9. LABORATORY TEST RESULTS OF BLACK COTTON SOIL

CTL CENTRAL TESTING LABORATORIES Ltd.

P.O. Box 18587 Tel. 559422/23

Nairobi

Client MOWLEM CONSTRUCTION CO. (E.A.) LTD

Location NAIROBI BY PASS

Job No.....

Sheet No. 1 of 1

Date 20/8/1990

SOIL TEST RESULTS SUMMARY SHEET

SAMPLE No.	SITE MARKING TR	ATTERBERG LIMITS L.L.	P.I.	LINEAR SHRINKAGE %	PLASTICITY MODULUS	GRADING % PASSING 75 mm	63 mm	50 mm	37.5 mm	28 mm	20 mm	14 mm	10 mm	6.3 mm	5 mm	4 mm	2 mm	1 mm	600 µm	500 µm	425 µm	300 µm	150 µm	75 µm	COMPACTION T99 M.D.D. Kg/m³	O.M.C. %	BULK DENSITY Kg/m³	% MOD.	FREE SWELL %		STRENGTH TESTS C.B.R. % S.	% AT B.D.	C.B.R. AT B.D.	% AT M.D.	SWELL %	U.C.S. Kg/cm² AT B.D.	SWELL %	AT M.D.	%	SAMPLE DEPTH (m)
4585	1B1																								1310	32							2	100	4.5					0.10 - 0.50m
4586	" 2	62	21			100	90	79	75	68	64	58	51	42	40	37	31	27	26	25	25	24	22	21	1300	30							22	100	1.1					0.50 - 1.00
4587	1BS3	78	33	16												100	99	99	99	99	99	98	97	95			1545	34.2	130	2.40										0.20 - 0.40
4588	2B1	73	30																																					0.00 - 1.70
4589	2B2	47	17				100	97	97	95	91	83	80	68	64	60	52	47	45	44	43	42	39	36															1.70 - 1.90
4590	3B1																								1330	30							1	101	5.0					0.10 - 1.10
4591	" 2	67	26				100	93	83	75	70	62	57	50	48	46	42	39	38	38	37	37	36	35	1250	32							3	99	2.7					1.10 - 1.40
4591	" "																								1380	27	(T180)						2	90	4.4					" "
																																	3	96	5.2					
																																	3	101	5.4					
4592	3BS3	80	42	20										100	99	99	99	98	98	98	98	97	95	93			1507	40.5	160	2.50										0.60 - 0.80
4593	4B1	73	40																																					0.00 - 0.50
4594	" 2	73	34			100	95	95	88	81	66	59	53	46	44	42	36	34	33	33	33	32	31	30	1300	21							2	99	4.5					0.50 - 0.90
4595	5B1																								1340	31							1	100	4.4					0.00 - 0.50
4596	5B2	54	18			100	85	74	68	60	50	43	39	33	31	29	25	23	21	21	20	20	18	18	1370	25							9	101	1.4					0.50 - 1.00
4597	5BS3	78	30	14							100	99	99	98	98	98	97	96	96	95	95	95	92	89			1568	40.3	165	2.44										0.20 - 0.40
4598	6B1	79	42																																					0.00 - 0.60
4599	7B1																								1390	29							2	100	5.5					0.00 - 0.60
4600	7BS2	74	43	20										100	99	99	99	98	97	97	97	96	94	92			1619	30.5	140	2.40										0.20 - 0.40
4601	8B1	73	32																																					0.00 - 0.60
4602	9B1	41	16																																					0.10 - 0.30
4603	9B2																								1590	23							5	100	1.3					0.30 - 0.60
4604	9BS3	39	14	8									100	97	95	90	71	56	52	51	50	49	45	41			1658	16.3	80	2.48										0.20 - 0.40
4605	10B1	83	30																																					0.70 - 1.10
4606	" 2	70	31												100	99	98	97	96	96	96	95	94	92	1320	33							1	101	5.2					1.10 - 1.30

CTL CENTRAL TESTING LABORATORIES Ltd.
P.O. Box 18507 Tel. 559622/23
Nairobi

Client THE MOWLEM CONSTRUCTION CO.(E.A.) LTD
Location NAIROBI BY PASS
Job No.....

Sheet No. 1 of 1
Date 14/10/1991

SOIL TEST RESULTS SUMMARY SHEET

SAMPLE No.	SITE MARKING	ATTERBERG LIMITS L.L	P.I.	LINEAR SHRINKAGE %	PLASTICITY MODULUS	GRADING % PASSING 75 mm	63 mm	50 mm	37.5 mm	28 mm	20 mm	14 mm	10 mm	6.3 mm	5 mm	4 mm	2 mm	1 mm	600 µm	500 µm	425 µm	300 µm	150 µm	75 µm	COMPACTION T99 M.D.D. Kg/m³	O.M.C. %	SWELLING PRESSURE Kg/m²	FREE SWELL %	M.C %	STRENGTH TESTS C.B.R. % % M.D.D.	C.B.R. % SOAK	% M.D.D.	SWELL %	U.C.S. (KN/m²) 7 D.S.	SWELL %	7 D.S.	% M.D.D.	MARKING	SAMPLE DEPTH (m)
7724	TC31	55	18	9												100	99	98	98	98	98	97	96	95	1390	35					16	100	0.8					B1	1.00-1.30
7725	" "	52	21	10				100	99	93	85	77	71	64	61	59	51	44	40	38	36	34	29	25	1360	30					30	100	0.2					B2	2.50-2.70
7726	TC32	50	18	9													100	99	99	99	98	98	96	94	1460	33					15	100	0.3					B1	1.80-2.20
7727	" "	53	21	10									100	99	98	97	93	89	88	87	87	86	83	81	1310	32					15	100	0.8					B2	3.00-3.40
7728	TC33	37	16	8										100	99	98	95	90	87	87	85	84	79	76	1580	23					4	101	3.6					B1	0.40-0.70
7729	" "																										101.9	98	21									BLOCK	0.40-0.70
7730	" "		NP	2		100	83	70	59	51	40	35	32	27	25	23	19	15	12	11	10	9	7	6	1420	23					48	100	0.2					B2	0.80-1.00
7731	TC 34	59	30	14												100	98	97	96	96	95	92	90	1350	25					2	100	5.2					B2	0.30-0.80
7732	" "																										72.4	78	26									BLOCK	0.20-0.50
7733	TC35	51	21	11								100	99	99	99	99	99	98	98	97	97	97	94	92	1420	30					9	100	1.5					B1	1.00-1.30
7734	TC36	57	23	11										100	99	98	93	92	92	92	92	91	90	89	1510	29					16	101	0.7					B1	2.90-3.20
7735	" "	53	21	10								100	99	97	96	94	89	86	84	84	83	82	79	76	1480	30					20	100	0.8					B2	4.00-4.20
7736	TC37	40	18	9												100	97	93	90	90	89	88	83	80	1480	22					3	100	4.2					B2	0.20-0.40
7737	" "																										32.2	68	20									BLOCK	0.20-0.40

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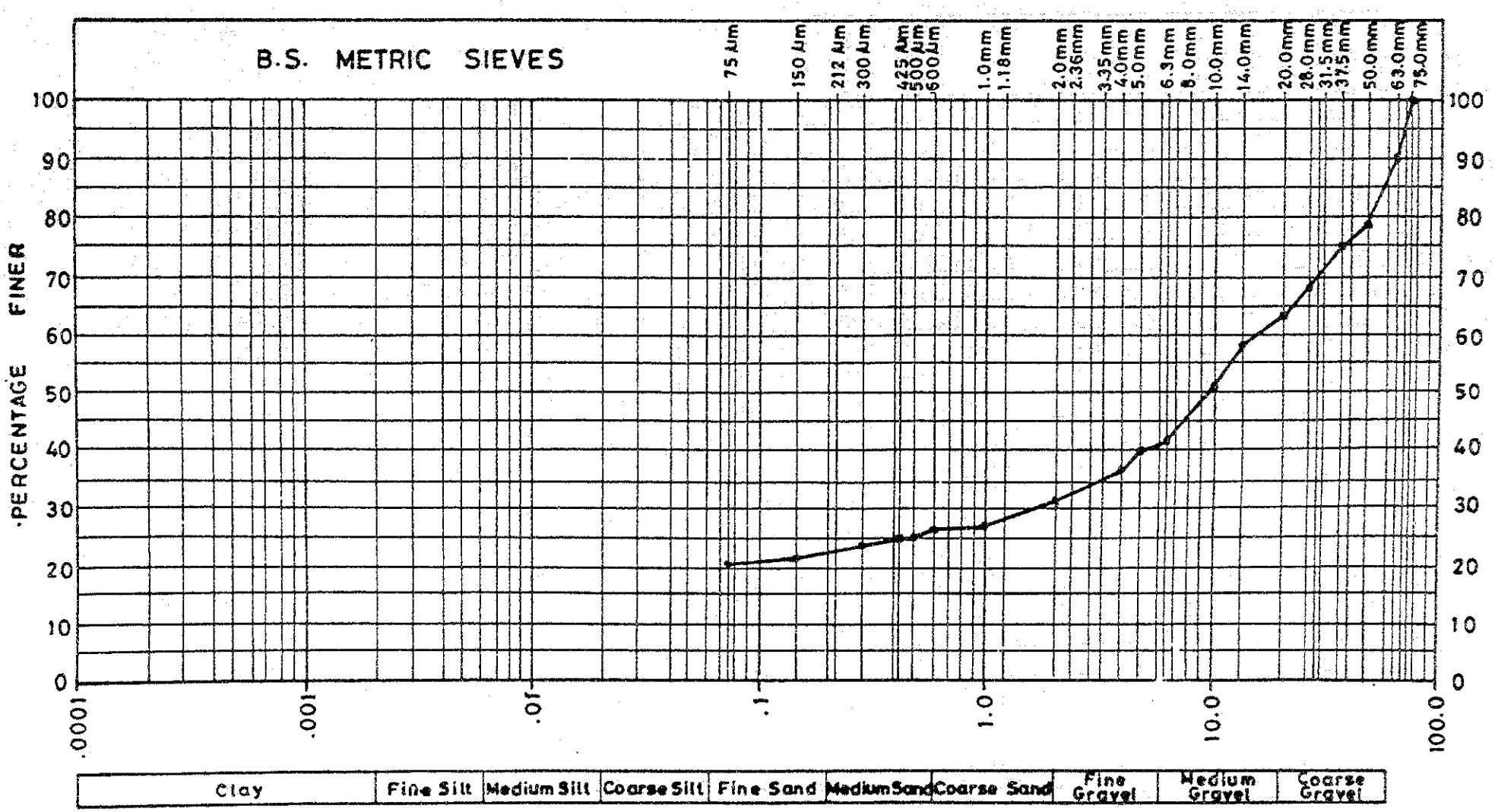
P.O. BOX 18507 TEL. 559422/23
NAIROBI.

PARTICLE SIZE DISTRIBUTION

Sample No. 4586	Location TB I BI 0.50-1.00m	Description of Sample Sandy, very silty GRAVEL



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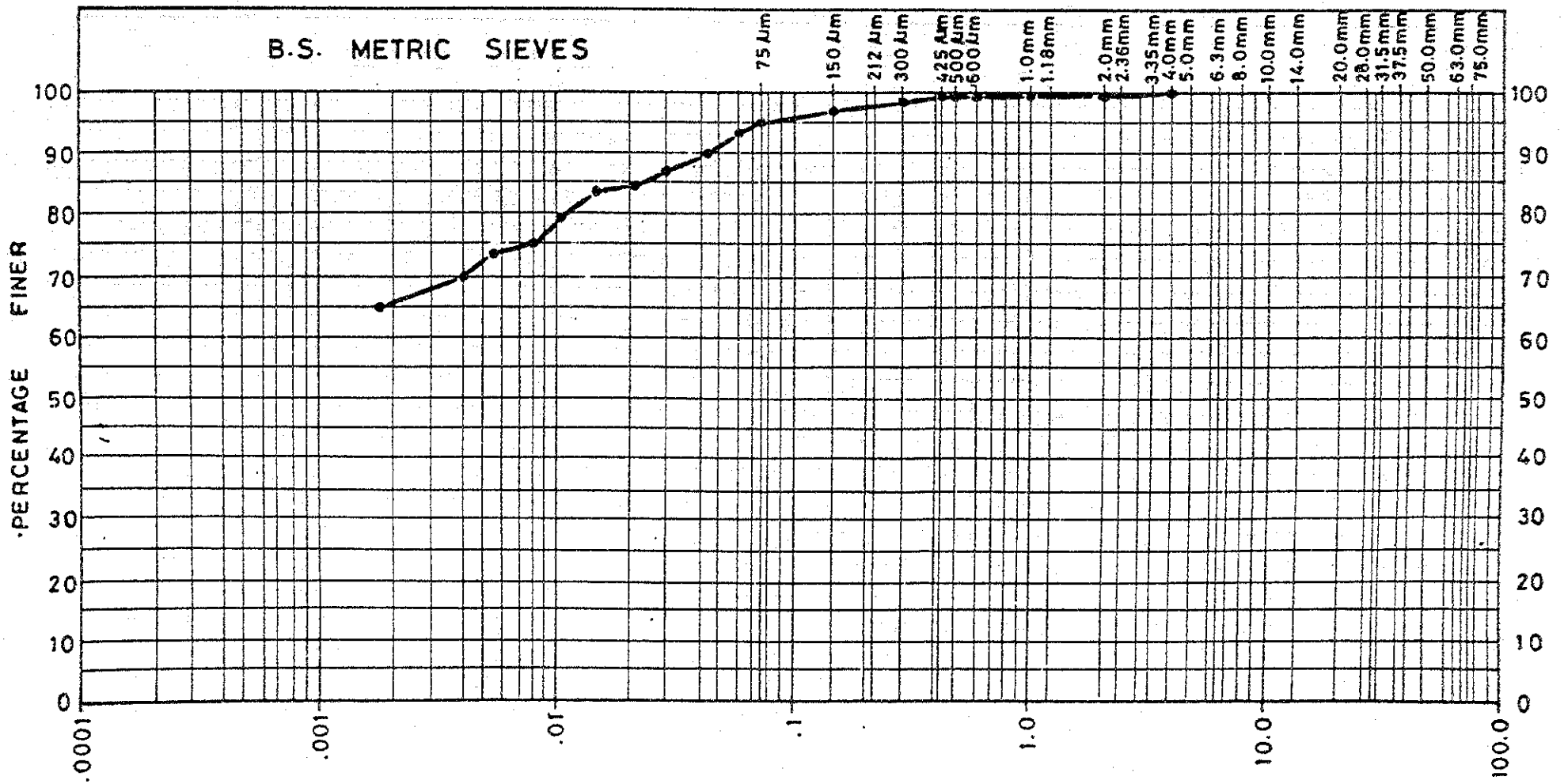
PARTICLE SIZE DISTRIBUTION

Sample No. 4587	Location TBI BS3 0.20 - 0.40m	Description of Sample Slightly gravelly,sandy,very silty CLAY



