66%	31	57,41%	28	49,12%	32	61,53%
From 5 to 10 years	9	17,31%	8	16	7	12,07%	5	9,26%	9	15,79%	12	23,08%
From 10 to 15 years	8	15,38%	6	12	3	5,17%	5	9,26%	4	7,02%	1	1,92%
From 15 to 20 years	8	15,38%	0	0	4	6,90%	7	12,96%	1	1,75%	0	0
More	7	13,46%	7	14	21	36,21%	6	11,11%	7	12,28%	7	13,46%
Total	**52**	**100%**	**50**	**100%**	**58**	**100%**	**54**	**100%**	**57**	**100%**	**52**	**100%**

Most of households of the 6 urban quarters under study have been living in their houses for more than 1 year up to 5 years. In Kouara-Kano, this rate is higher with 61,53%, probably in relation ships with its character of new quarter. In other quarters, the important migration from rural areas of last years and the low level of house renting are factors which can explain the results of the survey.

Table VII : Ethnic membership of heads of households

Quarter / Ethnics group	Lamordé		Gaweye		Lacouroussou		Banda-Bari		Yantala		Kouara-kano	
	Nb.	**%**	**Nb.**	**%**	**Nb.**	**%**	**Nb.**	**%**	**Nb.**	**%**	**Nb.**	**%**
Haoussa	19	36,54%	6	12	17	29,31%	16	29,63%	14	24,56%	16	30,77%
Djerma	16	30,77%	31	62	23	39,66%	22	40,74%	25	43,86%	13	25
Peulh	13	25	6	12	2	3,45%	2	3,70%	0	0	3	5,77%
Touareg	1	1,92%	2	4	0	0	4	7,41%	2	3,51%	2	3,85%
Others	3	5,77%	5	10	16	27,59%	10	18,52%	16	28,07%	18	34,62%
Total	**52**	**100%**	**50**	**100%**	**58**	**100%**	**54**	**100%**	**57**	**100%**	**52**	**100%**

Most of households heads belong to Djerma ethnic group located in valleys of Niger river. They are native of Niamey.

Table VIII : Households with domestic animals

Quarter / Domestic animal	Lamordé		Gaweye		Lacouroussou		Banda-Bari		Yantala		Kouara-kano	
	Nb.	**%**	**Nb.**	**%**	**Nb.**	**%**	**Nb.**	**%**	**Nb.**	**%**	**Nb.**	**%**
No	23	44,23%	42	84	55	94,83%	37	68,52%	51	89,47%	41	78,85%
Yes	29	55,77%	8	16	3	5,17%	17	31,48%	6	10,53%	11	21,15%
Don't know	0	0	0	0	0	0	0	0	0	0	0	0
Total	**52**	**100%**	**50**	**100%**	**58**	**100%**	**54**	**100%**	**57**	**100%**	**52**	**100%**

We observe that an appreciable ratio of households getting domestic animals are living in quarters far away from central area of the city, close to the grazing area. A great ratio of domestic animals is noticed at Lamordé because of its urban village characteristic, not far away from millet fields.

Table IX : Differents types of animals and number of heads

Quarter / Domestic animals	Lamordé		Gaweye		Lacouroussou		Banda-Bari		Yantala		Kouara-kano	
	Nb.	**%**	**Nb.**	**%**	**Nb.**	**%**	**Nb.**	**%**	**Nb.**	**%**	**Nb.**	**%**
Cows	26	19,26%	0	0	0	0	2	4,55%	6	22,22%	0	0
Goats	27	20	10	23,81%	0	0	12	27,27%	4	14,81%	0	0
Hens	20	14,81%	23	54,76%	10	38,46%	0	0	3	11,11%	26	41,27%
Donkeys	1	0,74%	2	4,76%	0	0	0	0	0	0	0	0
Sheeps	61	45,19%	1	2,38%	16	61,54%	30	68,18%	14	51,85%	15	23,81%
Others	0	0	6	14,29%	0	0	0	0	0	0	22	34,92%
Total	**135**	**100%**	**42**	**100%**	**26**	**100%**	**44**	**100%**	**27**	**100%**	**63**	**100%**

Most of animals are cows, sheeps, groats. There is also poultry farm in most of quarters.

Table X : Distribution of head of households based on education level

Quarter / Education level	Lamordé		Gaweye		Lacouroussou		Banda-Bari		Yantala		Kouara-kano	
	Nb.	**%**	**Nb.**	**%**	**Nb.**	**%**	**Nb.**	**%**	**Nb.**	**%**	**Nb.**	**%**
No school education	14	26,92%	20	40	30	51,72%	28	51,85%	22	38,60%	1	1,92%
Primary school	3	5,77%	11	22	7	12,07%	7	12,96%	13	22,81%	8	15,38%
Secondary school	12	23,08%	7	14	4	6,90%	7	12,96%	16	28,07%	19	36,54%
Senior secondary school-University	22	42,31%	12	24	8	13,79%	10	18,52%	6	10,53%	24	46,15%
No answer	1	1,92%	0	0	9	15,52%	2	3,70%	0	0	0	0
Total	**52**	**100%**	**50**	**100%**	**58**	**100%**	**54**	**100%**	**57**	**100%**	**52**	**100%**

One discover that more than 60% of heads of households, at Lamordé and Kouara-kano have attended secondary school and University. Is some quarters heads of households are less or not instructed.

Table XI : Distribution of housewives according to their education level

Quarter / Education level	Lamordé		Gaweye		Lacouroussou		Banda-Bari		Yantala		Kouara-kano	
	Nb.	**%**	**Nb.**	**%**	**Nb.**	**%**	**Nb.**	**%**	**Nb.**	**%**	**Nb.**	**%**
No school education	22	42,3	21	42	37	63,79	33	61,11	29	50,87	8	15,38
Primary school	10	19,23	13	26	12	20,68	4	7,4	17	29,82	14	26,92
Secondary school	15	28,84	10	20	7	12,06	10	18,51	9	15,78	23	44,23
Senior secondary school-University	2	3,84	3	6	1	1,72	4	7,4	2	3,5	7	13,46
No answer	3	5,76	3	6	1	1,72	3	5,55	0	0	0	0
Total	**52**	**100%**	**50**	**100%**	**58**	**100%**	**54**	**100%**	**57**	**100%**	**52**	**100%**

One observes that 28,84% of housewives in Lamordé have attended secondary school. This number is 44,23% at Kouara-kano. Heads of families in Kouara-kano and Lamordé are also benefiting with high level of education (see table on educated above).

In other quarters, an average of 80% of housewives are less or not educated. We observe also few educated women compare to men. It is a comon phenomenon noticed in all under developed country where, school access is unequal between girls an boys.

V – 2. General Trends

Practical and awareness

- Most of investigated families say that solid waste collection is not provided.
- Household refuse is disposed of on wild dumps or authorised ones because municipality did not provide containers.
- An appropriate collecting and disposing of solid waste represent the major priority for the city to get good level sanitation.
- Most of households protect themselves against flood by constructing water drainage pipes outside of compound.

- In general, children are in charge of disposing of solid waste outside compound.

Comments : A lack of motivation might be the reason why household waste is tiped near containers by children. This, in our view is the origin of wild dump ground encountered some times around empty containers.

- Most of households, basically in poor quarters indicate that they have constructed a septic tank or modern latrines.

Comments : According to our observation on field, they are traditional latrines with direct discharge to the streets when overflowing occurs.

- Most of household do think that waste are useful for streets embarkment, but did not practice it.

Comments : However, according to our own observations, several streets ravines near the compounds are filled in with waste materials.

- According a high ratio of households, unemployment is one of the main problems which must be solved in this city.
- Almost all the households do not satisfy by current sanitation system adopted by Niamey urban community. Specially for solid waste collection. But according to households, it is not necessary to complain.

Education and awareness heightening

- Majority of households think that children know hygiene principles. But, city officers do not usually advertise families about healhiness and hygiene.
- For cleanlinen of their neighbourhood, majority of residents are ready to collaborate. According to them awareness program is most important.
- In general, volunteers'actions regarding cleanliness of quarters are few or almost nonexistent.
- Cleanliness campaigns are very few in Niamey and have a little effect in the city.
- Almost all of households are able to contribute financially on sanitation improvement in their quarters.

Health

- Populations are awares on the negative effect of waste and solid waste dumped on roads.
- Mothers' role about daily hygiene education for their children, is important.

VI – GENERAL OBSERVATIONS

In general, the surveyors did not fird serious problems for receiving answers of the chiefs of households to fulfil the questionnaires.

VI – 1. Observations about general presentation of results

Differents results are shown on tables based on the following indicators :

- First numbers mentioned at the top side of a table correspond to the number of columns.

The numbers mentioned below are relating to questions (see investigation questionnaire on appendix 2)

- The letters : « **a** », « **b** », « **c** », etc… joining questionnaire numbers (ex : 9a, 9b, 9c etc…) explain that many answers are able to be given regarding question n°9.
- In the table, results are also numbered. Each question corresponds to one or many numbered answers except question n°**1** and n°**2** (answers are represented by numbers).

- In the case of one answer calling one answer, answer n°**3** is always « don't know »

- When a space is fulled with the number « **0** », this indicates that no answer was provided.

VI – 2. Observations about specific

Some answers are doublfull in our view. This is either due to a misunderstanding of investigated families (eventhough our investigators have developed many efforts) either hiding of informations. « Wrong » answers are concerning some questions.

Question n°4 : Average monthly income of households.
Answers to this question have been sometimes doubtful. From our experience, we know that the quantitative information provided by household, as regarde to their economic condition and expenses are almost minimized. This can be explained by the fact that households are afraid that this information could be used in other ways. Than solely for the survey purpose. Accordingly, data of question n°4 should be carefully considered.

Question n°5 : Socio-professional category of head of family

Question n°11 : Education level of the head of family.
There is an important link with question n°**4** and lead us to appreciate ist reliability.

In fact, the education level and socio-professional category of head of family are indicating his income level. Meanwhile, we recommend to consider answers relating to question n°4 with limitation of arguments

Question n°38 : If women are not attending cleanliness campaign does it means that their participation to community actions or campaign is not a taste for women ?

In general, women are actively participating in cleanliness campaigns in Niamey or even in Niger. Men intervention is scarce or almost non-existent.

Question n°38 : Is asked on negative way (case in woman doesn't participates…). This question is sometimes not understood.

Also, the fact that question n°38 implied a link with questions n°**35**, **36** and **37**, was often not perceived by investigators as households.

APPENDIX O: INSTITUTIONS SURVEY REPORT

APPENDIX O.1 SUMMARY OF DATA OF THE JICA SURVEY ON INSTITUTIONS

The following tables summarise the results of the JICA institutions survey according to the 5 aggregated groups and items of the questionnaire. The institutions is composed of only 3 samples, which makes it little representative, and is sometimes not retained in the tables below. Numbers in the first column refer to the type of response given by the institutions. In this column, 0 means the absence of response to the question. Numbers in bold in the first line of each table refer to the question number, as recorded in the questionnaire. Results in the tables referring to solid waste and perception and intentions are the number of responses in % of the total number of responses given for the question. Results in the tables referring to liquid waste and sludge are the number of responses given for the question. The data for the class called "institutions" are not given (only 3 institutions surveyed).

Remarks:

1. In the case of responses in %, when several responses were available for the same question, the % of each type of response takes into account the additional number of responses, overlapping each others. In the case of responses in number, the alternative responses to the same questions are indicated by a, b, c. All these cases are shown in the tables in grey.
2. The questions related to activities, salubrity and health in the questionnaire sheets have not been reported below. Focus has been put on the following 3 important tasks: Liquid waste and sludge, solid waste, and perception and intention.
3. For convenience, the categories of responses having systematically 0% or 0 number have been deleted. This is why the number of categories (lines) in tables can be different with the number of alternative responses given in the questionnaire. The absence of such category means that there was no any answer to it.

A. SOLID WASTE (%)

INDUSTRY	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**
0	8.3	0	50	8	67	42	58	0	67	50	33	17	33	42	17	17	33	50	100	75
1	17	67	25	33	0	0	8	83	25	17	17	33	25	8	75	83	42	42	0	17
2	0	33	8	0	0	25	17	17	0	8	42	0	25	0	8	0	25	8	0	8
3	25	0	8	33	0	25	8	0	0	8	8	33	17	33	0	0	0	0	0	0
4	17	0	8	8	8	8	0	0	0	0	0	0	0	8	0	0	0	0	0	0
5	33	0	0	0	17	0	8	0	8	8	0	0	0	25	0	0	0	0	0	0
6	8	0	0	0	0	0	0	0	0	8	0	17	0	8	0	0	0	0	0	0
7	8	0	0	0	8	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0
8	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	8	0	0	8	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0
11	8	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0
12	17	0	0	8	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0
13	25	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0
14	42	0	0	0	0	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0
total		100	100	100	100	100	100	100	100	100	100	100	100		100	100	100	100	100	100

HOSPITALS	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
0	0	0	50	0	50	63	50	0	13	13	0	0	25	0	0	0	0	0	100	100
1	63	25	38	75	13	0	25	25	50	13	25	50	25	75	100	100	100	100	0	0
2	75	75	0	13	0	13	25	75	38	25	75	13	50	63	0	0	0	0	0	0
3	88	0	0	0	0	13	0	0	0	0	0	25	0	88	0	0	0	0	0	0
4	38	0	13	13	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0
5	63	0	0	0	13	13	0	0	0	50	0	0	0	50	0	0	0	0	0	0
6	13	0	0	0	0	0	0	0	0	0	0	13	0	13	0	0	0	0	0	0
7	13	0	0	0	25	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0
10	13	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0
13	25	0	0	0	0	0	0	0	0	0	0	0	0	25	0	0	0	0	0	0
14	13	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0
total		100	100	100	100	100	100	100	100	100	100	100	100		100	100	100	100	100	100

MARKETS	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
0	0	0	100	14	0	0	0	0	0	14	0	0	29	0	0	0	0	0	100	100
1	71	86	0	57	0	0	14	14	29	14	0	57	0	71	86	86	100	100	0	0
2	29	14	0	14	0	71	57	86	14	0	100	0	71	29	14	14	0	0	0	0
3	86	0	0	0	14	14	0	0	14	0	0	14	0	71	0	0	0	0	0	0
4	29	0	0	14	0	0	14	0	29	0	0	0	0	29	0	0	0	0	0	0
5	57	0	0	0	71	0	14	0	14	71	0	0	0	57	0	0	0	0	0	0
6	14	0	0	0	0	14	0	0	0	0	0	29	0	14	0	0	0	0	0	0
7	14	0	0	0	14	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0
8	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	14	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0
11	43	0	0	0	0	0	0	0	0	0	0	0	0	29	0	0	0	0	0	0
12	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
total		100	100	100	100	100	100	100	100	100	100	100	100		100	100	100	100	100	100

SERVICES	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
0	0	0	93	4	54	50	18	0	39	7	7	14	18	0	4	4	4	7	96	100
1	29	86	4	64	4	4	57	39	32	18	11	50	14	21	75	89	86	71	4	0
2	39	11	0	4	0	25	11	61	7	25	82	14	68	25	18	7	11	18	0	0
3	75	4	0	4	4	14	7	0	14	7	0	11	0	57	4	0	0	4	0	0
4	21	0	4	14	4	0	7	0	4	7	0	4	0	21	0	0	0	0	0	0
5	57	0	0	4	29	7	0	0	4	32	0	4	0	32	0	0	0	0	0	0
6	7	0	0	0	0	0	0	0	0	4	0	4	0	0	0	0	0	0	0	0
7	4	0	0	4	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	32	0	0	4	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0
9	4	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0
10	4	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0
11	11	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0
12	36	0	0	0	0	0	0	0	0	0	0	0	0	29	0	0	0	0	0	0
14	7	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0
total		100	100	100	100	100	100	100	100	100	100	100	100		100	100	100	100	100	100

B. LIQUID WASTE AND SLUDGE (Number of responses)

	28	29	30	31	32	33		34		35	36	37		38		39	40	
INDUSTRY							**a**	**b**	**c**		**m3/j**	**a**	**b**	**a**	**b**		**a**	**b**
0	2	4	4	1	3	5	8	12	12	9	11	5	11	0	12	6	8	11
1	0	0	6	1	6	3	3	0	0	0	0	0	0	5	0	2	0	0
2	0	0	2	10	3	4	0	0	0	3	0	1	0	1	0	3	1	0
3	10	6	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0
4	0	1	0	0	0	0	0	0	0	0	0	4	1	5	0	0	0	1
5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
7	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0
total	12	12	12	12	12	12	12	12	12	12	11	12	12	12	12	12	12	12

	28	29	30	31	32	33		34		35	36	37		38		39	40	
HOSPITALS							**a**	**b**	**c**		**m3/j**	**a**	**b**	**a**	**b**		**a**	**b**
0	0	6	1	0	0	3	6	7	7	6	7	4	8	1	8	4	5	7
1	0	0	7	0	4	3	1	0	0	2	0	2	0	2	0	2	1	0
2	0	0	0	8	4	2	0	1	0	0	0	1	0	2	0	2	1	0
3	8	2	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0
4	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
total	8	8	8	8	8	8	8	8	8	8	7	8	8	8	8	8	8	8

MARKETS	**28**	**29**	**30**	**31**	**32**	**33**		**34**		**35**	**36**	**37**		**38**		**39**	**40**	
réponses nombre							**a**	**b**	**c**		**m3/j**	**a**	**b**	**a**	**b**		**a**	**b**
0	0	6	3	2	3	6	7	7	7	7	7	7	7	1	7	7	7	7
1	0	0	4	0	4	1	0	0	0	0	0	0	0	6	0	0	0	0
2	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
total	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7

	28	29	30	31	32	33		34		35	36	37		38		39	40	
SERVICES							**a**	**b**	**c**		**m3/j**	**a**	**b**	**a**	**b**		**a**	**b**
0	2	22	22	20	21	25	27	28	28	26	28	25	27	16	27	25	28	28
1	0	0	6	1	7	2	1	0	0	1	0	1	0	4	0	3	0	0
2	0	0	0	7	0	1	0	0	0	1	0	1	1	6	1	0	0	0
3	26	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0
total	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28

C. PERCEPTION AND INTENTIONS (%)

INDUSTRY	41	42	43	44	45	46	47	48	50	51	52	53	54	55	56	57	58
0	33	33	42	58	8	67	75	17	42	50	58	50	33	33	58	17	17
1	50	17	25	0	58	8	0	33	8	0	33	25	8	17	17	17	0
2	17	17	0	42	33	8	25	50	42	50	8	8	50	42	17	67	83
3	0	8	8	0	0	8	0	0	8	0	0	17	8	8	8	0	0
4	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	25	0	0	8	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	100	100	100	100	100	100	100	100	100	100	100	100	100	100		100	100

HOSPITALS	41	42	43	44	45	46	47	48	50	51	52	53	54	55	56	57	58
0	13	13	13	63	13	63	63	0	13	0	50	38	0	0	13	0	13
1	63	25	88	0	38	25	0	13	63	38	25	63	63	13	13	0	0
2	25	13	0	38	38	0	38	88	25	63	0	0	38	88	51	100	88
3	0	50	0	0	13	0	0	0	0	0	0	0	0	0	63	0	0
4	0	0	0	0	0	0	0	0	0	0	25	0	0	0	0	0	0
5	0	0	0	0	0	13	0	0	0	0	0	0	0	0	38	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	100	100	100	100	100	100	100	100	100	100	100	100	100	100		100	100

MARKETS	41	42	43	44	45	46	47	48	50	51	52	53	54	55	56	57	58
0	0	0	0	14	0	71	71	0	0	0	29	29	14	0	0	14	0
1	14	57	57	29	71	14	0	0	14	29	14	57	14	0	43	0	0
2	86	14	14	57	14	0	29	100	86	71	14	0	71	100	0	86	100
3	0	29	0	0	14	0	0	0	0	0	29	14	0	0	100	0	0
4	0	0	0	0	0	14	0	0	0	0	14	0	0	0	0	0	0
5	0	0	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0
	100	100	100	100	100	100	100	100	100	100	100	100	100	100		100	100

SERVICES	41	42	43	44	45	46	47	48	50	51	52	53	54	55	56	57	58
0	11	11	25	32	0	93	89	0	14	7	57	57	11	4	36	0	11
1	32	46	50	25	93	0	0	36	36	36	29	25	14	29	32	7	11
2	57	29	0	36	7	7	7	50	46	46	11	11	75	64	4	93	79
3	0	11	11	7	0	0	4	14	4	11	0	7	0	4	18	0	0
4	0	4	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0
5	0	0	11	0	0	0	0	0	0	0	0	0	0	0	11	0	0
6	0	0	4	0	0	0	0	0	0	0	0	0	0	0	4	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	100	100	100	100	100	100	100	100	100	100	100	100	100	100		100	100

APPENDIX O.2 REPORT OF SURVEY ON INSTITUTIONS (FABA Association)

I – INTRODUCTION

Within the context of sanitation improvement in Niamey Urban Community, JICA team has initiated studies regarding solid wastes and waste water management.

Households and industries investigations based on questionnaires have been carried out by FABA. The objective is to elaborate a data bank which make us to understand the issue of sanitation in Niamey Urban Community. The first report relating to households investigation has been edited and submitted to the JICA team.

This report presents progress and investigation results for industries, institutions and trading companies in Niamey Urban Community.

II – OBJECTIVE OF INVESTIGATIONS CLOSE TO INDUSTRIES, INSTITUTIONS AND TRADING COMPANY

The objective of investigation is to collect appropriate informations needed elaboration of master plan, in order to lunch Hygiene education program, and understand public awareness (see appendix 1 : TOR of survey). The survey questionnaire on industries and institutions is organized according to 5 items (see appendix 2) :

- Activities
- Solid wastes
- Waste water and sludge
- Perceptions and intentions
- Health and salubrity

III – PROGRESSE OF SURVEY ON INDUSTRIES AND INSTITUTIONS

III – 1. Select of Industries, Institutions and trading companies

According to the TOR, 100 Industries and Institutions must be identified for the survey. Waste generated by Industrial activities, trading, health and handicraft activities which generate signifcant quantities, have been sampled. Among 100 Industries and institutions on target, 58 have been interviewed.

III – 2. Justification of the choice of Industries and Institutions

The selected industries and institutions are localised in three (3) communes (see Localisation map on page 3).

Activity branches are varied as much as possible to reflew representativity of activities and nature of wastes generated (harmful, toxic or noxious wastes) as their importance (see table I : list of industries and Institutions selected for survey).

Table I : List of Industries and Institutions selected for survey regarding their practices and perceptions in the scope of Urban sanitation.

A - Industries
1. ENITEX (Textile)
2. BRANIGER (Brewerie)
3. SPCN (Soap manufacturing)
4. TANNERY
5. SOLANI (Milk production)
6. ONPPC (Pharmaceutical product)
7. ABATTOIR Frigorifique (Staughtering)
8. NIGER – Lait (Milk production)
9. SOGANI
10. NIGER GAZ
11. RIZ DU NIGER (Rice processing)
12. NIGELEC CENTRALE (Electricity supply)

B - Hospital – Clinics
13. CHU Lamorde
14. National Hospital
15. Central Maternity and Dispensary
16. Poudriere Maternity
17. Lahiya Clinic
18. Pro-Santé Clinic
19. Military Hospital

C - Pharmacies
20. Maoureye Public Pharmacy

D – University
21. University of Niamey

E - Hotels
22. Hotel Gaweye
23. Grand Hotel
24. Hotel Tenere
25. Hotel Sahel

F – Craft Industries
26. National Musuem
27. Wadata handicraft Center

G – Gaz Stations
28. ELF Gaz Gadafawa Station
29. Shell Gaz Lazaret Station
30. Mobil Gaz Gadafawa Station

H - Markets
31. Livestock Market (Tourakou)
32. Petit Marché
33. Grand Marché
34. Yantala Market
35. Katako Market
36. Bus Terminal
37. Wadata Market

I - Super Market
38. Score
39. Haddad Khalil Super Market

J – Military Comps
40. Republican Guard

K – Cinema
41. Cinema Soni

L – Informal Restaurants
42. Yasso Maquis
43. At Zara's Informel Restaurant
44. LAC Informel Restaurant

M - Other Restaurants
45. La Cloche (The bell)
46. Restaurant La Colline Parfumée (Perfumed Hill Restaurant)
47. Restaurant chez CHIN (at Chin's Restaurant)
48. BYBLOS Restaurant
49. Restaurant Dragon d'Or (Gold Drogon Retaurant)

N – Garages
50. Municipal Garage
51. NITOPPEN Garage
52. Cimetière de Voitures (Car cimetery)
53. Central Agency
54. Manutention Africaine (African Storehouse)

O – Informal Garages
55. HABI Garage at nouveau marché
56. BANDABARI Garage
57. Cazimir Garage

P - Offices
58. Hôtel de Postes (Poste Office)

Restaurants and garages have been taken in account when choosing Industries and Institutions sample. This is due to the high number of garages and restaurants wixh are generating wastes.

It must be take into account for the elaboration of master plan regarding management of wastes.

III – 3. Materials used

For carring out the surveys, 64 questions have been elaborated by JICA consultants and proposed to industries and Institutions through FABA.

Appointments with differents managers of Industries and Institutions have been made either by telephone orby reaching the place before interviews. Fours (4) surveyors distribued into 2 groups have been in charge of the execution.

IV – Results

Tables (appendix 3) have been set up after conducting survey at Industries and Institutions of Niamey Urban Community. These tables are based on the following :

- Questions numbers are mentioned at the top side of the table.
- Questions have been spread out according to the item. There are 5 items :
    - A. Activities
    - B. Solid wastes
    - C. Wastes liquid and sludges
    - D. Perceptions and intention
    - E. Health and salubrity

- When there are many answers for a specific question, letters : « **a** », « **b** », « **c** » are mentioned at the bottem of this question.
- In the results tables, answers are also numbered. Each question correspond to one or many numbered answers except questions number **4** (CFA Francs), **27** (CFA Francs/ton), **36** (m3/day), **49** (type of prejudice), **64** (disease type)
- In the case of a question calling for one answer only, answer n°**3** means « **I DON'T KNOW** ».
- When number « **0** » is mentioned, it indicates that there is no answer for this particular question.

APPENDIX P: WATER QUALITY SURVEY REPORT

APPENDIX P.1 WATER QUALITY SURVEY REPORT

JICA study team in collaboration with the LANSPEX.

THE WASTEWATER QUALITY AND QUANTITY SURVEY

FOR

THE STYDY ON SANITATION IMPROVEMENT

FOR

THE NIAMEY CITY

IN

THE REPUBLIC OF NIGER

OCTOBER 2000

LANSPEX

The original copie in French

TERMS OF REFERENCE

I STUDY TERMS

A contract agreement on the wastewater quality and quantity survey for the study on sanitation improvement for the Niamey City in the Republic of Niger was signed between JICA study team and the LANSPEX.

A sampling procedure was designed and was approved by both parties.

II SAMPLING

1-Sewer and Drainage

From the existing sewer & drainage, eight points were determined, and 10 samples were taken from each from 06.00 Am to 24.00 hours.

2-Typical enterprises and institutions

Five enterprises were choosen for wastewater quality & quantity testing. The background information were obtained which includes number of employees, water use and toilet type.

Thes enterprises and institutions are : Hotel Gaweye, National Hospital, University, Sonibank, SNE (Governement office).

3-Typical industries

Five industries were choosen for wastewater quality & quantity testing. The procedure was the same as for the typical enterprises and institutions. They are : BRANIGER (Brewerie), SPCN (soap factory), Tannery, ENITEX (textile) & NIGER-LAIT (milk).

4-Supplementary sampling

In order to make sure about water quantity and quality testing for the study, the JICA study team instructed the LANSPEX to make supplementary sampling, thus two & wells were sampled (at Banifandou I and Djida) and two points on the river (Saga bathing place, Saga).

Items	Survey items	Number of flow and sampling	Locations
Sewer and Drainage	Flow and sampling	6 : 00 hours to 24 : 00 hours every two hours	Katako
	Flow and sampling	6 : 00 hours to 24 : 00 hours every two hours	Deyzeibon
	Flow and sampling	6 : 00 hours to 24 : 00 hours every two hours	Boukoki III
	Flow and sampling	6 : 00 hours to 24 : 00 hours every two hours	Nord est
	Flow and sampling	6 : 00 hours to 24 : 00 hours every two hours	Terminus
	Flow and sampling	6 : 00 hours to 24 : 00 hours every two hours	Braniger
	Flow and sampling	6 : 00 hours to 24 : 00 hours every two hours	Musée
	Flow and sampling	6 : 00 hours to 24 : 00 hours every two hours	Onarem
Enterprises and Institutions	Flow and sampling (with background informations)	10 Am at 5 locations	Hotel Gaweye Hôpital national Sonibank SNE building
Typical Industries	Flow and sampling (with background informations)	10 Am at 5 locations	Braniger SPCN ENITEX Niger lait Tannerie

For each item, the following analysis were carried :

1) Raw sewage

- Chemical oxygen demand (COD)
- Biochemical oxygen demand (BOD)
- Suspended solids demand (SS)
- Coliform number (TCN)
- Total Nitrogen (TN)
- Total phosphate (TP)
- Oils and grease
- pH
- Temperature

2) Drainage water

- Chemical oxygen demand (COD)
- Biochemical oxygen demand (BOD)
- Total phosphate (TP)
- Suspended solids demand (SS)
- Temperature
- Total Nitrogen (TN)
- pH

3) Enterprises and institutions

- Total Nitrogen (TN)
- pH
- Total phosphate (TP)
- Chemical oxygen demand (COD)
- Biochemical oxygen demand (BOD)
- Suspended solids demand (SS)
- Temperature

4) Typical industries

- Chemical oxygen demand (COD)
- Suspended solids demand (SS)
- Phenol

- Biochemical oxygen demand (BOD)
- pH
- Temperature
- N-hexane extract

V-Analysis methods

The methods used to carry the laboratory test are those of « WATER ANALYSIS of J. Rodier.

V- Results

Table 3 : Quantity and quality of domestic waste water

Location Of outfalls	Measured Flow (m3/h)	Effluent quality								Discharge points
		PH	COD (mg/l)	BOD (mg/l)	SS (mg/l)	TP (mg/l)	TN (mg/l)	Oil & grease (mg/l)	TC (MPN/ 100 ml)	
Katako	67.16	8.36	215.7	90	1194	21	0.6	64	275.10^5	Gountou
Deizeybon	52.51	8.26	150.7	62	242	14.2	0.1	38	325.10^5	Gountou
Boukoki 3	28.34	8.52	254.1	94	628	31	0.5	270	261.10^5	Gountou
Nord-est	33.11	8.31	129.1	56	158	5.2	0.03	558	43.10^5	Gountou
ONAREM	21.54	8.80	84	35	150	4.5	0.04	726	30.10^5	Niger river
Terminus	108.40	8.67	126	51	174	14.5	0.2	290	17.10^5	Niger river
Museum	172.00	8.24	112.3	45	414	7.2	0.01	486	31.10^5	Niger river
Braniger (outfall)	23.20	10.95	198	90	900	8.2	0.04	54	95.10^2	Niger river

Table 4 : Quantity and quality of commercial waste water

Institutions/enterprises	Effluent quality						
	T° (C) water	pH	COD (mg/l)	BOD (mg/l)	SS (mg/l)	TP (mg/l)	TN (mg/l)
Hotel Gaweye	29.6	7.13	83.4	36.0	186	1.9	0.20
Hopital National	29.3	7.28	107.6	46.0	238	13	0.05
SONIBANK	29.2	7.46	116.2	46.0	394	4.1	0.02
SNE office	29.6	7.56	101.2	41.0	178	12	

Table 5 : Quantity and quality of industrial waste water

Industries	Activities	Flow (m^3/h)	Effluent quality						Discharge point
			T°© water	pH	COD (mg/l)	BOD (mg/l)	SS (mg/l)	Normal Hexane (mg/l)	
BRANIGER	Beer brewing & soft drink bottling		36.5	10.56	88	30	172	200	Channel
SPCN	Soap		29.6	7.65	58	10	229	200	Channel
ENITEX	Cotton weaving , printing	135.16	29.5	11.9	148	62	408	240	Niger river
NIGER-LAIT	Dairy products		29.5	10.53	96	68.4	330	160	Natural drain
TANNERIE	Tannery		31.1	7.34	7800	1200	10409	4380	Niger river
SOLANI	Dairy products		29.5	8.07	11.4	-	210	40	garden

Table 6 : Quantity and quality river & well

Location	TC(MPN/100 ml)	BOD (mg/l)	TN (mg/l)
Saga II river	93.10^3	10	0.01
Saga bathing	74.10^3	10	0.01
Djida	178.10^2	5	0.01
Banifandou	158.10^2	5	0.01
Gamkallé	0	0	-

APPENDIX Q: SOLID WASTE AMOUNT SURVEY REPORT

FABA « Ville Propre »

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THE STUDY ON SANITATION IMPROVEMENT FOR NIAMEY CITY IN THE REPUBLIC OF NIGER
JICA - TEAM

SOLID WASTE SURVEY

Final Report

Elaborated by Habibou ISSA (FABA)

February 2001

FIELD SURVEY ON SOLID WASTE

FINAL REPORT

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1. INTRODUCTION

Within the framework of the Study on sanitation improvement for the town of Niamey supervised by the technical team of JICA, the Economic interest group FABA « Niamey, Ville Propre» [Niamey- Clean Town] has been assigned a part of the work divided up into 2 components :

1.1 Households surveys and Industries surveys

In this first component, the objective aimed at gathering base figures at the level of 300 households divided up at least into 6 districts selected by the technical team of JICA in the Urban Community of Niamey and at the level of some fifty industries and institutions of the capital identified by FABA.

1.2 Determination of the Quantity and the Composition of Household Waste

This Component deals with the collection of waste from door to door at the level of 300 households which responded to the questionnaire in order to assess the quantity and the composition of household waste generated in the Urban Community of Niamey.
It is this second component which will be covered by this note.

2. STUDY ON THE QUANTITY AND THE COMPOSITION OF HOUSEHOLD WASTE GENERATED IN THE URBAN COMMUNITY OF NIAMEY

2.1 Objective of the Study

This study is an important component of the general study conducted by JICA on sanitation improvement for the town of Niamey.
It aims at gathering data on the quantity and composition of household waste in 6 areas at the level of 300 households representative of the Urban Community of Niamey. Figures on the quantities of waste will enable, after extrapolation to all the other areas of the capital, to work out the quantity of household waste produced per capita per day and the total quantity of household waste generated in the Urban Community of Niamey.

On the other hand, surveys concerning a sample of 50 industries, institutions, businesses, hospitals, heath centers, arts and trades centers among the most important of the capital, will enable to assess the quantities and the quality of waste specific to activities carried out by these other producers of waste in the Urban Community of Niamey. The results of these surveys will be included in the report on the industrial surveys (see separate report : **Industries and institutions survey realized within the scope of JICA study on improvement of sanitation in urban community of Niamey**).

The determination of the physical and chemical composition of household waste will provide data on the proportion of each component of household waste and will enable to assess risks of contamination of soils and the groundwater in the capital. The report on chemical data related to household waste will be elaborated in the care of LANSPEX and provided in the fringe of this study.

2.2 Justification of the Study

Any community generates waste coming mainly from housework or domestic activities (household waste) and professional activities (waste specific to industries, businesses, hospitals, and so on and so forth.

If household waste constitutes the most important waste as regards weight, the fact remains nonetheless that waste generated by hospitals and industries is the most dangerous for nature, human beings and animals. It turns out from that moment on that it is essential to take into consideration these two components of waste within the framework of this study on sanitation improvement for the town of Niamey.

3. METHODOLOGY

The methodology used for the realization of this study is made up of several sections :

- determination of representative zones for sampling and survey;
- weighing, sampling and analysis procedures;
- production and data processing of the survey preliminary results.

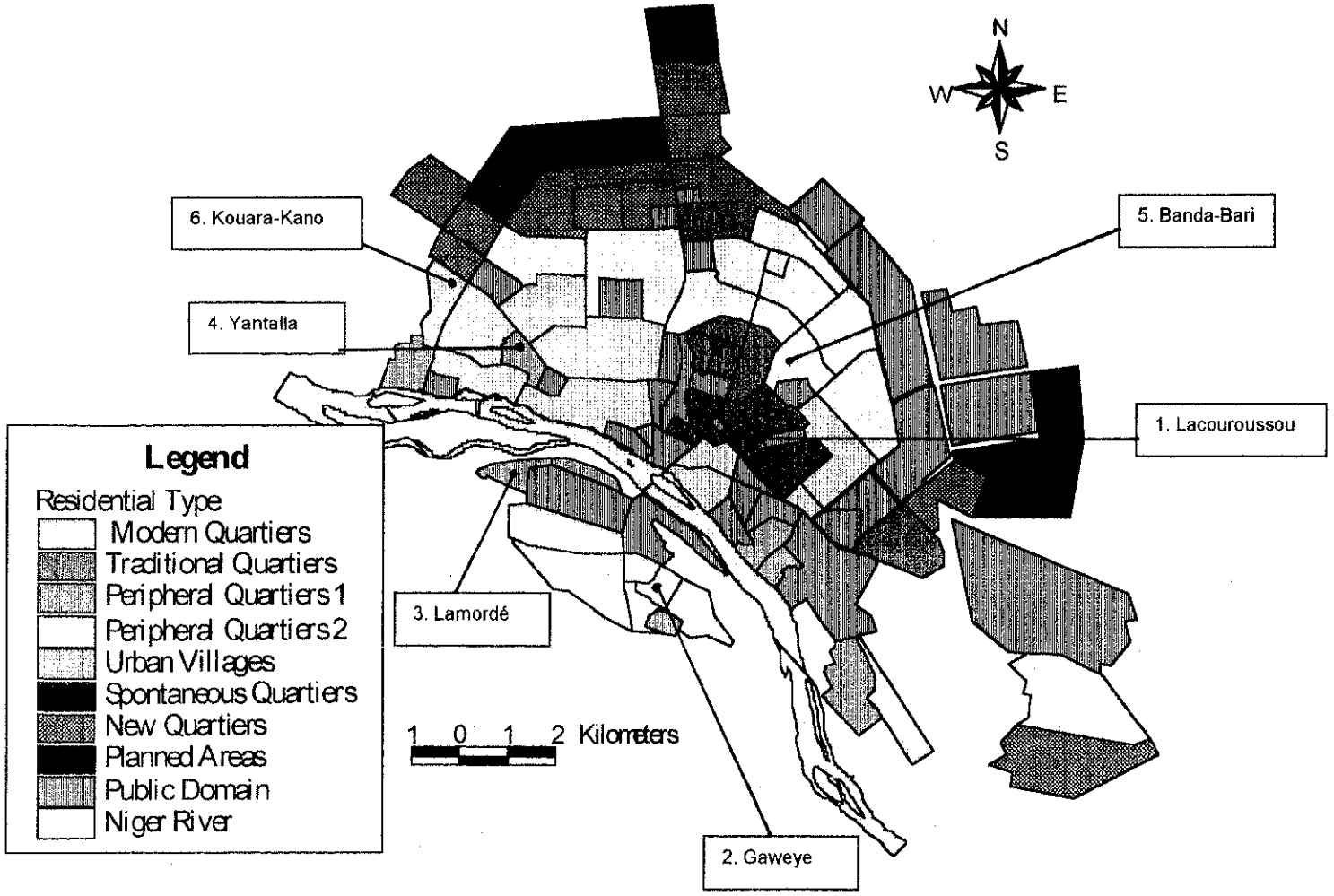
3.1 The Determination of representative zones for sampling and weighing

The consulting firm devoted the first week to the consultation and analysis of documents related to the study on Niamey urban program carried out by Harouna M. and Machiel P in 1999. In a second phase, the consulting firm went in the field to identify the districts that are to be selected.

The technical team of JICA in collaboration with the technicians of the urban community of Niamey and FABA selected 6 districts targeted by the study (see map 3-1 : Location map). These 6 districts are divided up into 4 residence zones and were identified on the basis of a map made by JICA from existing data (See Table 1).

Table I : Districts selected for the study

DIFFERENT DISTRICTS	SELECTED DISTRICTS AND THEIR FEATURES
1. Modern district	**Kouara Kano** Smart modern district with a low population density and well-equipped buildings as regards utilities (water, electricity, telephone) which meets good sanitation requirement standards. The selected compounds for the study are located in the new district towards the north-west periphery.
2. Urban Villages	**Yantala** There are the former and new Yantala or High Yantala. The latter, selected for the study, is an old district of Niamey and is considered as an urban village where traditional housing is in clay. Housing is collective and population concentration is very high. Besides, there are serious sanitation problems despite the recent construction of gutters in the area **Lamordé** It is a district located in the south bank of Niger river which presents two types of dwelling places : the former urban village and the new district. The houses selected for the study are divided up into the two (2) types of dwelling places. The urban village is one of the most traditional existing in the capital. Houses are in clay. There is neither electricity, nor water and houses lack latrines. The new district looks like Banda Beri, with permanent structures or semi-permanent structures in the middle of houses in clay.
3. Traditional districts	**Lacouroussou** It is a traditional district which lacks basic sanitation facilities. Besides, it has a high population concentration similar to Yantala. It is located in the town center at cables' length from gutters and waste containers.
4. Outlying districts	**Bandabari** It is about an outlying district in the North of Niamey characterized by a large proportion of houses in clay. It has some « semi-permanent » structures as well as collective « permanent » structures. It is the district which has the greater number of waste wild dumping sites throughout alleys. This lays the district open to very high pollution risks **Gawèye** It is also an outlying district of the south bank of river Niger. Housing in clay is collective. Population concentration is very high and the majority of houses lack latrines.



Map 3-1: Location of the chosen quartiers for the survey

In the six (6) districts selected for the purpose of the study, 50 households at least and/or 20 houses should be targeted for the households surveys in order to gather essential base figures for the Study (terms of references in Annex I). They will be collected through a questionnaire of 44 questions divided up into 4 main themes (see Annex II).

- A . General Information
- B . Practices and awareness
- C . Education and Awareness heightening
- D . Health

The analysis of the various answers collected during interviews will be the subject of a separated note from this one. We will confine ourselves here in giving some general information (see Table 2) important at the level of weighing and sampling results regarding household waste.

Table 2 : Summary of general information on the selected districts.

	Lacourou.	Lamordé	Gawèye	Banda Bari	Yantala	Kouara kano	Total
Number of compounds	20	44	20	25	20	47	**176**
Number of households	58	51	50	54	57	52	**322**
Number of inhabitants	313	437	328	366	353	349	**2146**

4. COLLECTION OF HOUSEHOLD WASTE, WEIGHING, SAMPLING AND ANALYSIS PROCEDURES

In compliance with the terms of references of the study (Annex I), 16 days for household waste collection at the level of households in the 6 selected areas have been planned. This collection period is divided up into 2 phases :

- a phase of 8 days (from Monday 18 to Monday 25/09/00) concerning an area of 3 districts (Iacouroussou, Gawèye, Lamordé);
- a second phase of 8 days (from Tuesday 03 to Tuesday 10/10/00) concerning the second area of the remaining 3 districts (Kouara-Kano, Yantala, Banda Bari).

Each collection period includes 3 working procedures :

- daily weighing of household waste;
- sampling : the taken of 12 samplings over the totality of the 6 districts (2 samplings / district);
- laboratory analysis of the various samplings which have been taken.

The flow chart of the survey process is summarized in Annex III.

4.1 Equipment used

In order to carry out the various assignments for collection, weighing and sampling on household waste, the following equipment has been used :

- ten thousand waste bags of 100 liters volume in light black plastic;
- 1 vehicle for waste bags collection;
- 1 liaison four-wheel drive;
- 4 weighing equipment;
- 2 sievers of 5 mm (meche)
- 2 canvas covers;
- 6 pairs of gloves;
- 6 masks or hob covers;
- 6 pairs of boots;
- 3 shovels;
- 3 pitchforks;
- 20 buckets (20 liters capacity).

4.2 Personnel used

- 6 interviewers / operators
- 6 workers / waste collectors
- 1 liaison officer / supervisor
- 2 drivers

4.3 Work progress

The study on the quantity and composition of household waste spreads over 16 days and dealt with 6 districts selected during the households surveys.
For efficiency and organization motives, the duration of that study was divided up into 2 phases of 8 days. During each phase, 3 districts were targeted (see above):

- during the first phase (from Monday 18/09/00 to Monday 25/10/00), the targeted areas were Lacouroussou, Lamordé, Gawèye;
- in the second phase (from Tuesday 3/10/00 to Tuesday 10/10/00), the targeted areas were Kouara-Kano, Yantala and Banda-Bari.

During each phase, similar tasks (collection, weighing, sampling) were regularly performed on household waste treated in waste bags and collected from door to door at the level of the households identified during the households surveys in the 6 test districts.

4.4 Collection and weighing procedures

Each day, agents (interviewers and workers) equipped with all the necessary outfit collect waste bags (identified in relation to households) and carry them to the district council garage. On the spot, always packed up wastes are first weighed up separately, per district of origin and the results are recorded by interviewers on sheets prepared beforehand (see Annex IV). After that process, sampling operations start.

4.5 The Sampling procedure

The objective here is to look for a sampling representative of 20 liters capacity of the entire quantity of household waste collected daily in a district and to record the weights and the nature of the various components of the waste.

A sampling timetable was first elaborated to avoid manipulations overload. The objective is to have at the end of each period of 8 days, 6 samplings (2 per district over the 3

districts concerned by one phase). Concerning the entire study, 12 samplings should be collected and analyzed in laboratory.

During a sampling, bags containing all kinds of household waste of a district (scheduled in the timetable) are opened and emptied on cemented terrace. The workers first extract the entire bulky components of waste (paper, plastic, textile, leather, wood and so on and so forth.). Then, the rest of household waste is gathered and mixed several times before the selection of a representative sampling through a bucket of 20 liters.

After weighing, the sampling is sieved by means of a sieve of 5 mm (meche) to extract sand and fines. The rest of waste is sorted out to separate : papers, plastics, textiles, wood and organics and metals.

Each of the pile thus obtained will be the subject of a weighing and the results are recorded on sheets returned to the JICA team.
After the sampling procedure, a part of the components of household waste is packed up separately and carried in the laboratory for analysis. We will append to this note the results related to weighing (see Annex IV) and sampling (see Annex V) procedures that we will later comment in the final report.

5. ANALYSES OF THE PRELIMINARY RESULTS OF THE SOLID WASTE CAMPAIGN ON HOUSEHOLD WASTE

5.1 Explanation of very high proportion of fines

Fines are considered as sand together with the other parts of waste whose diameter is inferior to 5mm since they have been obtained from direct sieving (use of a 5mm diameter sieve before weighing).

In the other fines, all the other components of waste do exist, but in a size which did not enable us to dissociate them. But most certainly, organic matters do occupy a great proportion.

The average proportion of fines in 6 districts (12 samplings) is superior to 80%. This can be explained by the conjunction of 2 factors:

The methodology applied during surveys :

In fact, the entire weight surveys of fines have been carried out through a sampling of 20 liters capacity of household waste selected through the entire waste collected during a day's work in the considered area.
This methodology may have influenced upwards the weight of the fines.

The type of houses and the households practices :

In all the districts of the capital and even in Niger in general, the typical house is in « clay » or is a « Semi-permanent » or « permanent » structure used by districts inhabitants. They include a main building and a yard whose predominant material is sand.

Thus, during sweeping activities in houses yards, (in average twice per day : in the morning and the afternoon), housewives incorporate in so doing, a high proportion of sand in the sweepings through their using of a traditional broom made up of a clump of straw or blades of grass. The sweepings thus obtained are then found in household waste. This is the reason why the fine portion is very high.

5.2 Explanation of organic matters low proportions

Organic matters or fermentables (matters originating from animals or vegetals and left-overs) are very less represented in all the districts covered by the study. This can be explained by the fact that some of these matters (left-overs and animal faecal waste) are not found in household waste, either because recuperators have already collected them very early before we arrived or that animal breeders have monopolized them. we can thus think that despite the sensitization efforts of our interviewers, some households were able to pre-sort out their waste before tipping out a part in our waste bags. This remark has been made concerning plastic or glass bottles and large cans of food which almost are no longer found in household waste due to the existence of a recycling channel at the level of the Katako market.

The example of Lamordé, where there is a high presence of animals reared in compounds and whose faecal waste is not nevertheless found in household waste confirms the reuse of organic matters at the base (before collection at the level of households), or by the households themselves, or other collectors.

Finally, the low proportion of recorded organic matters together with the high contribution of left-overs can also be explained by the heightened awareness of populations which no longer consume like before due to the economic slump over the past years which has weakened the buying power of the inhabitants in Niamey.

5.3 The quantity of waste produced per capita

The quantity of household waste produced per capita was calculated through weighting. Weighting of specific weights obtained over a week of weighing.

Table 3 : Weighting through the use of average specific weights obtained over a week of weighing

Districts	Lacourous sou	Yantala	Gawèye	Banda-bari	Lamordé	Average
Weighting values [1]	0.08	0.08	0.33	0.33	0.09	1
Average specific weight at collection	1.05	0.79	0.49	0.95	0.84	0.75

[1] The weighting value are obtained from the share of the population of the different quartiers that are considered

By using the average quantities of household waste produced per capita per day obtained in the 6 districts covered by the study over a week of weighing, we obtain by weighting an average of 0.75 kg/per capita/per day all over the urban community of Niamey.

Waste collection operations were carried out very early in the morning from door to door at the level of the various households identified and carefully sensitized. This enabled us to say that the impact of recuperators is almost non-existent on the results obtained. In considering that the quantity of household waste produced daily per capita in the urban community of Niamey is 0.75 kg, the annual weight of waste produced by the 652,517 (estimation of the population of Niamey in 2000) inhabitants of the capital is therefore 0.75 x 365 x 652,517 = 178,626 tons.

6. ANALYSES OF THE RESULTS OF HOUSEHOLD WASTE OBTAINED BY THE APPLICATION OF A SECOND METHODOLOGY

In order to compare our results with the ones of previous studies (Socrège Ed. 0200) and to check the respective high and low proportions of fines and organic matters obtained during the first household waste survey, a second survey using a different methodology was carried out over a period of 6 days.

The task consisted in collecting from door to door household waste at the level of the same households in the 6 districts in order to assess weights and volumes and analyze the composition of household waste over the totality of collected waste. Each district has been the subject of a meticulous application of that method during a full day's work.

On the other hand, in order to better compare the results obtained by that method to those of Socrège, we have integrated two districts of middle standing in our study. It is about : Route Filingué and the New district of Yantala (located above Boulevard de l'Indépendance and limited to the East by Boulevard Mali-Béro).

In short, districts are divided up in standings according to the following classification :

- low standing which includes the following districts : Lacouroussou, Lamordé, Gawèye, Bandadari, Yantala (« former Yantala ») ;
- middle standing which concerns the districts : Route Filingué and the « new Yantala » ;
- high standing is represented by Kouara Kano.

We obtain the following average quantities of household waste produced per day per capita (see Tables 4, 5, 6. 7)

- 0,767 kg/per capita/per day in the low standing ;
- 0,875 kg/per capita/per day in the middle standing ;
- 1.06 kg/per capita/per day in the high standing.

The average quantity of household waste produced per capita per day obtained through the weighting of results indicated above is 0.80 kg.

Table 4 : Quantities of household waste produced per capita in the districts classified low standing

Districts	Lacourous sou	Yantala	Gawèye	Banda-bari	Lamordé	Average
Weighting values	0,086	0.09	0,367	0,367	0.09	
Specific weight (kg/per capita/per day	0.70	0.88	0.52	1	0.80	0,767

Table 5: Quantity of household waste produced per capita in the districts classified average standing

Districts	Route de Filingué	Nouveau Yantala	Average
Specific weight (kg/per capita/per day)	0.92	0.83	0,875

Table 6 : Quantity of household waste produced per capita in the districts classified high standing

District	Kouara-Kano
Specific weight (kg/per capita/per day)	1.06

Table 7: Quantity of household waste produced per capita calculated at the level of all districts

Standing	Low Standing	Middle Standing	High Standing	Average
Weighting	0.75	0.2	0.05	1
Average specific weight (kg/per capita/per day)	0,767	0,875	1.06	0.8

7. COMPARISON OF THE RESULTS OF THE 2ND SURVEY WITH THE ONES OF SOCRÈGE

We have drew up Table 8 related to the composition in weight and volume of household waste by taken into account the results of the 2nd survey. This Table compared to the results of the similar study of Socrège Ed.0200 (see Table 9 and Table 10) gives the following observations :

Waste is mainly constituted of sand and organic matters in the 2 cases :

- sand represents 72% of the weight and 24% of the volume of waste in our study against 57% and 19% in the study of Socrège;
- organic matters represent 17% of the weight and 31% of the volume of waste in our study against 38% and 48% in the study of Socrège ;
- the other matters (recycling matters) represent 11% of the weight and 37% of the volume of waste in our study against 5% and 33% in the study of Socrège.

We are recalling that the quantity of household waste produced per capita per day is 0.80 kg in our study against 0.65 kg[2] in the study of Socrège.

In order to better assess the observations mentioned above, we put to your attention that the operating method for the waste collection adopted in our study is different from the one of Socrège.

In fact, in the study of Socrège, household waste was collected in the 3 types of districts (low standing, middle standing, high standing) at the level of waste containers by intercepting the people coming to tip out waste. Household waste was recuperated in drums of 200 liters capacity at the rate of 5 drums per standing. And all the waste surveys were carried out from these samples. We can imagine that the results be affected by the following inaccuracies :

- the intercepted waste collectors do not say with accuracy the number of people who have produced the household waste collected;
- household waste could have gone through a sorting at the source by the households themselves for the resale of certain recyclable products (bottles, cardboard in one piece and so on and so forth to those who recuperate them. This diminishes the quantities collected and tipped out in containers ;
- finally, in carrying waste to containers or wild dumping sites, the waste bags used can, if in bad condition, empty a part of the household waste .

On the other hand, the results obtained in our study are less or not at all influenced by these factors mentioned before since the collection of household waste was made very early from door to door by our agents, by means of plastic waste bags distributed beforehand to households which are themselves sufficiently sensitized in relation to the objectives of our study.

[2] Etude de Socrège : ED/0200

Table 8: Composition in weight and volume of household waste

Standing Weighting	Low Standing 0.75				Middle Standing 0.2				High Standing 0.05				Average 1			
	Weight Kg	%	Volume	%	Weight Kg	%	Volume	%	Weight Kg	%	Volume	%	Weight kg	%	volume	%
1 Paper and cardboard	1.19	1	25.5	10	1	1	31.0	11	1	1	20.0	7	1.2	1	26.3	10
2 Plastic	3.69	3	48.2	19	4	3	50.0	18	3	2	40.0	15	3.6	3	48.1	18
3 Textiles rags	0.56	0	5.7	2	1	1	11.0	4	1	0	3.0	1	0.6	1	6.6	2
4 Leather rubber	0.00	0	0.0	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0	0
5 Wood	0.80	1	8.9	4	1.15	1	15.5	5	0.60	1	3	1	0.9	1	10.0	4
6 Organic matter	19.28	17	101.6	39	17	15	98.5	34	31	25	128	47	19.3	17	62.5	39
7 Fine (<5mm)	83.82	74	63.2	24	74	68	59	21	83	67	66	24	81.8	72	62.2	24
8 Metal	0.63	1	2.2	1	1	1	6.5	2	1	0	7	3	0.8	1	3.26	1
9 Glass	0.03	0	0	0	0	0	0.5	0	1	0	0.3	0	0.1	0	0,105	0
10 Stones/Rubble	3.68	3	3.38	1	10	9	13.5	5	4	3	3	1	5	4	5.38	2
Total	**113.67**	**100**	**258.7**	**100**	**109**	**100 %**	**285.5**	**100**	**125**	**100 %**	**270.3**	**100%**	**113.3**	**100**	**264.6**	**100**

Table 9: Composition in weight of household waste (Study SOCREGE /0200)

Standing Weighting	Low Standing		Middle Standing		High Standing		Average	
	0.75		0.2		0.05		1	
	Kg/m3	%	Kg/m3	%	Kg/m3	%	Kg/m3	%
Sand	254	59	215	19	185	44	242.8	57
Organic	155	36	177	41	219	52	162.6	38
Paper/cardboard	7.5	2	16	4	7	2	9.2	2
Plastic	7	2	22	5	8	2	10.1	2
Metal	4	1	3.5	1	1,5	0	3.8	1
Glass	0.5	0	0.5	0	0.5	0	0.5	0
Total	428	100	434	100	421	100	429	100

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Table :10 Composition in volume household waste (Study SOCREGE ED/02 2000)

Standing Weighting	Low Standing		Middle Standing		High Standing		Average	
	0.75		0.2		0.05		1	
	Liters	%	Liters	%	Liters	%	Liters	%
Sand	203.2	20	172	17	148	15	194.2	19
Organic	470	47	480	48	520	52	474.5	48
Paper/ Cardboard	33%		35%		33%		33%	
Plastic								
Metal								
Glass								

However, the figure of 0.80 kg concerning household waste average quantity produced per day per capita looks nevertheless too high for us. We prefer the 0.75 kg obtained in the first weighing survey carried out over a week. Besides, by taking into account the factors which could have influenced downward the figure obtained by Socrège (0.65 kg/per capita/per day), we can definitively confirm the value 0.75 kg as the quantity of household waste produced per capita per day in the urban community of Niamey.

8. STUDY ON THE QUANTITIES OF WASTE REMOVED

8.1 Objective of the study

The first phase of the study on the quantity and composition of household waste enabled us to assess the weight of household waste produced annually in the urban community of Niamey (178,626 tons/year).

This study enables to complete the first study by assessing the quantities of waste removed after collection.

Collection is the operation which consists in storing temporarily in several places of the town household waste in waste containers (5,5 m^3), in authorized sites (official dumping sites) or in non-authorized ones (wild dumping sites). The collection of waste is made with the help of the dump trucks of the district councils services in charge of sanitation.

8.2 Methodology and equipment used

The principle aimed at weighing waste daily removed in Niamey. For that, we have first inventoried all the operating vehicles for the collection and transportation of waste. These vehicles are weighed when they are empty and after they have been loaded. Thus, we obtain the quantity of waste removed. This operation spreads over 2 consecutive days.

The equipment used is a Japanese equipment provided by JICA. It is made up of 2 sensors in the form of flowerbeds were rely the wheels of vehicles. These 2 sensors are connected through cables which transmit the results to a digital reading device.

8.3 Summary of the results of the study on the quantities of collected waste

During the 2 days devoted to weighing, 9 collection vehicles were inventoried.
The quantities of household waste collected each day are recorded in the Table of results in Annex VII.

We notice that :

- 107 tons of household waste were collected the first day (16/10/2000) against 106 tons the following day ;
- the proportions of the quantities of collected waste (calculated over the year) are respectively 21.8% and 21.6%.

The figures should be taken with care due to the variation of the number of vehicles allocated daily for the collection of household waste. In fact, this number depends on the condition of the number of cars which is bad and of the good will of those in charge of their daily programming.

9. STUDY ON THE INVENTORY OF DUMPING SITES IN THE TOWN OF NIAMEY

The district councils services in charge to collect household waste have collection points which are of 3 types:

- waste containers present in general in the town center, around markets and in smart modern districts ;
- official dumping sites created in concertation with the heads and organizations of districts aiming at compensating for the lack of waste containers ;
- wild dumping sites created spontaneously by the inhabitants in outlying areas lacking containers.

The sites for waste containers and official dumping sites are carefully considered by district councils services in charge of collecting household waste. And, unless due to frequent breakdowns of vehicles and shortages of fuel, the collection of household waste is made regularly.

On the other hand, the wild dumping sites are not well known and are only collected when their volume constitutes an obstacle for the traffic of vehicles.

9.1 Objective of the study

The objective of the study on the inventory of dumping sites deals with :

- the knowledge of points of official or wild dumping sites presenting an important volume and which are not frequently collected ;
- the assessment of weights and volumes of household waste thus stored ;
- the identification of provisional sites for the construction of sorting centers on the most important dumping sites within the framework of a solid waste management pilot-project

9.2 Site map of wild dumping sites

We were particularly interested in the identification of wild dumping sites and official dumping sites « abandoned » presenting an important volume of waste and causing nuisance for the inhabitants and the health of populations as well as bringing about disturbances for the traffic of vehicles. Other criteria have been complied with in the inventory of dumping sites. There are :

- the accessibility of the site in case a sorting center is being constructed ;
- the importance of the surface area of the dumping site ;
- the site is located in an area which is not liable to flooding ;
- the localization of the dumping site in relation to houses and roads ;
- etc...

The dumping sites inventoried on the basis of the above mentioned enumerated criteria are at the number of thirty-one (32). Thus, we have estimated on the basis of the average weight of a waste container of the district council (3 tons for 5.5m3) that their average weight is superior or equals to 15 tons.

All the data related to the identification of wild dumping sites inventoried are given in Annex VIII as well as their location map.

ANNEX I

Terms of Reference

TERMS OF REFERENCE

1. GENERAL

1.1 All measurement in the Solid Waste survey shall be recorded in metric units.

1.2 The Contractor is responsible for providing all survey equipement relating to the work.

1.3 Any other Terms of Refrence(TOR) required shall be discussed by the Client and the Contractor.

1.4 The Contractor shall submit the following reports before the survey.

1) Solid Waste Equipment list
2) Solid Waste Survey Method Report
3) Work Schedule

1.5 The Size of Drawings.

1) The result of Solid Waste survey shall be plotted by the Contractor on the A4 and/or A3 sizes.

2. DETAILED DESCRIPTION OF SOLID WASTE SURVEY

The Solid Waste surveys for the Study area shall include following details:

2.1. Survey on leachate

2.1.1 Objective

To make analysis on leachate at final disposal sites used at present in each district.

2.1.2 Location

There are three final disposal sites (one disposal site for each district) used at present. Two (2) samples for each final disposal sites shall be surveyed

3 disposal sites × 2 samples = 6 samples.

2.1.3 Scope of works

a .Sampling

b. Analysis

c. Reporting

2.1.4 Analysis

PH, COD (Chemical Oxygen Demand), SS Suspended Solids), Normal Hexane Extract, Coliform Number, Phenol, Copper, Iron, Manganese, Chromium.

2.2. Survey on soil contamination

2.2.1 Objective

To make analysis on soil contamination at former final disposal site in each district.

2.2.2 Location

There are three former disposal sites (one disposal site for each district). Two (2) points

for each final site shall be surveyed.

3 disposal sites × 2 points = 6 points

2.2.3 Scope of works

a. Sampling

b. Field observation

c. Analysis

d. Reporting

2.2.4 Analysis items

Hg, Cd, Pb, Organic-Phosphate, Cr, CN, As

2.3. Survey on Solid Waste quantity and composition

2.3.1 Objective

To obtain basic data for estimating solid waste generation, collection ratio, and average solid waste composition in the Niamey City.

2.3.2 Location

Niamey city consists of three district. To survey solid waste generation amount and composition, two (2) blocks from each district shall be select.

2.3.3 Scope of works

a. Solid waste amount survey at source (8 days)
b. Solid waste composition survey
c. Solid waste amount survey collected at the block (8days)
d. Laboratory analysis
e. Reporting

2.3.4 Conditions of survey

(1) Solid waste amount survey at source

a. Interview of household (Number of family, Activity, Discharge of solid waste, Request for cooperation). Number of household is 300. (3 districts × 2 blocks × 50 houses = 300 houses).
b. Delivery of collection bags to each house.
c. Collection of waste from each house and measurement of weight (survey shall be continued for 8 days).
d. Analysis of unit generation rate of solid waste.

(2) Solid waste composition survey

a. Taking sample (Two samples from each block × 6 blocks = 12 samples)
b. Physical composition

Weight of waste shall be measured after classified to following items. Material such as plastic bottle, branch, etc., will be also measured

- Paper, Plastic, Textile, Leather/rubber, Grass, Food waste, Metal, Glass, Ceramic/stone, Other (under 5mm)

c. Laboratory analysis

Moisture content shall be measured for above 10 items and ash content shall be measured 7 items (excluding metal, glass and ceramic/stone) for each sample.

- Moisture content: 12 sample x 10 items = 120 items
- Ash content: 12 sample x 7 items = 84 items

(3) Solid waste amount survey collected at the block (8 days)

Solid waste amount collected at the block shall be measured at final disposal site. Portable truck scale will be prepared by the JICA study team to measure the collection vehicle weight. Number of block shall be 6 blocks. Survey shall be continued for 8 days.

2.4. Reporting

Four (4) copies of the report, each for English and French, shall be submitted.

Necessary information in the quotation

- Cost for survey with unit cost breakdown
- Necessary number of surveyors
- Necessary tools.

ANNEX II

Questionnaire for Households

SURVEY QUESTIONNAIRE ABOUT HOUSEHOLDS PRACTICES AND AWARENESS IN THE FIELD OF HYGIENE AND SANITATION

A. GENERAL INFORMATION
B. PRACTICES AND AWARENESS
C. EDUCATION AND AWARENESS HEIGHTENING
D. HEALTH

Identification of area (quarter) and compound	
Identification of household	
Identification of persons who answered to the questionnaire (chief of household, housewife, others)	
Identification of the interviewer	
Number of families in the compound	

a) Check the number in respect of the answer given.
b) When question needs a written answer, write in the last column.
c) In case of answer belonging to "others" case, write the new proposed item in the last column.