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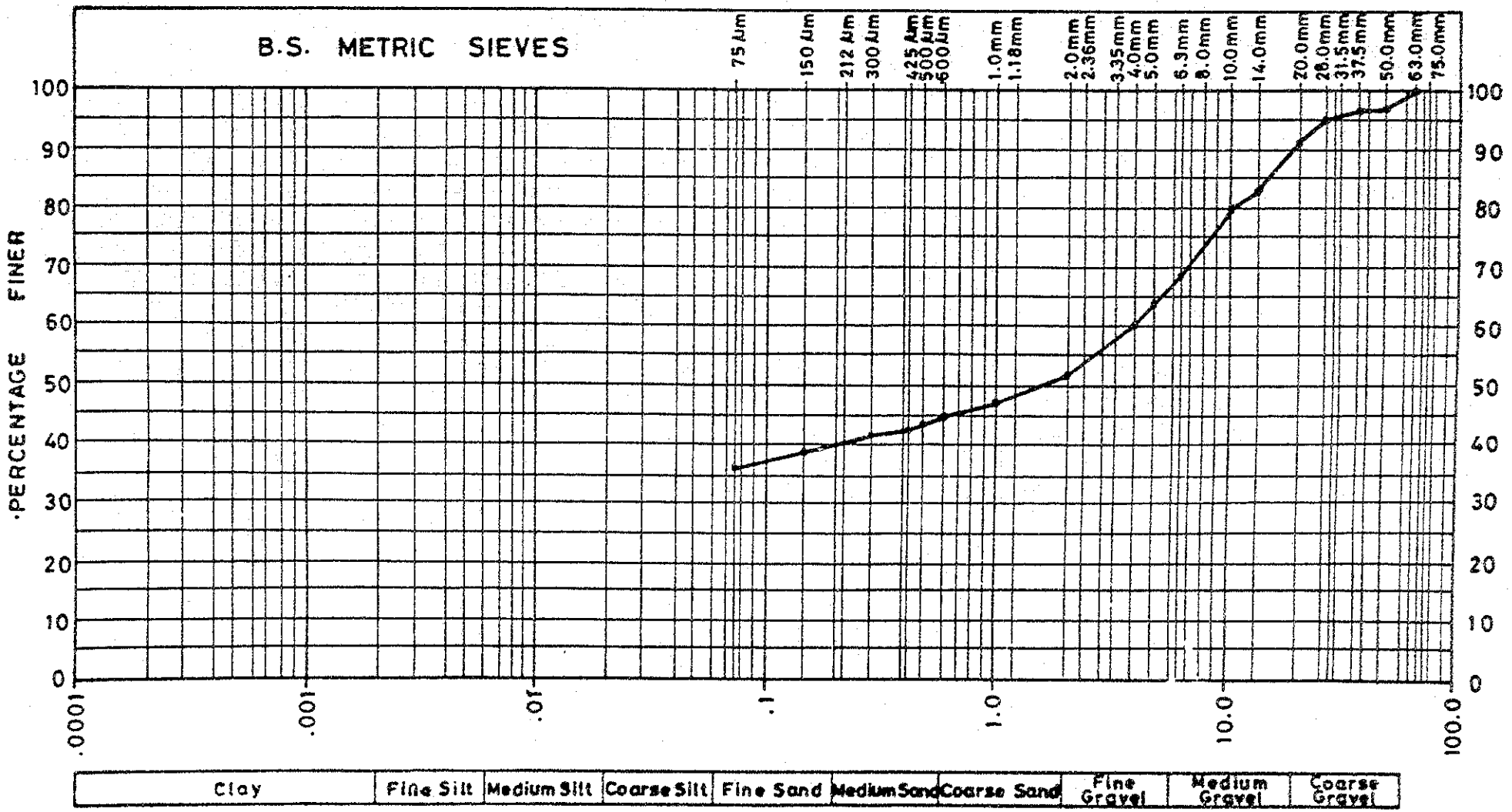
PARTICLE SIZE DISTRIBUTION

Sample No. 4589	Location TB 2 B2 1.70-1.90m	Description of Sample Sandy, very silty GRAVEL



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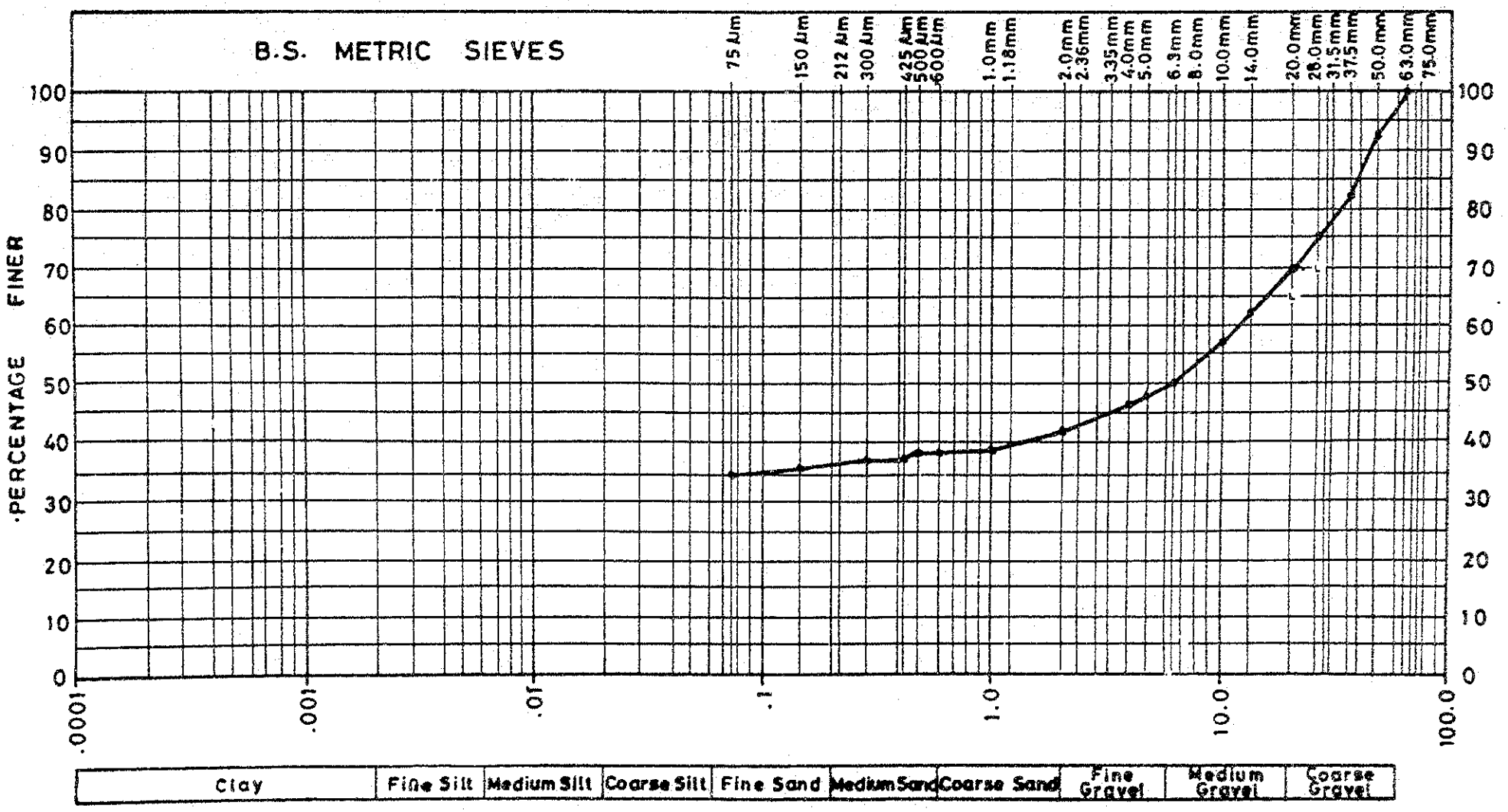
PARTICLE SIZE DISTRIBUTION

Sample No. 4591	Location TB3 B2 1.00 - 1.40m	Description of Sample Sandy,very silty GRAVEL



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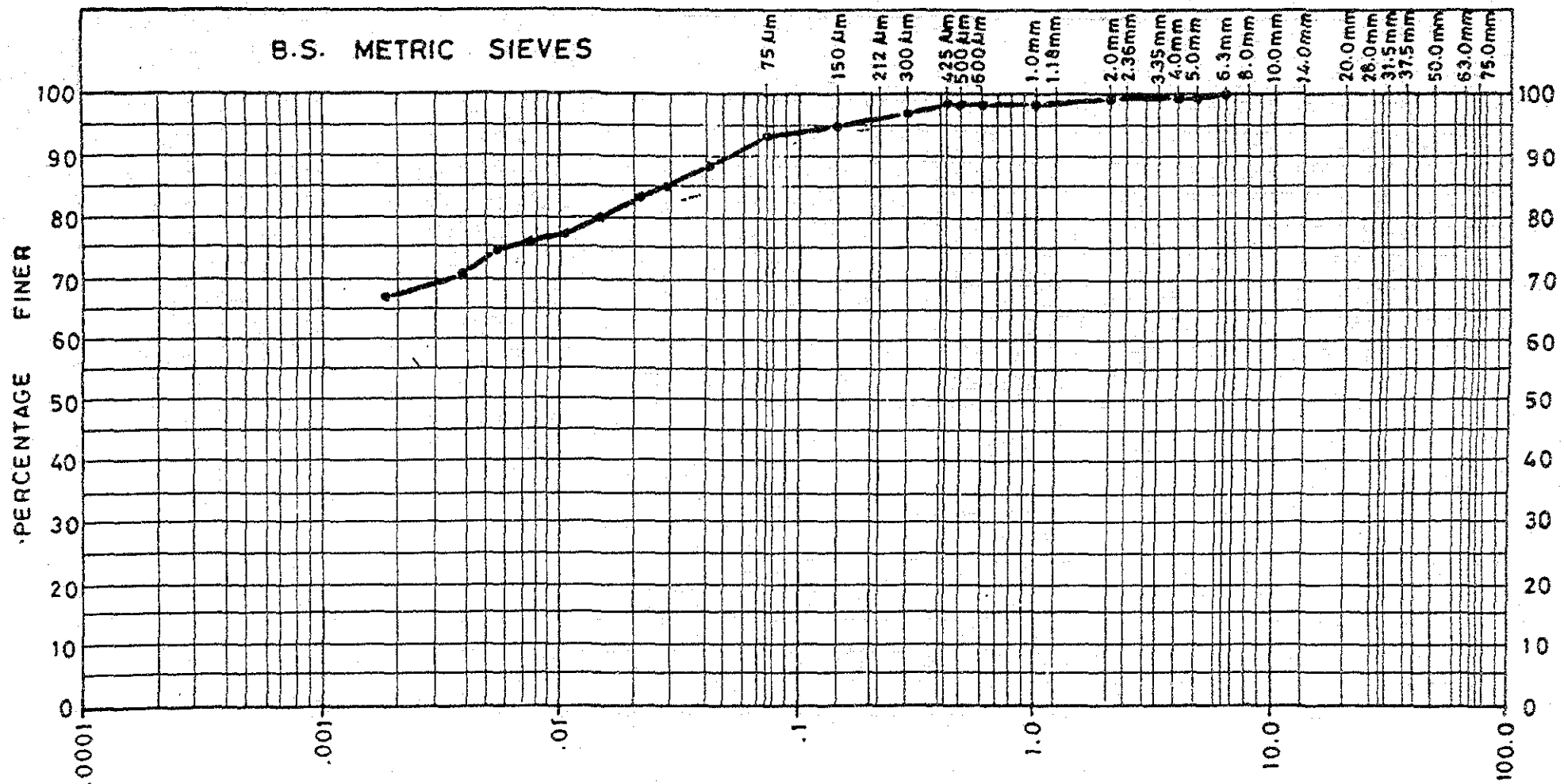
PARTICLE SIZE DISTRIBUTION

Sample No. 4592	Location TB3 BS3 0.60-0.80m	Description of Sample Slightly gravelly,sandy,very silty CLAY



A-260

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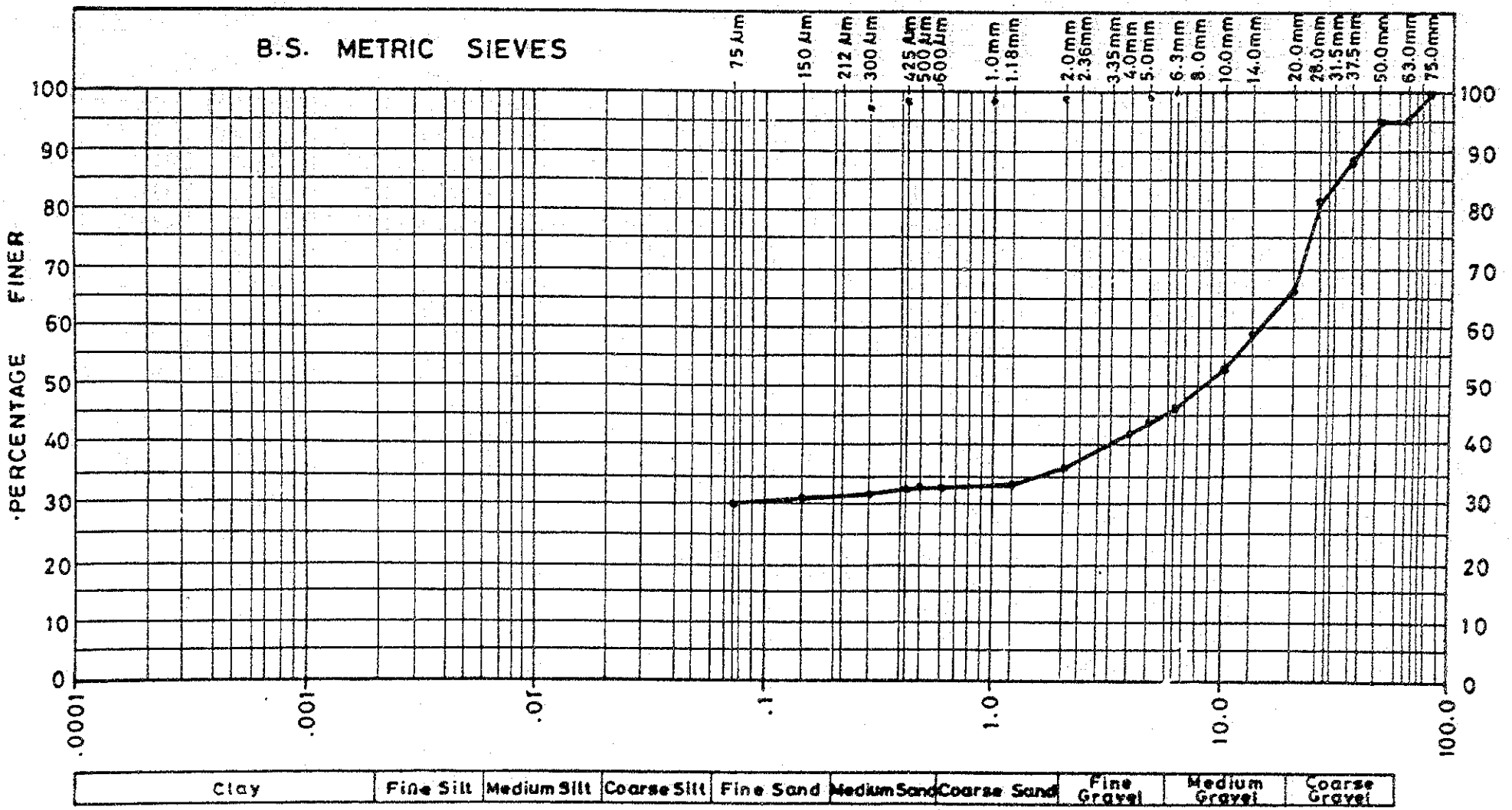
PARTICLE SIZE DISTRIBUTION