A.	1. Total number of persons in the interviewed household?			
	2. Number of persons who have income, in the household?			
	3. Average monthly income of the household?		1. Less than 30.000CFA 2. Between 30.000 and 50.000CFA 3. Between 50.000 and 100.000CFA 4. More than 100.000CFA	
	4. Socio-professional category of the chief of household?		1. Without employment or informal sector 2. Agriculture 3. Commerce 4. Government officer 5. Office employee 6. Factory employee 7. Others	
	5. Number of rooms in the house?		1. One room 2. Two rooms	

			3. Three rooms 4. More	
	6. How many years have you been living in this house (number of years)?			
	7. To which ethnic group do you belong?		1. Haoussa 2. Djerma 3. Peul 4. Touareg 5. Others	
	8. Have you farm animals in your house?	1. NO	2. YES	3. I DO NOT KNOW
	9. What kind of animals and how many heads?		1. Cows 2. Goats 3. Hens (chicken) 4. Donkeys 5. Others	Number:
	10. Which is the level of education of the household chief?		1. No scholar education 2. Primary school 3. Secondary school 4. High school, university 5. Others	
	11. Which is the level of education of the housewife?		1. No scholar education 2. Primary school 3. Secondary school 4. High school, university 5. Others	
B.	12. Are you provided with any service of collection of waste?	1. NO	2. YES	3. I DO NOT KNOW
	13. Type of collection service?		1. Public container 2. Authorised deposit 3. Collection service at the compound by a private organisation 4. Others	
	14. If you do not receive waste collection service, how do you do in order to dispose of your waste?		1. Temporary storage outside the compound 2. Use for enrichment of cultivated fields 3. Discharge in a non authorised deposit site 4. Others	
	15. Who is in charge of handling the waste bin and disposing of waste outside?		1. Children 2. Young women 3. Young boys 4. Servant 5. Housewife	

			6. Chief of household 7. Others	
	16. Have you toilets in the compound?	1. NO	2. YES	3. I DO NOT KNOW
	17. Type of toilets?		1. Rudimentary latrines 2. Improved latrines 3. Septic tank 4. Others	
	18. Do you think that waste materials can still be used after they have been disposed of outside?	1. NO	2. YES	3. I DO NOT KNOW
	19. Type of use?		1. For feeding cattle 2. For embanking street against flooding 3. For enrichment of cultivated fields 4. For other purpose	
	20. Do you think that a good collection of waste and their disposal in good conditions to improve salubrity of the city is a priority action to be done?	1. NO	2. YES	3. I DO NOT KNOW
	21. Have you ever paid for getting waste in order to bank up road in front of your compound?	1. NO	2. YES	3. I DO NOT KNOW
	22. If yes, did you find that banking up streets with waste material had advantages (which one)?	1. NO	2. YES	3. I DO NOT KNOW
	23. Do you sometimes suffer damages from flooding in your house?	1. NO	2. YES	3. I DO NOT KNOW
	24. Do you protect yourself against flooding by your own means?	1. NO	2. YES	3. I DO NOT KNOW
	25. How?		1. By embankment to protect against waters 2. By draining waters outside the compound 3. Others	
	26. What do you think is the most important problem to be resolved in the city in order to improve your living conditions?		1. Unemployment 2. Cleansing of public place 3. Waste collection services 4. Inadequacy of health care services 5. Drainage of water runoff against flooding 6. Collection of waste water	

			7. State of degradation of roads 8. Lack of public transportation services 9. Density of trafic 10. Others	
	27. Are you satisfied by the present system of sanitation (waste, waste water, drainage) as organised by the urban community?	1. NO	2. YES	3. I DO NOT KNOW
	28. Point of satisfaction or dissatisfaction?	1.Waste water collection 2.Waste collection 3.Drainage of rain water 4.Others	5.Waste water collection 6.Waste collection 7.Drainage of rain water 8.Others	
	29. Have you ever complained to the commune about your salubrity problems?	1. NO	2. YES	3. I DO NOT KNOW
	30. Object of the complaint?		1. Lack of waste collection 2. Lack of protection against flooding 3. State of unsalubrity of streets 4. Others	
	31. If you did suffer some problems but did not complain, why did you not complain?		1. Useless 2. Lack of motivation 3. Postponed 4. Others	
C.	32. Do children receive any information at school about hygiene rules?	1. NO	2. YES	3. I DO NOT KNOW
	33. Have you ever received advice from city officials about hygiene and salubrity?	1. NO	2. YES	3. I DO NOT KNOW
	34. Type of advice?		1. To dispose of the household waste correctly in authorised places 2. To maintain the compound clean (waste bin, yard, toilets) 3. To adopt hygiene rules in the household (hands and body hygiene) 4. Others	
	35. Have you ever participated in cleanliness campaigns or campaigns	1. NO	2. YES	3. I DO NOT KNOW

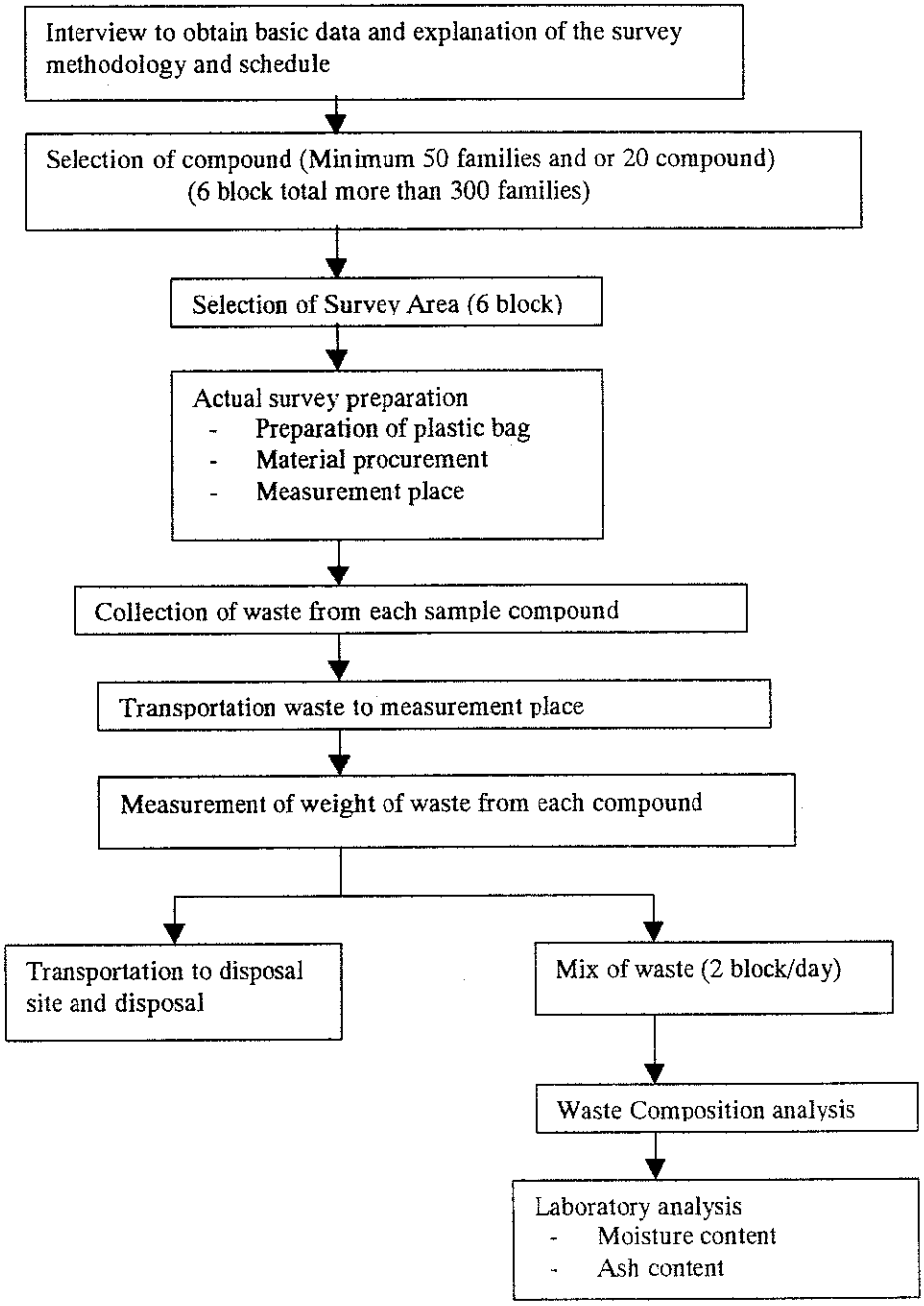
	to improve public salubrity conditions of surroundings?			
	36. If no, are you however ready to collaborate in cleansing campaigns in order to contribute to improve public salubrity conditions of surroundings?	1. NO	2. YES	3. I DO NOT KNOW
	37. If yes, who did participate among the members of your family?		1. Adult women (housewife) 2. Adult men 3. Children 4. Young 5. Others	
	38. If women do not participate, is it because you think that their participation in community actions or campaigns is not a task for women?	1. NO	2. YES	3. I DO NOT KNOW
	39. What was the purpose of the cleanliness campaigns which you have heard about or contributed to?		1. Appropriate storage of waste in the waste bins or containers 2. Eradication of the waste deposit sites 3. Cleansing of public places, street sweeping 4. Protection measures against malaria vectors 5. Hygiene practices at home 6. Others	
	40. How do you receive the information when an awareness campaign is launched?		1. Newspaper 2. Radio 3. Direct contact taken by the municipal officials 4. Association 5. TV set 6. Others	
	41. Do you remember which organisation was in charge of the execution of the campaign?	1. NO	2. YES	3. I DO NOT KNOW
	42. Type of organisation?		1. Local organisation of quarter 2. Association 3. Municipality 4. Urban community 5. Health services 6. Others	
	43. Do you think that these campaigns are useful and should be reinforced?	1. NO	2. YES	3. I DO NOT KNOW

	44. Does anyone in your household belong to any group of volunteers to regularly cleansing the streets of your quarter?	1. NO	2. YES	3. I DO NOT KNOW
	45. Type of belonging		1. Quarter association 2. National association 3. Others	
	46. Are you ready to pay for improving the salubrity conditions?	1. NO	2. YES	3. I DO NOT KNOW
D.	47. Do you know that waste disposed of in streets are a source of bad health?	1. NO	2. YES	
	48. Do you know that waste water discharged in streets are a source of bad health?	1. NO	2. YES	
	49. Does the housewife play an important role at home for maintaining or improving good health of the family?	1. NO	2. YES	3. I DO NOT KNOW
	50. Which kind of role?		1. Daily hygiene education of children 2. Care for drinking and cooking water 3. Cleansing of toilets and yard 4. Cleansing of kitchen 5. Care for family health 6. Others	
	51. If housewife has no any role in terms of health care as mentioned above, then who takes such responsibility?		1. Chief of household 2. Elderly 3. Others	

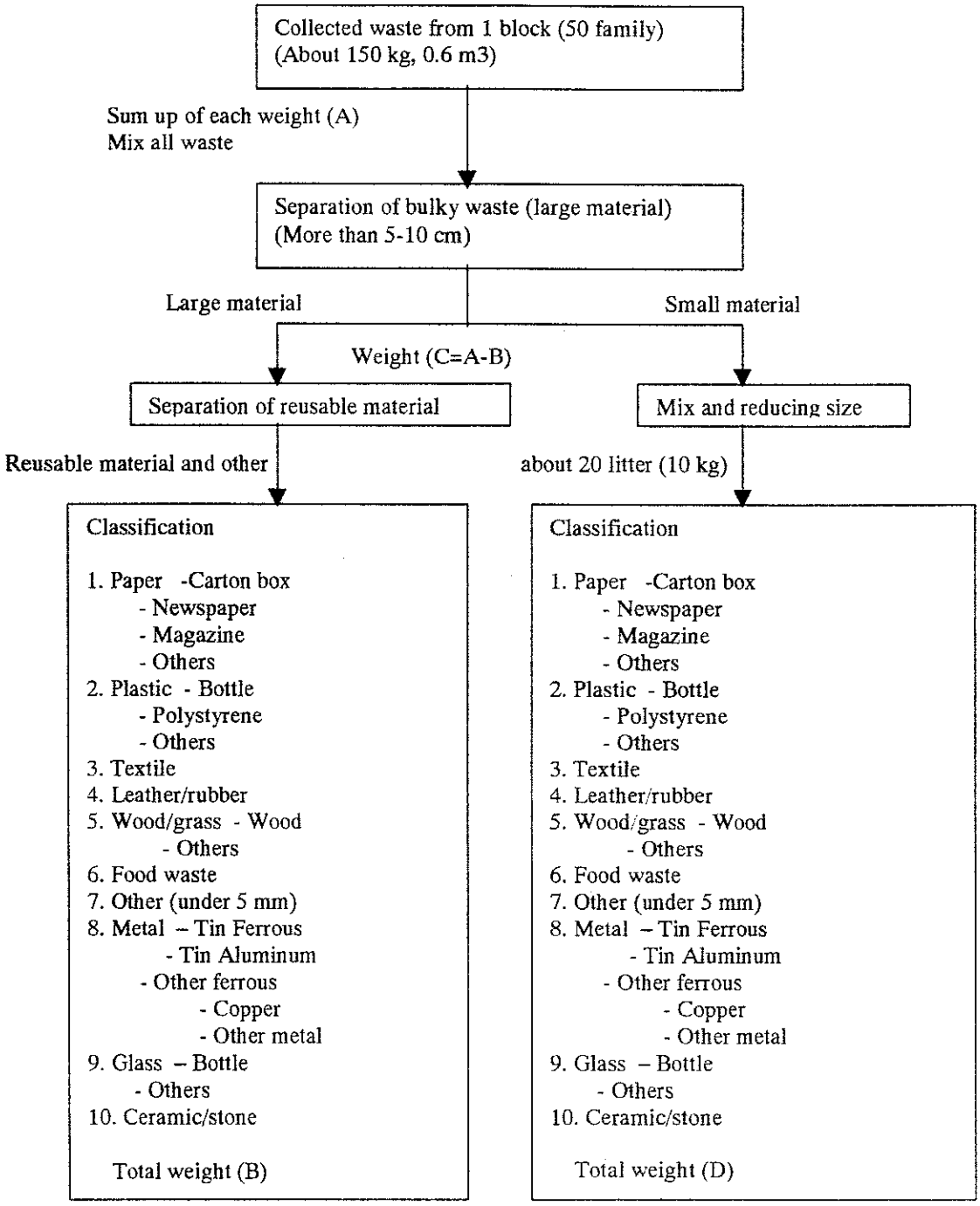
ANNEXE III

Flow chart of the survey process

Survey Process



Flow Chart of Solid Waste Composition analysis



Reducing ratio of small size sample E = D/C
Composition of each category (F)
Example F paper = B paper x F + D paper

ANNEXE IV
Results of the weighing campaign

Annex IV

Results of solid waste weighing survey

District : Lacouroussou

N°	District	N°	Household	Nbr of Persons	Quantity of solid waste								
	Lacroussou				1	2	3	4	5	6	7	8	Total (2 - 8)
1		1	Lac 1-A	5	5	3	5	10	5	8	7	4	42
	"	2	Lac 1-B	4	4	3	2	6	3	3	5	2	24
2	"	3	Lac 2-A	4	6	4	4	4	3,5	6	8	5	34,5
	"	4	Lac 2-B	4	1	1	2	1	1	2	1	2	10
3	"	5	Lac 3-A	7	3	1	5	6	7	4	3	3	29
	"	6	Lac 3-B	4	10	3,5	3	6	3	2	5	4	26,5
	"	7	Lac 3-C	7	1	2	5	4	2	5	4	4	26
	"	8	Lac 3-D	10	6	2	1,5	2	3	1	7	8	24,5
4	"	9	Lac 4-A	20	9	17	11	12	12	11	12	7	82
	"	10	Lac 4-B	9	3	2	5	1	4	4	5	3	24
	"	11	Lac 4-C	8	3	3	4	4	3	6	3	4	27
5	"	12	Lac 5-A	8	6	8	12	7	5	15	8	9	64
	"	13	Lac 5-B	4	7	1	7	5	1	5	3	3	25
	"	14	Lac 5-C	15	5	8	8	7	9	5	6	6	49
6	"	15	Lac 6-A	7	3	2	0	8	0	22	9	7	48
	"	16	Lac 6-B	3	4	7	0,5	4	4	5	3	4	27,5
7	"	17	Lac 7-A	8	3	1	8	2	3	3	3	2	22
	"	18	Lac 7-B	4	4	6	10	12	5	3	3	3	42
8	"	19	Lac 8-A	13	3	3	0	5	0	0	0	1	9
	"	20	Lac 8-B	2	6	8	8	5	5	6	11	4	47
9	"	21	Lac 9-A	6	12	1	1	18	1	1	1,5	9	32,5
	"	22	Lac 9-B	2	2	4	2	5	5	1,5	3	2	22,5
10	"	23	Lac 10-A	4	0	5	5	3	3	4	1	5	26
	"	24	Lac 10-B	10	9	6	15	16	12	10	14	4	77
	"	25	Lac 10-C	1	0	1	0,5	0,5	0,5	1	0,5	5	9
	"	26	Lac 10-D	4	0	2	4	3	3	2	3	3	20
	"	27	Lac 10-E	1	1,5	4	2	3	3	0	2	2	16
11	"	28	Lac 11-A	2	4	9	3	2	2	2	3	3	24
	"	29	Lac 11-B	4	3	5	3	3	1	2	4,5	7	25,5
12	"	30	Lac 12-A	2	8	6	13	7	12	19	19	11	87
13	"	31	Lac 13-A	6	7	5	4,5	5	2	2	5	2	25,5
	"	32	Lac 13-B	3	1	0,5	5	0,5	1	0,5	0,5	0,5	8,5
	"	33	Lac 13-C	5	3	3	0,5	9	3	9	12	8	44,5
	"	34	Lac 13-D	7	9	8	2	2	1,5	2	3	4	22,5
14	"	35	Lac 14-A	3	9	2	7	3	7	3	3	2	27
	"	36	Lac 14-B	6	3	4	3	3	4	4	6	4	28
	"	37	Lac 14-C	3	5	3	7	8	9	9	3	6	45
15	"	38	Lac 15-A	10	6	3	10	8	6	4	5	2	38
	"	39	Lac 15-B	3	5	13	11	9	6	5	16	8	68
	"	40	Lac 15-C	2	6	7	7	6	6	5	6	3	40

Annex IV

N°	District	N°	Household	Nbr of Persons	Quantity of solid waste								
	Lacroussou				1	2	3	4	5	6	7	8	Total (2 - 8)
16	"	41	Lac 16-A	2	12	21	17	29	23	12	17	13	132
	"	42	Lac 16-B	4	10	16	1	3	7	6	7	4	44
	"	43	Lac 16-C	4	9	9	12	13	6	10	12	5	67
17	"	44	Lac 17-A	3	6	11	10	13	9	7	5	8	63
	"	45	Lac 17-B	5	1	3	5	5	2	1,5	5	1	22,5
	"	46	Lac 17-C	3	4	16	19	11	6	8	15	13	88
18	"	47	Lac 18-A	7	2	3	2	3	4	5	4	1	22
	"	48	Lac 18-B	3	2	2	2	2	3	1,5	2	3	15,5
	"	49	Lac 18-C	7	2	1	2,5	5	3	2	3	3	19,5
	"	50	Lac 18-D	5	3	2	5	4	3	3	2	3	22
19	"	51	Lac 19-A	3	20	7	10	10	14	5	10	10	66
	"	52	Lac 19-B	7	7	9	6	4	5	15	1,5	5	45,5
	"	53	Lac 19-C	4	5,5	6	5	10	4	4	7	3	39
	"	54	Lac 19-D	7	9	7	9	6	6	7	5	8	48
	"	55	Lac 19-E	3	4	1	0,5	1,5	0,5	1	0,5	1	6
	"	56	Lac 19-F	3	3	8	6	4	3	5	5	3	34
20	"	57	Lac 20-A	8	30	7	24	35	0	34	27	19	146
	"	58	Lac 20-B	5	15	6	8	10	6	4	24	8	66
Total		**20**											
Total households			**58**										
Nber of Persons				**313**									
Total (2 - 8)													**2315,5**
Average generation rate (waste quantity generated per day and capita)													**1,05**

Annex IV

Results of solid waste weighing survey

District : Lamordé

N°	District	N°	Household	Nbr of Persons	Quantity of solid waste								
	Lamordé				**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total (2 - 8)**
1		1	Lam 1-A	6	2	3	5	6	3	4	9	3	33
	"	2	Lam 1-B	5	9	0	3	4	7	8	6	8	36
	"	3	Lam 1-C	6	12	2	5	3	5	7	3	3	28
2	"	4	Lam 2-A	6	3	3	3	3	3	2	3	6	23
3	"	5	Lam 3-A	7	9	6	7	11	11	12	5	11	63
	"	6	Lam 3-B	6	11	8	10	6	9	12	8	7	60
4	"	7	Lam 4-A	13	4	0	9	4	20	10	7	9	59
5	"	8	Lam 5-A	14	9	9	8	5	4	3	6	5	40
6	"	9	Lam 6-A	13	3,5	7	4	7	7	6	6	8	45
7	"	10	Lam 7-A	30	9	5	6	5	8	11	2	11	47
8	"	11	Lam 8-A	7	20	4	1	3	1	2	3	1	15
9	"	12	Lam 9-A	17	12	2	5	14	6	5	6	10	48
10	"	13	Lam 10-A	15	5	3	3,5	9	4	1	2	1	23,5
11	"	14	Lam 11-A	6	6	1	3	9	8	11	3	6	41
12	"	15	Lam 12-A	7	6	3	4,5	7	7	4	5	3	33,5
13	"	16	Lam 13-A	5	0	0,5	3	0	2	17	3	12	37,5
14	"	17	Lam 14-A	4	13	3	5	4	4	7	2	4	29
15	"	18	Lam 15-A	15	13	17	9	10	13	10	11	15	85
16	"	19	Lam 16-A	7	8	0	7	3	9	4	9	10	42
17	"	20	Lam 17-A	6	1	2	4	4	4	3	6	1	24
18	"	21	Lam 18-A	9	15	9	12	6	5	0	2	1	35
19	"	22	Lam 19-A	5	2	11	4	9	7	4	8	5	48
20	"	23	Lam 20-A	4	9	13	1	5	6	4	7	6	42
21	"	24	Lam 21-A	8	9	0	9	11	4	8	2	3	37
22	"	25	Lam 22-A	5	5	3	4	3	4	3	4	1	22
23	"	26	Lam 23-A	3	3	7	0	15	5	3	3	4	37
24	"	27	Lam 24-A	10	15	6	0	6	3	10	5	2	32
25	"	28	Lam 25-A	2	5	5	14	8	5	4	6	4	46
26	"	29	Lam 26-A	9	8	9	5	6	10	11	4	6	51
27	"	30	Lam 27-A	2	12	0	6	12	5	4	5	0	30
28	"	31	Lam 28-A	8	6	0	8	10	9	6	10	10	53
29	"	32	Lam 29-A	4	15	7	15	13	11	10	6	1	63
	"	33	Lam 29-B	4	9	5	8	5	4	7	8	3	40
	"	34	Lam 29-C	2	13	9	6	10	5	3	10	6	49
30	"	35	Lam 30-A	17	15	15	10	4	5	11	6	1	52
31	"	36	Lam 31-A	5	10	5	4	18	7	12	8	8	62
32	"	37	Lam 32-A	6	15	13	10	8	12	14	6	7	70
33	"	38	Lam 33-A	6	7	13	7	18	9	11	11	12	81
	"	39	Lam 33-B	5	5	5	7	8	11	10	2	13	56
	"	40	Lam 33-C	4	11	14,5	6	20	21	16	3	6	66,5

Annex IV

N°	District	N°	Household	Nbr of Persons	Quantity of solid waste								
	Lamordé				1	2	3	4	5	6	7	8	Total (2 - 8)
34	"	41	Lam 34-A	8	0	2	6	19	9	14	10	5	65
35	"	42	Lam 35-A	20	5	9	15	7	8	16	5	16	76
36	"	43	Lam 36-A	10	11	2	7	12	7	8	2	7	45
37	"	44	Lam 37-A	5	6	4	10	7	7	8	2	8	46
38	"	45	Lam 38-A	15	1,5	9	9	10	1 1	9	9	9	66
39	"	46	Lam 39-A	7	8	24	18	15	6	11	12	6	92
	"	47	Lam 39-B	7	13	6	13	7	5	9	6	10	56
40	"	48	Lam 40-A	7	14	11	2	17	19	9	14	13	85
41	"	49	Lam 41-A	20	3	5	8	9	7	4	5	7	45
42	"	50	Lam 42-A	18	4	10	8	9	13	7	11	9	67
43	"	51	Lam 43-A	4	6	0	9	11	6	12	8	7	53
44	"	52	Lam 44-A	3	9	2	9	10	12	20	7	9	69
Total		**44**											
Total households			**52**										
Nber of Persons				**437**									
Total (2 - 8)													**2550**
Average generation rate (waste quantity generated per day and capita)													**0,83**

Annex IV

Results of solid waste weighing survey

District : Gawéye

N°	District	N°	Household	Nbr of Persons	Quantity of solid waste								
Gawéye					1	2	3	4	5	6	7	8	Total (2 - 8)
1		1	G 1-A	8	3	1	5	1	3	1	9	4	24
	"	2	G 1-B	5	3	2	3	3	2,5	3	7	10	30,5
	"	3	G 1-C	9	6	1	8	3	4	2	4	2	24
	"	4	G 1-D	9	6	1	2	3	12	3	10	3	34
2	"	5	G 2-A	5	3	1	4	4	2	2	5	3	21
	"	6	G 2-B	3	2	1	4	4	6	3	4	8	30
	"	7	G 2-C	5	0	4	1	3	2	3	8	8	29
	"	8	G 2-D	2	1	1	6	2	1	4	1	2	17
	"	9	G 2-E	5	3	6	2	4	4	5	6	4	31
3	"	10	G 3-A	5	2,5	2	1	13	0,5	3	8	2	29,5
	"	11	G 3-B	6	13	0	4	6	7	1	2	7	27
4	"	12	G 4-A	10	0	0	2	5	5	5	4	1	22
5	"	13	G 5-A	9	2	3	2	2	3	4	2	1	17
	"	14	G 5-B	11	1	2	4	0,6	8	5	4	1	24,6
6	"	15	G 6-A	2	6	1	2	3	2	4	4	6	22
	"	16	G 6-B	4	3	2	1	8	5	5	4	2	27
7	"	17	G 7-A	8	3	1	1	6	2	1	1	3	15
	"	18	G 7-B	5	7	3	1	6	2	2	7	4	25
8	"	19	G 8-A	6	4	1	2	3	5	4	2	5	22
	"	20	G 8-B	6	2	8	4	8	2	7	8	3	40
	"	21	G 8-C	5	3	3	3	3	2	2	4	2	19
	"	22	G 8-D	5	2	2	1	7	6	4	7	5	32
9	"	23	G 9-A	4	7	1	0,5	10	4	1	12	2	30,5
	"	24	G 9-B	7	9	4	1	2	3	11	2	0,5	23,5
10	"	25	G 10-A	15	2	1	2	2	2	6	5	3	21
	"	26	G 10-B	10	4	2	1	2	2	4	1	4	16
	"	27	G 10-C	2	1	2	4	8	2	1	4	8	29
	"	28	G 10-D	4	1	4	2	2	4	4	9	1	26
11	"	29	G 11-A	14	2	1	1	1	0,5	1	4	7	15,5
12	"	30	G 12-A	4	4	2	3	7	3	1	2	6	24
	"	31	G 12-B	9	3	0,2	2	3	4	4	1	2	16,2
13	"	32	G 13-A	6	7	3	5	3	2	2	3	0,5	18,5
	"	33	G 13-B	13	5	5	3	5	4	0,5	4	1	22,5
14	"	34	G 14-A	2	1	2	1	2	2	1	2	7	17
	"	35	G 14-B	4	4	0,5	1	3	1	1	2	1	9,5
	"	36	G 14-C	3	0,5	0,1	1	1	2	9	1	8	22,1
15	"	37	G 15-A	3	3	0,5	2	2	2	8	3	5	22,5
	"	38	G 15-B	9	2	2	3	2	7	5	6	2	27
	"	39	G 15-C	5	2	2	2	5	0,5	4	5	2	20,5
	"	40	G 15-D	3	2	1	1	2	3	3	3	2	15

Annex IV

N°	District	N°	Household	Nbr of Persons	Quantity of solid waste								
Gawéye					1	2	3	4	5	6	7	8	Total (2 - 8)
16	"	41	G 16-A	11	3	2	4	6	10	4	7	2	35
	"	42	G 16-B	5	0	1	4	1	4	5	2	5	22
17	"	43	G 17-A	7	2	1	2	2	4	5	3	6	23
18	"	44	G 18-A	20	3	6	6	3	2	2	2	3	24
19	"	45	G 19-A	7	0,5	0,2	1	1,5	2	1	1	1	7,7
20	"	46	G 20-A	3	1,5	1	2	3	2	2	8	2	20
	"	47	G 20-B	8	1	1	2	3	3	3	2	2	16
	"	48	G 20-C	9	0,5	1	2	5	3	2	5	4	22
	"	49	G 20-D	5	1	0	1	3	1	8	4	2	19
	"	50	G 20-E	3	0,3	0.1	1	2	2	1	2	1	9.1
Total		**20**											
Total households			**50**										
Nber of Persons				**328**									
Total (2 - 8)													**1136,7**
Average generation rate (waste quantity generated per day and capita)													**0,49**

Annex IV

Results of solid waste weighing survey

District : Yantala

N°	District	N°	Household	Nbr of Persons	Quantity of solid waste								
Yantala					1	2	3	4	5	6	7	8	Total (2 - 8)
1		1	YA 1-A	11	10	3	2	1	2	2	2,5	2	14,5
	"	2	YA 1-B	3	3	2	2	1	2	1	1,5	1	10,5
2	"	3	YA 2-A	15	4	6	5	3	5	2	1,5	2,5	25
3	"	4	YA 3-A	2	20	2	3	3,5	8	2,5	1,5	1	21,5
	"	5	YA 3-B	7	6	2	1	3	10	2,5	7	2	27,5
4	"	6	YA 4-A	4	5	2	3	2	2	3	2,5	0,5	15
	"	7	YA 4-B	4	4	3	15	5	6	4,5	5,5	9	48
	"	8	YA 4-C	3	3	6	4	3	2	4	2	2	23
	"	9	YA 4-D	4	0,5	3	3	2	2	3,5	2,5	2	18
	"	10	YA 4-E	3	2	2	2	1	2	3	2	0,5	12,5
5	"	11	YA 5-A	8	12	6	6	7	7	9	5	9	49
	"	12	YA 5-B	4	24	3	6	5	7	5	5	4,5	35,5
	"	13	YA 5-C	17	17	7	5	6	6	4	2,5	10	36,5
	"	14	YA 5-D	3	6	8	7	4	4	6,5	0	5,5	35
6	"	15	YA 6-A	5	3	3	5	1	3	4	1,5	2,5	20
	"	16	YA 6-B	7	6	7	5	5	6	2	3	4	32
7	"	17	YA 7-A	5	3	2	3	4	4	3,5	5	2,5	24
8	"	18	YA 8-A	11	12	4	7	4	5	2,5	4	6,5	33
9	"	19	YA 9-A	8	3	6	5	3	7	7	4	3,5	35,5
	"	20	YA 9-B	3	15	2	5	4	6	5,5	6	3	31,5
	"	21	YA 9-C	6	14	2	9	6	7	6	6	0	36
10	"	22	YA 10-A	4	6	12	7	2,5	9	9	4	6	49,5
	"	23	YA 10-B	9	3	16	6	6	6,5	6	3	10	53,5
11	"	24	YA 11-A	2	3	3	2	3	5	4	3	1,5	21,5
	"	25	YA 11-B	4	2	1	3	9	2	6,5	4	2	27,5
	"	26	YA 11-C	5	8	5	8	4	2	3	1	3	26
	"	27	YA 11-D	2	2	2	3	3	3	2	1	3	17
12	"	28	YA 12-A	19	5	16	12	14	10	18	7	13	90
13	"	29	YA 13-A	4	4	4	4	4	5	8,5	3	3	31,5
	"	30	YA 13-B	9	9	3	8	5	5,5	6	8	13	48,5
	"	31	YA 13-C	6	3	2	3	3	5	5	3	3,5	24,5
	"	32	YA 13-D	4	4	14	4	11	5	8	4	9	55
	"	33	YA 13-E	8	16	1	3	2	3	2	9	2	22
14	"	34	YA 14-A	23	8	2	2	7	4,5	7	9	8	39,5
15	"	35	YA 15-A	3	9	5	4	4	3	4,5	3	2	25,5
	"	36	YA 15-B	6	5	3	7	2	5,5	8	1,5	3	30
	"	37	YA 15-C	4	7	6	8	4	6	3	4	0	31
	"	38	YA 15-D	6	6	7	6	4	4	4	3	1	29
	"	39	YA 15-E	8	5	3	6	6	6	6	5	5	37

Annex IV

N°	District	N°	Household	Nbr of Persons	Quantity of solid waste								
					1	2	3	4	5	6	7	8	Total (2 - 8)
	Yantala												
16	"	40	YA 16-A	15	6	0	11	20	25	19	10	0	85
17	"	41	YA 17-A	5	10	7	5	2	8	9	4	1,5	36,5
	"	42	YA 17-B	2	4	3	5	3	6	6	0,5	1	24,5
	"	43	YA 17-C	4	14	6	10	2	4	2	2	4	30
18	"	44	YA 18-A	7	8	9	6	7	5	17	6	7	57
	"	45	YA 18-B	3	3	3	5	6	2	6	6	6	34
	"	46	YA 18-C	3	7	5	8	6	9	15	5	2,5	50,5
	"	47	YA 18-D	4	3	3	2	1,5	2	9	1,5	2	21
	"	48	YA 18-E	7	3	4	5	2	2,5	6,5	1	4	25
19	"	49	YA 19-A	4	0	1	6	2	5	3	3	2	22
		50	YA 19-B	4	6	8	4	3	4	4	3,5	4	30,5
	"	51	YA 19-C	3	3	4	3	3	3	2	2	3	20
20	"	52	YA 20-A	6	5	6	4	9	7	12	3	8	49
	"	53	YA 20-B	4	2	5	7	0	6	7,5	3	3	31,5
	"	54	YA 20-C	7	2	3	5	2	9	4	4	4	31
	"	55	YA 20-D	6	3	6	6	4	3	11	7	2	39
	"	56	YA 20-E	4	0	8	4	7	18	10,5	8	7,5	63
	"	57	YA 20-F	6	9	7	10	9	5	5	7	11	51
Total		**20**											
Total households			**57**										
Nber of Persons				**353**									
Total (2 - 8)													**1945,5**
Average generation rate (waste quantity generated per day and capita)													**0,78**

Annex IV

Results of solid waste weighing survey

District : Kouara Koura

N°	District	N°	Household	Nbr of Persons	Quantity of solid waste								
	Koira-Kano				1	2	3	4	5	6	7	8	Total (2 - 8)
1		1	KK 1-A	4	7	8	2	6	11	5	7	4	43
2	"	2	KK 2-A	7	3	6	10	5	6	5	8	8	48
3	"	3	KK 3-A	7	2	3	6	3	0	8	1	10	31
4	"	4	KK 4-A	3	5	8	5	2	2	6	8	8	39
5	"	5	KK 5-A	3	1	1	3	1	4	1	2	1	13
6	"	6	KK 6-A	7	12	11	11	4	2	6	2	6	42
7	"	7	KK 7-A	8	2	4	5	1	0	0	0	4	14
8	"	8	KK 8-A	2	0,5	0,5	1	0,5	0,5	7	2	2	13,5
9	"	9	KK 9-A	8	6	4	4	2	6	3	2	4	25
10	"	10	KK 10-A	3	12	2	5	2	1,5	4	3	2	19,5
11	"	11	KK 11-A	9	1	3	1	2	1,5	3	2	4	16,5
12	"	12	KK 12-A	3	2	8	3	3	6	3	8	6	37
13	"	13	KK 13-A	9	2	8	11	5	3	14	5	4	50
14	"	14	KK 14-A	8	11	3	4	2	4	10	2	2	27
15	"	15	KK 15-A	7	3	2	3	2	2	4	3	5	21
16	"	16	KK 16-A	3	21	3	2	4	2	2	2	2	17
17	"	17	KK 17-A	3	1	6	2	4	6	5	4	2	29
18	"	18	KK 18-A	10	1	6	3	2	7	0	2	18	38
19	"	19	KK 19-A	6	10	6	2	11	2	3	2	2	28
20	"	20	KK 20-A	2	9	9	4	3	3	4	6	4	33
21	"	21	KK 21-A	6	2	10	6	6	9	5	2	6	44
22	"	22	KK 22-A	3	2	4	4	5	10	2	10	1	36
23	"	23	KK 23-A	6	5	11	6	4	4	6	5	4	40
24	"	24	KK 24-A	9	2	4	2	3	3	4	3	3	22
25	"	25	KK 25-A	12	5	3	2	11	10	5	5	6	42
26	"	26	KK 26-A	4	10	6	7	15	8	6	4	10	56
27	"	27	KK 27-A	5	9	8	8	16	8	6	3,5	12	61,5
28	"	28	KK 28-A	8	9	10	10	6	9	8	17	8	68
29	"	29	KK 29-A	9	2	3,5	6	9	6	6	18	6	54,5
30	"	30	KK 30-A	7	10	2	3	2	2	2	5	1	17
31	"	31	KK 31-A	3	10	3	0,5	2	6	8	2	5	26,5
	"	32	KK 31-B	2	3	3,5	6	2	2	6	2	12	33,5
	"	33	KK 31-C	6	4	3	4	3	1,5	2	5	4	22,5
	"	34	KK 31-D	11	3	2	4	5	2	2	2	2	19
32	"	35	KK 32-A	10	3	6	2	4	1	13	10	2	38
33	"	36	KK 33-A	6	1	8	7	20	9	9	13	10	76
34	"	37	KK 34-A	6	19	8	4	9	10	6	6	8	51
35	"	38	KK 35-A	7	9	4	2	5	12	4	4	4	35

Annex IV

N°	District	N°	Household	Nbr of Persons	Quantity of solid waste								
Koirakano					1	2	3	4	5	6	7	8	Total (2 - 8)
36	"	39	KK 36-A	10	8	5	3	4	3	8	4	6	33
37	"	40	KK 37-A	11	4	8	6	4	3	7	8	5	41
38	"	41	KK 38-A	9	15	4	3	4	2	4	8	6	31
39	"	42	KK 39-A	6	14	8	10	4	8	15	3	4	52
40	"	43	KK 40-A	9	2	9	7	2	18	5	6	2	49
41	"	44	KK 41-A	5	1	3	5	1,5	3	3	6	6	27,5
42	"	45	KK 42-A	9	1	9	1	1	3	1	4	4	23
43	"	46	KK 43-A	10	2	4	11	1	2	5	5	2	30
44	"	47	KK 44-A	4	5	3	4	11	2	3	4	2	29
	"	48	KK 44-B	10	1	2	0	2	4	2	1,5	2	13,5
45	"	49	KK 45-A	8	2	2	2	2	2	5	2	4	19
46	"	50	KK 46-A	7	2	4	3	4	4	4	4	2	25
	"	51	KK 46-B	3	1	4	2	0	0	0	0	4	10
47	"	52	KK 47-A	16	2	23	2	6	3	14	3	10	61
Total		**47**											
Total households			**52**										
Nber of Persons				**349**									
Total (2 - 8)													**1771**
Average generation rate (waste quantity generated per day and capita)													**0,72**

Annex IV

Results of solid waste weighing survey

District : Banda Bari

N°	District	N°	Household	Nbr of Persons	Quantity of solid waste								
Banda-Bari					1	2	3	4	5	6	7	8	Total (2 - 8)
1		1	BD 1-A	9	15	11	14	20	8	9	4	10	76
	"	2	BD 1-B	4	10	21	13	15	18	20	11	10	108
	"	3	BD 1-C	6	12	6	9	10	6	5	11	6	53
	"	4	BD 1-D	2	11,5	12	15	12	13	17	9	9	87
2	"	5	BD 2-A	13	6	3	8	2	4	3	9	4	33
	"	6	BD 2-B	7	4	6	2	2	4	2	5	5	26
	"	7	BD 2-C	7	7	5	8	10	6	5	4	8	46
	"	8	BD 2-D	6	3	3	4	4	4	3	3	5	26
	"	9	BD 2-E	2	2	4	7	5	5	8	3	4	36
3	"	10	BD 3-A	8	2	4	1	9	4	13	2	10	43
	"	11	BD 3-B	3	1	5	10	1	2	7	5	2	32
4	"	12	BD 4-A	20	11	17	13	7	5	3	5	7	57
5	"	13	BD 5-A	3	5	5	3	3	3	7	3	2	26
	"	14	BD 5-B	4	6	5	1	7	6	4	3	4	30
	"	15	BD 5-C	7	8	2	11	6	1	10	2	6	38
	"	16	BD 5-D	6	8	3	14	1	5	10	3	4	40
	"	17	BD 5-E	4	5	2	10	5	3	6	0	0	26
6	"	18	BD 6-A	6	16	2	6	4	9	10	4	10	45
	"	19	BD 6-B	7	5	5	17	2	4	6	6	8	48
	"	20	BD 6-C	6	5	7	20	5	2	5	3	7	49
	"	21	BD 6-D	5	2	4	7	3	2	5	5	4	30
7	"	22	BD 7-A	4	2	3	2	3	2	3	3	2	18
	"	23	BD 7-B	5	8	2	3	2	4	4	3	3	21
	"	24	BD 7-C	2	4	2	2	3	2	7	2	4	22
	"	25	BD 7-D	3	2	1	3	3	5	3	2	6	23
8	"	26	BD 8-A	5	2	18	8	5	3	3	5	6	48
9	"	27	BD 9-A	8	12	11	18	7	11	12	5	5	69
	"	28	BD 9-B	9	9	7	10	5	3	8	8	9	50
	"	29	BD 9-C	8	2	8	11	11	7	11	7	5	60
10	"	30	BD 10-A	14	20	9	7	11	12	11	6	7	63
11	"	31	BD 11-A	7	16	14	13	4	11	14	7	6	69
	"	32	BD 11-B	7	7	7	15	20	5	9	5	3	64
	"	33	BD 11-C	5	12	4	10	12	3	5	5	7	46
	"	34	BD 11-D	8	15	5	5	6	4	10	10	6	46
12	"	35	BD 12-A	13	28	13	10	9	10	14	11	8	75
13	"	36	BD 13-A	5	4	7	6	7	6	9	7	5	47
14	"	37	BD 14-A	8	14	8	5	5	8	9	6	8	49
15	"	38	BD 15-A	2	4	6	3	5	6	4	2	9	35
	"	39	BD 15-B	5	14	11	6	4	7	4	4	7	43

Annex IV

N°	District	N°	Household	Nbr of Persons	Quantity of solid waste								
Banda-Bari					**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total (2 - 8)**
16	"	40	BD 16-A	11	4	9	8	12	6	10	9	10	64
	"	41	BD 16-B	2	1	1	3	2	3	1	4	1	15
17	"	42	BD 17-A	5	6	10	10	6	10	5	16	6	63
18	"	43	BD 18-A	9	18	7	6	6	8	7	10	10	54
19	"	44	BD 19-A	13	6	5	4	6	17	4	4	5	45
20	"	45	BD 20-A	7	2	0,5	5	4	6	2	5	3	25,5
	"	46	BD 20-B	5	2	1	1	2	3	4	1	2	14
21	"	47	BD 21-A	6	8	4	3	7	5	1	4	10	34
	"	48	BD 21-B	5	4	3	6	5	6	1	7	6	34
22	"	49	BD 22-A	15	12	5	3	13	10	5	2	7	45
23		50	BD 23-A	10	16	9	5	15	13	13	11	9	75
24	"	51	BD 24-A	5	3	7	6	6	5	5	6	5	40
	"	52	BD 24-B	6	18	11	5	9	11	8	7	7	58
25	"	53	BD 25-A	8	2	5	6	4	9	5	5	4	38
	"	54	BD 25-B	6	5	7	8	9	2	7	3	6	42
Total		**25**											
Total households			**54**										
Nber of Persons				**366**									
Total (2 - 8)													**2449,5**
Average generation rate (waste quantity generated per day and capita)													**0,95**

ANNEX V
Results of the second solid waste survey

Annex V

Results of solid waste weighing survey

District : Lacouroussou

N°	District	N°	Household	Number of Persons	Quantity of solid waste	
	Lacouroussou					kg/day
1	"	1	Lac 3-A	7		7,00
	"	2	Lac 3-B	4		1,50
	"	3	Lac 3-C	7		3,50
	"	4	Lac 3-D	10		3,50
2	"	5	Lac 4-A	20		8,00
	"	6	Lac 4-B	9		4,50
	"	7	Lac 4-C	8		4,50
3	"	8	Lac 5-A	8		4,00
	"	9	Lac 5-B	4		10,00
	"	10	Lac 5-C	15		11,00
4	"	11	Lac 6-A	7		10,00
	"	12	Lac 6-B	3		2,00
5	"	13	Lac 7-A	8		1,50
	"	14	Lac 7-B	4		5,00
6	"	15	Lac 13-A	6		7,00
	"	16	Lac 13-B	3		4,00
	"	17	Lac 13-C	5		6,00
	"	18	Lac 13-D	7		3,00
7	"	19	Lac 14-A	3		3,00
	"	20	Lac 14-B	6		3,00
	"	21	Lac 14-C	3		1,00
Total		**7**				
Total household			**21**			
Number of persons				**147**		
Total waste quantity						**103**
Average generation rate (waste quantity generated per day and capita)						**0,70**

Annex V

Results of solid waste weighing survey

District : Lamordé

N°	District	N°	Household	Number of Persons	Quantity of solid waste	
	Lamordé					kg/jour
1	"	1	Lam 1-A	6		14,00
	"	2	Lam 1-B	5		5,00
	"	3	Lam 1-C	6		4,00
2	"	4	Lam 2-A	6		4,00
3	"	5	Lam 3-A	7		8,00
	"	6	Lam 3-B	6		7,00
4	"	7	Lam 4-A	13		6,00
5	"	8	Lam 5-A	14		3,00
6	"	9	Lam 6-A	13		3,00
7	"	10	Lam 7-A	30		8,00
8	"	11	Lam 26-A	9		5,00
9	"	12	Lam 27-A	2		19,00
10	"	13	Lam 28-A	8		7,00
11	"	14	Lam 29-A	4		7,00
6	"	15	Lam 29-B	4		5,00
	"	16	Lam 29-C	2		4,00
12	"	17	Lam 30-A	17		2,00
13	"	18	Lam 31-A	5		4,00
14	"	19	Lam 33-A	6		16,00
Total		**14**				
Total household			**19**			
Number of persons				**163**		
Total waste quantity						**131**
Average generation rate (waste quantity generated per day and capita)						**0,80**

Annex V

Results of solid waste weighing survey

District : Gaweyé

N°	District	N°	Household	Number of Persons	Quantity of solid waste	
	Gaweyé					kg/jour
1	"	1	G 3-A	5		8,00
	"	2	G 3-B	6		14,00
2	"	3	G 4-A	10		9,00
3	"	4	G 5-A	9		6,00
	"	5	G 5-B	11		2,00
4	"	6	G 6-A	2		7,00
	"	7	G 6-B	4		4,00
5	"	8	G 7-A	8		3,00
	"	9	G 7-B	5		5,00
6	"	10	G 9-A	4		5,00
	"	11	G 9-B	7		3,00
7	"	12	G 10-A	15		2,00
	"	13	G 10-B	10		4,00
	"	14	G 10-C	2		4,00
	"	15	G 10-D	4		2,00
8	"	16	G 11-A	14		1,00
9	"	17	G 12-A	4		6,00
	"	18	G 12-B	9		4,00
10	"	19	G 13-A	6		3,00
	"	20	G 13-B	13		1,00
11		21	G 16-A	11		2,00
		22	G 16-B	5		4,00
12		23	G 17-A	7		1,00
13		24	G 18-A	20		2,00
14	"	25	G 19-A	7		1,00
Total		**14**				
Total household			**25**			
Number of persons				**198**		
Total waste quantity						**103**
Average generation rate (waste quantity generated per day and capita)						**0,52**

Annex V

Results of solid waste weighing survey

District : Yantala

N°	District	N°	Household	Number of Persons	Quantity of solid waste	
	Yantala					kg/day
1	"	1	YA 9-A	8		7,50
2	"	2	YA 9-B	3		5,00
	"	3	YA 9-C	6		4,00
3	"	4	YA 10-A	4		7,00
	"	5	YA 10-B	9		4,50
4	"	6	YA 11-A	2		2,50
	"	7	YA 11-B	4		7,50
	"	8	YA 11-C	5		9,50
	"	9	YA 11-D	2		3,00
	"	10	YA 12-A	19		7,00
5	"	11	YA 14-A	23		7,00
	"	12	YA 15-A	3		4,50
	"	13	YA 15-B	6		9,00
	"	14	YA 15-C	4		8,00
6	"	15	YA 15-D	6		13,00
7	"	16	YA 15-E	8		3,00
	"	17	YA 16-A	15		9,50
Total		**7**				
Total household			**17**			
Number of persons				**127**		
Total waste quantity						**111,5**
Average generation rate (waste quantity generated per day and capita)						**0,88**

Annex V

Results of solid waste weighing survey

District : Kouara Kano

N°	District	N°	Household	Number of Persons	Quantity of solid waste	
	Kouara Kano					**kg/day**
1	"	1	KK 1-A	4		5,00
2	"	2	KK 2-A	7		14,00
3	"	3	KK 9-A	8		2,00
4	"	4	KK 10-A	3		6,00
5	"	5	KK 13-A	9		2,00
6	"	6	KK 14-A	8		3,00
7	"	7	KK 19-A	6		4,00
8	"	8	KK 20-A	2		3,00
9	"	9	KK 23-A	6		12,00
10	"	10	KK 25-A	12		1,00
11	"	11	KK 26-A	4		9,00
12	"	12	KK 27-A	5		11,00
13	"	13	KK 28-A	8		9,00
14	"	14	KK 29-A	9		12,00
15	"	15	KK 30-A	7		6,00
16	"	16	KK 31-A	3		10,00
	"	17	KK 31-B	2		9,00
	"	18	KK 31-C	6		5,00
	"	19	KK 31-D	11		4,00
Total		**16**				
Total household			**11**			
Number of persons				**120**		
Total waste quantity						**127**
Average generation rate (waste quantity generated per day and capita)						**1,06**

Annex V

Results of solid waste weighing survey

District : Banda Bari

N°	District	N°	Household	Number of Persons	Quantity of solid waste	
	Banda Bari					**kg/day**
1	"	1	BD 1-A	9		13,00
	"	2	BD 1-B	4		10,00
	"	3	BD 1-C	6		14,00
	"	4	BD 1-D	2		10,50
2	"	5	BD 2-A	13		2,50
	"	6	BD 2-B	7		10,00
	"	7	BD 2-C	7		9,00
	"	8	BD 2-D	6		3,00
	"	9	BD 2-E	2		8,50
3	"	10	BD 3-A	8		3,50
	"	11	BD 3-B	3		3,00
4	"	12	BD 4-A	20		2,50
5	"	13	BD 9-A	8		12,00
	"	14	BD 9-B	9		2,00
	"	15	BD 9-C	8		9,00
Total		**5**				
Total household			**15**			
Number of persons				**112**		
Total waste quantity						**112,5**
Average generation rate (waste quantity generated per day and capita)						**1,00**

Annex V

Results of solid waste weighing survey

District : Route de Filingué

N°	District	N°	Household	Number of Persons	Quantity of solid waste	
	Route de Filingué					kg/2days
1	"	1	RF 1-A	5		10,00
	"	2	RF 1-B	2		1,00
	"	3	RF 1-C	2		3,00
	"	4	RF 1-D	3		3,00
2	"	5	RF 2-A	8		5,00
3	"	6	RF 4-A	3		8,00
	"	7	RF 4-B	4		12,00
	"	8	RF 4-C	7		20,00
	"	9	RF 4-D	3		9,00
	"	10	RF 4-E	3		14,00
4	"	11	RF 6-A	3		13,00
5	"	12	RF 8-A	15		11,00
Total		**5**				
Total household			**12**			
Number of persons				**58**		
Total waste quantity						**109**
Average generation rate (waste quantity generated per day and capita)						**0,94**

Annex V

Results of solid waste weighing survey

District : Yantala Nouveau

N°	District	N°	Household	Number of Persons	Quantity of solid waste	
	Yantala Haut					kg/4days
2	"	5	YAH 2-A	2		3,00
	"	6	YAH 2-B	2		5,00
3	"	7	YAH 3-A	9		8,00
	"	8	YAH 3-B	4		6,00
4	"	9	YAH 4-A	6		9,00
5	"	10	YAH 5-A	6		7,00
6	"	11	YAH 6-A	4		11,50
7	"	14	YAH 7-C	8		3,00
	"	15	YAH 7-D	5		2,00
8	"	16	YAH 8-A	4		8,00
	"	17	YAH 8-B	5		5,00
9	"	22	YAH 10-A	7		1,00
10	"	23	YAH 11-A	4		8,00
11	"	24	YAH 12-A	3		4,00
	"	25	YAH 12-B	4		6,00
	"	26	YAH 12-C	2		5,50
	"	27	YAH 12-D	5		5,50
12	"	28	YAH 13-A	10		11,50
Total		**12**				
Total household			**28**			
Number of persons				**33**		
Total waste quantity						**109,00**
Average generation rate (waste quantity generated per day and capita)						**0,83**

ANNEX VI
Results of the solid waste composition

Annex VI

SURVEY ON SOLID WASTE COMPOSITION IN THE CITY OF NIAMEY

COMMUNE: **III**

DISTRICT: **LACOUROUSSOU**

DATE: **25. Okt 00** **Initial weight:** **103 kg**

COMPOSITION AND GENERATION RATE OF SOLID WASTE

	Component	Weight(kg)	%	Volume(l)	%	Generation rate (g/pers.day)
1	Paper et Cardboard	2,10	2,2%	40,0	14,4%	14
2	Plastic	4,70	4,8%	76,0	27,4%	32
3	Textiles & rag	0,80	0,8%	10,0	3,6%	5
4	Leather & rubber	0,00	0,0%	0,0	0,0%	0
5	Wood	1,10	1,1%	6,0	2,2%	7
6	Organic	25,80	26,5%	91,0	32,9%	176
7	Fines (<5mm)	56,20	57,6%	47,0	17,0%	382
8	Metal	0,60	0,6%	1,0	0,4%	4
9	Glass	0,00	0,0%	0,0	0,0%	0
10	Stones	6,20	6,4%	6,0	2,2%	42
	Total	97,50	100,0%	277,0	100,0%	701

Water loss **5,50** kg

Analysis of the component Fines: 56,20 kg

Fines<3mm	48,6	**85,41%**
Fines>3mm	8,3	**14,59%**
Total	56,9	100,00%

Number of persons: 147

Annex VI

SURVEY ON SOLID WASTE COMPOSITION IN THE CITY OF NIAMEY

COMMUNE: **III**

DISTRICT: **YANTALA**

DATE: **28. Okt 00** **Initial weight:** **111,5 kg**

COMPOSITION AND GENERATION RATE OF SOLID WASTE

	component	Weight(kg)	%	Volume(l)	%	Generation rate (g/pers.day)
1	Paper et Cardboard	1,10	1,0%	40,0	14,0%	9
2	Plastic	2,40	2,2%	60,0	21,1%	19
3	Textiles & rag	1,10	1,0%	10,0	3,5%	9
4	Leather & rubber	0,00	0,0%	0,0	0,0%	0
5	Wood	0,60	0,5%	10,0	3,5%	5
6	Organic	17,30	15,7%	89,0	31,2%	136
7	Fines (<5mm)	84,50	76,6%	67,0	23,5%	665
8	Metal	0,75	0,7%	6,0	2,1%	6
9	Glass	0,00	0,0%	0,0	0,0%	0
10	Stones	2,60	2,4%	3,0	1,1%	20
	Total	110,35	100,0%	285,0	100,0%	878

Water loss **1,15** kg

Analysis of the component Fines: 84,50 kg

Fines<3mm	74,9	**87,91%**
Fines>3mm	10,3	**12,09%**
Total	85,2	100,00%

Number of persons: 127

Annex VI

SURVEY ON SOLID WASTE COMPOSITION IN THE CITY OF NIAMEY

COMMUNE: **III**

DISTRICT: **GAWEYE**

DATE: **24. Okt 00** **Initial weight:** **103 kg**

COMPOSITION AND GENERATION RATE OF SOLID WASTE

	Component	Weight(kg)	%	Volume(l)	%	Generation rate (g/pers.day)
1	Paper et Cardboard	1,30	1,3%	30,0	11,0%	7
2	Plastic	5,50	5,5%	67,0	24,5%	28
3	Textiles & rag	0,30	0,3%	6,7	2,4%	2
4	Leather & rubber	0,00	0,0%	0,0	0,0%	0
5	Wood	0,60	0,6%	12,0	4,4%	3
6	Organic	19,50	19,4%	98,0	35,8%	98
7	Fines (<5mm)	67,90	67,7%	54,0	19,7%	343
8	Metal	0,60	0,6%	1,0	0,4%	3
9	Glass	0,07	0,1%	0,0	0,0%	0
10	Stones	4,50	4,5%	5,0	1,8%	23
	Total	100,27	100,0%	273,7	100,0%	520

Water loss **2,73** kg

Analysis of the component Fines: 67,90 kg

Fines<3mm	61,6	**88,13%**
Fines>3mm	8,3	**11,87%**
Total	69,9	100,00%

Number of persons: 198

Annex VI

SURVEY ON SOLID WASTE COMPOSITION IN THE CITY OF NIAMEY

COMMUNE: **III**

DISTRICT: **BANDABARI**

DATE: **26. Okt 00** **Initial weight:** **112,5 kg**

COMPOSITION AND GENERATION RATE OF SOLID WASTE

	Component	Weight(kg)	%	Volume(l)	%	Generation rate (g/pers.day)
1	Paper et Cardboard	1,00	1,0%	20,0	8,8%	9
2	Plastic	2,60	2,5%	40,0	17,7%	23
3	Textiles & rag	0,60	0,6%	4,0	1,8%	5
4	Leather & rubber	0,00	0,0%	0,0	0,0%	0
5	Wood	1,00	1,0%	8,0	3,5%	9
6	Organic	15,50	14,7%	90,0	39,8%	138
7	Fines (<5mm)	80,90	76,9%	60,0	26,5%	722
8	Metal	0,60	0,6%	1,0	0,4%	5
9	Glass	0,00	0,0%	0,0	0,0%	0
10	Stones	3,00	2,9%	3,0	1,3%	27
	Total	105,20	100,0%	226,0	100,0%	1004

Water loss **7,30** kg *) Windy day, where particules have been scattered during the

Analysis of the component Fines: 80,90 kg

Fines<3mm	73,2	**89,38%**
Fines>3mm	8,7	**10,62%**
Total	81,9	100,00%

Number of persons: 112

Annex VI

SURVEY ON SOLID WASTE COMPOSITION IN THE CITY OF NIAMEY

COMMUNE: III

DISTRICT: LAMORDE

DATE: 23. Okt 00 **Initial weight:** 131 kg

COMPOSITION AND GENERATION RATE OF SOLID WASTE

	Component	Weight(kg)	%	Volume(l)	%	Generation rate (g/pers.day)
1	Paper et Cardboard	0,81	0,6%	20,0	7,1%	5
2	Plastic	1,31	1,0%	20,0	7,1%	8
3	Textiles & rag	0,75	0,6%	5,0	1,8%	5
4	Leather & rubber	0,00	0,0%	0,0	0,0%	0
5	Wood	0,75	0,6%	4,0	1,4%	5
6	Organic	29,60	23,0%	140,0	49,6%	182
7	Fines (<5mm)	93,20	72,3%	87,0	30,9%	572
8	Metal	0,75	0,6%	5,0	1,8%	5
9	Glass	0,00	0,0%	0,0	0,0%	0
10	Stones	1,75	1,4%	1,0	0,4%	11
	Total	128,92	100,0%	282,0	100,0%	804

Water loss **2,08** kg

Analysis of the component Fines: 93,20 kg

Fines<3mm	83,2	**85,55%**
Fines>3mm	14,05	**14,45%**
Total	97,25	100,00%

Number of persons: 163

Annex VI

SURVEY ON SOLID WASTE COMPOSITION IN THE CITY OF NIAMEY

COMMUNE: **III**

DISTRICT: **KOIRAKANO**

DATE: **27. Okt 00** **Initial weight:** **127 kg**

COMPOSITION AND GENERATION RATE OF SOLID WASTE

	Component	Weight(kg)	%	Volume(l)	%	Generation rate (g/pers.day)
1	Paper et Cardboard	1,30	1,0%	20,0	7,4%	11
2	Plastic	2,60	2,1%	40,0	14,8%	22
3	Textiles & rag	0,60	0,5%	3,0	1,1%	5
4	Leather & rubber	0,00	0,0%	0,0	0,0%	0
5	Wood	0,60	0,5%	3,0	1,1%	5
6	Organic	31,40	25,2%	128,0	47,4%	262
7	Fines (<5mm)	83,20	66,8%	66,0	24,4%	693
8	Metal	0,60	0,5%	7,0	2,6%	5
9	Glass	0,50	0,4%	0,3	0,1%	4
10	Stones	3,75	3,0%	3,0	1,1%	31
	Total	124,55	100,0%	270,3	100,0%	1058

Water loss **2,45 kg**

Analysis of the component Fines: 83,20 kg

Fines<3mm	71,9	**85,90%**
Fines>3mm	11,8	**14,10%**
Total	83,7	100,00%

Number of persons: 120

Annex VI

SURVEY ON SOLID WASTE COMPOSITION IN THE CITY OF NIAMEY

COMMUNE: II

DISTRICT: ROUTE DE FILINGUE

DATE: 01. Nov 00 **Initial weight:** 109 kg

COMPOSITION AND GENERATION RATE OF SOLID WASTE

	Component	Weight(kg)	%	Volume(l)	%	Generation rate (g/pers.day)
1	Paper et Cardboard	2,00	1,9%	42,0	12,8%	17
2	Plastic	4,50	4,2%	60,0	18,2%	39
3	Textiles & rag	1,00	0,9%	14,0	4,3%	9
4	Leather & rubber	0,00	0,0%	0,0	0,0%	0
5	Wood	1,30	1,2%	20,0	6,1%	11
6	Organic	21,50	19,9%	124,0	37,7%	185
7	Fines (<5mm)	71,90	66,6%	58,0	17,6%	620
8	Metal	1,50	1,4%	5,0	1,5%	13
9	Glass	0,60	0,6%	1,0	0,3%	5
10	Stones	3,60	3,3%	5,0	1,5%	31
	Total	107,90	100,0%	329,0	100,0%	940

Water loss **1,10** kg

Analysis of the component Fines: 71,90 kg

Fines<3mm	63,9	**87,65%**
Fines>3mm	9	**12,35%**
Total	72,9	100,00%

Number of persons: 58

Annex VI

SURVEY ON SOLID WASTE COMPOSITION IN THE CITY OF NIAMEY

COMMUNE: I

DISTRICT: YANTALA HAUT

DATE: 03. Nov 00 **Initial weight:** 113 kg

COMPOSITION AND GENERATION RATE OF SOLID WASTE

	Component	Weight(kg)	%	Volume(l)	%	Generation rate (g/pers.day)
1	Paper et Cardboard	0,80	0,7%	20,0	8,3%	6
2	Plastic	2,60	2,4%	40,0	16,5%	20
3	Textiles & rag	0,60	0,5%	8,0	3,3%	5
4	Leather & rubber	0,00	0,0%	0,0	0,0%	0
5	Wood	1,00	0,9%	11,0	4,5%	8
6	Organic	11,50	10,5%	73,0	30,2%	87
7	Fines (<5mm)	75,40	68,5%	60,0	24,8%	571
8	Metal	1,10	1,0%	8,0	3,3%	8
9	Glass	0,10	0,1%	0,0	0,0%	1
10	Stones	16,90	15,4%	22,0	9,1%	128
	Total	110,00	100,0%	242,0	100,0%	856

Water loss **3,00** kg

Analysis of the component Fines: 75,40 kg

Fines<3mm	64,2	**83,05%**
Fines>3mm	13,1	**16,95%**
Total	77,3	100,00%

Number of persons: 33

Annex VI

SURVEY ON SOLID WASTE COMPOSITION IN THE CITY OF NIAMEY

AVERAGE VALUE FOR THE 6 DISTRICTS

DATE: **30. Okt 00** **Initial weight:** **111,495 kg**

COMPOSITION AND GENERATION RATE OF SOLID WASTE

	Component	Weight(kg)	%	Volume(l)	%	Generation rate (g/pers.day)
1	Paper et Cardboard	1,20	1,1%	26,5	10,2%	8
2	Plastic	3,59	3,4%	51,6	19,9%	24
3	Textiles & rag	0,57	0,5%	5,8	2,2%	4
4	Leather & rubber	0,00	0,0%	0,0	0,0%	0
5	Wood	0,79	0,7%	8,5	3,3%	5
6	Organic	20,49	19,1%	100,6	38,7%	137
7	Fines (<5mm)	76,24	71,1%	60,5	23,3%	509
8	Metal	0,63	0,6%	2,3	0,9%	4
9	Glass	0,07	0,1%	0,0	0,0%	0
10	Stones	3,67	3,4%	3,7	1,4%	25
	Total	107,25	100,0%	259,6	100,0%	745

Water loss **2,75** kg

Analysis of the component Fines: 76,24 kg

Fines<3mm	68,323	**87,88%**
Fines>3mm	9,4245	**12,12%**
Total	77,7475	100,00%

Number of persons: 149,69 (theoretical)

ANNEX VII
Results of the survey on the quantities of removed waste

The survey for the identification of the wild dumping sites in the City of Niamey is listed in the following Table. Beside the identification of their location and size of waste, the suitability for the conversion to a sorting center has been analyzed. The following criteria has been take into consideration: Location, importance, accessibility and faraway

COMMUNE I

Number of The dump	Quartiers	Identification of the wild sites	Types of the wild dumping	Location	Accessibility	Possibility of conversion into sorting center	Estimated Volume m^3
1	Yantala	1 A	Official	1st turn right on the Avenue Tiguidit	+++	Impossible (in the middle of the street)	50
1	Koira- Kano	2 A	Official	Close to Parc d'agrément	+	Impossible (in the middle of the street)	165
2	Bani-fandou II	3 A	Wild	On the road latéritique in front of cabinet bani-kaly	+	Impossible	27,5
		3 B	Official	Near to Grillage Ali Chaibou	++	Possible (within the belt)	5,5
3	Boukoki II	4 A	Official	Boulevard Mali Béro Behind filling station Shell	+++	Possible	100
		4 B	Official	On the same road, after the bridge Street maouri Koye,	+++	Possible	27,5
		4 C		close to jardin d'enfant, croix rouge	++	Impossible (in the middle of the street)	5,5
1	Banda-bari	5 A	Wild	Close to marché des céréales	+	impossible (close to the marché)	27,5
1	Deyzébon	6A	Official	Close to Ecole primaire	+++	possible	150
1	Katako	7A	Wild	On the way to the filling station Mobil	+++	Possible	16,5
1	liberté	8A	Official	In front of boutique Doula Tondi (Grand marché)	+	Impossible (very close to the marché	15
1	Boukoki IV	9A	Official	Close to école Diori	+	Impossible (in front of Boulevard de indépendance)	15
1	Zongo	10A	Wild	In Gountou Yéna	++	Impossible (in the middel of water stream)	35
1	Plateau	11A	Official	Within the cases allemandes	+++	Possible	25

Legend = accessibility
+++ = very easy to access
++ = accessible
+ = not easy to access
Number and identification of the wild dumping site
1= number
1A = identification

COMMUNE II

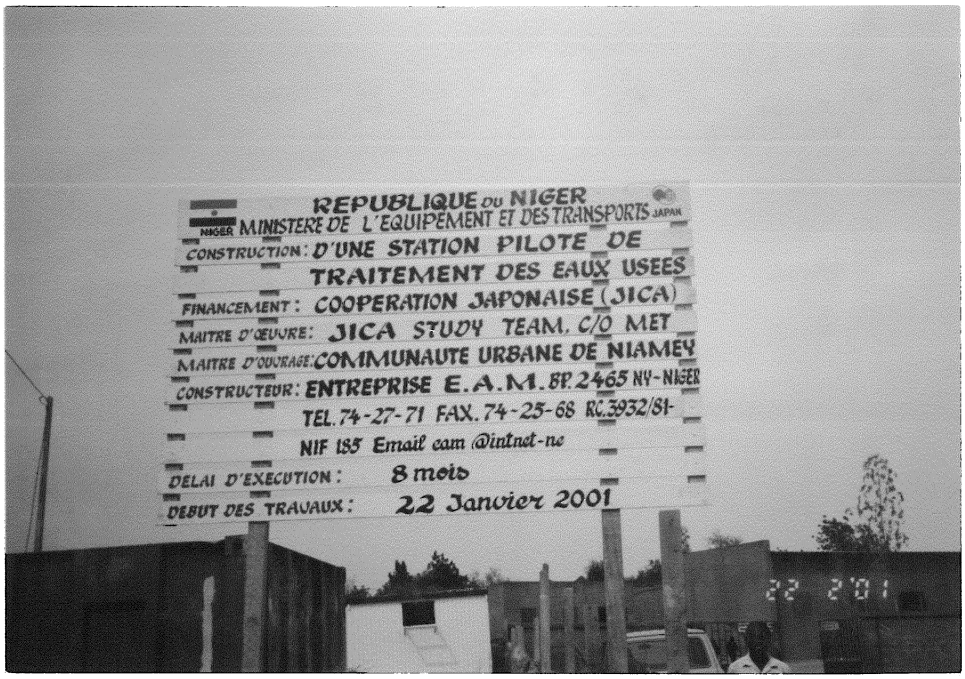
Number of The dump	Quartiers	Identification of the wild sites	Types of the wild dumping	Location	Accessibility	Possibility of conversion into sorting center	Estimated Volume m^3
2	Madina	1A'	Official	Close to école primaire on the Boulevard Mali Béro	+++	Impossible (in the middle of the street)	200
		1B'	Official	After méca-Diésel on the boulevard Mali Béro	+++	Impossible (in the middle of the boulevard)	55
2	Wadata	2A'	Official	Close to la samaria sabongari	++	impossible (very close to habitations)	27
		2B'	Wild	Close to Lycée Kouara	++	Impossible (in the middle of the street)	22
2	Route Filingué	3A'	Official	After station Sikièye on left side of the large road	++	possible	15
		3B'	Wild	CEG 8	++	impossible (very close to a school)	20
2	Gamkallé	4A'	Wild	On the Avenue de Gamkallé	++	Impossible (in front of an avenue)	35
		4B'	Wild	On the Avenue de Gamkallé	++	Impossible (in front of an avenue)	10
1	Sabongari	5 A'	Official	Marché cimetière musulman	++	Impossible (close to a market)	80
1	Lacouroussou	6 A'	Official	In front of samaria lacouroussou	++	impossible (in front of the boulevard du marché)	10
2	Terminus	7 A'	Official	In front of Dispensaire central	++	impossible (in front of the bd de la liberté)	5,5
		7 B'	Official	Near to la Piscine Olympique	+++	Possible	30
3	Talladjé	8 A'	Official	Near to Ecole dans la ceinture verte	+++	Impossible (very close to a school)	
		8 B'	Official	Near to Ecole dans la ceinture verte	++	Impossible (very close to habitations)	-
		8 C'	Wild	In the green area close to habitations	+	Impossible (very close to habitations and street)	-

COMMUNE NIAMEY III

Number of The dump	Quartiers	Identification of the wild sites	Types of the wild dumping	Location	Accessibility	Possibility of conversion into sorting center	Estimated Volume m^3
2	Lamordé	1 A"	Wild	After la maternité on the left side	+	Impossible (Close to the maternity)	11
		1 B"	Wild	In marché de bétail	++	Possible	10
1	Gawèye	2 A"	Wild	On the road of Say left side after Nigemat	++	Impossible (in the middle of the street)	5,5

Legend = accessibility
+++ = very easy to access
++ = accessible
+ = not easy to access
Numbrer and identification of the wild dumping site
1= number
1A = identification

APPENDIX R: PILOT STUDY FACILITY CONSTRUCTION REPORT



APPENDIX R.1 PROCESS DESIGN FOR UASB PLANT

MATERIAL BALANCE & DESIGN CALCULATION.