Sample No. 4594	Location TB4 B2 0.50 - 0.90m	Description of Sample Very silty,sandy GRAVEL



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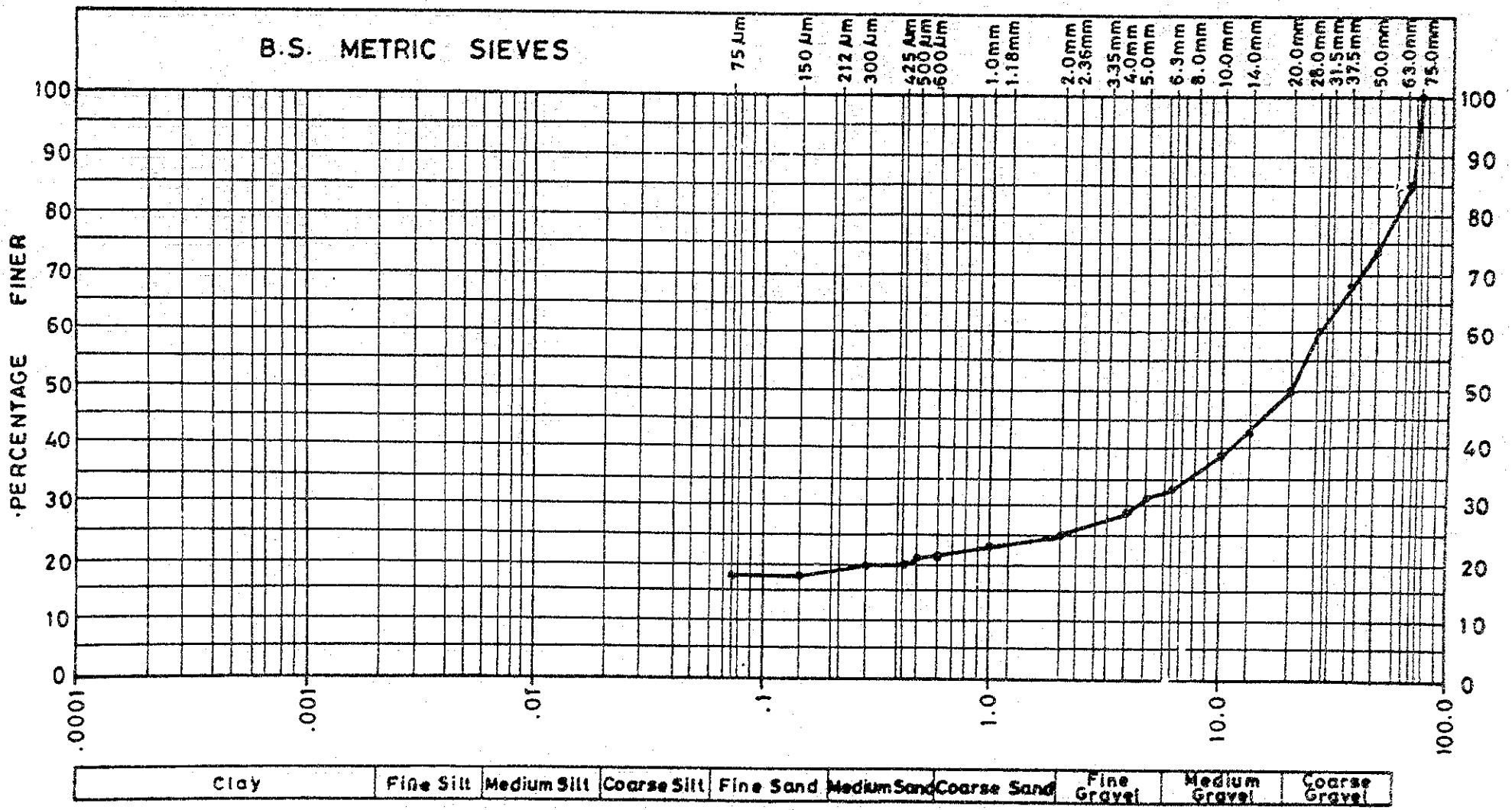
PARTICLE SIZE DISTRIBUTION

Sample No. 4596	Location TB5 B2 0.50 - 1.00m	Description of Sample Sandy, silty GRAVEL.



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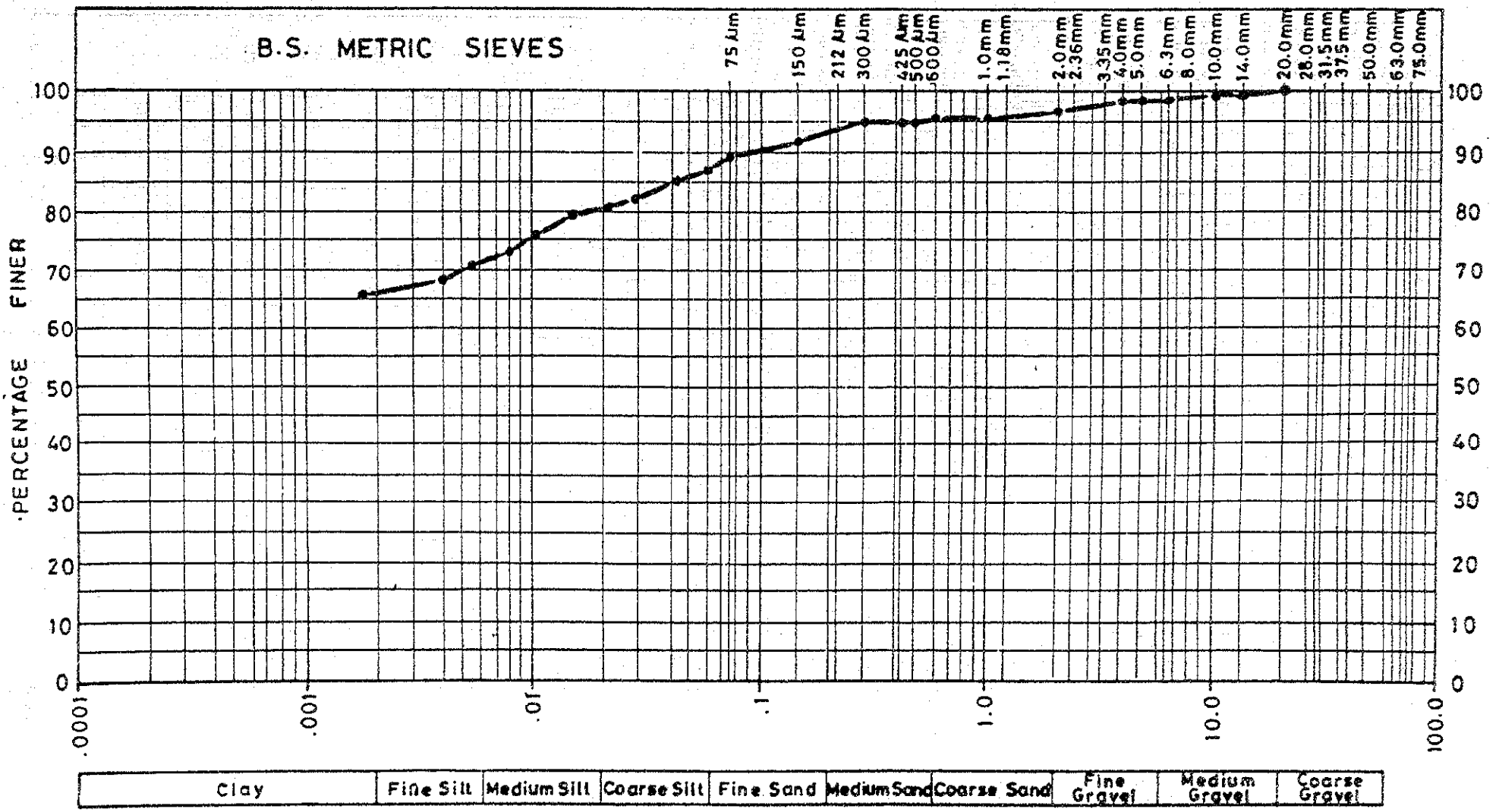
PARTICLE SIZE DISTRIBUTION

Sample No. 4597	Location TB5 BS3 0.20-0.40m	Description of Sample Slightly gravelly, sandy, very silty CLAY



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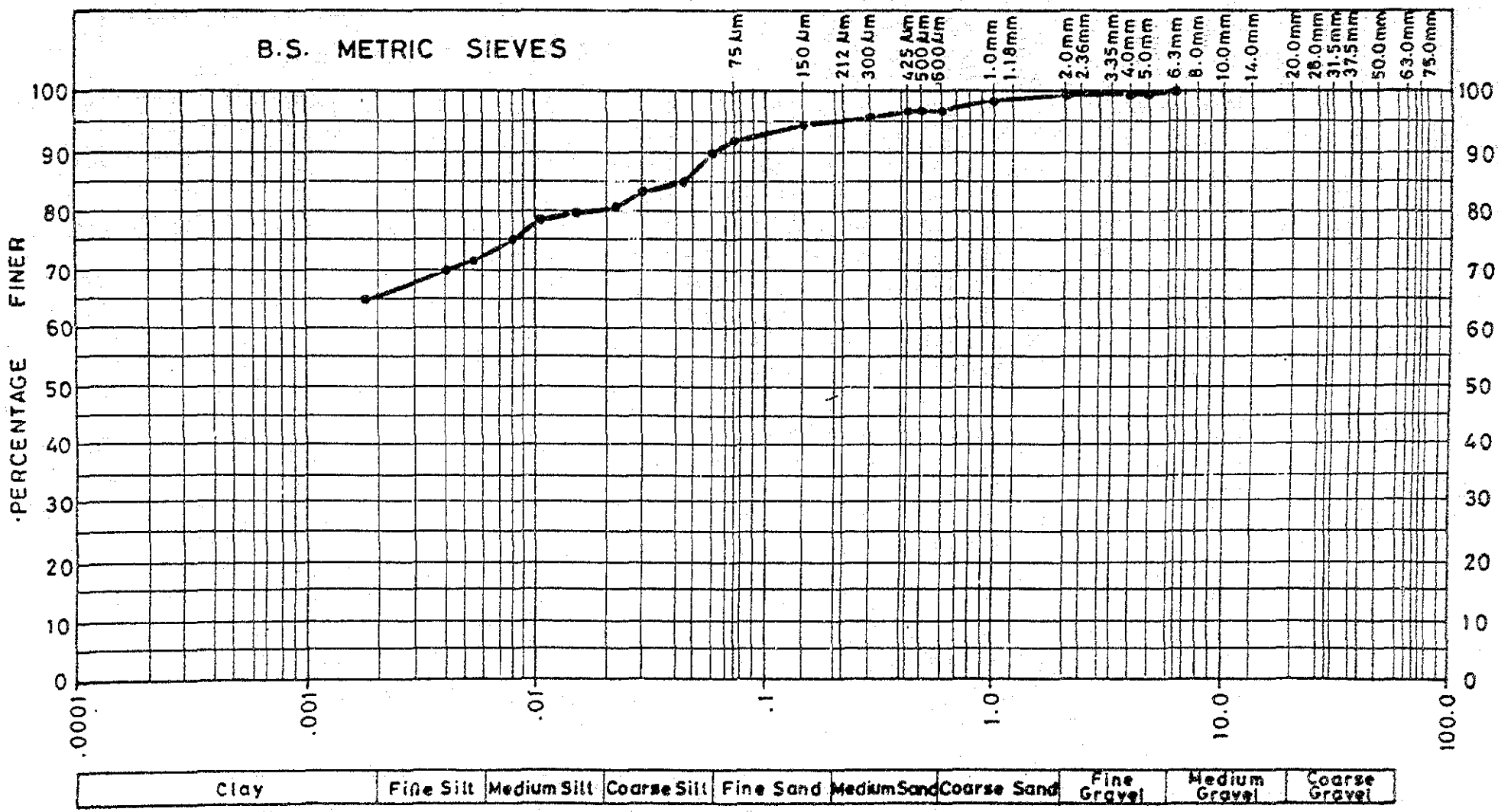
PARTICLE SIZE DISTRIBUTION

Sample No. 4600	Location TB7 BS2 0.20-0.40m	Description of Sample Slightly gravelly,sandy,very silty CLAY



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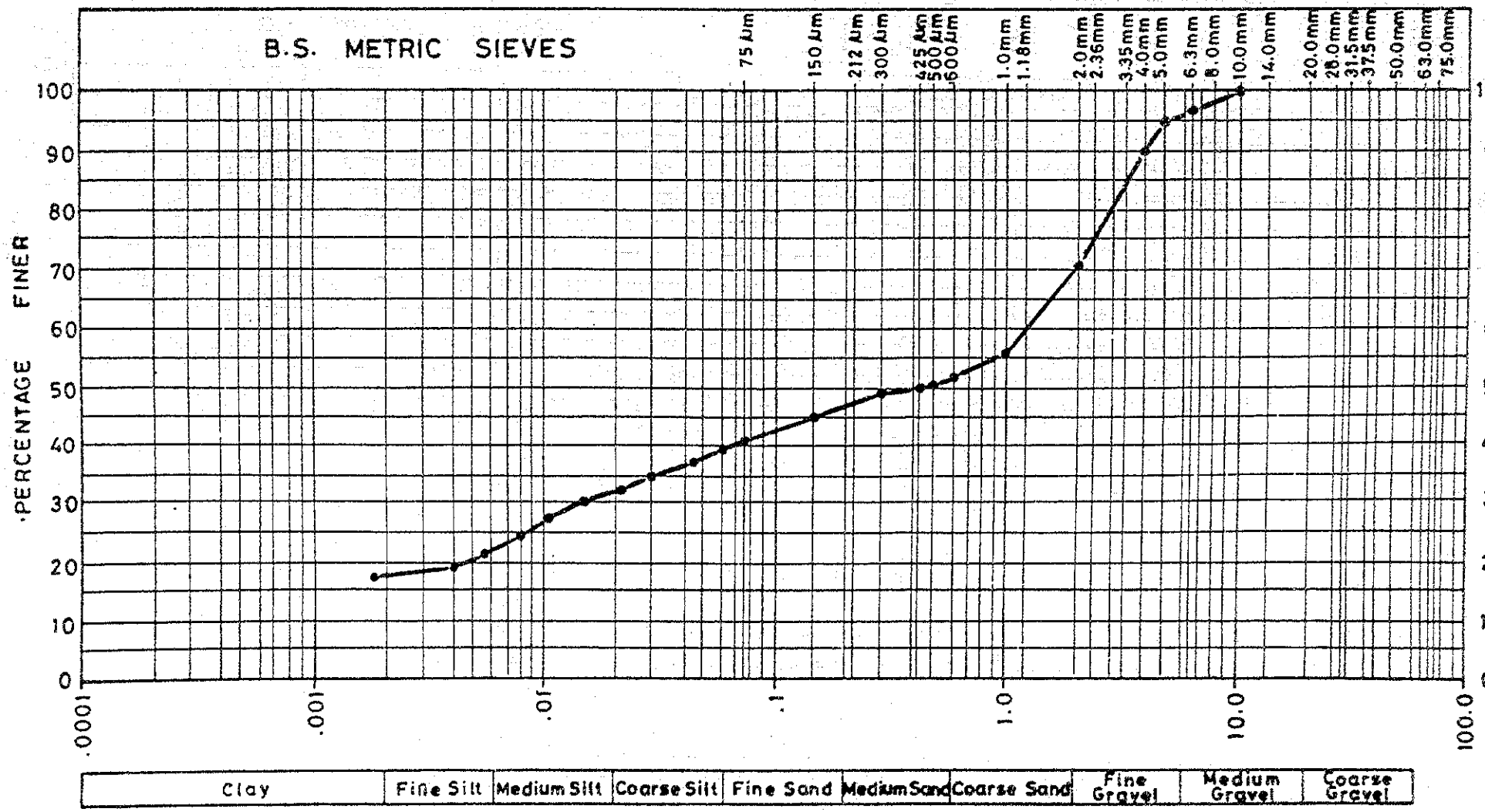
PARTICLE SIZE DISTRIBUTION

Sample No. 4604	Location TB9 BS3 0.20 - 0.40m	Description of Sample Very silty,clayey, GRAVEL/SAND



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CIL CENTRAL TESTING LABORATORIES LTD.