FOR UASB REACTOR:

Flow - 100 M3/day or 4.16 M3//hr. ~ 4.2 M3/hr.
BOD - 500 mg/l
COD - 850 mg/l

BIOGAS PRODUCTION: 0.1 M3/kg of COD Redn., ie, 5.5 M3/day

INLET TO UASB
COD = 850 mg/l
Load = 85 kg/day
BOD = 500 mg/l
Load = 50 kg/day
BOD-
Loading=1.04 kg/M3/day
COD-
Loading -1.77 kg/M3//day

UASB REACTOR
Vol. = 48 M3
DT = 11.52 hrs
Upward =0.35M/hr. vel.

REDUCTION EFFICIENCY
BOD - 75%
COD - 65%

OUTLET OF UASB REACTOR (CLARIFIER OVERFLOW)
BOD 125 mg/l
COD 300 mg/l

SLUDGE GENERATION
(0.1 to 0.2 kg Sludge/kg of COD destroyed)
11 kg sludge/day on dry basis (as 2% solids, 550 litres.)

FOR BIOTOWER:

INLET
COD = 300 mg/l
Load = 30 kg/day
BOD = 125 mg/l
Load = 125 kg/day
HLR* -
Loading=0.093M3/M2/day

Biotower (with DHS Media)
HLR= *
0.093M3/M2/day

REDUCTION EFFICIENCY
BOD - 75-80%
COD - 60-65%

OUTLET OF BIOTOWER (CLARIFIER)
BOD <30 mg/l
COD <100 mg/l

SLUDGE GENERATION
(0.15 kg Sludge/ kg of BOD destroyed)
1.425 kg sludge/day on dry basis(as 2% solids, 72 litres.)

*HLR = Hydraulic Loading Rate.
(M3 of Effluent per day per available surface area of sponge media)

UNIT SIZE DESIGN CALCULATION

Flow	:	100 M^3/day or 4.16 M^3/hr ~ 4.2 M^3/hr
BOD	:	500 mg/l
COD	:	850 mg/l

NOTE : Above BOD value is based on data given by Tokyo Engg. Consultants Co. Ltd. faxed by EAM - BP Niger on Feb 06, 2001.

1. **Screen & Pump pit**

- 0.5 M wide x 1.5 M long (Min. Size)
- Pump pit 1.0 M x 1.0 M (Min. Size)
- Grit Channel 0.5 M x 4 M (Min. size)

Flow : 0.0012 Cu.M/sec.
Vel. in pump header : 0.6 M/sec.

2. **UASB Reactor**

Design parameters

Total BOD load	:	50 kg/day
COD load	:	85 kg/day
BOD reduction	:	75%
COD reduction	:	65%
BOD loading rate	:	1.04 kg/M^3/day
COD loading rate	:	1.77 kg/M^3/day

∴ Volume of the reactor : $\frac{85}{1.77}$
: 48 M^3
Size : 4 M x 3 M x 4 M LD

3. **Biotower with DHS Media**

Design Parameters

Total BOD load	:	12.5 kg/day
COD load	:	30 kg/day
BOD reduction	:	75 - 80%
COD reduction	:	60 - 65%
Hydraulic loading rate (H.L.R)	:	0.093 M^3/M^2 of sponge media/day

Recommended 0.11 M^3/M^2/day

(as per technical paper entitled "Treatment of Raw Sewage in a temperate climate using UASB reactor and hanging sponge cube process by Dr. Lalit Agrawal et al published by Elesebier Science Ltd.).

∴ For 100 M^3/day, surface area required for sponge media	:	100 / 0.093 = 1075.27 M^2
Selecting 20 x 20 x 20 mm size cubes: for media, surface area of each cube		0.0024 M^2
No. of cube required	:	1075.27/0.0024 = 4,48,030
With 2500 media height,	:	2500
No. of cubes/strings (held diagonally)		28.3 mm = 88 Nos.
No. of strings required	:	4,48,030 / 88
	:	5092.21
With 40 mm spacing both ways		
No. of strings/M^2 of tank area	:	625
∴ Plan area required for tank	:	5092.21 / 625
	:	8.146 M^2
∴ Dia of tank	:	3.22
Tank dia. provided	:	3.2 met ∴ O.K.

Details of down flow handing sponge (DHS) Media

Type of media	:	Polyurethane Sponge (media with sponge cubes)
Density	:	40 kg/M^3
Size of sponge cubes	:	20 mm x 20 mm x 20 mm
Arrangement of cubes	:	Held diagonally vertically Close to each other through string and spaced at 40 mm c/c horizontally
Height of DHS media	:	2500 mm
No. of cubes/string	:	≃ 88.0
Total No. of cubes in biotower	:	≃ 4,50,000.0
MOC of media frame	:	Stainless Steel

4. **Polishing pond**

Flow	:	100.0 M^3/day
Holding period	:	9.0 hrs.
Total capacity required	:	37.5 M^3
Size provided (overall)	:	3 Nos. - 6 M x 3 M
Liquid depth	:	0.75
Capacity provided	:	40.5 M^3 ∴ O.K.

5. **Sludge Drying beds**

Total amount of sludge produced

From UASB Reactor	:	550 lit/day
From Biotower	:	72 lit/day

		622lit/day i.e. 0.622 M^3/day

With 10 days drying period

Vol. handled by beds	:	0.627 M^3 x 10.0
	:	6.27 M^3
With liquid depth	:	0.3 met
Area required	:	20.9 M^2
Area provided	:	3 Nos. - 4.0 M x 2.2 $\simeq$ 27.0 M^2

$\therefore$ O.K.

APPENDIX R.2 HYDRAULIC DESIGN FOR UASB PLANT

HYDRAULIC DESIGN CALCULATION:

PILOT PLANT NIGER

Flow = 100 M^3/day

1. **Raw Sewage Channel - Inlet sump**

The raw sewage is transferred to inlet sump by by gravity through existing open channel.

Min. level in inlet channel = 197.45 m
(Same as bottom of existing channel)
Loss through screen = 50 to 80 mm
Considering 100 mm loss
level in inlet raw sewage sump = 197.45 - 0.1
= 197.35 > 197.30 (Provided)
With 1.0 MLD of Sump = 197.30 m
B.L. of sump = 196.30 m

2. **Raw Sewage Transfer Pumps to Grit channel**

W.L in grit channel = 207.40 m
W.L in sump = 196.30 m
Static head;
207.4 - 196.3 = 11.0 m
. . . . . .(1)
Pipe size/length = 50 mm/40 M
Flow - m^3/hr = 5.0 (max.)
m^3/sec. = 0.014
Velocity m/sec. = 0.71
Head Loss m/1000 = 23/1000
Head loss in 40 m pipe length = $\frac{23 \times 40}{1000}$
= 0.92 m . . . .. . (2)

Frictional losses in fittings

Sr. No.	Description	Qty.	K-value	Total -K
1.	Gate valve	1	0.4	0.4
2.	Check valve	1	2.5	2.5
3.	90^0 bend	7	0.3	2.1
		Total K		5.0

Head loss in fittings = $K \frac{V^2}{2g}$

= $5.0 \times \frac{(0.71)^2}{2 \times 9.81}$

= 0.127 m . . . . . (3)

Total Head loss:

(1) + (2) + (3)

= 11.0 + 0.92 + 0.127

= 12.047 m Say 12.1 m

With residual pressure of = 1.0 m

Total head required = 12.1 + 1.0

= 13.1 m

Pump Provided:

Capacity- m^3/hr = 5.0

Head - m = 14.0

Type = Submersible

(3) **Grit Channel - UASB Reactor.**

Flow M^3/day = 100.0

W.L in grit channel = 207.4 m

Ht. of water for 45^0 V- notch for designed flow = 90 mm (0.09 m)

Free Fall = 100 mm

W.L. down streamof V-notch = 207.4 - (0.09 + 0.1)

= 207.21 m

W.L. provided = 207.20 m

Losses in exist & entry

Sr No.	Description	Qty.	K-value	Total
1.	Entry	1	1.0	1.0
2.	Exit	1	1.0	1.0

Total K-value = 2.0

Dia of pipe = 80 mm

Vel. = 0.280 m/sec.

Head loss = 2.4 m/1000

Losses : $K \frac{V^2}{2g}$ = $2.0 \times \frac{(0.28)^2}{2 \times 9.81}$

= 0.016 m

:. W L required at inlet of UASB reactor. = 207.2 - 0.016 = 207.184 m
provided as 206.8 m ∴ OK

In UASB reactor hydraulic drop is provided from distribution box about 600 mm which includes free fall as well as losses in reactor down take pipe.

∴ W L in reactor unit = 206.8 - 0.6
= 206.2 m

Losses in Outlet Launder of Reactor:

Total Flow = 5 m^3/hr.
2 Nos. outlet launder is provided with total 10 nos. - 90^o V-notch.

:. Flow/V-notch = 0.5 m^3/hr.
Ht. of water of = 6 mm (0.006 m)
Free fall = 50 mm

:. W L required in launder = 206.2 - (0.006 + 0.05)
= 206.144 m
W L provided in outlet gutter/launder = 206.10 m O.K.

(4) **Losses Between - UASB Reactor & Biotower**:

Dia of pipe = 80 mm
Vel. = 0.28 m/sec.
Losses = 2.4 m/1000 m
W.L. in outlet of reactor = 206.1 m
Length = 15 m (max.)
Straight pipe = $\frac{15 \times 2.4}{1000}$
= 0.036 m
. . . . . .(1)

Losses in fittings:

Sr. No.	Description	Qty.	K-value	Total K-value
1.	Exit	1	1.0	1.0
2.	Bemds - $45^0/90^0$	3	1.0	3.0
3.	Entry	1	1.0	1.0
	Total K-value			5.0

Head losses = $\frac{KV^2}{2g}$

= $5 \times \frac{(0.28)^2}{2g}$

= 0.02 m . . . . (2)

Free fall (min.) over media = 300 mm . . . . . (3)

Totasl head loss (1) + (2) + (3)

= 0.036 + 0.02 + 0.30

= 0.406 m

∴ Top of media required in biotower = 206.1 - 0.406

= 0.406 m

= 205.789 >> 204.6 m (Top of DHS media in provided biotower) ∴ OK.

5. **Biotower - Clarifier Zone.**

The water tricked through 2.5 met. high media is collected at 201.5 met. and then transferred under gravity to bottom clarifier tank at WC 200.85 through inlet chamber.

6. **Clarifier (of biotower) - Pond I.**

W.L in Clarifier = 200.85 m

Total length of weir opening in clarifier outlet = 4 x 0.375 x 2 nos. x 0.75

= 3.0 m (This is equivalent rect. weir)

Ht of water
Over rect. weir is estimated with following formula:

Q = 1500 x LH 3/2 where Q is in US GPM, L & H in ft.

Flow Q = 5 m^3/hr i,e 22 .0 US GPM

L = 3.0 m ie, 9.84 ft.

∴ H 3/2 = 1.49

∴ H = 0.13 ft., ie, 3 - 9 mm . . . . . .(a)

Say 4.0 mm (0.004 m) . . . . . (b)

With Free fall 100 mm
W L required in outlet chamber of clarifier; = 200.85 - 0.004 + 0.10
= 200.746 > 200.700 m ∴ OK

Losses from Chamber - Pond I.

Pipe dia = 80 mm
length = 10 m (ax.)
Vel. = 0.28 m/sec.
Head loss = 2.4 m/1000

Losses in stright pipe

$\frac{2.4 \times 10}{1000}$ = 0.024 m

Fitting losses for entry & exit (K = 2)

$= 2 \frac{V^2}{2g}$ = $2 \times \frac{(0.28)^2}{2 \times 9.81}$

= 0.008 m

∴ W.L required in pond - I
= 200.7 - 0.008 = 200.692 > 200.6 ∴ O.K.

Hydraulic Drop provided between each Pond-I, II & III is 100 mm having between each overflow weir pond.

∴ Total fall provided between pond-I, II & III is 200 mm which is adequate

7. **Head loss from pond III to chlorine contact tank**

W.L. in pond - III : 200.4 met
Width of over flow weir at pond - III outlet : 500 mm i.e. 1.64 ft.

Ht. of water

Q	:	$1500\ H^{3/2}$
22	:	$1500 \times 1.64 \times H^{3/2}$
H	:	0.015 ft i.e. 4.5 mm
		Say 5 mm i.e. 0.005 m

With free fall of 100 mm

W.L. required in chlorine contact tank : 200.4 - (0.005 & 0.1) = 200.295
>200.25 ∴ O.K.

From this unit treated effluent will be disposed under gravity at about 199.0 M RL on western side of plant boundary at 15.0 metre distance.

The sludge from UASB reactor and clarifier bottom will be also discharged under gravity over sludge drying beds.

APPENDIX R.3 STRUCTURAL DESIGN FOR UASB PLANT

PARAMOUNT LIMITED

STRUCTURAL DESIGN PHILOSOPHY

DOCUMENT NO.	:	PL \ 528 \ SDB -01
PROJECT NAME	:	PILOT PLANT FOR SEWAGE TRETMENT (100 M3 / DAY) -NIGER
JOB NO	:	PL \ 528
CLIENT	:	EAM NIAMEY - NIGER
DESIGNED BY	:	GIRISH PANCHAL
CHECKED BY	:	NR SHAH
APPROVED BY	:	NR SHAH

SUBMISSION :	REV	DATE	PAGE NO.
	(0)	20 / 02 / 2001	1 TO 4

Structural Design Basis

1.0 GENARAL

1.1 The design considerations given hereunder establish the minimum basic requirements of reinforced cement concrete (RCC) structures, masonary structures and structural steel works.

1.2 Whenever any reference to IS Codes is made , the same shall be taken as the latest revision with all amendments issued there to.

2.0 FOUNDATIONS

2.1 For minimun founding depth and other related parameters such as soil profile, safe bearing capacity, design depth of water table, recommended type of foundation and corrosion protective treatment for underground concrete works in view of presence of harmful chemicals in soil and subsoil water etc. are considered as per given soil report.(Refer soil report of survey, study on sanitation for the Niamey city in the republic of niger)

2.1.1 Minimun founding level	:	2.6 m below NGL
2.1.2 Ground Water Table	:	3.0 m below NGL
2.1.3 Safe Bearing Capacity	:	5.0 T/Sq.M at 2.6 m below NGL (bore no. f4)
Safe Bearing Capacity	:	7.0 T/Sq.M at 3.0 m below NGL (bore no. f5)
2.1.4 Type Foundation System	:	Raft Foundation

3.0 GROUND FLOOR SLAB

Non suspended/suspended ground floor shall consists of the following minimum specification unless othewise specified.

3.1 200 thk sand filling over well compacted soil/sand.
3.2 100/50 thk PCC(1:5:10) over well compacted soil/sand.
3.3 150mm/125mm thk RCC slab M20 over lean (PCC) concrete.
3.4 Floor Finish as specified in architectural requirements.
Where ever requird , proper slope shall be provided for adequete drainage of ground floor slab .

4.0 SUPERSTRUCTURES

4.1 All buildings designed as framed structures of RCC/STEEL.
4.2 RCC structures are designed using limit state method as per IS:456 & STEEL structure as per IS:800.
4.3 Minimum Grade of Concrete used is M20.
4.4 Liquid Retaining structures is designed as Uncracked section as per IS: 3370 , with M20 minimum grade of Concrete.
4.5 Liquid Retaining structures is designed assuming liquid upto waterlevel excluding free board.
4.6 In all pipe racks, MS rod is provided at the centre of the top surface of all the tranverse beams for the length of the beams.
4.7 All machine/equipments supports is of RCC/Steel.
4.8 The walls and base slab of Liquid Retaining structures is provided with reinforcement on both faces for thickness greater than 100 mm

5.0 DESIGN LOADS

All Buildings/Structures are designed to resist the worst Combination of the following loads.

5.1 Dead Loads
The weight of all permanent construction includind walls, floors, floor finish, roofs, partitions , stairways and fixed services equipment and other equipment excluding their contents.

5.2 Live Loads
Live Loads shall be in general as per IS :875.However the folowing minimum live loads is considered in the design of structures.

5.2.1 office buiilding -- 300 Kg/Sq.M
5.2.2 Staircase -- 300 Kg/Sq.M
5.2.3 Operational Area/process/Technological Bldg.- 300 Kg/Sq.M

5.3 Wind loads

Wind Loads is considered in general as per IS:875.
Design Wind Pressure = 150 Kg/Sq.M
In addition ,Wind force on equipment supported on frame including all fixtures,piping , staircase/ladder, Handrailing and any other attachment is also considered.

5.4 Earthquake/Seismic Forces

Seismic design and forces in general as per zone III of IS:1893 is considered.

Other Important parameter are as follows:
αo = Design Seismic coefficient =1.0
k= Performance factor = 1.0
I = Factor depending upon the Importance of the structure = 1.5
β = 1.0 Coefficient Depending upon the Soil- Foundation System.

6.0 Design Code

IS : 3370 - 1967 (I to IV PART) Code of practice for concrete structures for the storage of liquids
IS : 269 - 1989 Ordinary portland cement
IS : 456 - 2000 Plain and reinforced concrete -code of practice
IS : 800 - 1984 Code of practice for general construction in steel
IS : 1893 - 1984 Criteria for Earthquake resistant design of structures.
IS : 1786 - 1985 Specifiacation for high strength deformed steel bars and wires for concrete reinforcement.
IS : 2062 - 1992 Steel for general structural purposes.
IS : 875 - 1987 Code of practice for design loads (other than earthquake) for building structures.
Part - 1 : 1987 Dead loads -unit weights of building material and stored materials.
Part - 2 : 1987 Imposed loads
Part - 3 : 1987 Wind loads
Part - 4 : 1987 Snow loads
Part - 5 : 1987 Special loads and Load Combination

APPENDIX R.4 TOILET CONSTRUCTION

RÉPUBLIQUE DU NIGER

FRATERNITE-TRAVAIL-PROGRES

R.4 TOILET CONSTRUCTION

ASSAINISSEMENT DE LA VILLE DE NIAMEY:
CONSTRUCTION DE BLOCS SANITAIRES
(TOILETTES ET W-C) A L'ÉCOLE BANDABARI
COMMUNE II, NIAMEY - NIGER

CAHIER DES CHARGES

(VERSION PROVISOIRE)

- **DEVIS DESCRIPTIF**
- **CADRE DU DEVIS ESTIMATIF**
- **CADRE DE BORDEREAU DES PRIX UNITAIRES**
- **PLANS**

Septembre 2000

BUREAU D'ÉTUDES BALA ET HIMO

Architecture, Génie civil, Amén R.4-1 ıt urbain, Expertise, Développement
B.P. 939 - Tél. 73 44 90 - Fax. 73 64 89 - Niamey - Niger
E-mail : balahimo@intnet.ne

20 20

COUPE B.B

ASSAINISSEMENT DE LA VILLE DE NIAMEY

CONSTRUCTION DE BLOCS SANITAIRES A L'ECOLE BANDABARI

MINISTERE DE L'EDUCATION NATIONALE	PLAN / COUPES

PLAN N° 002	Echelle: 1 / 100	09 / 2000	

BUREAU D' ETUDES BALA & HIMO

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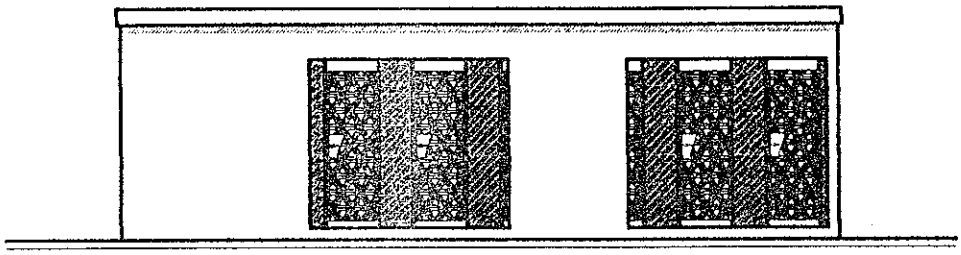
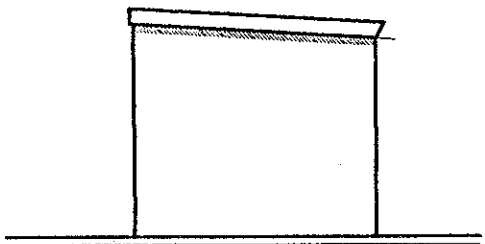
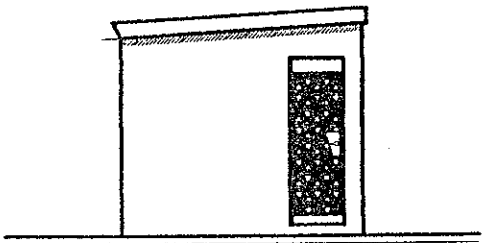
R.4-2



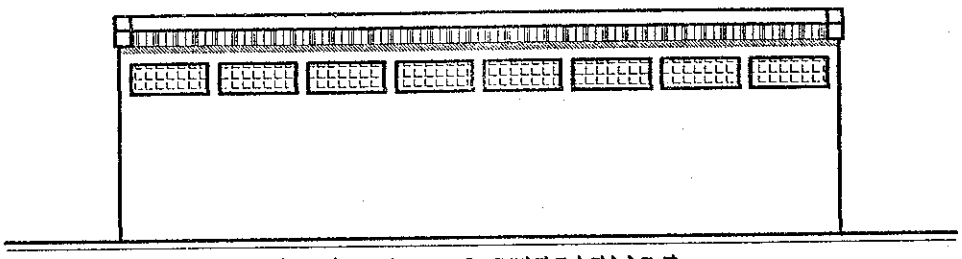
FACADE PRINCIPALE



PIGNON DROIT

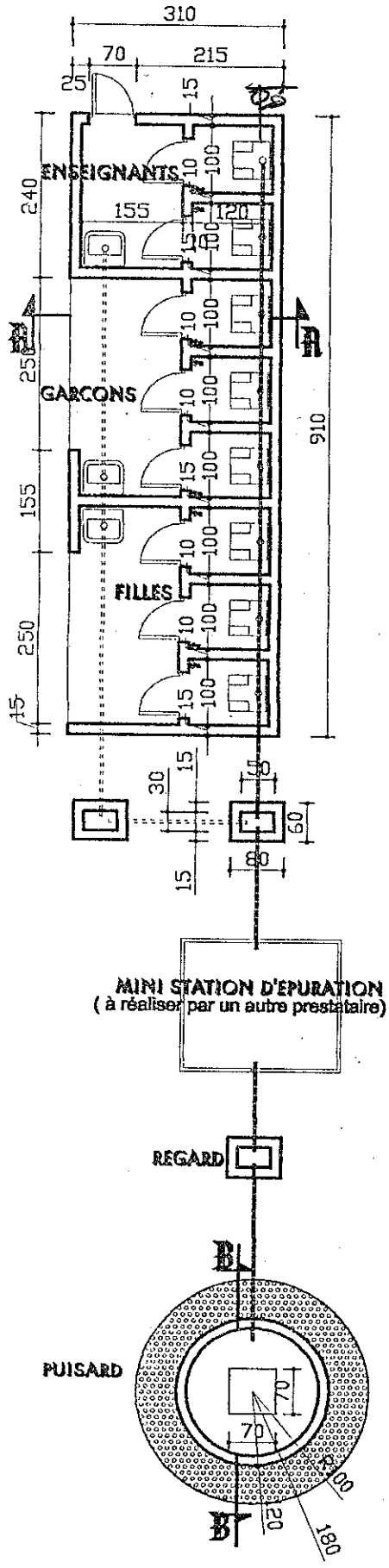


PIGNON GAUCHE



FACADE POSTERIEURE

VUE EN PLAN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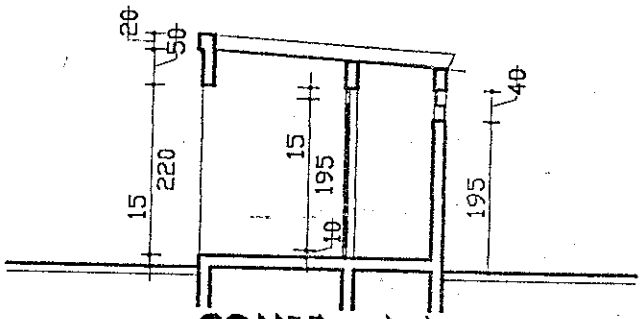
70
215
25
15
ENSEIGNANTS
240
155
120
10
100
15
B
A
250
GARCONS
910
155
FILLES
250
15
30
15
50
60
80
15
MINI STATION D'EPURATION
(à réaliser par un autre prestataire)
REGARD
B
PUISARD
70
70
100
20
180
B



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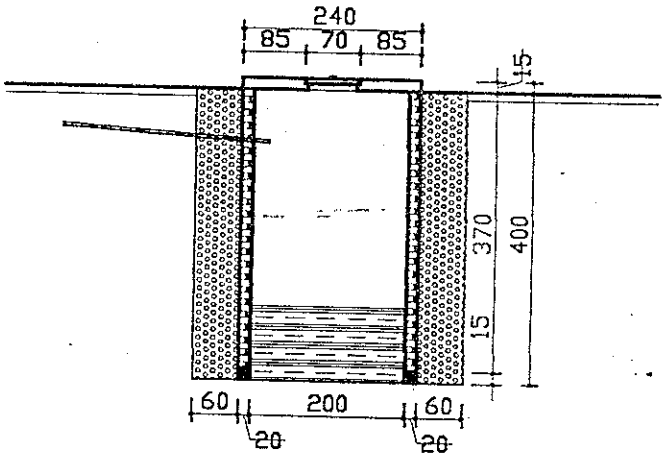

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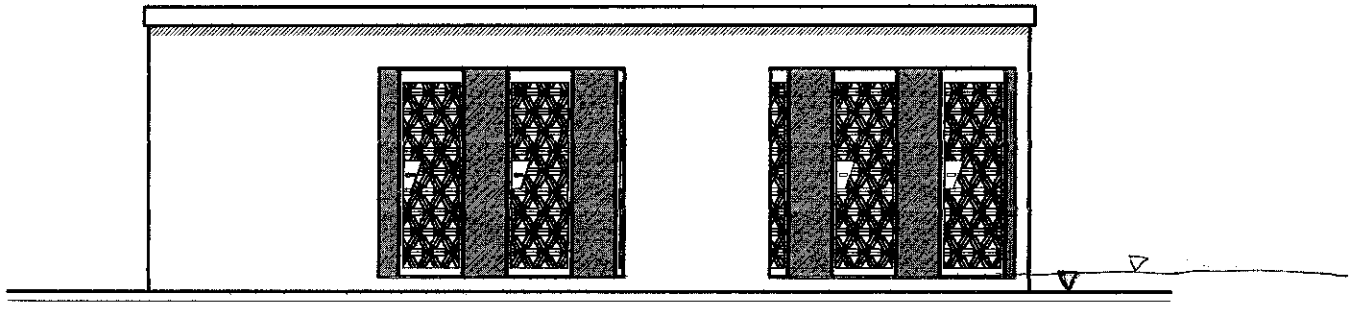

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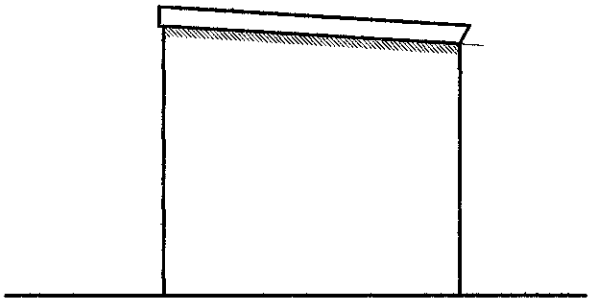

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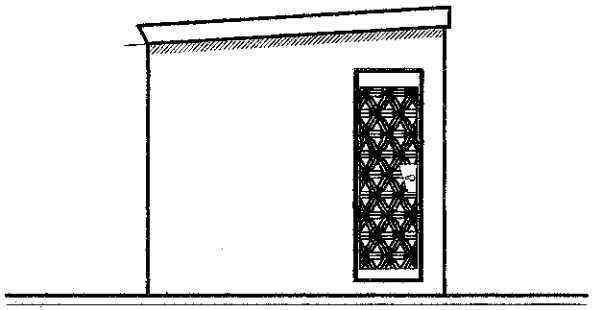

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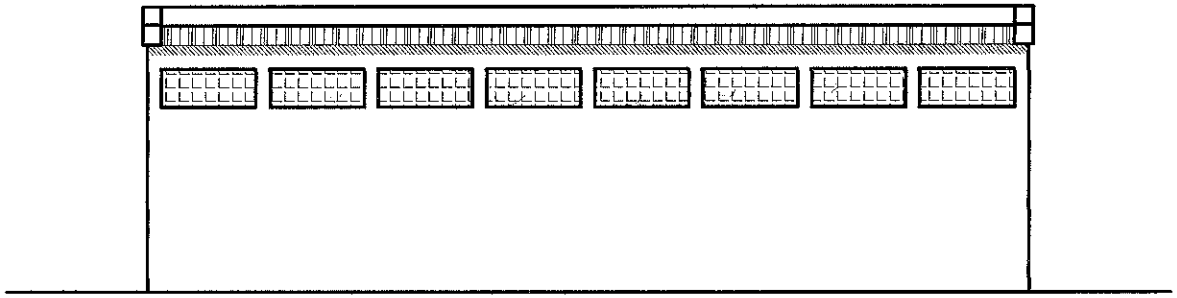

FACADE POSTERIEURE

R.4-7

ASSAINISSEMENT DE LA VILLE DE NIAMEY
CONSTRUCTION DE BLOCS SANITAIRES

ECOLE BARBARBARI	FACADES

PLAN N° 001	Echelle: 1 / 100	09 / 2000	

BUREAU D' ETUDES
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CADRE DU DEVIS ESTIMATIF

CADRE DE BORDEREAU DES PRIX UNITAIRES

ASSAINISSEMENT DE LA VILLE DE NIAMEY: CONSTRUCTION D'UN BLOC SANITAIRE A L'ECOLE BANDABARI 2, COMMUNE NIAMEY II

DEVIS ESTIMATIF CONFIDENTIEL

A) BLOC DE TOILETTES

REF.	DESIGNATION DES OUVRAGES	U	QTITE	P.U	P.T.
I	**TERRASSEMENTS**				
1	Sondage, études techniques	ff	1,00	PM	PM
2	Installation de chantier	ff	1,00	50 000	50 000
3	Implantation	ff	1,00	30 000	30 000
4	Nettoyage du terrain	m2	75,00	150	11 250
5	Fouilles en rigole	m3	11,78	2 200	25 907
6	Remblai de fouilles	m3	6,35	1 450	9 208
7	Remblai arrosé et compacté	m3	3,37	3 850	12 975
	SOUS TOTAL				**139 339**
II	**BETON, MACONNERIE**				
1	Béton de propreté	m3	0,63	32 500	20 345
2	Béton armé pour semelle	m3	1,88	100 000	187 800
3	Béton armé pour chaînage bas	m3	1,25	115 000	143 750
4	Béton armé pour poteaux	m3	0,70	115 000	80 270
5	Béton armé pour linteau	m3	1,13	115 000	129 950
6	Agglos pleins de 15 x 20 x 40	m2	17,22	4 900	84 378
7	Agglos creux de 15 x 20 x 40	m2	71,93	4 200	302 106
8	Agglos creux de 10 x 20 x 40	m2	29,13	3 200	93 216
	SOUS TOTAL				**1 041 815**
III	**ENDUITS, REVETEMENTS**				
1	Enduit tyrolien extérieur	m2	60,07	2 100	126 147
2	Enduit ciment int.	m2	113,42	1 000	113 420
3	Carreaux anti-dérapant	m2	24,45	12 000	293 400
	SOUS TOTAL				**532 967**
IV	**CHARPENTE, COUVERTURE**				
1	Bac alu	m2	31,81	5 868	186 661
2	Tubes carrés	ml	28,05	1 600	44 880
3	Feutre bitumineux	ml	28,05	350	9 818
	SOUS TOTAL				**241 359**
V	**MENUISERIES**				
	Ménuiseries métalliques				
1	Porte pleine de 70 x 195	u	9,00	47 775	429 975
2	Cornière de protection de marches	ml	6,90	1 700	11 730
	SOUS TOTAL				**441 705**
VI	**PEINTURE**				
1	Peinture à huile sur menuiseries métalliques	m2	24,57	1 550	38 084
2	Peinture à huile sur murs intérieurs	m2	108,97	1 550	168 904
	SOUS TOTAL				**206 987**
VII	**ELECTRICITE**				
1	Branchement au réseau	ff	1,00	PM	PM
2	Filerie de distribution	ff	1,00	80 000	80 000
3	Interrupteur simple	u	11,00	2 600	28 600
4	Reglette de 60	u	3,00	4 600	13 800
5	Globe opalin	u	8,00	3 500	28 000
	SOUS TOTAL				**150 400**

REF.	DESIGNATION DES OUVRAGES	U	QTITE	P.U	P.T.
VIII	**PLOMBERIE - SANITAIRES**				
1	Branchement au réseau existant	ff	1,00	300 000	300 000
2	Tuyauterie de distribution	ff	1,00	100 000	100 000
3	Lavabo	u	3,00	95 000	285 000
4	WC à la Turque	u	8,00	65 000	520 000
5	Vannes d'arrêt	u	2,00	2 500	5 000
6	Robinet de puisage	u	8,00	4 665	37 320
	SOUS TOTAL				1 247 320
IX	**ASSAINISSEMENT**				
1	Tuyauterie d'évacuation	ff	1,00	100 000	100 000
2	Mini station d'épuration	ff	1,00	PM	PM
3	Regards	u	3,00	22 000	66 000
	SOUS TOTAL				166 000
	TOTAL BLOC DE TOILETTES				4 167 692

B) PUISARD

I	TERRASSEMENTS				
1	Fouilles en pleine masse	m3	38,49	1 500	57 735
	SOUS TOTAL				57 735
II	BETON, MACONNERIE				
1	Béton de propreté	m3	0,11	62 500	6 875
2	Béton armé pour semelle	m3	0,22	100 000	22 000
3	Béton armé pour dallette	m3	0,33	105 000	34 650
4	Agglos pleins de 20 x 20 x 40	m2	28,92	5 900	170 628
5	Pierre pour remblai puisard	m3	21,87	11 250	246 038
	SOUS TOTAL				480 191
	TOTAL PUISARD				537 926

TOTAL TRAVAUX HORS TAXES	**4 705 817**
TVA (18%)	**847 047**
Enregistrement (5%)	**235 291**
TOTAL GENERAL TOUTES PRESTATIONS EN TTC	**5 788 155**

Arrêté le présent devis à la somme de:
CINQ MILLIONS SEPT CENTS QUATRE-VINGT HUIT MILLE CENT CINQUANTE-CINQ FRANCS (5 788 155 F) CFA.

Fait à Niamey, le 13 Septembre 2000

BUREAU D'ETUDE
BALA ET HIMO
S.C.R D'ARCHITECTURE
B.P. 939 NIAMEY - NIGER

CHAPITRE 1: DISPOSITIONS GENERALES

ARTICLE 1.1- GENERALITES

Le présent Devis Descriptif a pour objet:
- de définir les travaux à exécuter pour la construction de blocs sanitaires à l'Ecole Banbabari dans le cadre de l'Assainissement de la ville de Niamey;
- de déterminer l'origine et la qualité des matériaux et matériels entrant dans la réalisation des ouvrages;
- de définir les normes auxquelles ces matériaux et matériels devront répondre;
- de définir le mode d'exécution des ouvrages.

ARTICLE 1.2- PRESENTATION DU PROJET

1.2.1- LOCALISATION DE L'OPERATION

Les travaux décrits ci-dessus se dérouleront dans la communauté urbaine de Niamey au Niger.
Le terrain se situe à la commune II, lotissement Bandabari.

1.2.2- ELEMENTS CONSTITUTIFS DU PROJET

Le projet est constitué d'un bâtiment comprenant:
- 1 Bloc de toilettes pour Enseignants de 5,63 m²;
- 1 Bloc de toilettes pour Elèves (Garçons) de 8,55 m²;
- 1 Bloc de toilettes pour Elèves (Filles) de 8,55 m²;

Soit une surface totale de 22,73 m²

CHAPITRE 2: GROS OEUVRE

ARTICLE 2.1- TERRASSEMENTS

2.1.1- IMPLANTATION

Les blocs sanitaires seront implantés en se référant aux plans et plan de masse; les cotes de niveaux seront scrupuleusement respectées.
L'implantation des axes principaux des différents ouvrages, suivant les cotes définis sur les plans, sera exécutée au moyen de tous les repères nécessaires (bornes maçonnées, piquets et chaises). Le repérage sera placé hors des limites d'emprise et sera préservé pendant la durée du chantier.
Les repères seront, si nécessaires, rétablis ou remplacés. Le repérage sera effectué par un géomètre agréé.
Les revêtements de cette opération feront obligatoirement l'objet d'un plan côté sur lequel apparaîtront les bornes repérées, les distances, angles et altitude, ainsi que certains points de repérage particulier d'ouvrages existants: voie de rive ou autres.

2.1.2- NETTOYAGE DU TERRAIN

Le nettoyage concerne les emprises de constructions et d'aménagements ainsi que leur pourtour sur une distance de 5,00 m; le nettoyage concernera le sol des détritus suivants: constructions (hors matériaux végétaux), matières plastiques, sacs de ciment et autres. Il est précisé que le nettoyage ne concerne pas les buissons ni autres débris végétaux.

2.1.3- CONSERVATION D'ARBRES

Les arbres existants à conserver sont protégés dès l'ouverture du chantier par une gaine en planches avec paillasson protecteur en paille ou autre de 2,00 m de hauteur au maximum, Ces arbres seront entretenus et arrosés pendant toute la durée du chantier. Les arbres détériorés seront remplacés.

2.1.4 - DECAPAGE

Il sera prévu un décapage du sol sur une épaisseur à déterminer sur les surfaces nettoyées (cf. paragraphe 2.1.2). Cette opération sera effectuée manuellement sans débroussaillage préalable afin que la terre végétale ou considérée comme telle soit mélangée avec les débris végétaux en vue de former un humus qui sera mis en dépôt aux endroits indiqués et stockée de telle sorte qu'elle puisse être récupérée par la suite.
En cas de non utilisation, ces déblais seront évacués à la fin du chantier. Ils seront transportés jusqu'à une décharge publique.

2.1.5- NIVELLEMENT

Il sera prévu un nivellement du terrain pour tous les mouvements de terre ayant une cote supérieure ou inférieure à +0,25m.

2.1.6- REMBLAIS

Les travaux comprennent les remblais au pourtour des constructions et des murs de soubassement, le remblaiement des fouilles en rigoles y compris le remblaiement des talus. Le remblais des fouilles se fera avec les terres en provenance des déblais par couche de 20 cm suffisamment arrosées et compactées mécaniquement. Les remblais complémentaires seront fournis si nécessaires, et en terre de bonne qualité. L'entrepreneur épandra aussi la terre excédentaire s'il ya lieu et stockera éventuellement les terres végétales pour réemploi. Avant le remblai et à mesure de son avancement, les vides de fouilles seront soigneusement nettoyés et débarrassés des sacs de ciment, boiseries, etc...

ARTICLE 2.2- FOUILLES

2.2.1- GENERALITES

Il sera exécuté toutes les fouilles, excavations rigoles et tranchées jusqu'aux profondeurs reconnues nécessaires après avis du contrôle.

2.2.2- FOUILLES EN RIGOLES

Ces fouilles seront exécutées à la main; elles comprennent le montage des terres sur berge, les étaiements et blindages, les épuisements, talutage, redressement des fonds, la mise en dépôt pour remblai ultérieur, la protection des talus, l'abaissement du niveau d'assise en cas de présence de poches de terre, vides,..... et toutes sujétions d'exécution.
Ce type de fouille est à exécuter pour les semelles filantes de fondations.

2.2.3- FOUILLES EN TRANCHEES

Fouilles en tranchées pour les canalisations des eaux usées, des eaux vannes ainsi que pour les conduites d'eau potable et d'électricité. Ces tranchées doivent avoir une profondeur de 1,00 m de manière à ce que la génératrice supérieure des canalisations soit au moins à 0,80 m du terrain naturel.

2.2.4 - FOUILLES EN TROUS OU EN PLEINE MASSE

Elles seront réalisées pour les muni stations d'épuration, les puisards, les regards de visite et les semelles isolées éventuelles.

ARTICLE 2.3- FONDATIONS

2.3.1- SONDAGES

Des sondages devront normalement s'effectuer pour trouver le taux de travail du sol. A défaut les fondations seront calculées à partir des résultats existants dans la zone ou sur un sol identique à celui du site.

2.3.2- BETON DE PROPRETE

Tous les fonds de fouilles et de fondations recevront une couche de béton de propreté d'une épaisseur minimale de 5 cm. Le béton de propreté est un béton de gravillons dosé à 150 kg de CPA 210/325.

2.2.3- SEMELLES DE FONDATIONS

Les semelles de fondation seront en béton armé dosé à 350 kg de CPA 210/325; elles seront filantes pour tous les murs côtés 15 cm et isolées pour les points porteurs. Les fondations seront descendues jusqu'au bon sol (0,80 m minimum de profondeur). Le ferraillage sera déterminé par calcul d'après les résultats des sondages.
Les fondations seront de type superficiel.

2.2.4- MURS DE FONDATION OU SOUBASSEMENTS

Les murs de soubassement reposent sur les semelles de fondations et montent jusqu'au chaînage inférieur des murs. Ils seront construits en parpaings pleins de 20 x 20 x 40 cm hourdés au mortier de ciment dosé à 350 kg de CPA210/325 bloqués par les poteaux d'ossature.

ARTICLE 2.3- BETON ARME MAÇONNERIE

2.3.1- GENERALITES

TOLERANCES ET JEUX

Les tolérances de mise en oeuvre du béton armé seront conformes aux règles B.A.E.L, dernière version. Les tolérances de dimensions ne devront pas dépasser 0,5 cm, compte tenu des jeux nécessaires à la mise en place des éléments éventuellement préfabriqués des façades.
Les fourreaux et éléments incorporés seront implantés dans les coffrages avec une tolérance de 0,5 cm.
Toutes les cotes seront vérifiées.

Pour mettre la mise en place des éléments de menuiseries, les tolérances seront très faibles:
- tolérance de dimension: ± 5 mm;
- tolérance d'équerrage:
  . différence inférieure à 5 mm entre les deux diagonales d'une même ouverture;
  . différence inférieure à 5 mm entre les côtés opposés d'une même ouverture.

Ces tolérances constitueront des maxima à ne pas dépasser notamment en ce qui concerne les éléments, de façon à ne pas nuire à l'étanchéité des menuiseries.

- Verticalité: ± 1 cm sur la hauteur du bâtiment.

- Eléments de cloisonnement: pour ces éléments, il est expressément rappelé que, conformément aux règles de l'Art, aucune tolérance ne sera acceptée surtout en ce qui concerne la verticalité, la planéité et l'équerrage des cloisons.

DOSAGE DES BETONS

Les compositions à employer sont celles à minimum de sable assurant:
- un béton plein;
- une résistance à 7 et 28 jours supérieure à celle exigée ci-dessous;
- une facile mise en place.

Les dosages préciseront les quantités de gravillons, de sable et de liant nécessaires à l'obtention des résistances à 28 jours indiquées sur les plans et les pièces écrites de la façon suivante:
- V 28 - contrainte de compression à obtenir avec des essais d'écrasement à 28 jours;
- V 28 - contrainte de traction à obtenir avec les essais à la flexion à 28 jours.

GRANULARITE DES BETONS (A TITRE INDICATIF)

GRAVILLONS OU CAILLOUX (Vm3)	SABLE GRANULO. ET QUANTITE (Vm3)	NATURE DU CIMENT, RESISTANCE A LA COMPRESSION DU MORTIER (7 et 28 jours)	DOSAGE/CIMENT (kg/m3 béton)	DESTINATION	DESIGNATION DU BETON	
					COMPRESSION 28 (kg/cm2)	TRACTION 28 (kg/cm2)
20/60 800	0.08/20 400	CLK 250 ou CPJ 35	250	Béton de prop., Remplissage	184	18.1
10./25 750	0.08/5 600	CPA 325 ou CPJ 35	300	Fondations	235	21.2

10./25 ou 5/15 750	0.08/5 600	CPJ 325 ou CPA 325	350	Murs porteurs et assimilés	275	23.7
10./25 750	0.08/5 600	CPJ 35 ou CPA 325	400	Eléments Préfabriqués	306	25.5

CONFECTION ET CONSISTANCE DES BETONS

La confection des bétons sera effectuée par malaxage dans les appareils mécaniques comportant obligatoirement des récipients étalonnés recevant pour mesure, avant introduction, les quantités de ciment et granulats nécessaires à chaque gâchée et un dispositif de contrôle de la quantité d'eau introduite. Cette eau de gâchage sera soumise aux conditions de la NF P 18.303.

Les produits obtenus devront être parfaitement homogènes et présenter des granulats parfaitement enrobés de liant, la durée de malaxage étant suffisante pour obtenir le résultat voulu.

Il ne sera incorporé que la quantité d'eau strictement nécessaire pour donner au béton la consistance "béton ferme" suivant dénomination du DTU N° 20.

Tous les bétons et mortiers desséchés ou rebattus seront rejetés hors du chantier.

Sauf dérogation accordée par le contrôle, la consistance des bétons sera telle que les affaissements au cône d'Abrams (Slump test) seront au maximum, les suivants:
- béton ordinaire en fondation et en grande masse: 4 cm;
- béton armé pour ouvrages : 5 cm;
- pièces préfabriquées : 3 cm.

MISE EN PLACE DES BETONS

Celle-ci sera toujours faite afin d'éviter toutes cavités sauf celles inhérentes à sa structure, ainsi que toute introduction de matières ou corps étrangers.

Elle sera effectuée suivant les prescriptions du DTU par vibration pour tous les ouvrages en béton armé.

Le coffrage sera exécuté conformément aux normes et dans le respect des règles de l'Art. Le béton sera décoffré dès qu'il aura atteint une résistance triple de la contrainte de compression qu'il subit à la suite du décoffrage.

Toutes les précautions nécessaires seront prises dès le coulage du béton pour assurer sa bonne conservation. La cure des bétons sera assurée par humidification par l'intermédiaire de paillassons maintenus constamment humides et disposés dès que le béton aura commencé à faire prise.

Les surfaces d'arrêt de coulage doivent être horizontales; les reprises sur surfaces verticales doivent être évitées. Toutefois, s'il ne peut être fait autrement, les surfaces verticales seront limitées par un coffrage approprié.

De semblables joints verticaux comportement une rainure pour assurer une meilleure liaison avec la partie encore à exécuter; cette rainure pourra être obtenue à l'aide d'une pièce de bois à section triangulaire.

ADJONCTION D'HYDROFUGES

L'hydrofuge sera utilisé dans la réalisation des planchers bas afin d'éviter les remontées capillaires dans l'exécution des enduits étanches pour cuvelage. L'hydrofuge sera du type SIKA CRETE ou similaire.

FAÇONNAGE ET CONFECTION DES ARMATURES

Les armatures seront façonnées de manière à respecter les formes prévues aux dessins d'exécution approuvés par le Maître d'oeuvre suivant les règlements et normes en vigueur.

La coupe et le cintrage des armatures seront effectués à froid.

MISE EN PLACE DES ARMATURES

Les armatures seront disposées dans les moules aux emplacements prévus aux dessins d'exécution et y seront arrimées par ligatures et cales judicieusement disposées, de solidité convenable et en nombre suffisant pour que ces armatures ne puissent se déplacer, soit pendant la mise en place du béton, soit du fait de la circulation des ouvriers ou autres.

Au moment de la mise en oeuvre du béton, les armatures devront être parfaitement propres, sans souillures de rouille non adhérente, de peinture, de graisse, d'huile, de mortier, de béton ou de terre.

ETUDE, CONCEPTION, CONFECTION DES COFFRAGES

Les coffrages, les échafaudages et les cintres devront être conçus pour résister, sans déformation excessive et avec le coefficient de sécurité voulu, à toutes les charges à supporter jusqu'au décoffrage ou au décintrement.

Leurs déformations sous les actions de toute nature agissant ou susceptible d'agir sur eux, ne devront pas pouvoir causer de dommages aux ouvrages frais coulés ou en cours de prise et durcissement. Leur stabilité sera telle qu'elle ne puisse porter atteinte à la sécurité des personnes et de l'environnement.

La flèche maximum qu'ils pourront prendre n'excédera pas 1/100 ème de la portée.

Les coffrages devront avoir, en tout point, les dispositions et les orientations prévues, de manière à réaliser avec précision, les formes des ouvrages. Ils devront être étanches.

Les emplacements des scellements de toutes natures seront réservés dans les coffrages conformément aux indications des plans de montage des différentes pièces d'équipement.

Les coffrages devront être suffisamment propres pour ne laisser aucune tâche sur le parement des ouvrages.

Toutes les reprises, tous les ragréages seront meulés après séchage, de manière à livrer une surface régulière, de teinte et d'aspect uniforme.

2.7.2- BETON ARME

Il sera exécuté en béton armé tous les ouvrages nécessaires à la stabilité de l'édifice, notamment:
- les chaînages horizontaux;
- les linteaux de portes et de fenêtres;
- Les poteaux et poteaux raidisseurs;
- les formes d'aire;
- les ouvrages divers tels: couronnement, dalettes de puisards et regards etc.....

Tous les coffrages et armatures nécessaires ainsi que toutes sujétions d'étaiement, de vibrages, de décoffrages, etc. seront prévus.

2.7.3- COFFRAGES

En planches non rabotées y compris toutes sujétions de mise en oeuvre.

2.7.4- CHAINAGE BAS DES MURS DE SOUBASSEMENT

En béton armé dosé à 350 kg de CPA 210/325 au niveau de la dalle du plancher bas; dimensions: 20 x 15 cm hauteur.

2.7.5- CHAINAGES HAUTS

En béton armé dosé à 350 kg de CPA 210/325; dimensions 15 x 15 cm.

2.7.6- POTEAUX

En béton armé dosé à 350 kg de CPA 210/325 chaque fois qu'ils seront rendus nécessaires à la stabilité ou au raidissement de la construction après avis de contrôle.

2.7.7- LINTEAUX

En béton armé dosé à 350 kg de CPA 210/325; prévoir les réservations pour feuillures et dormants.

2.7.8- POUTRES

En béton armé dosé à 350 kg de CPA 210/321 à chaque fois qu'elles seront rendues nécessaires à la stabilité de la construction après avis du contrôle (Néant).

2.7.9- REMBLAI COMPACTE

Les planchers de sol reposeront sur un remblai latéritique compacté humide par couches de 20 cm de sorte qu'il présente une compacité de 95 % du PROCTOR modifié.

2.7.10- PLANCHERS SOLS,

Planchers de sols : ils seront en gros béton armé par treillis soudés métallique. Epaisseur minimale de 8 cm. La forme d'aire sera arasée au niveau supérieur du chaînage bas. Une humidification du plancher qui ne sera mise en oeuvre que sous abri, devra être respectée pendant les premiers jours de séchage.

2.7.11- MURS EN ELEVATION ET CLOISONS

Les murs et les cloisons seront respectivement en parpaings creux de 15 x 20 x 40 et de 10 x 20 x 40; les agglomérés seront hourdés au mortier de ciment dosé à 400 kg de CPA 210/325 par m3 de sable.

2.7.12- ENDUITS EXTERIEURS

Toutes les faces extérieures vues des maçonneries ou des ouvrages en béton recevront un enduit de ciment projeté en trois (3) couches:

- 1ère couche: d'accrochage de 4 à 5 mm d'épaisseur au mortier de ciment dosé à 500 kg de CPA 210/325;
- 2ème couche: de dressage de 10 à 12 mm d'épaisseur au mortier de ciment dosé à 400 kg de CPA 210/325;
- 3ème: finition de 7 à 8 mm d'épaisseur au mortier bâtard de ciment blanc et de chaux blanche type LAFARGE 400 ou similaire, additionné d'un oxyde de coloration; coloris au choix du Maître d'œuvre Associé.

2.7.13 - ENDUITS INTERIEURS

Toutes les faces intérieures vues des ouvrages en maçonnerie ou en béton recevront un enduit de ciment de 15 mm d'épaisseur au mortier de ciment dosé à 300 kg de CPA 210/325, taloché fin y compris toutes sujétions d'arêtes.

2.7.14- SEUILS DE PORTES

Glacis de ciment sans saillie au nu extérieur avec pente de 2 % (2 cm/m) vers l'extérieur.

2.7.15-APPUIS DE BAIES

Glacis simple au mortier de ciment, sans saillie y compris une pente de 2 % (2 cm/m) vers l'extérieur et rejingot sous pièces d'appui.

CHAPITRE 3: CHARPENTE, COUVERTURE, ETANCHEITE

ARTICLE 3.1- GENERALITES

3.1.1- RAPPEL DES DTU APPLICABLES

Charpente: DTU N° 32-1;
Couverture: DTU N° 40-32: couverture en plaques ondulées métalliques;

3.1.2- RAPPEL DES PRINCIPALES NORMES

NFA 35 001 ronds carrés plats exogames;
PNA 35 501 tôles fortes et moyennes, larges plats laminés marchands et poutrelles;
NRA 36 321 plaques en acier galvanisé;
NFA 67 101 plaques ondulées en aluminium;

3.1.3-REGLES DE CALCUL

Règles charpentes métalliques pour le calcul et l'exécution des constructions métalliques dites cm 66.

3.2.1-ETUDES TECHNIQUES

Il est rappelé que les éléments de structure seront calculés par un ingénieur qui fournira les plans d'exécution et les notes de calcul.

ARTICLE 3.3- DESCRIPTION DES OUVRAGES

3.3.1-CHARPENTE

La couverture reposera sur un cours de pannes en IPN de dimensions appropriées aux portées à franchir et d'écartement selon prescriptions du fabricant, qui sera fixé sur le rampant des mur de refend au moyen d'attaches permettant la libre dilatation.

3.3.2- COUVERTURE

Couverture en bacs NIGERAL de type ALUZINC de 35/100 d'épaisseur. Ils seront fixés sur les pannes au moyen de crochets métallique filetés à une extrémité pour la libre dilatation longitudinale et empêcher le soulèvement dû au vent. Il sera prévu l'interposition d'un feutre bitumineux entre la panne et le bac nervuré pour éviter les phénomènes électrolytiques.

La pente de la toiture est de 5% minimum.

3.3.3- ETANCHEITE

Les crochets seront boulonnés sur la face supérieure des bacs après interposition d'une rondelle d'étanchéité. Les bacs pénétreront dans la maçonnerie sur une longueur de cinq (5) centimètres. Un volume de ciment dosé à 400kg/m3 assurera l'étanchéité du raccord.

CHAPITRE 4: MENUISERIES METALLIQUES, SERRURERIE

ARTICLE 4.1- GENERALITES

4.1.1- RAPPEL DES APPLICABLES

- DTU N°37.1 Travaux de menuiserie métallique additif d'Avril 1971;
- DTU N°36.1-de mai 1974:choix des fenêtres en fonction de leur exposition;

4.1.2- RAPPEL DES NORMES PRINCIPALES APPLICABLES

MENUISERIES METALLIQUES

- NFP 24.302: caractéristiques des fenêtres;
- NFP 24 101: Terminologie;
- NFP 24 301: Spécifications;
- NFP 24 351: Protection des menuiseries contre la corrosion.

SERRURERIE
- Cahier N° 91 du CSTB livraison N°9;
- Normes NFP applicables aux travaux de serrurerie.

4.1.3-ESSAIS
- NFP 20 501: Essais physiques et mécaniques des fenêtres.

NOTA: les dimensions figurant aux plans indiquent:
- pour les portes, le passage libre minimum;
- pour les fenêtres, les cotes en tableau;

Les sections minimales sont définies par les normes; il sera tenu compte de la résistance au vent en fonction de l'implantation. Des détails d'exécution devront être soumis à l'agrément du contrôle qui pourra faire augmenter les sections jugées insuffisantes et ce, sans supplément au niveau du prix.

Il sera réalisé la protection anti-corrosive par une couche de peinture antirouille après sablage.

ARTICLE 4.3- DESCRIPTION DES OUVRAGES

4.3.1- SERRURERIE, QUINCAILLERIES

Les différentes pièces seront de type économique et robuste.

Clefs: toutes les clefs seront fournies en trois (3) exemplaires. Pour chaque bloc bâtiment, il sera prévu un passe général en trois (3) exemplaires ouvrant toutes les portes.

Arrêts et seuils de portes pour toutes les portes et pour chaque portail.

Les portes et fenêtres comprendront tous les accessoires nécessaires à leur bon fonctionnement: crémones, paumelles, pattes à scellement, etc...

Tous les vitrages prévus sont à poser sur parcloses intérieurs et à bain de mastic.

Les portes pourront être bloquées en position ouverte par des arrêtoirs scellés dans la maçonnerie.

4.3.2-BATIS DE PORTES

Ils seront réalisés en profilés de tôles d'acier pliés à froid.

4.3.4-PORTES DONNANT SUR L'EXTERIEUR

Ils seront réalisés en profilés de tôles d'acier pliés à froid. L'attention de l'Entrepreneur est particulièrement attirée sur le soin à apporter à la conception des menuiseries, notamment aux dispositions visant à assurer leur étanchéité. Dans tous les cas, un joint THIOKOL ou similaire sera interposé entre les montants et les traverses hautes et basses des ensembles menuisés et la maçonnerie. Ce joint sera mis en place avant la pose des menuiseries.

4.3.5- GRILLES DE VENTILATION

Devant toutes les ouvertures de ventilation, il sera prévu un grillage anti-vermine sur cadre métallique placé au nu des murs intérieurs (Néant).

4.3.5- NOMENCLATURES DES PORTES METALLIQUES

(Voir les détails estimatifs).

CHAPITRE 5: ELECTRICITE

ARICLE 6.1- GENERALITES

6.1.1-RAPPEL DES DTU ET DES PRINCIPALES NORMES APPLCABLES

. DTU 70.1 installations électriques des bâtiments à usage d'habitation;
. DTU 70.2 installations électriques des bâtiments à usage collectif;
. NFC 14 100-1964 et additifs installations,branchements;
. NFC 15 100- Installations électriques de 1ère catégorie;
. NFC 13 127;
. NFC 13 100;
. NFC 13 200;
. NFC 93 001 et 93 420 composants électriques;

Le bâtiment sera alimenté en électricité par la NIGELEC. L'on se mettra en rapport avec les services intéressés pour obtenir tous les accords et les renseignement utiles pour l'exécution des travaux.

Il se soumettra à toutes exigences, vérifications et visites des agents de ces services et fournira tous les documents et pièces justificatives demandés. Les offres seront réputées établies en parfaite connaissance des obligations prescrites par la NIGELEC.

ESSAIS

Essais thermiques, aérauliques, électriques en concordance avec les fiches techniques 81 T 102 Spécifications et CT 475 B Performances techniques.

ARTICLE 6.2- TRAVAUX

On procédéra à la pose de tous appareils, appareillages, conduits, fils, câbles et tous accessoires auxiliaires et matériaux nécessaires à l'exécution dans les règles de l'Art et du complet achèvement des installations qui devront être livrées complètes, conformes aux normes et en bon ordre de marche. Dans le cadre de marché seront compris:

- les essais ainsi que la mise en route et le réglage des installations après la mise sous tension de celles-ci;
- la fourniture d'instructions claires et précises sur la conduite et l'entretien des appareils;
- le repérage des circuits dans les armoires et tableaux de distribution;
- les plans et schémas d'exécution;

TABLEAU GENERAL

Il sera prévu un tableau général d'arrivée d'électricité avec disjoncteurs et fusibles.

RESEAUX

L'installation comportera les réseaux suivants:

- R1: Eclairage et prises de courant;
- R2: Ventilation;

Chacun de ces réseaux aura son circuit propre et sera raccordé à la terre.

DESCRIPTION DES APPAREILS

Toutes les alimentations secondaires se feront sous fourreaux conformes aux normes, soit encastrés dans la maçonnerie (agglos).

Fixation des appareils et appareillages par le système prévu par le fabricant.

. Tubes fluorescents: blocs standard de 600mm; type RB MC 40 N 20 des Etablissements MAZDA ou similaire;
. Globes opalins de format carré: Catégorie standard des Etablissements MAZDA ou similaire;
. Prises de courant de la série NEPTUNE encastrées à griffe. Type 801 19 des Etablissements LEGRAND ou similaire; option étanche pour l'extérieur (Néant).
. Interrupteurs simple allumage de la série NEPTUNE encastrés à griffe des Etablissements LEGRAND ou similaire;
. Appliques de lavabos: modèle standard de type 690 80 des Etablissements LEGRAND ou similaire; prévoir les diffuseurs plastiques, prises de courant et toutes sujétions;

CHAPITRE 6. REVETEMENTS DES SOLS ET MURS

ARTICLE 7.1- GENERALITES

RAPPEL DTU ET DES PRINCIPALES NORMES APPLICABLES

- DTU N°52.1 Revêtements de sol scellés additif N°1;
- NFP61.311 à 61.314 grès cérame fin vitrifié.

ARTICLE 7.2- DESCRIPTION DES OUVRAGES

CARRELAGE

posés au mortier de ciment dosé à 450 kg; jointoiement par coulis de ciment pur.
Néant.

PLINTHE

Prévoir pour tous les locaux, excepté ceux recevant de la faïence murale ou de la chape bouchardée, une plinthe encastrée de 10cm de hauteur de même nature que le revêtement du sol.
Néant.

FAIENCES MURALES

Faïences blanches de 108 x 108 posées à la colle, sur tous les murs des locaux sanitaires sur une hauteur de 1,60 m. Faïences également pour la paillasse et le dessus de paillasse.

CHAPE BOUCHARDEE

Néant.

CHAPITRE 7: PLOMBERIE, SANITAIRES, ASSAINISSEMENT

ARTICLE 8.1- GENERALITES

RAPPEL DES PRINCIPALES NORMES

- NFP 16 301 NFP 16 403 à 16 410;
- NFP 98 301 à 401;
- Code de santé publique;
- Code de l'urbanisation.

Le terrain est déjà alimenté en eau potable à partir du réseau interne AEP.

ARTICLE 8.2- DESCRIPTION DES OUVRAGES

BRANCHEMENT D'EAU : Branchement à partir du réseau interne au site, par tuyaux galvanisés y compris toutes sujétions de pose.

ALIMENTATION EN EAU : L'installation devra être conforme aux normes générales et aux règlements de la SNE. La distribution se fera par tubes galvanisés, le raccordement des appareils en tubes de cuivre montés sur colliers démontables en acier nickelé y compris façons et raccords.

CANALISATIONS AEP : Elles seront posées en tranchées à 1,00 m de profondeur du sol fini, sur un lit de pose de 0,10 m d'épaisseur et recouvertes d'une couche de sable de protection de 0,20 m d'épaisseur.

L'Entrepreneur prendra toutes les dispositions pour poser ou faire poser à sa charge, les fourreaux nécessaires avant le coulage des fondations et dalles.

DESCRIPTION DES APPAREILS SANITAIRES : Chaque appareil ou groupe d'appareils sera commandé par une vanne d'arrêt. Les appareils seront de type économique et robuste; ils seront équipés de tous les accessoires nécessaires à leur bon fonctionnement.

INVENTAIRE DES APPAREILS : Voir documents graphiques et devis estimatifs.

ASSAINISSEMENT
Les ouvrages d'assainissement seront réalisés conformément aux plans.

EAUX PLUVIALES
Toutes les parties des constructions doivent présenter des dispositions de nature à assurer l'écoulement rapide des eaux pluviales.

La réalisation des ouvrages devra être telle que les eaux pluviales des toitures ne pourront pas s'écouler sur la voie publique ni d'une propriété à l'autre.

Les murs de clôture ne devront favoriser en aucun cas, la stagnation des eaux pluviales.
FOSSES SEPTIQUES ET PUISARDS
Uniquement un Puisard est prévu avec un système de Mini Station d'Epuration.

CHAPITRE 8: PEINTURE

PEINTURE

ARTICLE 9.1- GENERALITES

RAPPEL DES DTU ET DES PRINCIPALES NORMES APPLICABLES
- DTU N° 59.1 travaux de peinture (peinturage) et additifs;
- Décisions N°1 et N°2 émanant du GPEMPV
- peinture: Spécifications UNP; NFT 30.003 : produits employés en peinture.

NETTOYAGE DE MISE EN SERVICE
Les travaux de nettoyage de concernent toutes les parties apparentes: sols, revêtements verticaux, quincailleries, appareils électriques, glaces y compris balayage et évacuation. Ces travaux ont pour but de livrer les locaux en parfait état de propreté pour la réception provisoire avant prise de possession par le Maître d'Ouvrage.

ARTICLE 9.2- QUALITE, CHOIX DES MATERIAUX ET MATERIELS

DEFINITION GENERALE DE QUALITE
Tous les matériaux et matériels mis en oeuvre devront obligatoirement répondre:
- aux normes énumérées ci-dessus;
- aux différents labels de qualité;
- pour tous les matériaux et matériels nouveaux, à un label de qualité, à un agrément ou à un avis technique favorable édité soit par le CSTB, soit par un organisme public local.

A défaut, afin de prouver sa bonne qualité pour l'utilisation qui en est faite, ce matériau ou matériel subira tous les essais nécessaires. Il sera en outre obligatoirement soumis à l'agrément du contrôle.

Toutes les fournitures utilisées doivent être obligatoirement neuves et de première qualité.

Dans les lignes qui suivent, la nature des matériaux sera précisée chaque fois que cela sera utile à une définition sans ambiguïté de leur qualité. Les fournitures proposées ne pourront, en aucun cas, être de qualité inférieure.

CHOIX DES MATERIAUX ET MATERIELS
Il sera prévu obligatoirement les matériaux désignés dans les pièces écrites du dossier. Les différents matériaux et matériels retenus seront, avant le commencement des travaux soumis à tous contrôles et essais nécessaires.

Le contrôle se réserve la possibilité de refuser les matériaux et matériels qui ne seraient pas conformes aux demandes du présent Cahier de Clauses Techniques Particulières.

Le Maître d'oeuvre effectuera un choix de coloris dans la gamme complète du matériau retenu. Il aura la faculté de choisir plusieurs teintes dans chaque catégorie de matériau.

NATURE DES CONSTITUANTS

- Mastic: Mastic à l'huile de lin obtenu par mélange de craie et d'huile de lin répondant aux spécifications de la norme NFP 78 331.

- Enduits: Enduit à l'eau pelliculaire à base de liants organiques et matériaux, de pigments pulvérisés et triés en pâte prête à l'emploi.
- Peinture glycérophtalique: Email glycérophtalique satiné thixotropique à base de résines alkyles hautement polymérisées, oxyde de titane rutile classe III suivant spécifications de la norme NFT 30.003 pour métaux ferreux ou peinture au chromate de zinc.

- Peinture anti-rouille à la poudre de zinc glycérophtalique classe III suivant spécifications de la norme NFT 30.003 pour métaux non ferreux, éléments galvanisés.

- Vernis: Vernis glycérophtalique classe III suivant spécifications de la norme NFT 30.003.

- Peinture garnissante: peinture garnissante crépie plastique à forte teneur en terpolymère classe X groupe 3 suivant spécifications de la norme NFT 30.003.

RELATIONS AVEC LES AUTRES CORPS D'ETAT
Une coordination étroite devra s'établir entre les différents corps d'état et notamment pour mettre au point:
- l'aspect des différents subjectiles;
- la qualité et la planéité des rebouchages de trous,
passages de canalisations, etc...;
- la qualité des pré-traitements effectués au niveau des autres corps d'état;
- la compatibilité avec les impressions ou les traitements effectués.

PRESCRIPTIONS GENERALES DE MISE EN OEUVRE
La mise en oeuvre de tout ou partie des matériaux constituant les ouvrages devra respecter les critères et directives particulières regroupés sous le vocable de "règles de l'art".

L'application des produits pourra s'effectuer, soit naturellement, soit mécaniquement, le choix de la méthode sera arrêté en fonction des subjectiles, de l'aspect de finition et des spécifications de la fiche technique du fabricant.

- Transport, manutention , stockage: Ces opérations doivent s'effectuer avec précaution afin d'éviter toute altération des matériaux nuisant à leur pose, à leur résistance et à leur aspect.