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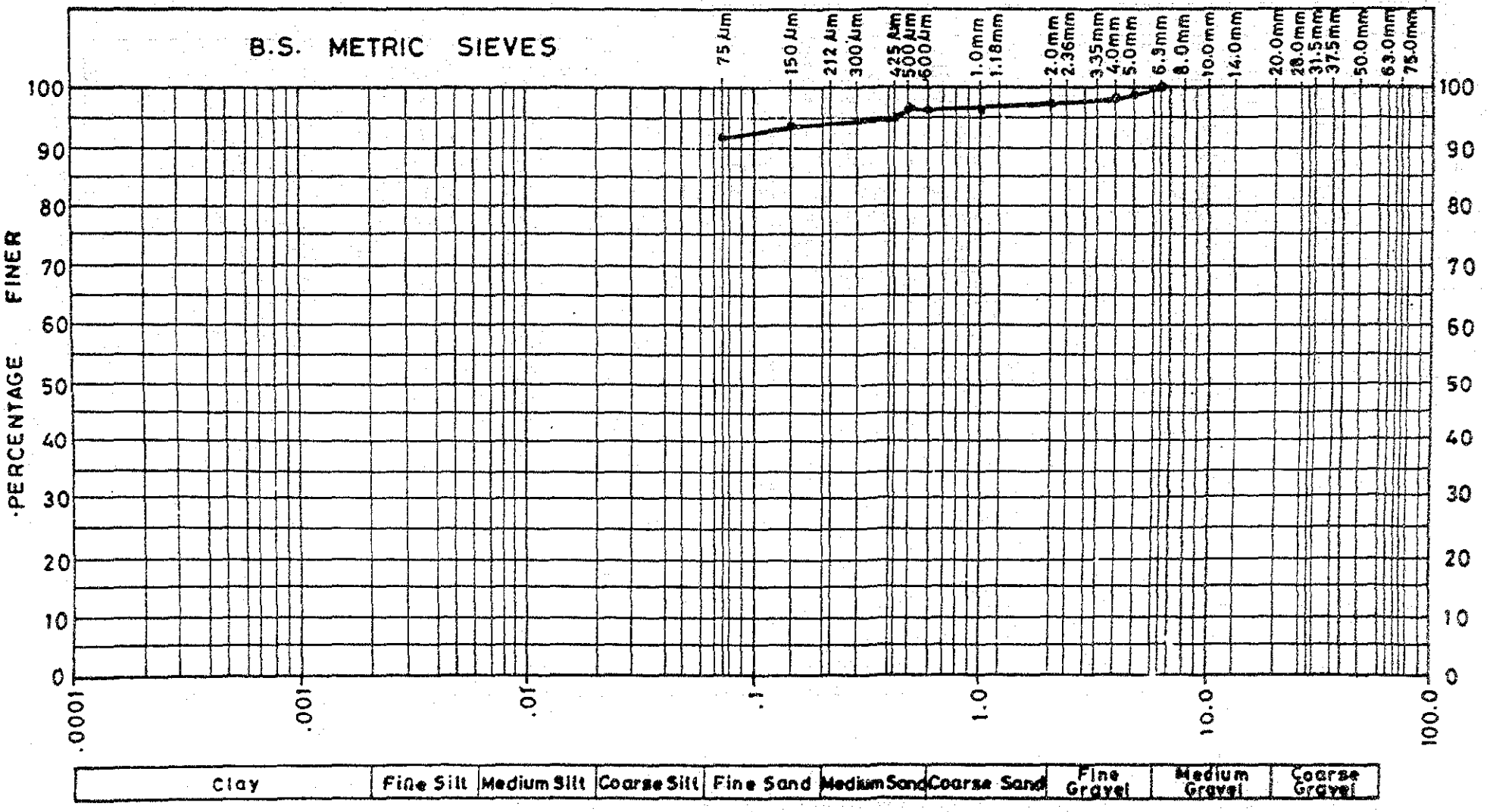
PARTICLE SIZE DISTRIBUTION

Sample No. 4606	Location TB10 B2 1.10 - 1.30m	Description of Sample Sandy SILT



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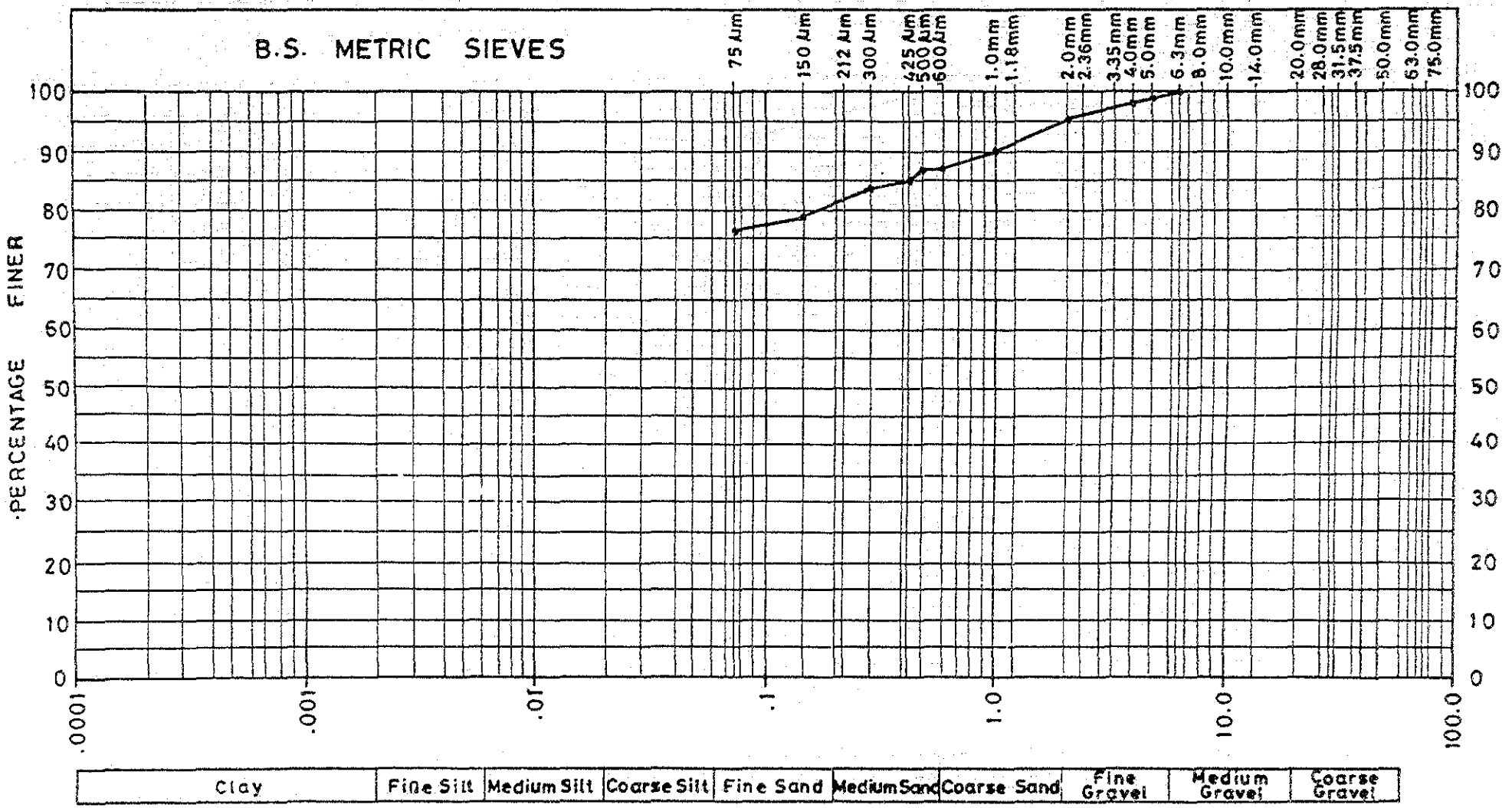
PARTICLE SIZE DISTRIBUTION

Sample No. 7728	Location TC 33 0.40-0.70m	Description of Sample Gravelly, sandy, CLAY



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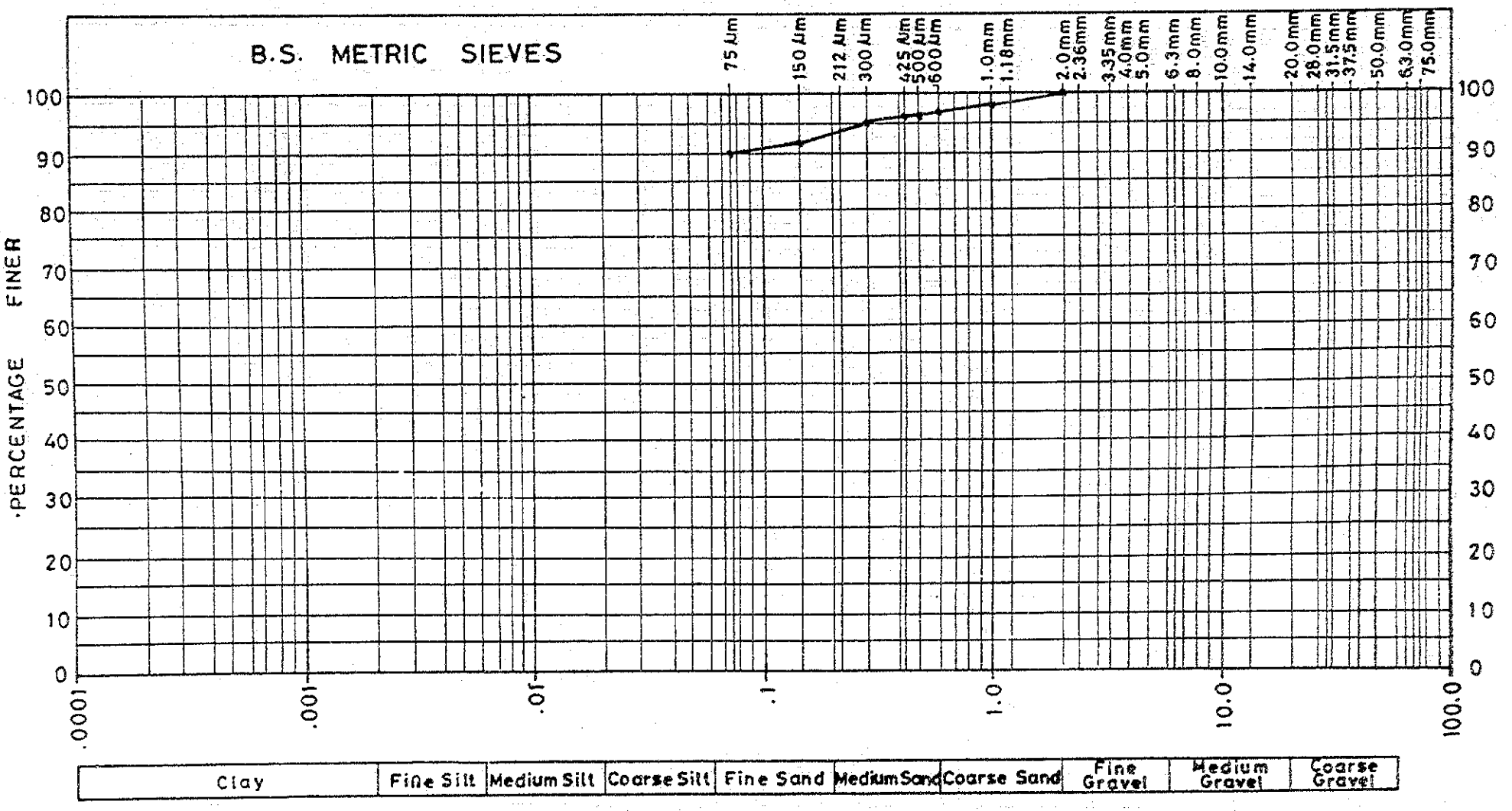
PARTICLE SIZE DISTRIBUTION