Les divers produits seront stockés sur des emplacements à l'abri de toute intempérie dans un local spécialement conçu pour cet usage.

Travaux avant peinturage: il devra être exécutés tous travaux préparatoires et d'apprêt pour rendre aptes à l'application tous les subjectiles et notamment:

SUBJECTILES A BASE DE LIANT HYDRAULIQUE
. Meulage, ébavurage (PM = au gros oeuvre);
. Egrenage;
. Brossage;
. Epoussetage;
. Dégrossissage du bullage et des creux et balèvres;
. Impressions;
. Enduisages.

SUJECTILES BOIS ET DERIVES
. Brossage;
. Ponçage;

. Essuyage soigné;
. Imprégnations ou impressions suivant les sujectiles et le traitement désiré;
. Masticage, bouche porage;
. Enduisages.

SUJECTILES METALLIQUES:
(Suivant la nature du subjectile, les travaux devront être parfaitement adaptés)
. Dégraissage;
. Décapage du vert-de-gris;
. Enlèvement de la rouille;
. Elimination de la calamine;
. Couche primaire inhibitrice de corrosion;
. Enduisages, masticage.

RACCORDS ENTRE MATERIAUX DIFFERENTS
Pour limiter les fissurations, il sera procédé à la mise en oeuvre de bandes de calicot, tissu naturel ou synthétique à cheval sur le raccord; cette armature sera noyée dans la couche d'apprêt;

FISSURES
Les fissures seront traitées dans les rebouchages et dégrossissages; comme pour les raccords, des bandes d'armatures seront disposées.

Les couches de finition devront être compatibles avec la couche d'impression ou la couche intermédiaire et également être compatibles entre elles.

Un ponçage, un brossage et un époussetage devront être effectués dans l'intervalle de l'application des couches successives.

La couche de finition donnera l'aspect définitif prescrit et la couleur désirée.

ARTICLE 9.4- DESCRIPTION DES OUVRAGES

9.4.1-GENERALITES

Les travaux concernent la réalisation des ouvrages suivants:
- peintures intérieures;
- ravalements extérieurs
- travaux divers.

9.4.2- PEINTURE SUR OUVRAGES EN BETON OU EN MAÇONNERIE, ASPECT LISSE OU SATINE

Peinture plastique vinylique satinée y compris tous les travaux préparatoires et d'apprêt:
- égrenage, brossage;
- enduit repassé afin d'obtenir une surface lisse et uniforme;
- ponçage et époussetage;
- couche de peinture intermédiaire compatible avec la couche de finition et répondant aux spécifications techniques du fournisseur;
- révision générale;
- couche de peinture de finition.

Prévoir des couches de laque glycérophtalique avec ponçage pour les sanitaires et des couches d'émulsion polyvinylique pour tous les autres locaux.

Une attention toute particulière devra être observée en ce qui concerne la qualité et l'aspect des travaux préparatoires et d'enduisage.

D'autre part, la nature et la qualité de la peinture utilisée en couche intermédiaire devront correspondre à la peinture de finition. Dans le cas où des traces d'huile de démoulage subsisteraient, les zones douteuses seront traitées tout spécialement.

9.4.3- PEINTURE SUR OUVRAGES BOIS: Néant

9.4.6- RAGREAGE MURS

Sur murs, brossage, époussetage, ragréage partiel à la demande pour bouchement des trous par un produit de charge.

9.4.7- RAVALEMENT EXTERIEUR

Peinture garnissante plastique de marque ZOLPAN, ZOLGRAIN ou similaire y compris tous travaux préparatoires:
- Egrenage, brossage et révision complète des subjectiles;
- Couche de peinture d'impression diluée à 50 % suivant qualité du support;
- Couche de peinture intermédiaire diluée à 20 %;
- Couche de peinture de finition

La qualité de finition sera soignée.

Les travaux comprendront également, pour certains ouvrages, l'enduisage avec un produit spécial parfaitement adapté du type ZOLDAN ZOLENDUIT (ou similaire) afin d'obtenir des surfaces en finition "très soignée".

Aucune prise visible ou phénomène de "fantôme" ne sera toléré.

9.4.8- TRAVAUX DIVERS

Les travaux comprendront en outre:
- Le nettoyage de tous les locaux en nombre de fois nécessaires, afin qu'il ne subsiste pas de détritus, gravois et autres;
- Le nettoyage des graines techniques verticales qui ne sont pas traitées dans le paragraphe précédent (brossage et époussetage des parois et plafonds);
- Le lavage à l'éponge et l'essuyage soigneux des appareils sanitaires, miroiteries, tuyauteries et carrelages, arrachage des papiers de protection.

VITRERIE, MIROITERIE

ARTICLE 9.5- VITRERIE, MIROITERIE

Vitrages en verre simple posé à bain de mastic et parcloses. (Néant).

CHAPITRE 9 : AMENAGEMENT DES ABORDS, SECURITE INCENDIE

ARTICLE 10.1- GENERALITES

Les travaux seront réalisés conformément aux articles suivants:
- Gros-oeuvre;
- Menuiseries métalliques.

ARTICLE 10.2- DESCRIPTION DES OUVRAGES

VRD: VOIES DE CIRCULATIONS, PLANTATIONS:

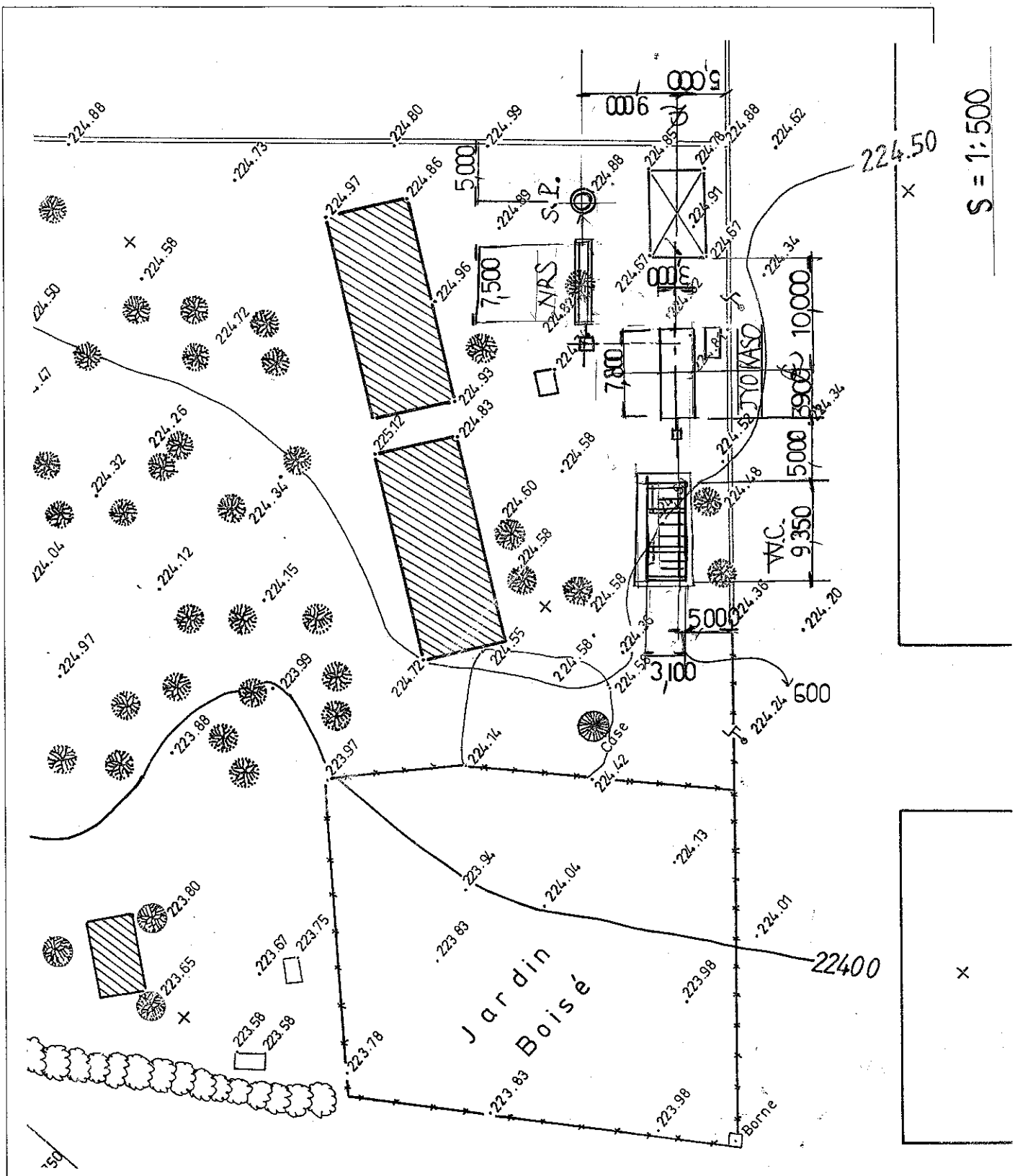
NEANT.

CLOTURE:

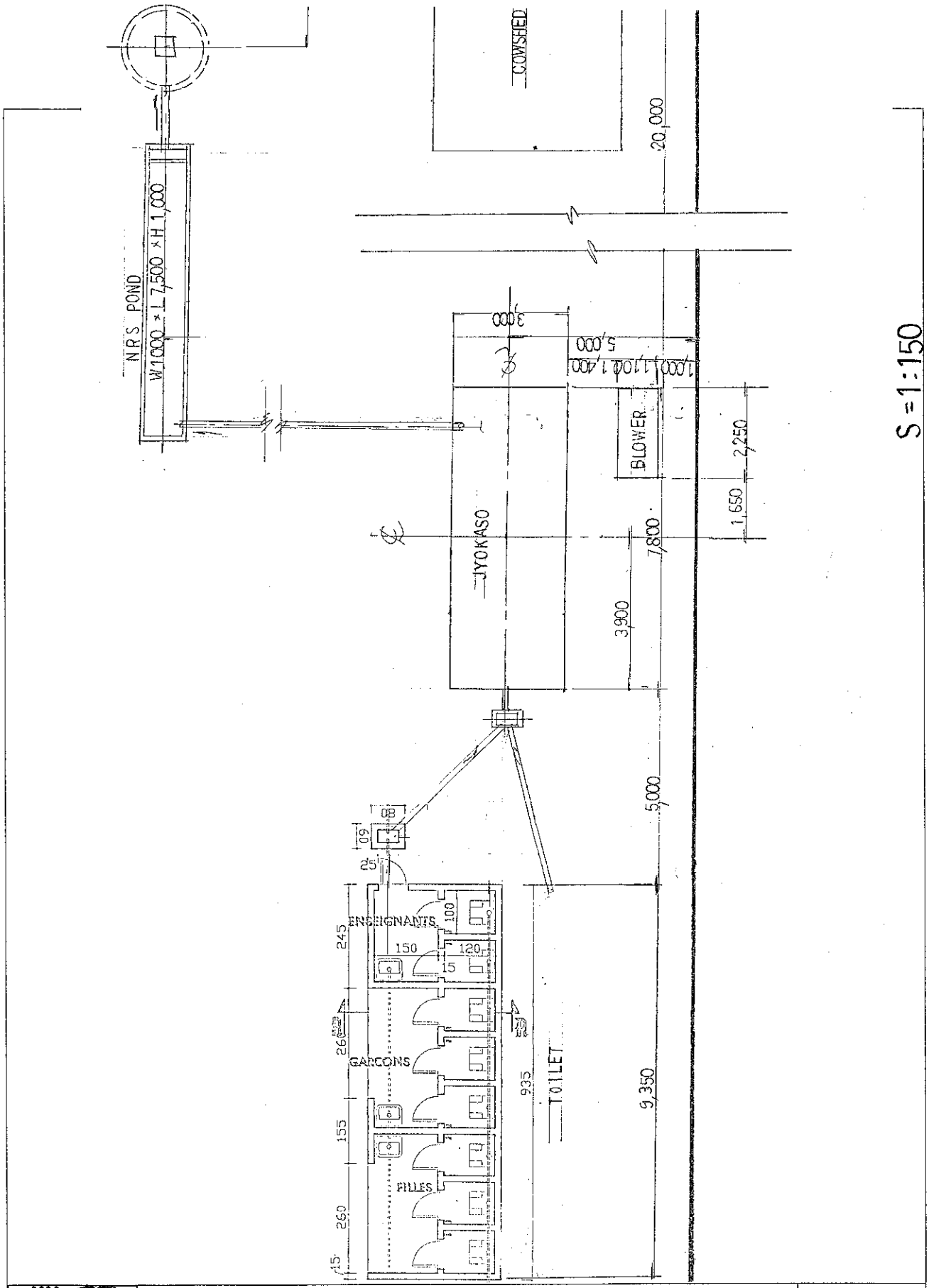
Néant.

APPENDIX R.5 JYOKASO DRAWING

R.5 JYOKASO DRAWING



JICA	*The Study on Sanitation Improvement for the Niamey City in the Republic of Niger*	Figure
TOPOGRAPHI PLAN OF JYOKASO PILOT PLANT		



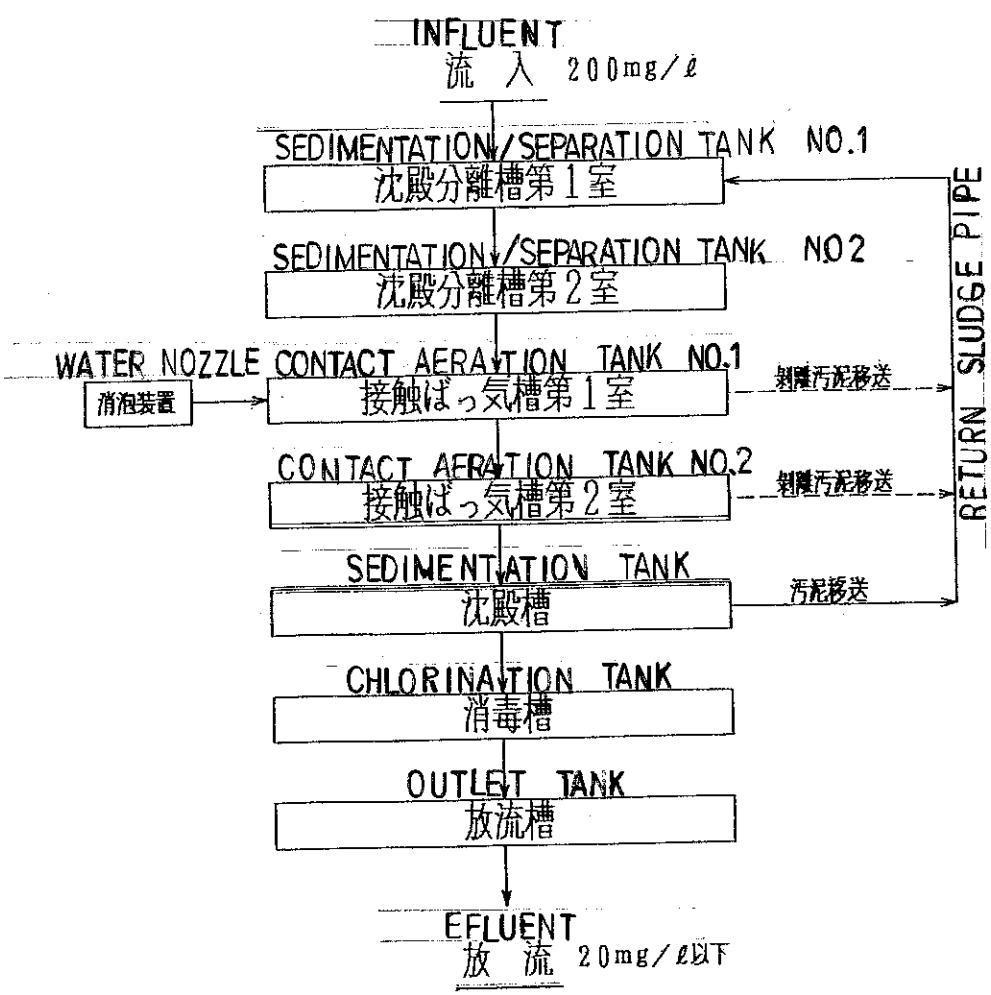
The Study on Sanitation Improvement for the Niamey City in the Republic of Niger

Figure

LAYOUT PLAN OF JYOKASO PILOT PLANT

フローシート

SCHEMATIC FLOW



JICA	*The Study on Sanitation Improvement for the Niamey City in the Republic of Niger*	Figure
	JYOKASO / SCHEMATIC FLOW	

JICA

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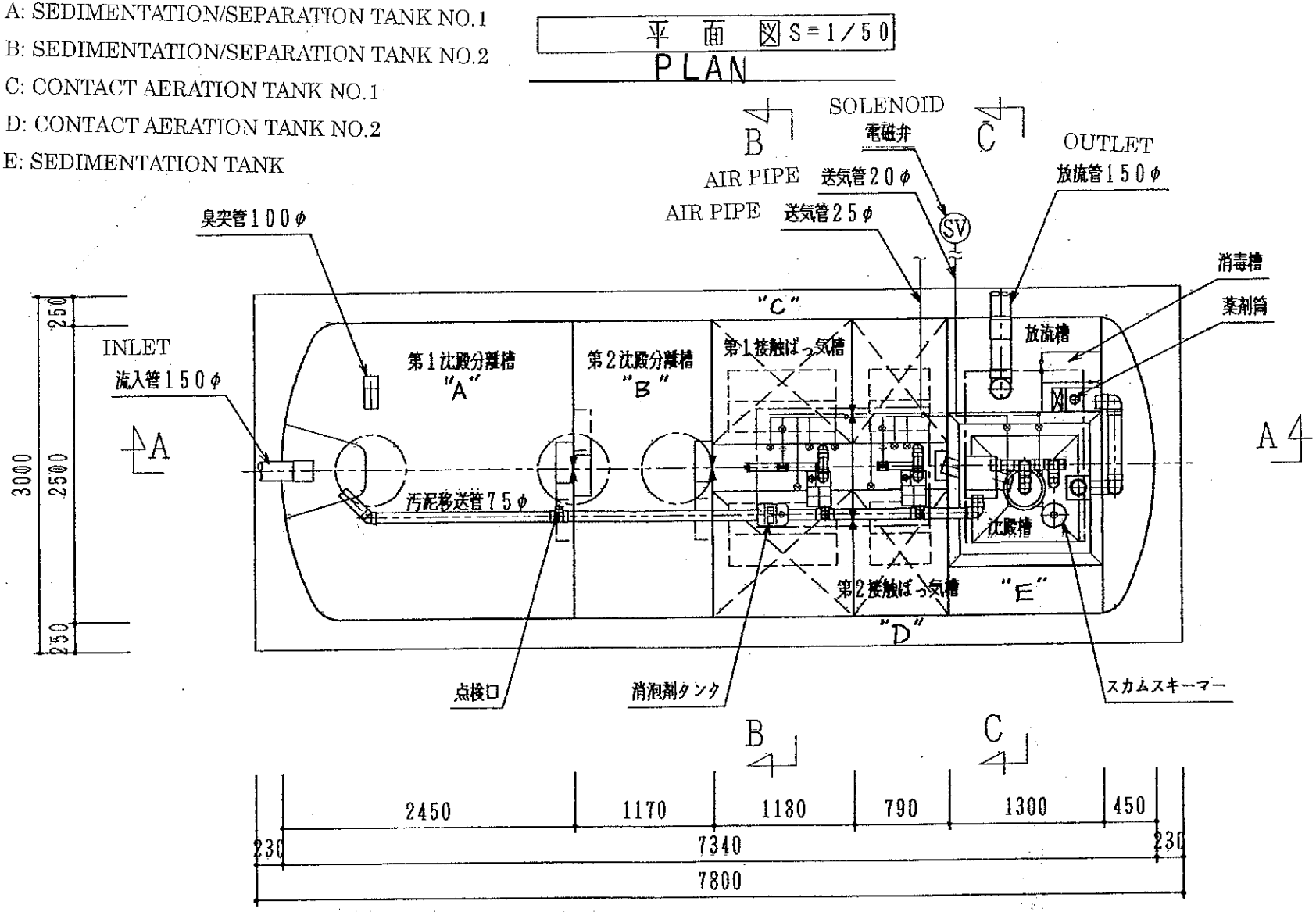
JYOKASO / PLAN

Figure

A: SEDIMENTATION/SEPARATION TANK NO.1
B: SEDIMENTATION/SEPARATION TANK NO.2
C: CONTACT AERATION TANK NO.1
D: CONTACT AERATION TANK NO.2
E: SEDIMENTATION TANK



JICA

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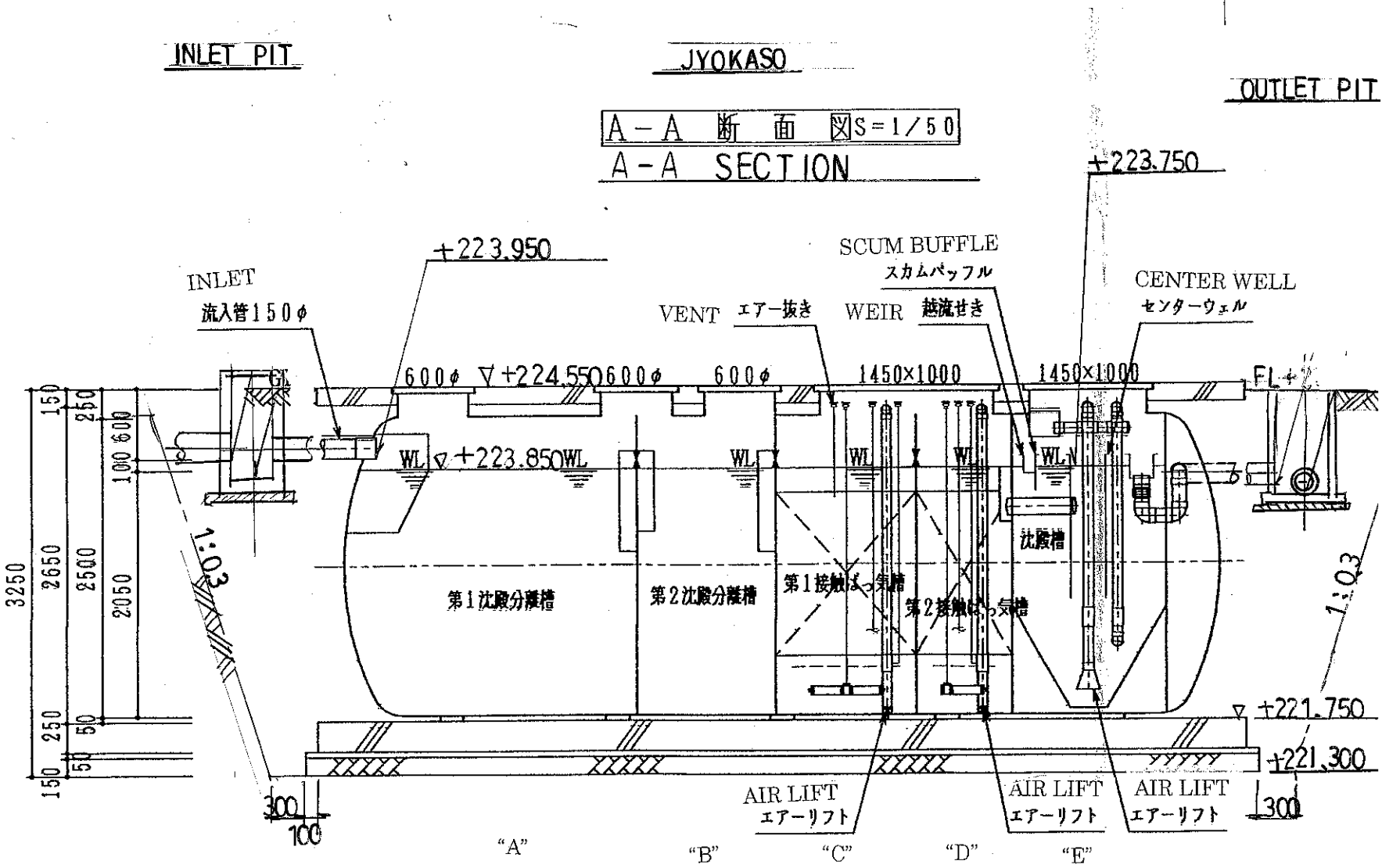
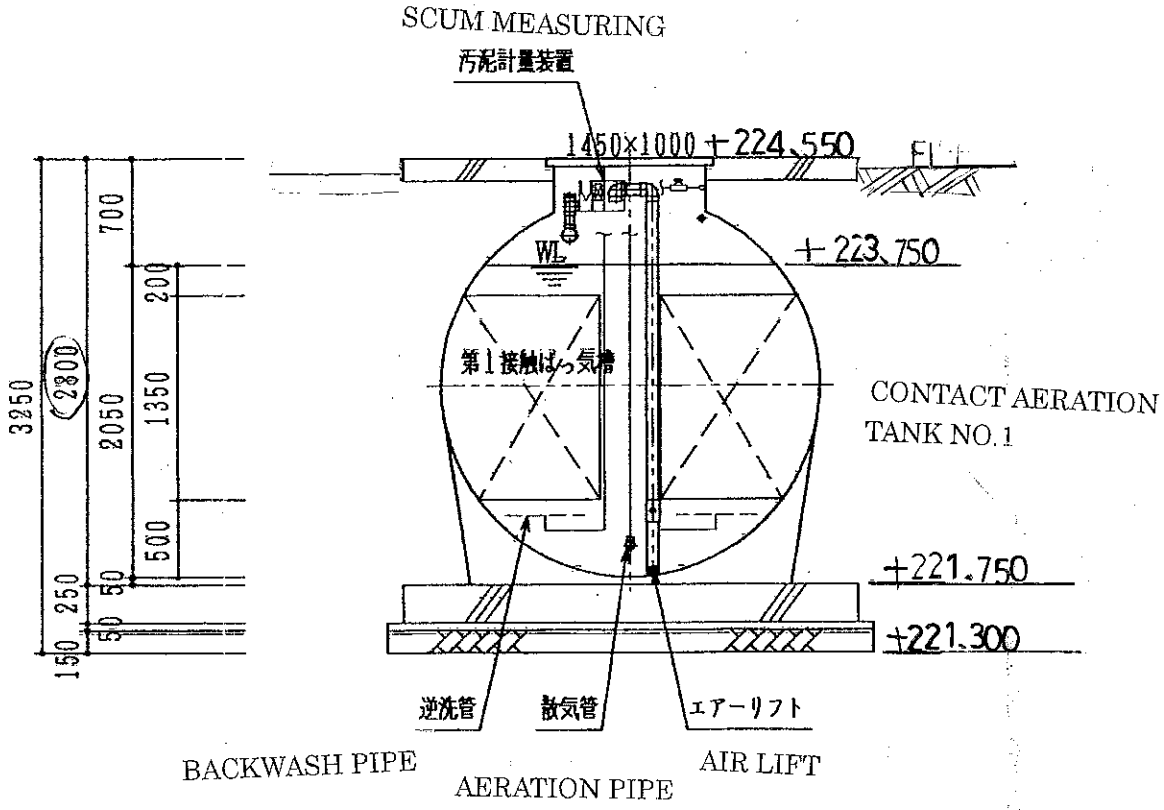
JYOKASO / A-A SECTION

Figure

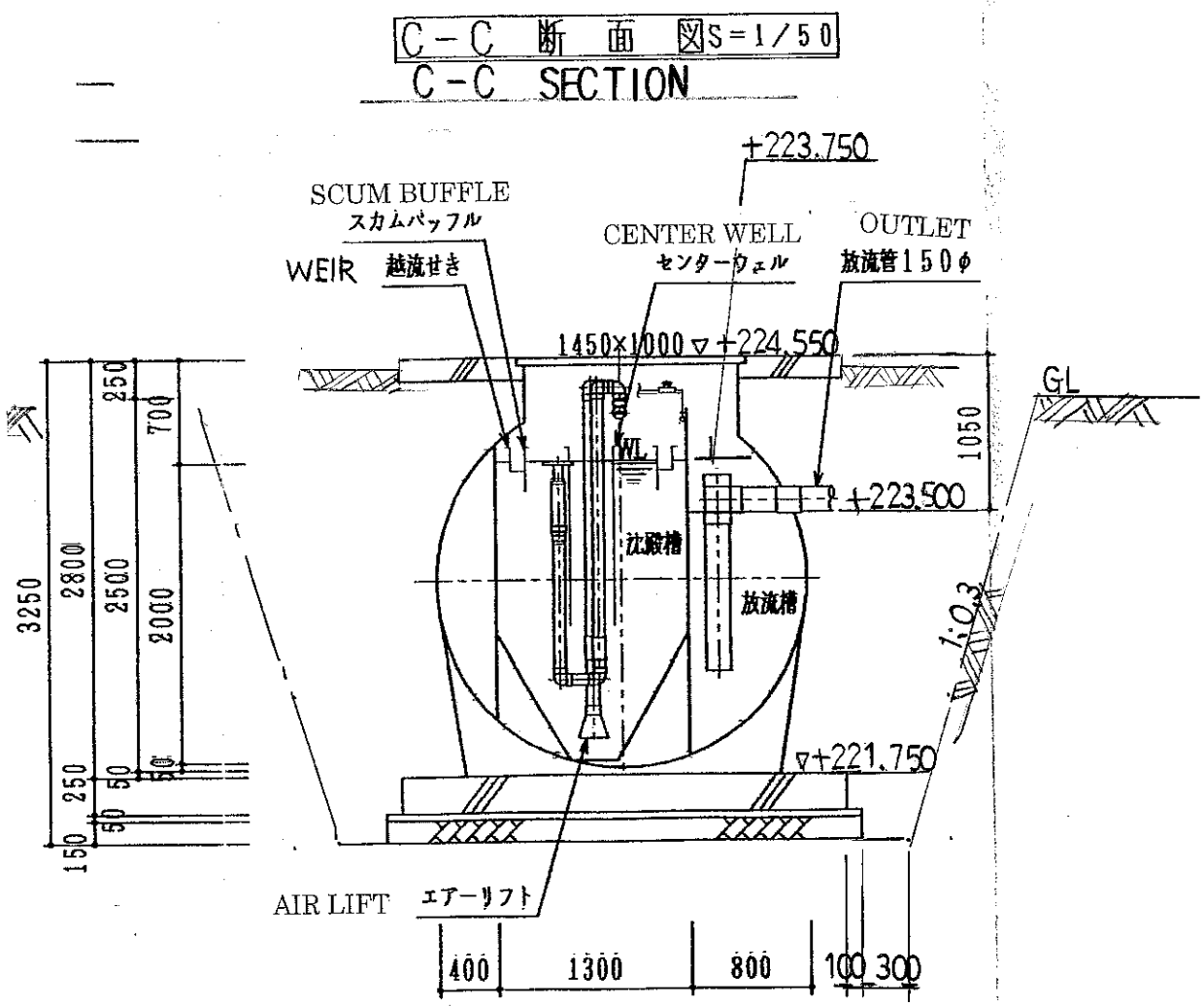


B－B 断 面 図S＝1／50

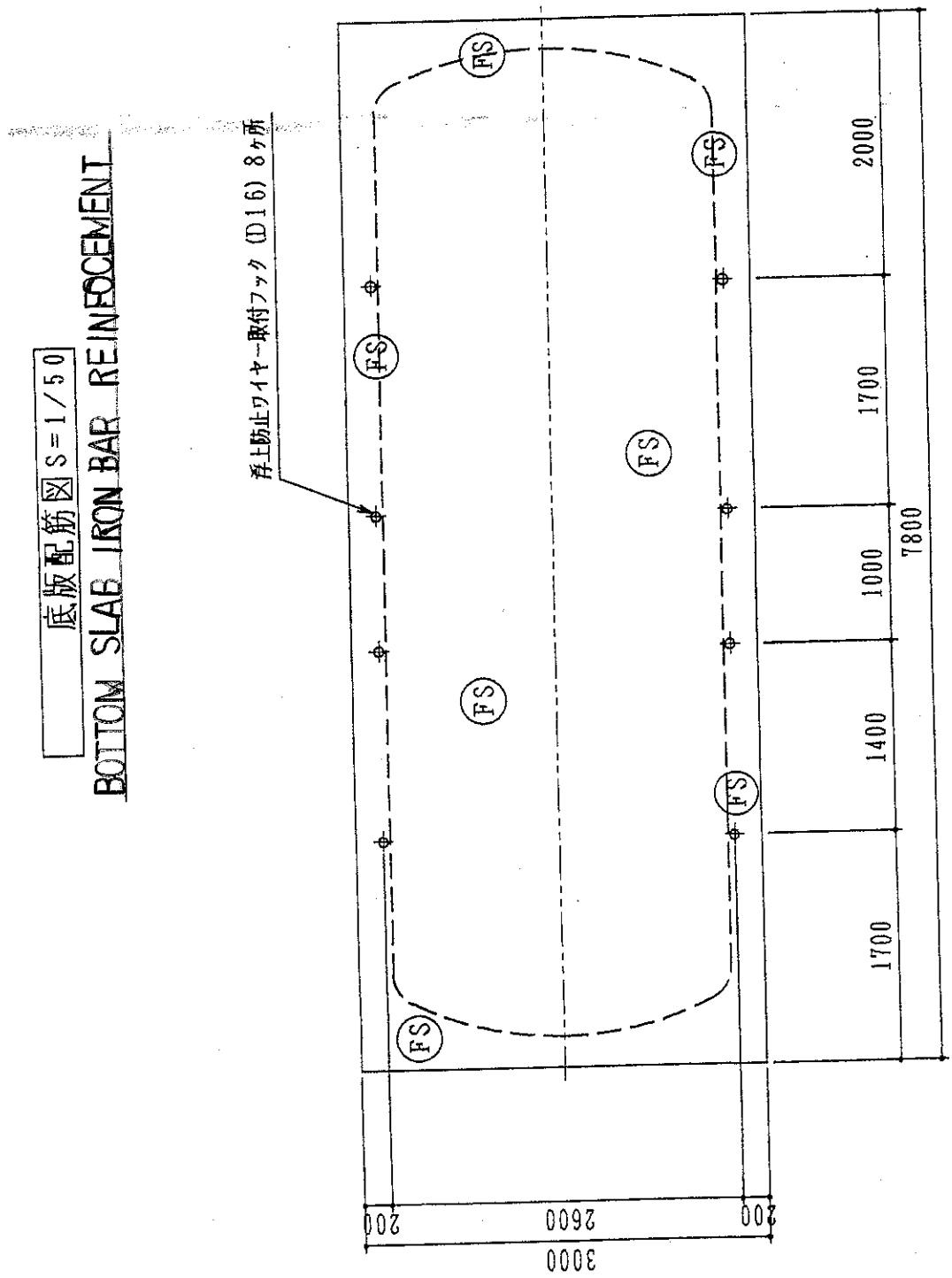
B－B SECTION



JICA	*The Study on Sanitation Improvement for the Niamey City in the Republic of Niger*	Figure
	JYOKASO / B-B SECTION	



JICA	*The Study on Sanitation Improvement for the Niamey City in the Republic of Niger*	Figure
	JYOKASO / C-C SECTION	



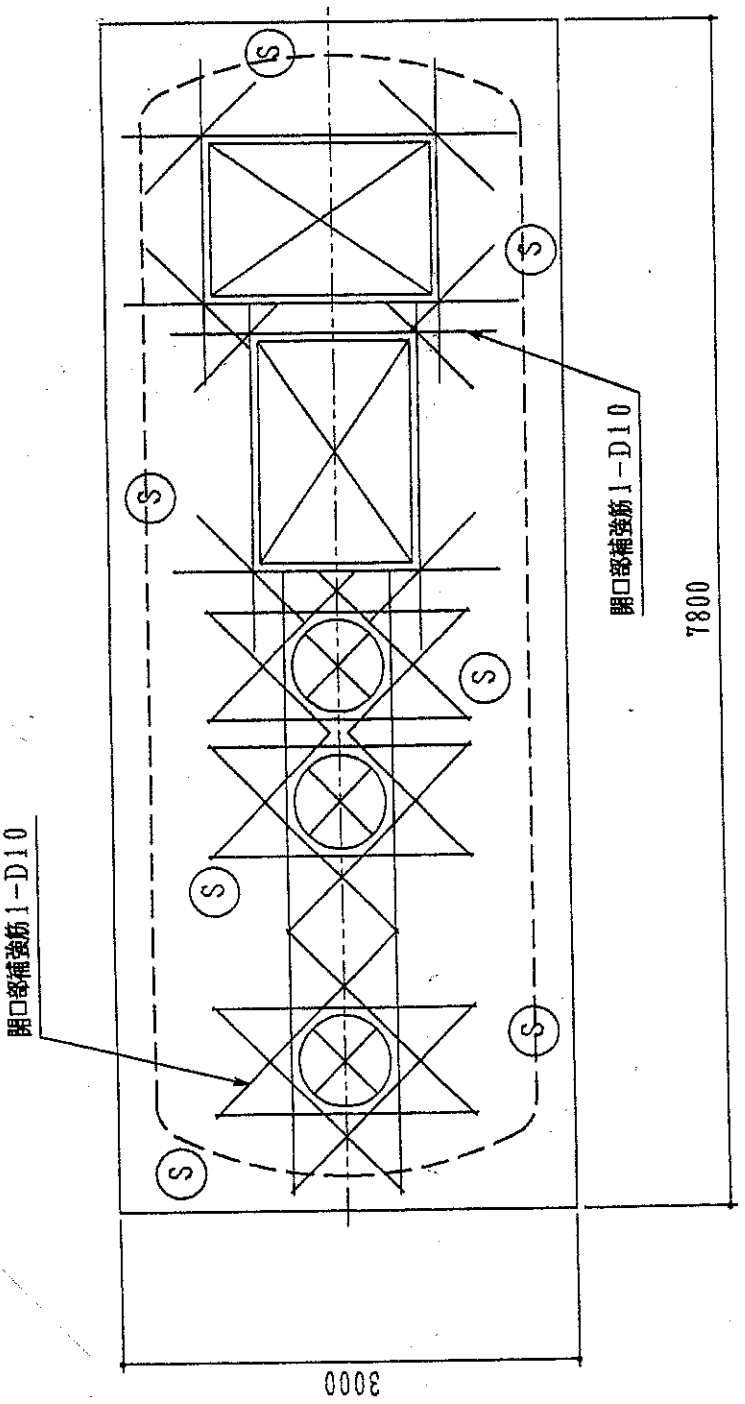
The Study on Sanitation Improvement for the Niamey City in the Republic of Niger

Figure

JYOKASO / IRON BAR ARRANGEMENT

スラブ配筋図 S=1/50

SLAB IRON BAR REINFORCEMENT

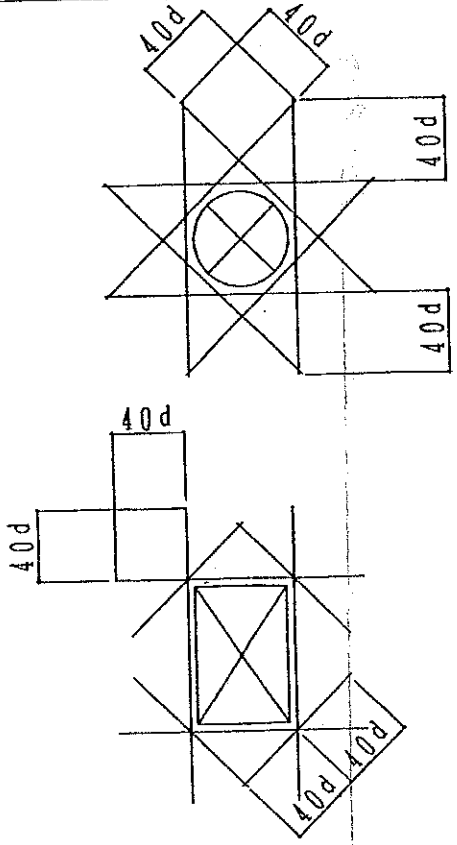


JICA	*The Study on Sanitation Improvement for the Niamey City in the Republic of Niger*	Figure
JYOKASO / SLAB IRON BAR REINFORCEMENT		

JICA	*The Study on Sanitation Improvement for the Niamey City in the Republic of Niger*	Figure
	JYOKASO / SECTION BAR ARRANGEMENT	

開口部補強筋（1－D10）

OPENIG REINFORCEMET

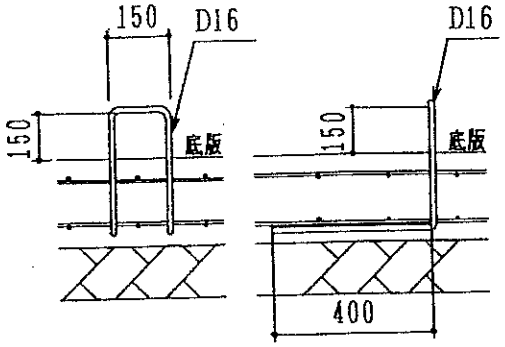


一　般　事　項

コンクリート	Fc＝21N／mm²
捨テコンクリート	Fc＝18N／mm²
使用鉄筋	SD295A
定着長	40d（dハ鉄筋径）
カブリ厚サ	60mm

浮上防止ワイヤー取付けフック

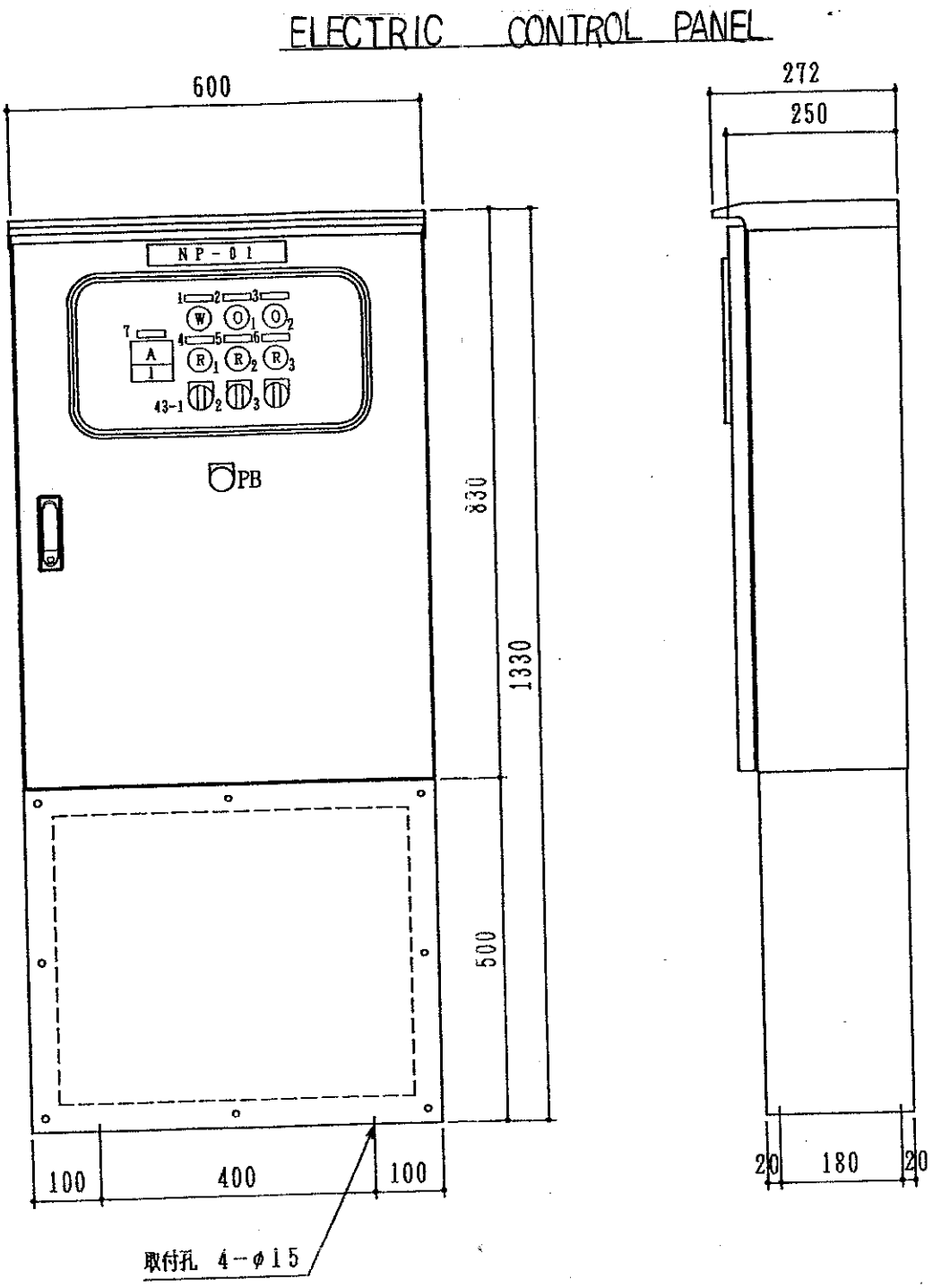
ANTI-ERCTION WIRE HOOK



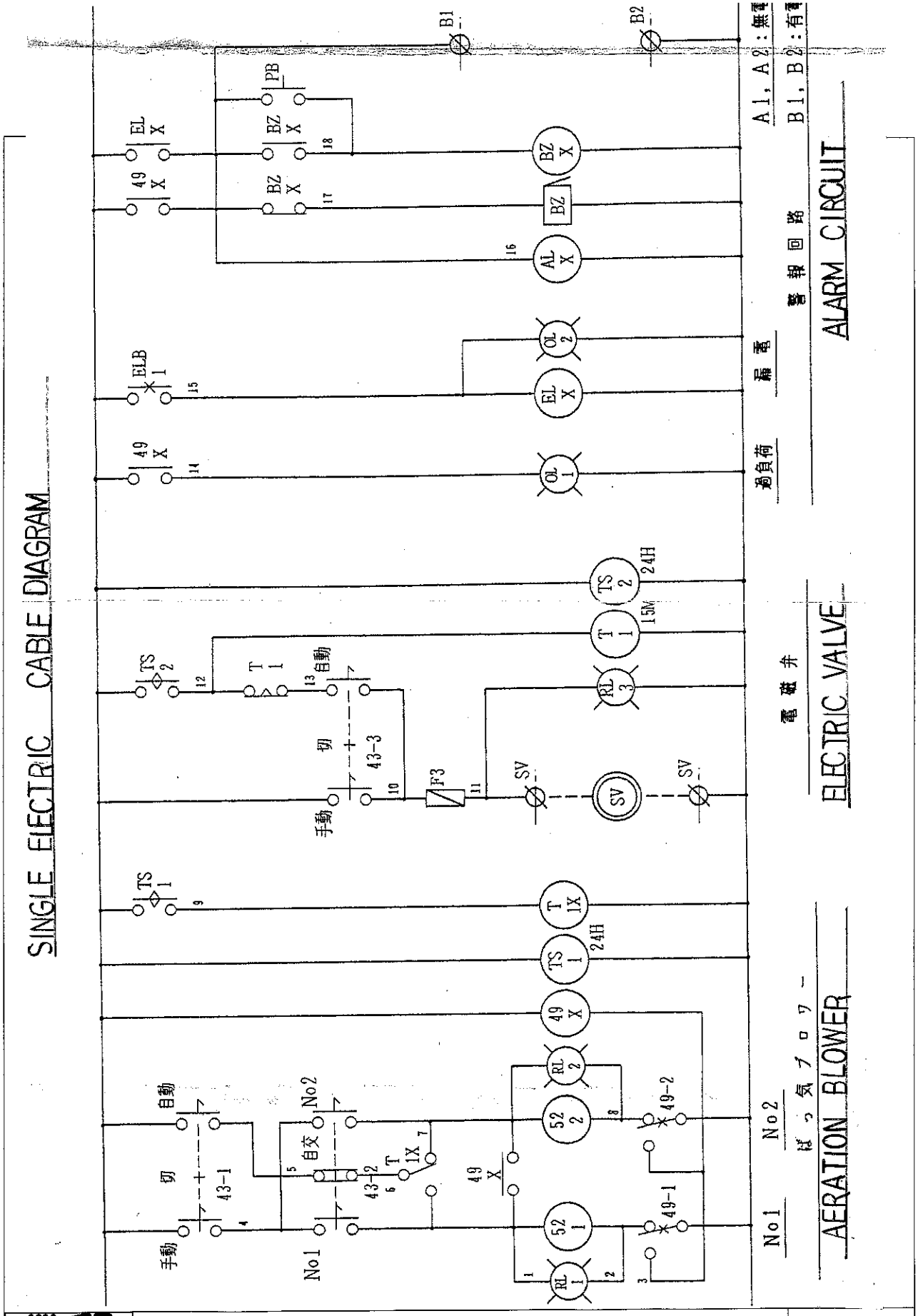
※取付けフックは土木工事に含む（材工共）

JICA	*The Study on Sanitation Improvement for the Niamey City in the Republic of Niger*	Figure
JYOKASO / OPENING REINFORCEMENT		

COMBINED TYPE JYOKASO SYSTEM	50 PERSONS EQUIVALENT
WASTE WATER(DAILY AVERAGE)	100 M3/D
INLET/OUTLET BOD	200 / 20 mg/l
SEDIMENTATION/SEPARATION TANK NO.1	10.025 M3
SEDIMENTATION/SEPARATION TANK NO.2	5.039 M3
CONTACT AERATION TANK NO.1	5.082 M3
CONTACT AERATION TANK NO.2	3.402 M3
SEDIMENTATION TANK	2.382 M3
CHLORINATION TANK	0.150 M3
OUTLET TANK	1.218 M3
AIR BLOWER	0.4 M3/MIN x 0.3 KG/CM2 x 0.75 KW x 2 SETS
SOLENOID VALVE	20 A x 1 SET



JICA	*The Study on Sanitation Improvement for the Niamey City in the Republic of Niger*	Figure
JYOKASO / ELECTRIC CONTROL PANEL		



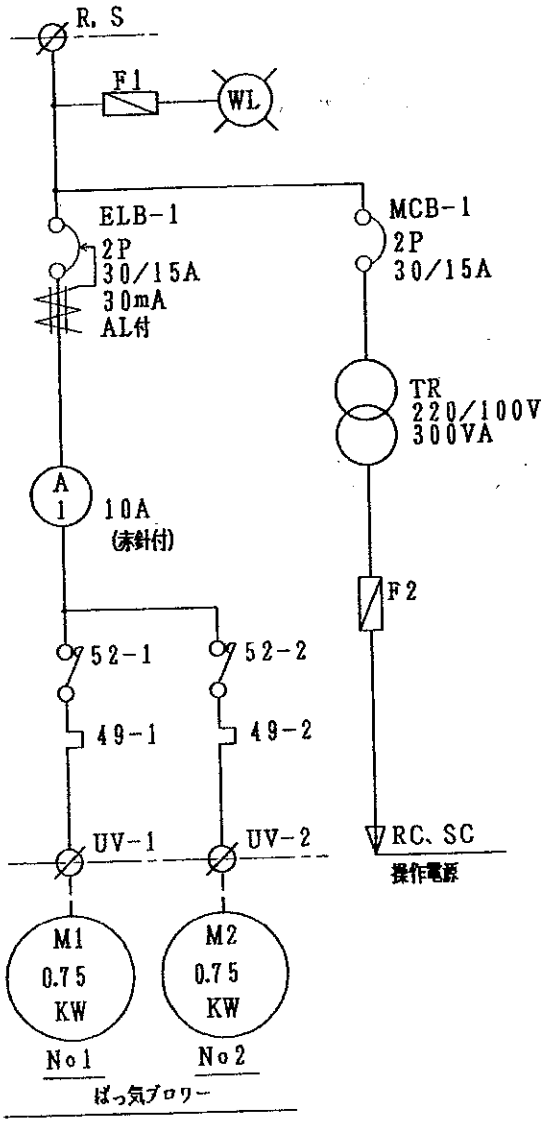
The Study on Sanitation Improvement for the Niamey City in the Republic of Niger

Figure

JYOKASO / SINGLE ELECTRIC CABLE DIAGRAM

POWER INPUT

1φ2W220V50HZ



NAME PLATE

NP0	JYOKASO PANEL
NP1	POWER
NP2	OVER LOAD
NP3	SHORT CIRCUIT
NP4	NO. 1 AERATION BLOWER
NP5	NO.2 AERATION BLOWER
NP6	SOLENOID VALVE
NP7	AERATION BLOWER
43 – 13	MANUAL – OFF – AUTO
43 – 2	NO. 1 – AUTO CHANGE – NO.2
PB	BUZZER STOP

APPENDIX R.6 LAND PROPERTY EXCHANGE AGREEMENT FOR UASB SITE

R.6 LAND PROPERTY EXCHANGE AGREEMENT FOR UASB SITE

ECHANGE D'IMMEUBLES

L'AN DEUX MIL UN
ET LE DEUX JANVIER

Maître MAYAKI Oumarou, Notaire à Niamey (NIGER), 5, Rue du Terminus, Boîte Postale 13.453, soussigné ;

A reçu le présent acte authentique entre les parties ci-après dénommées :

LA COMMUNAUTE URBAINE DE NIAMEY, représentée à l'effet des présentes par Monsieur le Préfet Président de la Communauté Urbaine de Niamey, *Monsieur Amadou SALIFOU*, agissant ès-qualité pour le compte de la ville de Niamey en exécution de **l'article 17 de la Loi n° 65-006 du 08 Février 1965** déterminant l'administration des Arrondissements et des Communes, les règles d'aliénation et de gestion de leur domaine public et privé ainsi que leurs ressources ;

D'UNE PART

Et **Monsieur HASSANE MOUSSA**, Revendeur, demeurant à Niamey, quartier Kalley-Est ;
Né le 21/11/1963 à Niamey/NIGER ;
De nationalité nigérienne ;
Titulaire du permis de conduire numéro 045736NY, délivré le 02/12/1996 par le Ministère des Transports et du Tourisme ;
Agissant en vertu d'une procuration sous seing privé en date du 03/05/1999 à moi donnée par les ayants-droits de Feu SIDDO Hima, demeurée ci-annexée après mention ;

D'AUTRE PART

Lesquelles ont fait entre elles l'échange suivant :

ECHANGE D'IMMEUBLES SANS SOULTE

I - LA COMMUNAUTE URBAINE DE NIAMEY, comparant de première part, cède, à titre d'échange, en s'obligeant à toutes les garanties ordinaires et de droit ;

A

Monsieur HASSANE MOUSSA, comparant de seconde part, qui accepte ;

Des terrains sis à Niamey, objet des parcelles J et C2, respectivement d'une superficie de mille huit (1800) mètres carrés et mille (1000) mètres carrés, à usage commercial, lotissement Nord-Faisceau.

II – En contre échange, ***Monsieur HASSANE MOUSSA***, comparant de seconde part, cède en s'obligeant à toutes les garanties ordinaires et de droit, à la Communauté Urbaine de Niamey, comparant de première part, qui accepte ;

- un terrain d'une superficie de mille quatre cent vingt cinq (1425) mètres carrés, à distraire d'un terrain urbain d'une superficie de 01ha 83a 05ca, sis à Niamey, en zone commerciale non lotie du Guntu Yéna.

Tel que ledit immeuble existe, s'étend, se poursuit et se comporte avec toutes ses aisances et dépendances, sans aucune exception ni réserve.

SERVITUDES

Les échangistes feront leur affaire personnelle des servitudes concernant l'immeuble reçu, sans recours contre le cédant, et sont subrogés tant activement que passivement dans tous les droits, actions et obligations, de celui-ci à cet égard.

ORIGINE DE PROPRIETE

i. Concernant l'immeuble cédé par Monsieur HASSANE MOUSSA :

Celui-ci en est propriétaire par suite de l'acquisition qu'il en a faite suivant un acte de détention coutumière en date du 29/05/1998 délivré par le Chef de quartier de Gandatché, demeuré ci-annexé après mention.

ii. Concernant l'immeuble cédé par la Communauté Urbaine de Niamey :

Celle-ci en est propriétaire par suite de l'acquisition qu'elle en a faite en exécution de **l'article 17 de la Loi n° 65-006 du 08 Février 1965** déterminant l'administration des Arrondissements et des Communes, les règles d'aliénation et de gestion de leur domaine public et privé ainsi que leurs ressources.

PROPRIETE – JOUISSANCE

Les échangistes seront respectivement propriétaires de l'immeuble qu'ils reçoivent en vertu de l'échange au moyen et par le seul fait des présentes, et à compter de ce jour, et ils en auront la jouissance également à compter de ce jour.

CHARGES ET CONDITIONS

Le présent échange est fait sous les charges et conditions ordinaires et de droit, et notamment sous celles suivantes que les échangistes s'obligent respectivement à exécuter, savoir :

GARANTIE

De prendre les immeubles présentement échangés dans l'état où ils se trouvent actuellement, sans pouvoir exercer aucun recours ni répétition, contre leur coéchangiste à raison de la nature du sol et du sous-sol, et sans garantie aucune de la part du cédant.
En conséquence, soit l'état des immeubles et les vices de toute nature, apparents ou cachés dont ils peuvent être affectés, soit des mitoyennetés, soit enfin la désignation et la contenance, toute différence entre celle réelle et celle indiquée devant faire le profit ou la perte de l'échangiste ou de l'acquéreur.

SERVITUDE

De souffrir les servitudes passives, conventionnelles ou légales, apparentes ou occultes, continues ou discontinues qui grèvent les immeubles échangés, sauf à s'en défendre et à profiter de celles actives s'il en existe, le tout aux risques et périls de chacun des échangistes, sans que la présente clause puisse donner à qui que ce soit plus de droits qu'il n'en aurait en vertu des titres réguliers non prescrites ou de la loi.
A cet égard, les échangistes déclarent qu'ils n'ont respectivement créé ni laissé acquérir aucune servitude sur les biens sus indiqués et qu'à leur connaissance il n'en existe aucune autre que celle pouvant résulter de tous anciens titres, de la situation naturelle des lieux, des dispositions d'urbanisme et de la loi.

IMPOTS ET CHARGES

D'acquitter à compter du jour de l'entrée en jouissance tous les impôts, contributions et autres charges de toutes natures auxquels lesdits immeubles peuvent ou pourront être assujettis.

FRAIS-DROITS-HONORAIRES

La Communauté Urbaine de Niamey s'oblige à acquitter les frais d'enregistrement et honoraires des présentes, et ceux qui en seront la suite et la conséquence.

EVALUATION DES IMMEUBLES ECHANGES ABSENCE DE SOULTE

Les échangistes évaluent les immeubles échangés à la même somme de sept millions (7.000.000) de Fcfa.

En conséquence, le présent échange est fait sans soulte ni retour de part ni d'autre.

DECLARATIONS D'ETAT CIVIL ET AUTRES

SUR L'ETAT CIVIL DES ECHANGISTES

Les échangistes déclarent qu'il n'existe de leur chef aucun obstacle ni aucune restriction d'ordre légal ou contractuel à la libre disposition du bien présentement échangé, par suite d'incapacité, de liquidation des biens, de règlement judiciaire, de confiscation totale ou partielle de ses biens, ou de toute autre raison.

SUR LES IMMEUBLES ECHANGES

Les deux immeubles objet du présent échange sont libres de tout privilège immobilier et de toute hypothèque conventionnelle, judiciaire ou légale.

RENONCIATION SANS CONDITION SUSPENSIVE A L'ACTION EN REPETITION

Chacun des échangistes renonce mais seulement sous la condition suspensive que l'immeuble reçu par lui soit libre d'inscription d'hypothèque ou privilège de publication ou transcription à l'action en répétition de **l'article 1705 du code civil** pour le cas où il viendrait à être évincé de l'immeuble reçu en échange.
La réalisation de la condition suspensive pourrait résulter de la délivrance par la conservatrice des hypothèques d'un état entièrement négatif délivré sur les immeubles échangés du chef de l'échangiste cédant et les précédents propriétaires s'il y a lieu.
La renonciation deviendra définitive et interdira à chaque échangiste l'exercice de toute action réelle sur l'immeuble reçu par lui en échange, seule une action personnelle en dommage-intérêts lui étant alors réservée en cas d'éviction.

TITRES

Les échangistes pourront respectivement se faire délivrer à leurs frais tous titres fonciers à créer et à venir, toutes expéditions, copies, ampliations d'actes ou de pièces de propriété dont ils pourront avoir besoin et seront subrogés dans tous les droits du cédant à ce sujet.

ELECTION DE DOMICILE

Pour l'exécution des présentes les parties font élection de domicile en leur demeure respective sus-indiquée.

AFFIRMATION DE SINCERITE

Les parties affirment sous les peines édictées par le régime fiscal de la République du NIGER, que le présent acte est bien sans soulte.

Elles reconnaissent avoir été informées par le notaire soussigné que des sanctions encourues en cas d'inexactitude de cette affirmation.

En outre, le notaire soussigné affirme qu'à sa connaissance le présent acte n'est contredit ni modifié par aucune contre-lettre contenant stipulation d'une soulte.

DROIT DE PREEMPTION DE L'ETAT

Les parties reconnaissent que le notaire soussigné leur a donné connaissance de l'article 129 du Code de l'Enregistrement instituant au profit du Trésor Public un droit de préemption sur les immeubles dont le prix de vente est estimé insuffisant.

DONT ACTES SUR QUATRES PAGES
FAIT ET PASSE A NIAMEY (NIGER)
EN L'ETUDE DU NOTAIRE SOUSSIGNE

Et après lecture faite, les parties ont signé avec le notaire.

Mr HASSANE MOUSSA

LE NOTAIRE

POUR LA CUN
Le Préfet-Président

EAM

BATIMENTS ET TRAVAUX PUBLICS

R.C. 3932 / 81
B.P. 2465
TEL . 74 - 27 -71
FAX. 74 - 25 – 68 NIF 185
E-mail : eam@intnet.ne
NIAMEY – NIGER

DESIGN AND CONSTRUCTION OF PILOT STUDY FOR THE STUDY ON SANITATION IMPROVEMENT FOR THE NIAMEY CITY IN REPUBLIC OF NIGER

INCEPTION REPORT

CLIENT : Japon Internatinational Cooperation Agency (STUDY TEAM)
C/O Ministry of Equipment and Tranportation
BP : 669 Niamey – Niger

Janvier 2001

REPORTING

The work to be performed for the pilot study consists of two plants, which are located in part of Deizeibon and Bandabari district respectively (vide attached map).

The first UASB pilot plant is located at Deizeibon Primary school at Katako discharge point; it's basically an upflow anaerobic sludge blanket (UASB) process followed by trickling filter and echo system ponds, with daily average design flow of 100 m3/day.

The second plant is a Jyokaso system (Japanese) which is proposed to treat toilet waste water of Bandabari Primary School II; it's basically a compact conventional sewage treatment plant with anaerobic process followed by aerobic process then sedimentation completed by echo – system ponds and soak pit with daily average design flow of 10 m3/day.

The above pilot study is undertaken because domestic wastewater should be properly treated to prevent water pollution and waterborne diseases and parasitic infections to raise public health level.

WORKING SCHEDULE

Works are carried out according to working schedule (vide attached planning).
It's specifies that construction work shall be completed within 5 months.
The total work which includes construction, commissioning, O and M, training, and evaluation are to be completed within 11 months from 20 th january 2001.
Works are executed with respect of laws and customs of the Republic of Niger and in accordance with the professional standards.

DESIGN ENGINEERING, ENGINEERING SERVICES

Design and construction supervision partner : - M/S Paramount Ltd-Baroda-India have been approved by JICA Team as our Design and construction partners. The work of Design and Engineering has been completed by 30th January 2001 and copies submitted to you, their Civil Engineer for construction supervision is in Niamey from 05th february 2001; Mechanical / Erection Engineer will be in Niamey in third week of March 2001.

PROCUREMENT

1-Equipment :
Equipment is purchased and procured from Paramount Limited Baroda 390 007 India.
Equipment (Mechanical / Electrical and instrumentation), that is to be supplied by Paramount are as follow:

1-Screens (coarse and fine) in the inlet channel

2-Pumps for inlet channel

3-Weir in outlet of grit channel

4-Three phase separator in UASB

5-Media for trickling filter

6-Rotating mechanism for trickling filter

7-Recirculation pump

8-Sludge pump

9-Gas holder

10-Flare and gas flow meter

11-All interconnecting piping / valve instruments such as pressure gauges, gas flow meter

12-Electrical motor control panel

13-Electrical cabling, earthling

14-PH meter on the testing

The equipement for UASB plant will be desptched from India by 15th february 2001 and are expected to arrive in Niamey by 25th March 2001 (in 40 days time) .

II-Materials :

Materials are purchased in Niamey city markets, which are supplied from either Cotonou port Benin republic, Lome port Togo republic, Accra port Ghana republic or Federal republic of Nigeria.
Materials that are purchased are as followed :

-Cement

-Iron bars

-Planks

-Etc.

Materials such as gravel, sand and filling materials are fetched from quarries in the neighbourhwod of Niamey.

CONSTRUCTION

Construction is carried out at Bandabari Primary school and Deizeibon sites simultaneously.
Setting - out of structures is done according to the layout out plan, and work schedule implementation (vide attached plan and Work implementation).

Civil and structural works are listed below :

1-Inlet channel pump pit

2-Grit channel

3-UASB reactor

4-Trickling filter

5-Chrorination contact tank

6-Gas holder basin

7-Foundation for pumps, flare

8-Structural supports required for piping / cabling

9-Sludge drying beds

10-Building for housing electrical panel and toilet block

11-Boundary wall / fencing and gate

12-Site development

13-Requied insert plates in concrete

14-Approch ladder / safety railing around unit

15-Eco systems tems ponds

PROGRAMME OF WORKS

Designation	Start	Completion	Progress
Fencing wall	15 Feb.	20 Mar.	Exc. started
Inlet channel $ pump pit	08 Feb.	28 Feb.	
Grit channel and UASB	15 Feb	15 Mar.	
Biotower	12 Feb.	20 Mar.	
Ponds I, II, III	12 Feb.	12 Mar.	
MCC Room	20 Feb.	27 Mar.	
Sludge drying bed	20 Feb.	10 Mar.	
Roads	01 Mar.	27 Mar.	

Note: The mobilisation started from 20th January, 2001 . We have removed garbage about 960 cu.m. till date.

UASB SITE:

Concerning the UASB site which is located at Deizeibon Primary School near katako, we have received from JICA team the site only on 20-01-01 (vide attached site plan and agrement between landowners and CUN), and with reference to your letter N°.JT-0116 dated 16/01/01 we are expressing the following observation :

1-We would like to put on record that construction site has been received by EAM from Jica Team on 20th, January 2001 to carry out the construction activities. The site is on point where household refuse of about 4 m height was found. This work was not included in our costs at tender time.
This situation has to be sorted out because the actual proposed construction site was not finalised during the estimation / bidding process (may 2000).
JICA Team instructed EAM to remove the housheld refuse dump from the site. We have removed about 960 cu.m. (62 truck loads) and still about 500 cu.m. is required to be removed.In view of the additional costs to us we request you to please resolve this on priority.

2- At time of EAM bid in May 2000, the length of this fence was 79.0 mt, on 20/01/01, the proposed site plan has been given by Jica Team to EAM and actual length of fence is 138.59 mt.This leads to a difference in length of 59.58 mt

3-This situation should be resolved to enable EAM to proceed with works towards the fulfilment of its contractual agreement.

JYOKASO SITE :

i-Toilet block of a 9.35 m x 3.10 m and is subdivided into three parts:

- Teacher 's toilet

- Boy ' s toilet
- Girl ' s toilet

ii-Jyokaso with dimension of 2.50 m x 7.34 m x 2.8 m installation
iii-Soak-pit dia. 3.60 m, height 4.00 m
iv-Ponds w 1.0 m x L 0.75 m x H 1.0 m

PROGRAMME OF WORKS

Designation	Start	Completion	Progress
Toilet block	01 Dec.	28 Feb.	99 %
Jyokaso Installation	15 Jan.	28 Feb.	50 %
NRS Pond	15 Jan.	30 Jan.	100 %
Soak - pit	07 Jan.	21 Jan	100 %

Note : As indicated in the above progress table, toilet construction is almost completed.

Labour

The provision of labour necessary for the works is done according to the list attached. Site engineers, Forman are from the enterprise, the remaining workers are from the office of labour witch supply labour to construction companies based on their requests.
Each section of work is provided with skill labour necessary for it's completion.
Construction is carried out under the supervision of JICA Team Engineers (Japanese International Corporation Agency), Paramount Limited Baroda India and EAM Engineers.

List of Staff

1	Maman	Harouna	Civil Enginner	EAM
2	A.G.	Joshi	Civil Enginner	- Paramount Ltd. BARODA
3	A. M.	Abdoul Kassoum	Civil Enginner	EAM
4	G.	Maazou	Civil Enginner	EAM
5	S.J	Chrysostome	Architecte	EAM