Sample No.7731	Location TC 34 0.30-0.80m	Description of Sample Sandy CLAY



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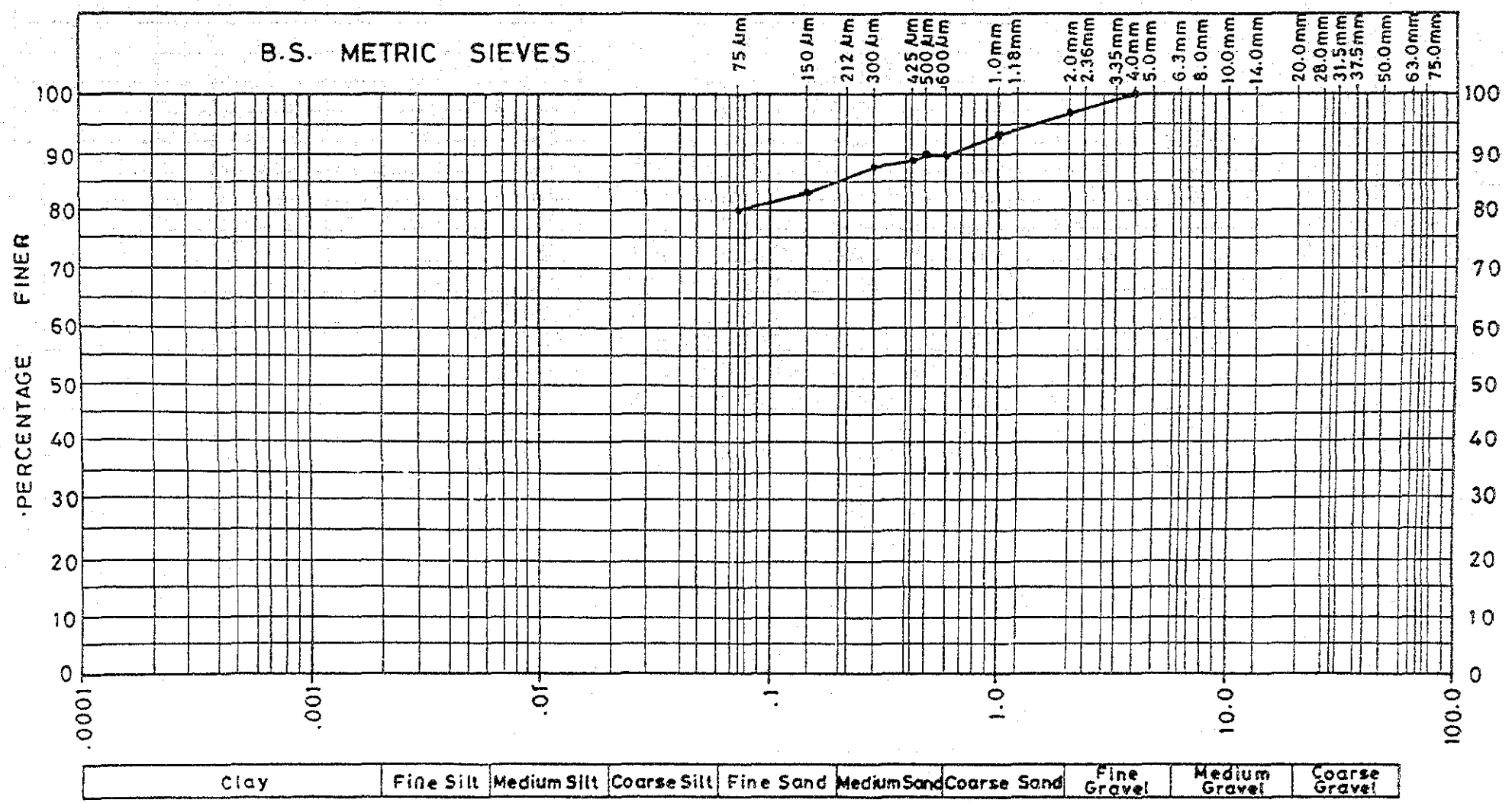
PARTICLE SIZE DISTRIBUTION

Sample No. 7736	Location TC37 0.20-0.40m	Description of Sample Gravelly, sandy CLAY



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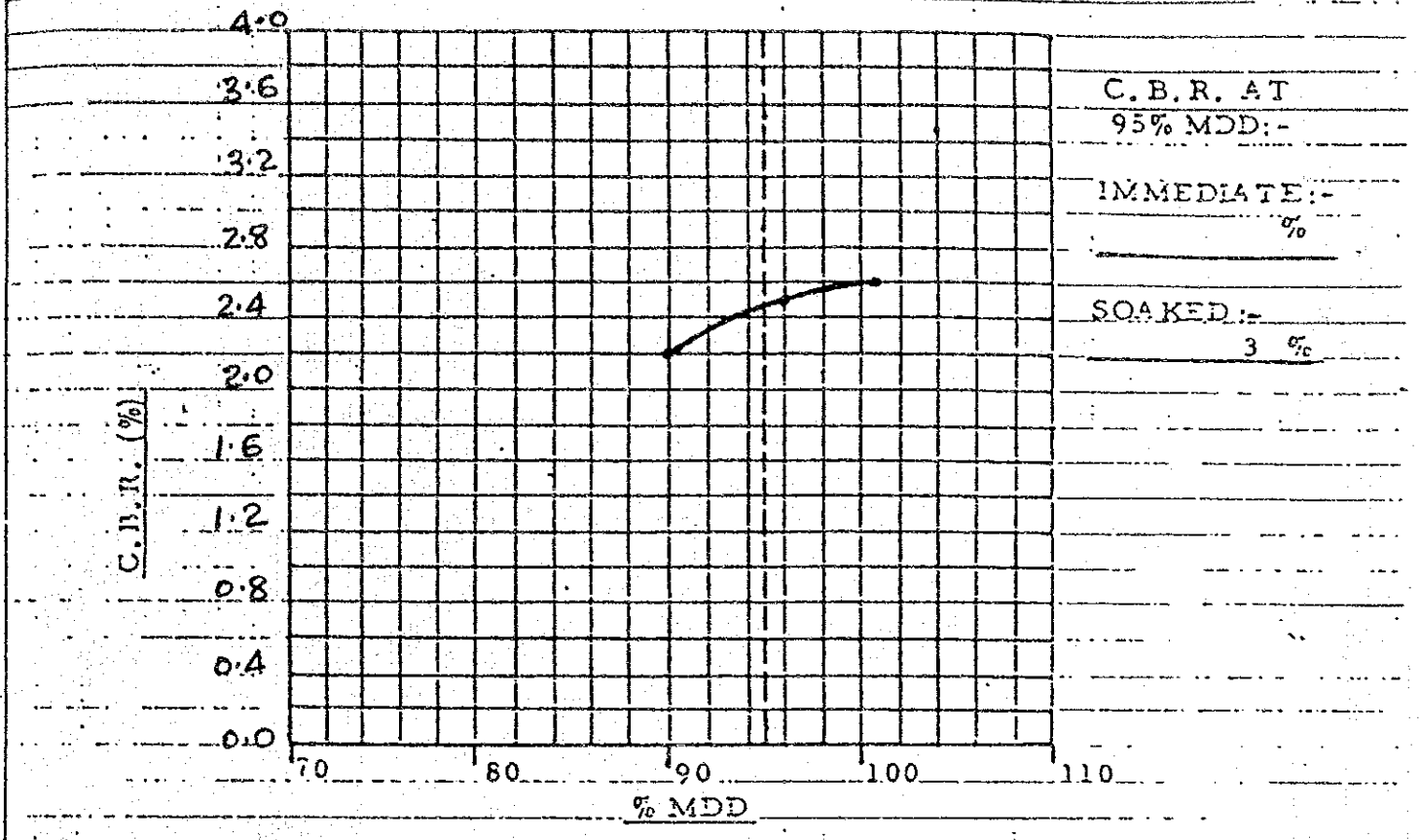
CENTRAL TESTING LABORATORIES LTD.
P. O. Box 18507,
NAIROBI.

CALCULATIONS

FOR 3 POINT C. B. R. AND SWELL MEASUREMENT

S/No.	Date		
4591	20/8/1990	TB3 B2	1.10-1.40m

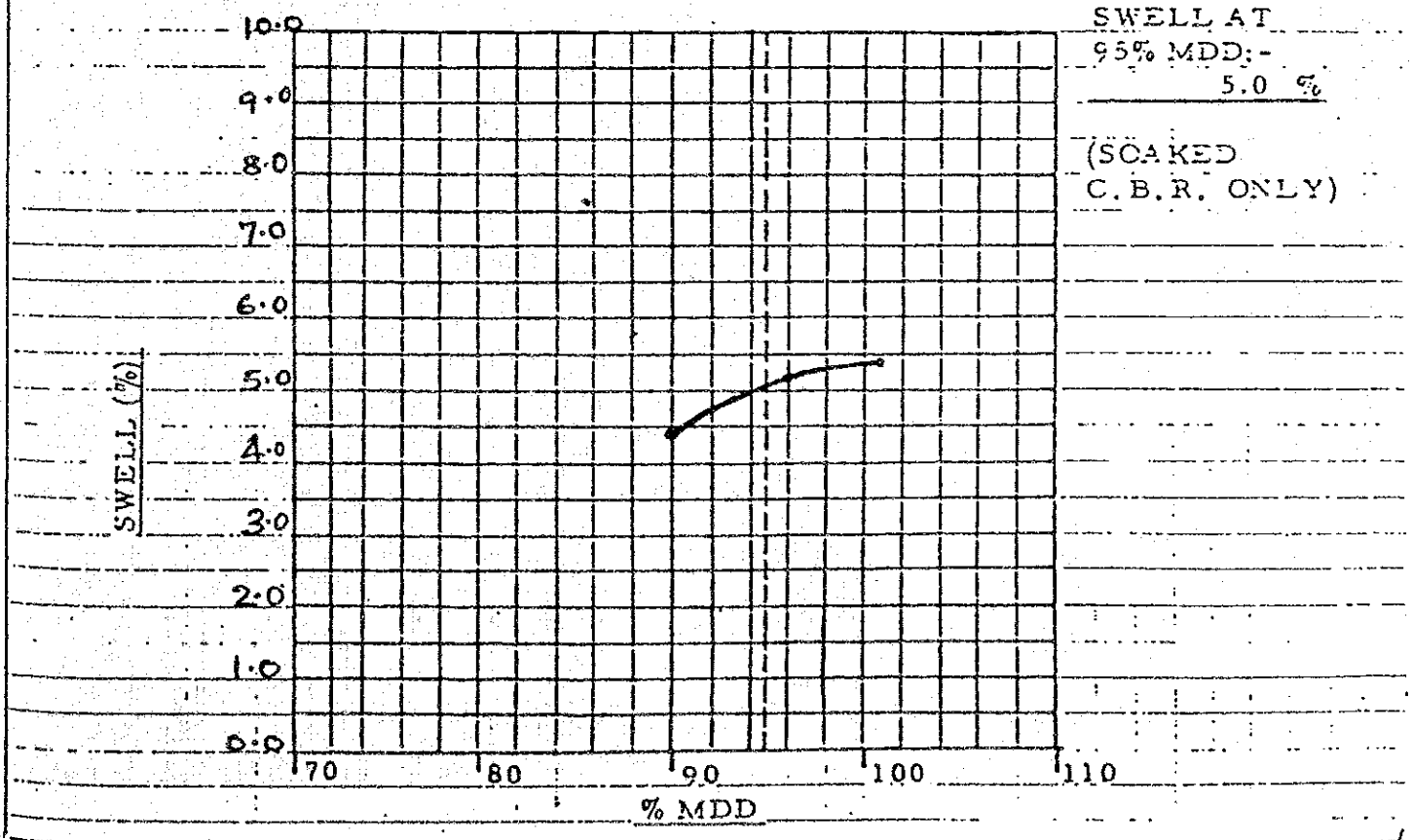
Client MOWLEM CONSTRUCTION CO. (E.A.)LTD Location NAIROBI BY-PASS



C.B.R. AT 95% MDD:-

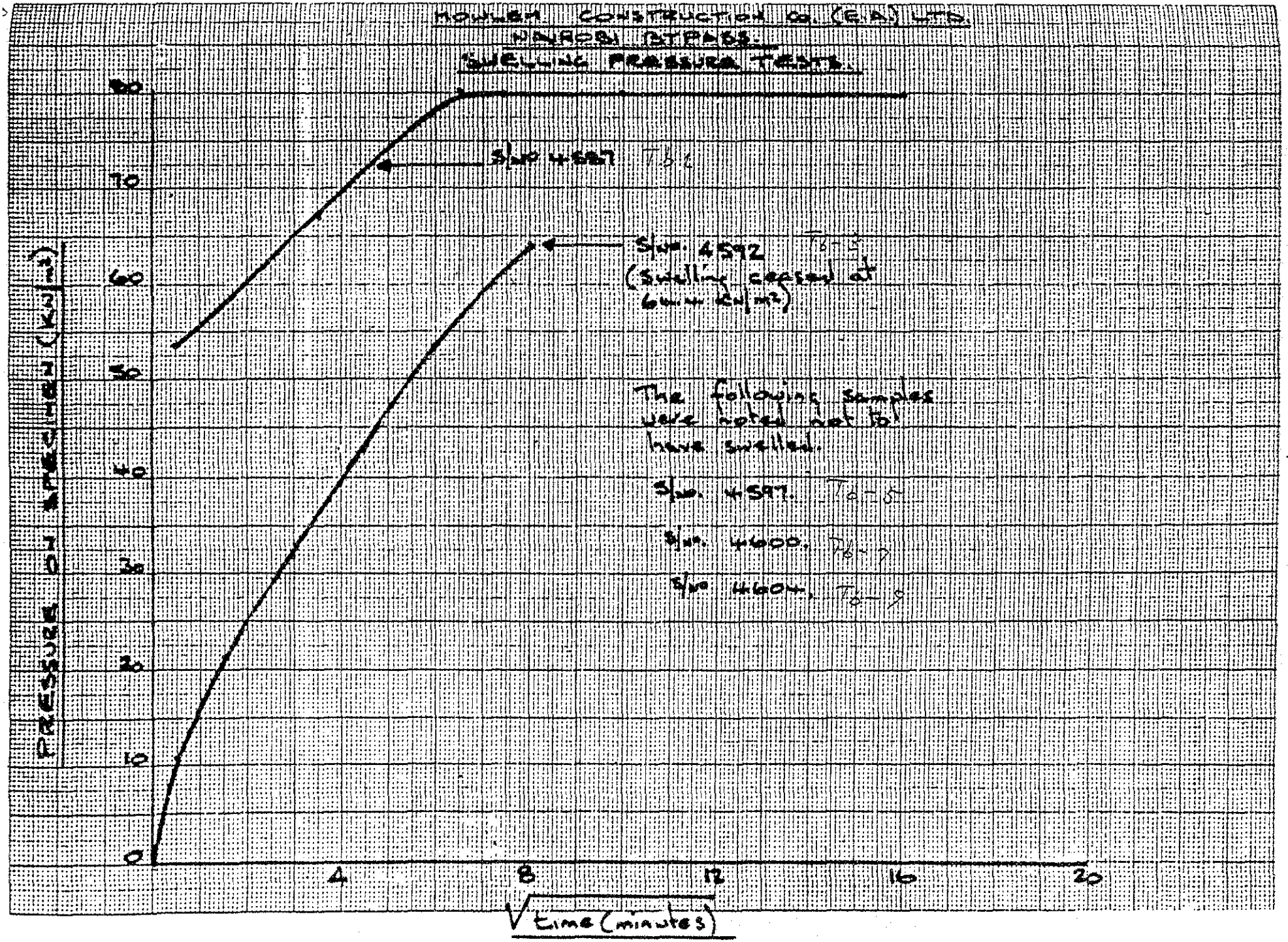
IMMEDIATE:- %

SOAKED:- 3 %



SWELL AT 95% MDD:- 5.0 %

(SOAKED C.B.R. ONLY)


MOWLEM CONSTRUCTION CO. (E.A.) LTD.
NAIROBI DISTRICT
SWELLING PRESSURE TESTS.
S/No 4587 Tb 6
S/No. 4592 Tb 15
(Swelling ceased at 6 kN/m²)
The following samples were noted not to have swelled.
S/No. 4597. Tb 5
S/No. 4600. Tb 7
S/No 4604. Tb 9
PRESSURE (kN/m²)
0
10
20
30
40
50
60
70
80
4
8
12
16
20
√Time (minutes)

CENTRAL TESTING LABORATORIES LTD
P.O. Box 18507, NAIROBI, KENYA

MOWLEM CONSTRUCTION CO.(E.A.)LTD.

CONSOLIDATION TEST

4604 :sample number TB9 BS3 0.2m-0.4m

Sample Descr.:- Brown,very silty,clayey GRAVEL/SAND

2.48 :relative density of soil

1.33 :dry density of sample

20.03 :initial height of sample

0.87 :initial void ratio

0.09 :void ratio reduction factor

-0.00 :dial gauge constant (positive if increases with settlement if not then negative)

pressure	dialread	htchange	voidchge	voidratio	sqrt90	cv m2/yr	mv m2/MN
-	2596	0.000	0.000	0.872	-	-	
26.8	2497	0.251	0.023	0.848	1.8	14.2	0.47
53.6	2334	0.665	0.062	0.810	2.0	10.5	0.78
107.3	2010	1.488	0.139	0.733	2.3	7.8	0.79
214.5	1660	2.377	0.222	0.650	2.0	9.0	0.45
429.0	1246	3.429	0.320	0.551	2.5	5.2	0.26
26.8	1366	3.124	0.292	0.580			

CENTRAL TESTING LABORATORIES LTD
P.O. Box 18507, NAIROBI, KENYA

MOWLEM CONSTRUCTION CO.(E.A.)LTD.

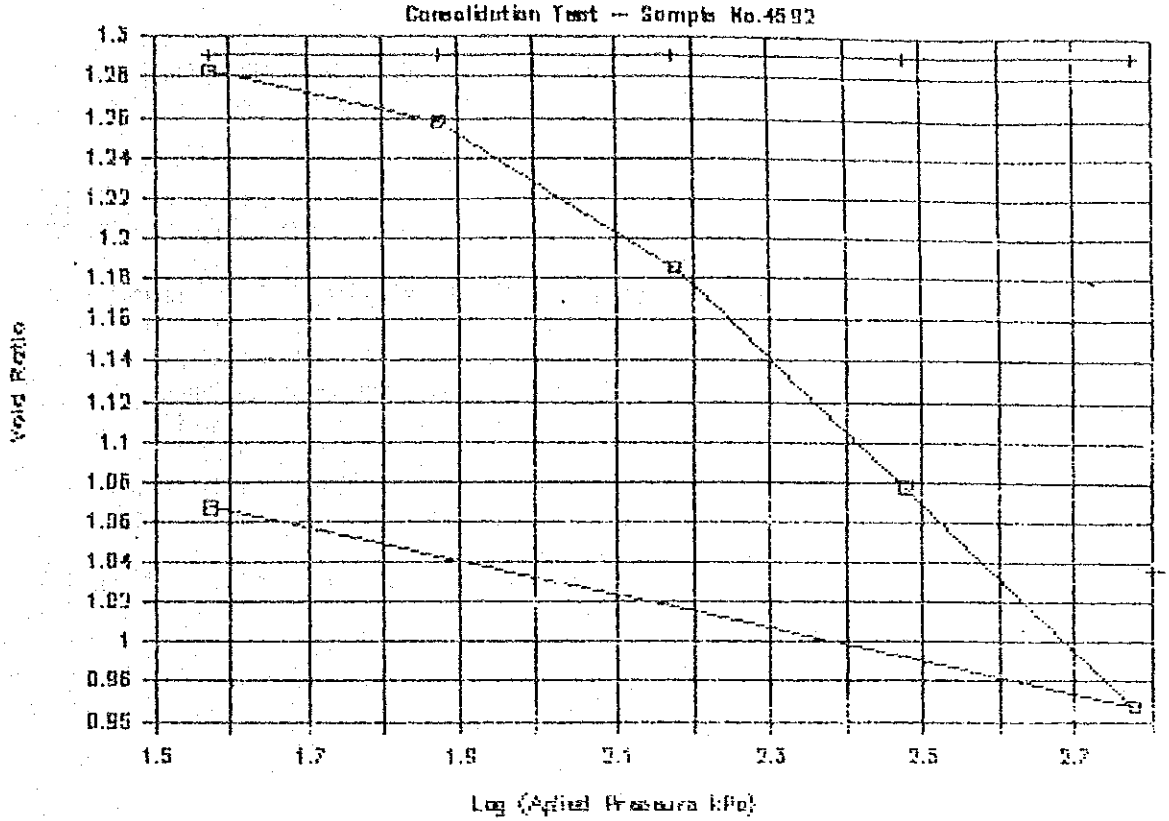
CONSOLIDATION TEST

4592 :sample number TB3 BS3 0.6m-0.8m
Sample Descr.:- Black,slightly gravelly,sandy,very silty CLAY
2.50 :relative density of soil
1.09 :dry density of sample
21.50 :initial height of sample
1.29 :initial void ratio
0.11 :void ratio reduction factor
0.00 :dial gauge constant (positive if increases with settlement
if not then negative)

pressure	dialread	htchange	voidchge	voidratio	sqrt90	cv m2/yr	mv m2/MN
-	30	0.000	0.000	1.291	-	-	
37.5	60	0.076	0.008	1.283	2.0	12.7	0.09
75.0	152	0.310	0.033	1.258	2.5	8.0	0.29
150.0	422	0.996	0.106	1.185	4.5	2.4	0.43
300.0	820	2.007	0.214	1.078	7.0	0.9	0.33
600.0	1228	3.043	0.324	0.967	9.0	0.5	0.18
37.5	856	2.103	0.224	1.067			

CENTRAL TESTING LABORATORIES LTD

Consolidation Test – Sample No.4592



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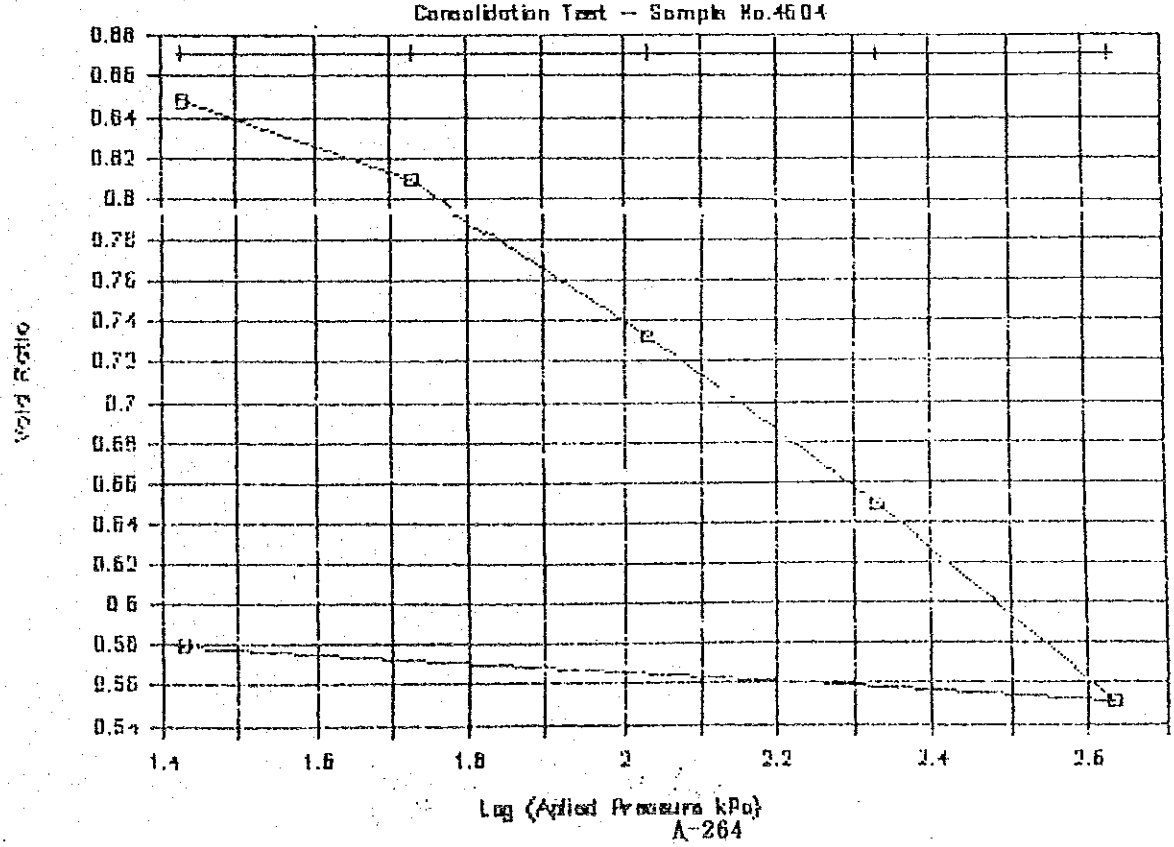
Consolidation Test – Sample No.4604



13-Aug-90

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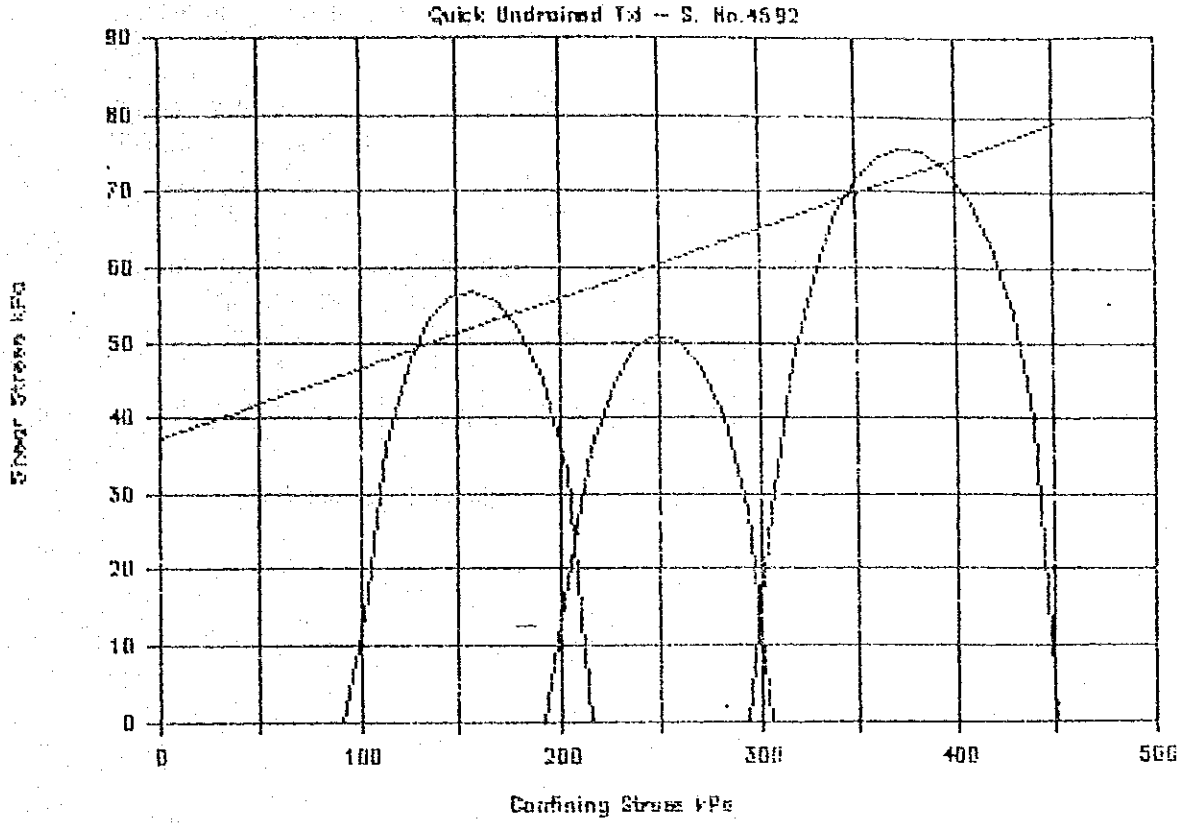
P.O. Box 18507, NAIROBI, KENYA

NAIROBI BY PASS
TB3 BS3 0.6m-0.8m
QUICK UNDRAINED TRIAXIAL
4592 Sample No.
Description:- Black,slightly gravelly,sandy,very silty CLAY

Specimen No.	Bulk Density kg/m3	Moisture Content %	Confining Pressure kN/m2	1/2 Deviator Stress kN/m2
1	1646	40.0	100	57
2	1648	40.2	200	51
3	1660	41.5	300	76

Slope 5.3 degrees Intercept — 37 kN/m2

CENTRAL TESTING LABORATORIES LTD



20-Aug-90

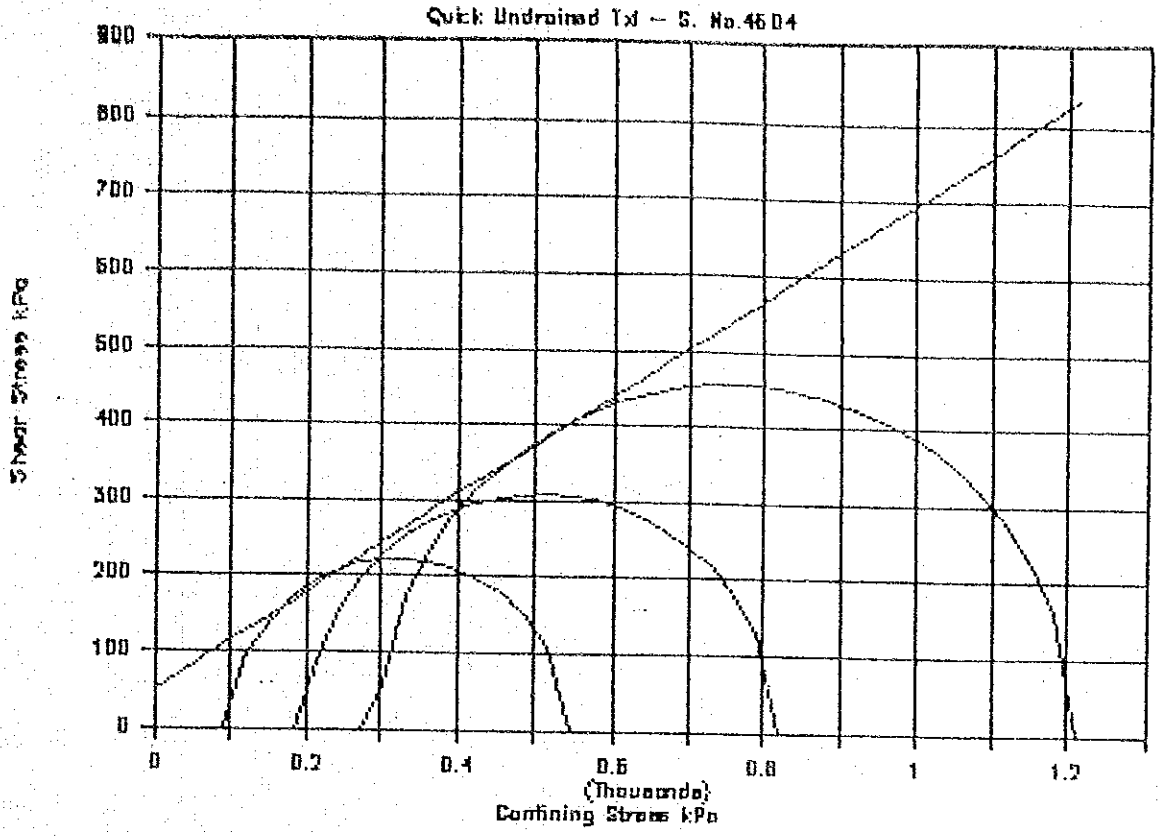
CENTRAL TESTING LABORATORIES LTD
P.O. Box 18507, NAIROBI, KENYA

NAIROBI BY PASS
TB9 BS3 0.2m-0.4m
QUICK UNDRAINED TRIAXIAL
4604 Sample No.
Description:- Brown, clayey MURRAM with grass root fibres

Specimen No.	Bulk Density kg/m3	Moisture Content %	Confining1/2 Pressure kN/m2	Deviator Stress kN/m2
1	1659	16.2	100	223
2	1660	16.3	200	309
3	1661	16.3	300	457

Slope 32.8 degrees Intercept 51 kN/m2

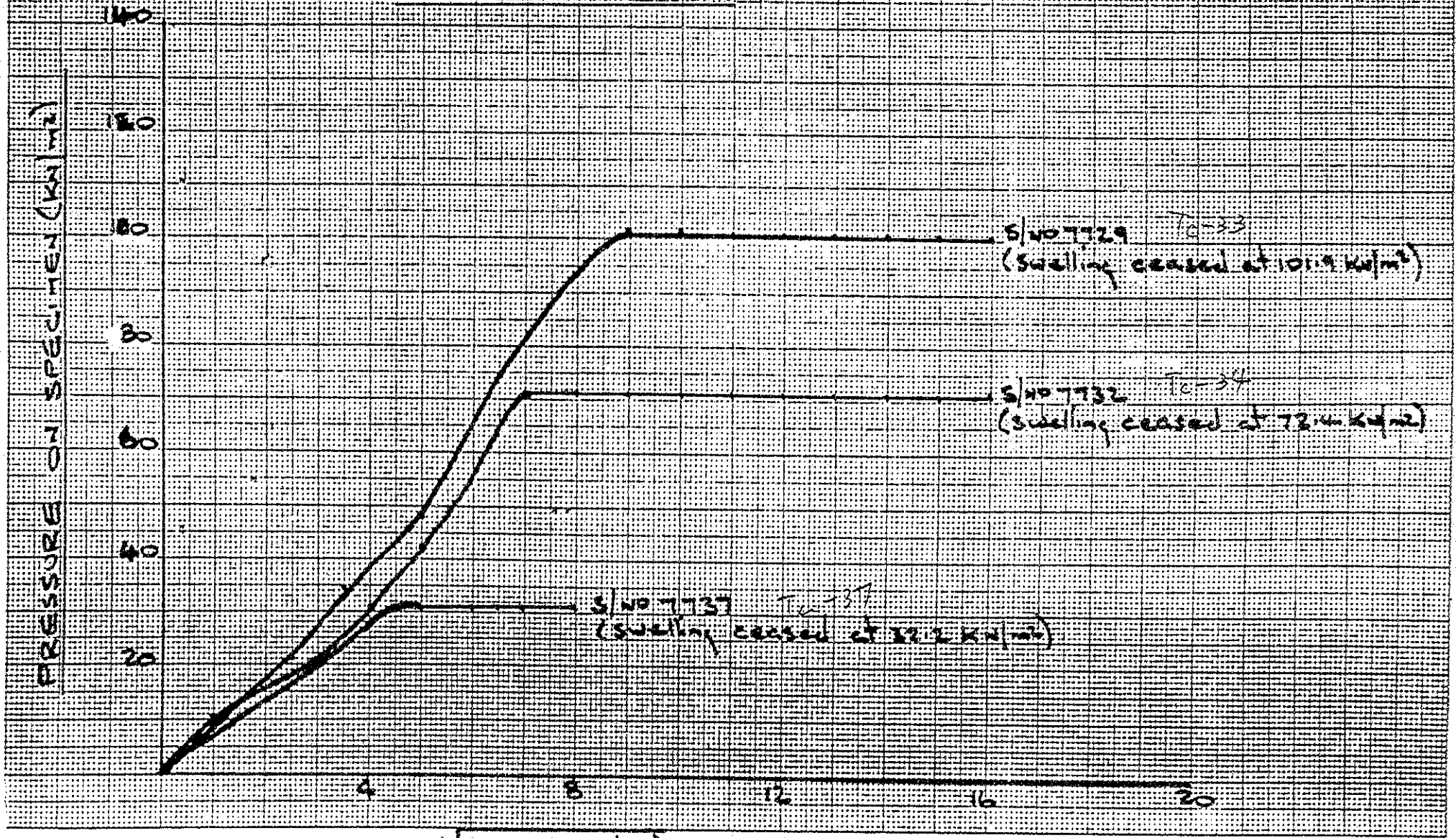
CENTRAL TESTING LABORATORIES LTD



THE MOWLEM CONSTRUCTION CO. (E.A.) LTD.

NAIROBI BY PASS

SWELLING PRESSURE TESTS



A-269

CENTRAL TESTING LABORATORIES LTD.
P.O. Box 18507,
NAIROBI.

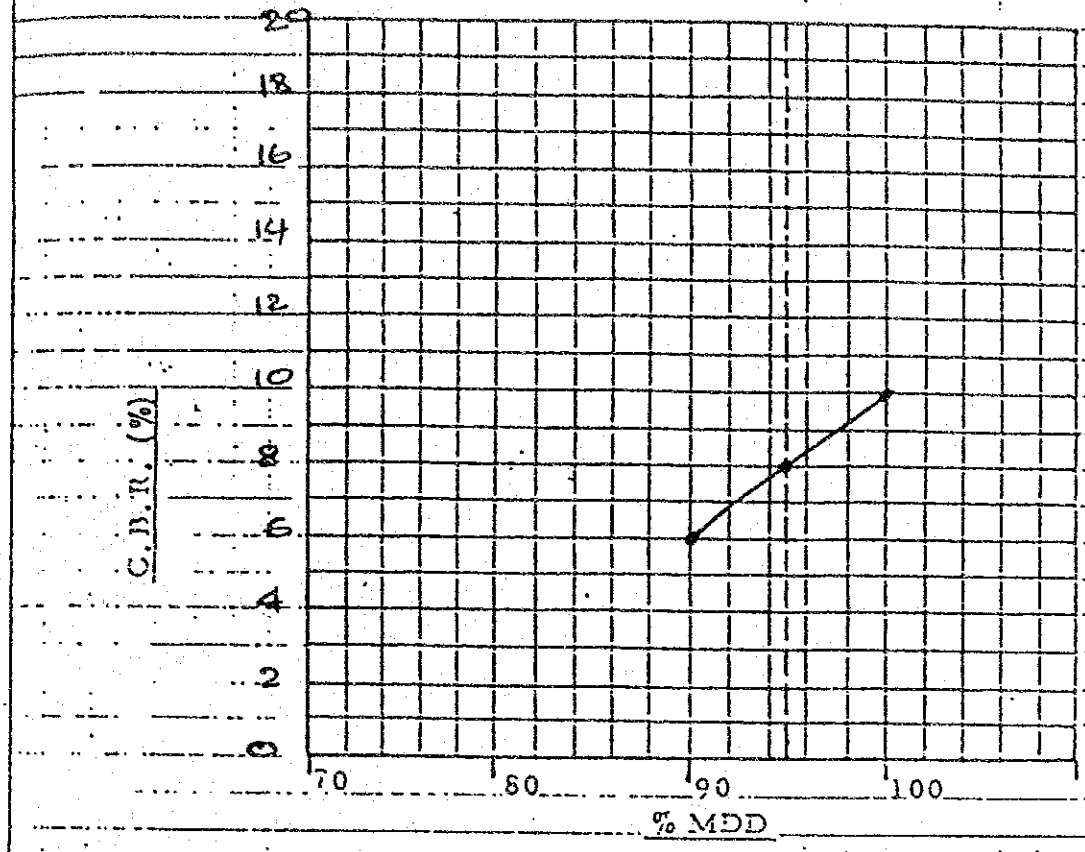
CALCULATIONS

FOR 3 POINT C.B.R. AND SWELL MEASUREMENT

S/No.	Date		
4663	27/8/90	TC12B1	0.50-4.00m

Client --- MOWLEM CONSTRUCTION CO(EA)LTD

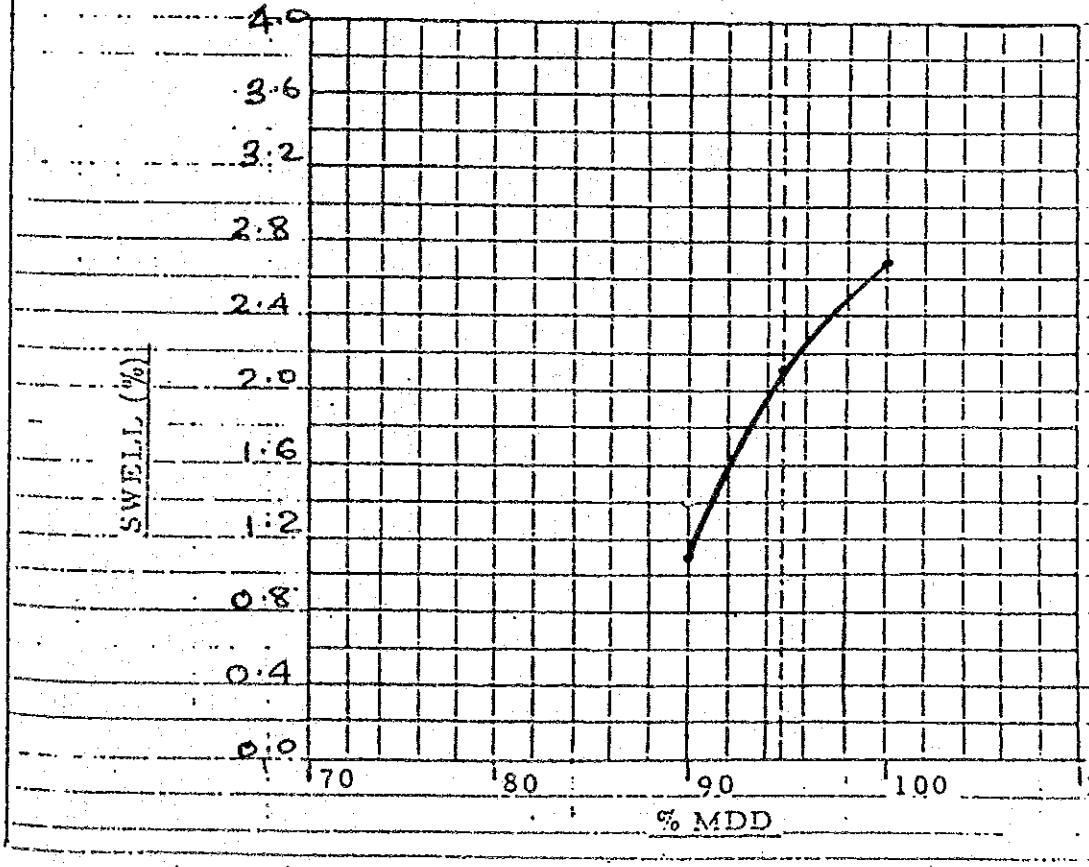
Location --- NAIROBI BY PASS



C.B.R. AT 95% MDD:-

IMMEDIATE:-
N/A %

SOAKED:-
8 %



SWELL AT 95% MDD:-
0.2 %

(SOAKED C.B.R. ONLY)

CENTRAL TESTING LABORATORIES LTD.
P. O. Box 18507,
NAIROBI.

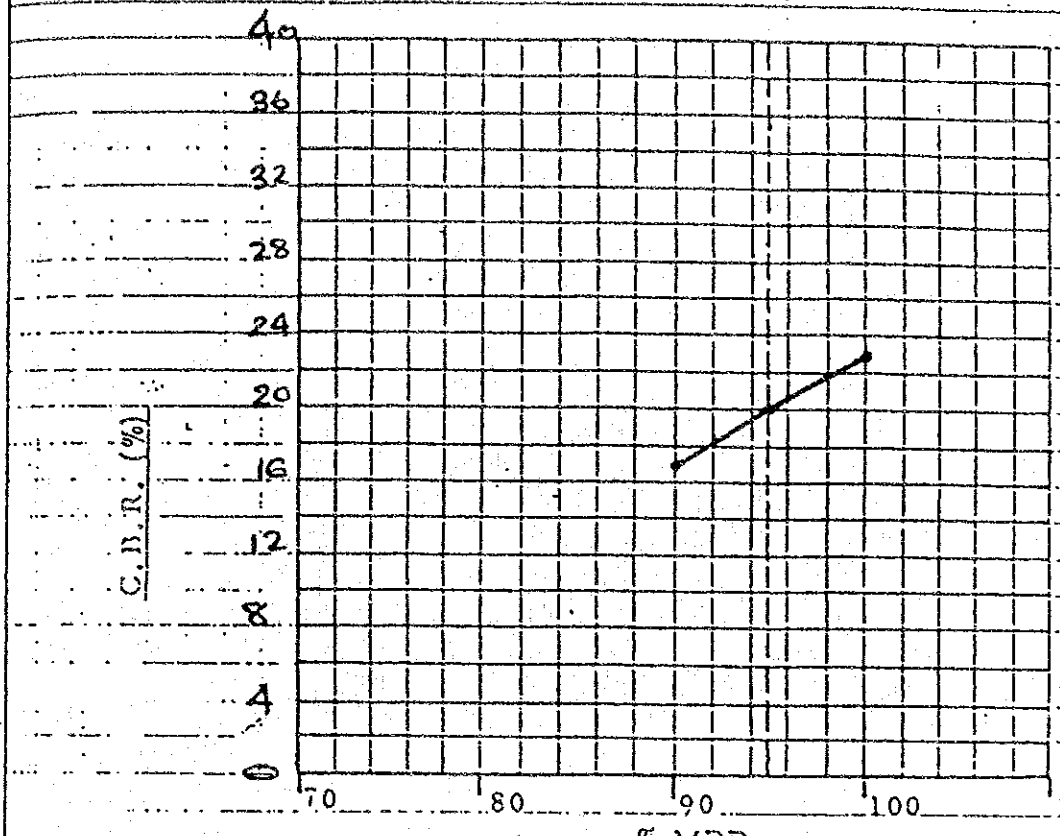
CALCULATIONS

FOR 3 POINT C.B.R. AND SWELL MEASUREMENT

S/No.	Date		
4677	27/8/90	TC23B1	0.70-2.60m

Client MOWLEM CONSTRUCTION CO (EA)LTD

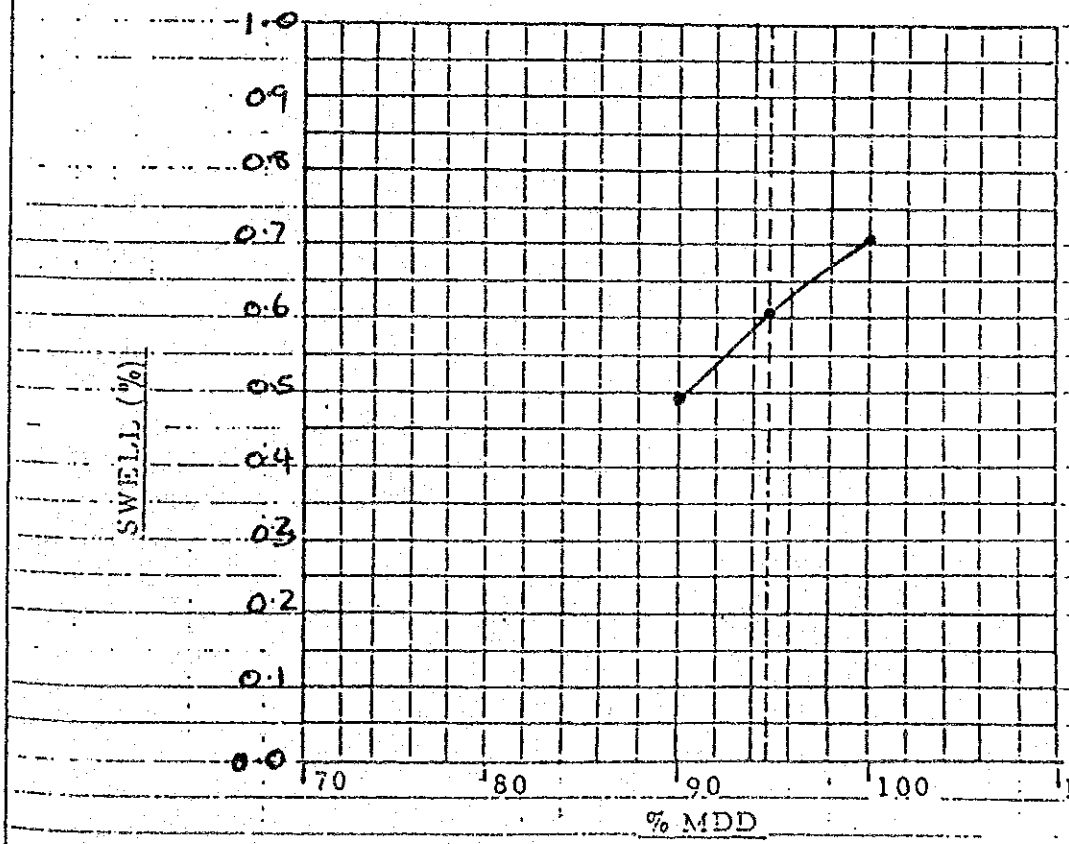
Location NAIROBI BY PASS



C.B.R. AT 95% MDD:-

IMMEDIATE:-
N/A %

SOAKED:-
20 %



SWELL AT 95% MDD:-
0.6 %

(SOAKED C.B.R. ONLY)

1 0. LABORATORY TEST RESULTS OF GRAVEL MATERIAL SITE

SAMPLE No.	ATTERBERG LIMITS LL	PI	LINEAR SHRINKAGE %	PLASTICITY MODULUS	GRADING - % PASSING BS SIEVE 3/4"	3/8"	3/16"	No. 7	No. 36	No. 100	No. 200	COMPACTION B.S.S. M.D.D. kg/m³	O.M.C %	STRENGTH TESTS STABILISER TYPE %	C.B.R. % 1 DAY CURE	% MDD	4 DAY SOAK	% MDD	SWELL %	7 D.C + 7 D.S.	SWELL %	U.C.S. kN/m² 7 D.C + 7 D.S.	% M.D.D.	NODULE HARDNESS G = GOOD A = ADEQUATE P = POOR	P.R. CLASSIFICATION	SAMPLE LOCATION
4525	45	13	7	312	58	49	40	32	24	21	19	1540	24	-	80	95	35	95	0.1							MUTUINI
4526	49	19	9	722	100	97	80	50	38	35	34	1760	20	-	50	95	30	95	0.4							MUTUINI
4525	44	12		238										L 2				96		140	<1					MUTUINI
	47	7		168								1600	23	L 4				95		180	<1					
		NP		0										L 6				95		320	<1					
	46	11		264										C 2				95		170	<1					
		NP		0								1620	24	C 4				96		260	<1					
		NP		0										C 6				95		330	<1					
4526	47	17		646										L 2				95		55	<1					MUTUINI
	45	15		570								1800	18	L 4				95		55	<1					
	47	14		532										L 6				96		110	<1					
	46	15		570										C 2				95		75	<1					
	48	14		532								1800	18	C 4				95		160	<1					
	48	12		456										C 6				95		230	<1					

FOR QUARRY PLAN SEE FIG. No.

TABLE No.

WANJOHI CONSULTING ENGINEERS

SAMPLE No.	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	LINEAR SHRINKAGE %	PLASTICITY MODULUS	GRADING - % PASSING BS SIEVE 3/4"	3/8"	7/16"	No. 7	No. 36	No. 100	No. 200	COMPACTION B.S.S. M.D.D. kg/m³	COMPACTION B.S.S. O.M.C %	STRENGTH TESTS STABILISER TYPE	STABILISER %	C.B.R. % 1 DAY CURE	C.B.R. % MDD	C.B.R. 4 DAY SOAK	C.B.R. % MDD	C.B.R. SWELL %	C.B.R. 7 D.C. + 7 D.S.	C.B.R. SWELL %	U.C.S. kN/m² 7 D.C. + 7 D.S.	U.C.S. kN/m² % N.D.D.	NODULE HARDNESS G= GOOD A=ADEQUATE P= POOR	P.R. CLASSIFICATION	SAMPLE LOCATION
4522	44	17	8	110	70	60	40	21	10	6	5	2030	15			120	96	90	96	0.1							FOREST GUARD

FOR QUARRY PLAN SEE FIG. No.

SAMPLE No.	ATTERBERG LIMITS LL	PI	LINEAR SHRINKAGE %	PLASTICITY MODULUS	GRADING - % PASSING BS SIEVE 3/4"	3/8"	3/16"	No. 7	No. 36	No. 100	No. 200	COMPACTION B.S.S. M.D.D. kg/m³	O.M.C %	STRENGTH TESTS STABILISER TYPE	%	C.B.R. % 4 DAY CURE	% MDD	4 DAY SOAK	% MDD	SWELL %	7 D.C. 7 D.S.	SWELL %	U.C.S. kN/m² 7 D.C. 7 D.S.	% M.D.D.	NODULE HARDNESS G = GOOD A = ADEQUATE P = POOR	P.R. CLASSIFICATION	SAMPLE LOCATION
4555	50	19	9	437	61	46	35	28	23	21	20	1510	24					11	89	0.1							KIBERA
																		13	95	0.1							
																		24	100	0.2							
																											KIBERA
4555	50	12	6	276										L	2				95		50	< 1					
	49	10	5	230								1520	24	L	4				96		90	< 1					
	49	9	5	207										L	5				96		140	< 1					
	48	9	8	207										C	2				95		170	< 1					
	49	8	4	184								1580	23	C	4				95		190	< 1					
		NP	2	0										C	6				96		320	< 1					

FOR QUARRY PLAN SEE FIG. No.

TABLE No.

WANJOHI CONSULTING ENGINEERS

A-275

3.1/3

SAMPLE No.	ATTERBERG LIMITS LL	PI	LINEAR SHRINKAGE %	PLASTICITY MODULUS	GRADING - % PASSING BS SIEVE 3/4"	3/8"	3/16"	No. 7	No. 36	No. 100	No. 200	COMPACTION B.S.S. M.D.D. kg/m³	O.M.C. %	STRENGTH TESTS STABILISER TYPE	%	C.B.R. % 1 DAY CURE	% MDD	4 DAY SOAK	% MDD	SWELL %	D.C. 7 D.S.	SWELL %	U.C.S. kN/m² 7 D C. 7 D.S.	% M.D.D.	NODULE HARDNESS G= GOOD A=ADEQUATE P= POOR	P.R. CLASSIFICATION	SAMPLE LOCATION
4581	49	19	10		95	86	67	51	44	40	39	1730	20					9	90	0.2							THANDI
																		26	95	0.33							
																		30	100	0.47							
4582	41	13	7		68	62	49	31	20	17	16	1890	18					26	90	0.11							THANDI
																		30	95	0.16							
																		38	100	0.04							
4583	35	14	7		93	86	67	43	34	30	29	1890	15					7	90	0.04							THANDI
																		26	95	0.11							
																		45	100	0.15							
4584	51	16	9		93	79	57	36	28	25	24	1800	20					9	90	0.04							THANDI
																		20	95	0.07							
																		27	100	0.09							
																											THANDI
4582	39	12	6	240										1 - 2					96		40	< 1					
	40	10	5	200								1910	16	1 - 4					96		95	< 1					
		NP	1	0										1 - 6					96		160	< 1					
		NP	2	0										C - 2					95		220	< 1					
		NP	1	0								1950	15	C - 4					95		260	< 1					
		NP	0	0										C - 6					95		370+	< 1					
																											THANDI
4584	42	14	7	392										1 - 2					95		35	< 1					
	41	13	6	354								1820	18	1 - 4					95		45	< 1					
	38	12	6	336										1 - 6					95		60	< 1					
	41	13	6	364										C - 2					95		100	< 1					
	42	10	5	280								1850	17	C - 4					95		160	< 1					
		NP	1	0										C - 6					95		260	< 1					

FOR QUARRY PLAN SEE FIG. No.

WANJOHI CONSULTING ENGINEERS

TABLE No.

A-276

3.1/4

SAMPLE No.	ATTERBERG LIMITS LL	PI	LINEAR SHRINKAGE %	PLASTICITY MODULUS	GRADING - % PASSING BS SIEVE 3/4"	3/8"	3/16"	No. 7	No. 36	No. 100	No. 200	COMPACTION B.S.S. M.D.D. kg/m³	O.M.C %	STRENGTH TESTS STABILISER TYPE — %	C.B.R. % 1 DAY CURE	% MDD	4 DAY SOAK	% MDD	SWELL %	7 D.C. + 7 D.S.	SWELL %	U.C.S. kN/m² 7 D.C. 7 D.S.	% M.D.D.	MODULE HARDNESS G= GOOD A=ADEQUATE P= POOR	P.R. CLASSIFICATION	SAMPLE LOCATION
4571	37	10	5	180	62	52	39	26	18	16	15	1800	20				93	90	0.05							CHURCH
																	100	95	0.13							
																	170	100	0.18							
4572	40	13	7	273	75	66	50	29	21	19	18	1910	18				39	91	0.08							CHURCH
																	55	96	0.18							
																	110	101	0.22							
4573	51	15	8	465	97	89	66	40	31	28	26	1710	21				15	91	0.09							CHURCH
																	35	96	0.18							
																	75	100	0.23							
4572	37	12	6	252										L — 2				95		160	< 1					CHURCH
	41	11	5	231								1890	19	L — 4				95		190	< 1					
	42	9	4	189										L — 6				95		250	< 1					
	41	11	6	231										C — 2				96		180	< 1					
	44	9	5	189								1910	18	C — 4				95		270	< 1					
		NP	1	0										C — 6				95		370+	< 1					

FOR QUARRY PLAN SEE FIG. No.

WANJOHI CONSULTING ENGINEERS

TABLE No.

A-277

3.1/5

SAMPLE No.	ATTERBERG LIMITS LL	PI	LINEAR SHRINKAGE %	PLASTICITY MODULUS	GRADING - % PASSING BS SIEVE 3/4"	3/8"	3/16"	No. 7	No. 36	No. 100	No. 200	COMPACTION B.S.S. M.D.D. kg/m³	O.M.C. %	STRENGTH TESTS STABILISER Type & %	C.B.R. % 1 DAY CURE	% MDD	4 DAY SOAK	% MDD	SWELL %	7 D.C.+ 7 D.S.	SWELL %	U.C.S. kN/m² 7 D.C. 7 D.S.	% M.D.D.	NODULE HARDNESS G = GOOD A = ADEQUATE P = POOR	P.R. CLASSIFICATION	SAMPLE LOCATION
4574	44	16	9	352	68	52	37	26	22	21	19	1960	15				55	91	0.04							KIRIBA
																	75	96	0.07							
																	95	101	0.15							
4575	51	20	10	860	99	96	76	49	43	40	38	1750	27				14	91	0.04							KIRIBA
																	19	96	0.07							
																	22	101	0.09							
4576	47	17	9	204	59	45	31	19	12	10	9	1740	20				160	90	0.02							KIRIBA
																	190	95	0.05							
																	209	101	0.08							
4577	46	16	9	256	63	54	40	23	16	14	13	1900	17				50	90	0.02							KIRIBA
																	80	95	0.04							
																	110	100	0.07							
4575	47	18	9	774										L 2				95		58	<1					KIRIBA
	46	16	8	688								1810	19	L 4				95		130	<1					
	48	14	7	602										L 6				96		165	<1					
	45	17	8	731										C 2				95		70	<1					
	47	15	7	645								1790	20	C 4				95		150	<1					
	47	13	6	559										C 6				96		210	<1					
4577	37	10	5	160										L 2				95		110	<1					KIRIBA
	36	9	4	144								1920	17	L 4				95		180	<1					
		NP	2	0										L 6				95		210	<1					
	37	9	4	144										C 2				95		160	<1					
		NP	2	0								1930	17	C 4				95		270	<1					
		NP	1	0										C 6				95		300	<1					

FOR QUARRY PLAN SEE FIG. No.

TABLE No.

A-278

3.1/6

SAMPLE No.	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	LINEAR SHRINKAGE %	PLASTICITY MODULUS	GRADING - % PASSING BS SIEVE 3/4"	3/8"	3/16"	No. 7	No. 36	No. 100	No. 200	COMPACTION B.S.S. M.D.D. kg/m³	COMPACTION B.S.S. O.M.C %	STRENGTH TESTS STABILISER TYPE	STABILISER %	C.B.R. % 1 DAY CURE	C.B.R. % % MDD	C.B.R. % 4 DAY SOAK	C.B.R. % % MDD	C.B.R. % SWELL %	C.B.R. % 7 D.C.S.	C.B.R. % SWELL %	U.C.S. kN/m² 7 D.C.S.	U.C.S. kN/m² % M.D.D.	MODULE HARDNESS G = GOOD A=ADEQUATE P = POOR	P.R. CLASSIFICATION	SAMPLE LOCATION
4521		NP	2	0	61	44	31	21	9	4	2	1240	39	--	--	1.20	95	90	90	0.2							WAIGANJO
																		90	95	0.3							
																		100	101	0.4							
4521		NP	1	0										L	2				95		150	< 1					WAIGANJO
		NP	1	0								1300	24	L	4				95		230	< 1					
		NP	0	0										L	6				95		230	< 1					
		NP	1	0										C	2				95		210	< 1					
		NP	1	0								1320	27	C	4				95		250	< 1					
		NP	0	0										C	6				95		370+	< 1					

FOR QUARRY PLAN SEE FIG. No.

A-219

3.1.74

CONSULTING ENGINEERS

TABLE No

SAMPLE No.	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	LINEAR SHRINKAGE %	PLASTICITY MODULUS	GRADING - % PASSING BS SIEVE 3/4"	3/8"	3/16"	No. 7	No. 36	No. 100	No. 200	COMPACTION B.S.S. M.D.D. kg/m³	O.M.C %	STRENGTH TESTS STABILISER TYPE	%	1 DAY CURE	C.B.R. % % MDD	4 DAY SOAK	% MDD	SWELL %	7 D.C.+ 7 D.S.	SWELL %	U.C.S. kN/m² 7 D.C. 7 D.S.	% M.C.O.	NODULE HARDNESS G = GOOD A = ADEQUATE P = POOR	P.R. CLASSIFICATION	SAMPLE LOCATION
4578	41	12	6	240	58	50	42	29	20	18	17	1710	23				-	26	90	0.15							KAREN
																		50	95	0.28							
																		75	100	0.39							
4579	34	13	7		58	48	36	24	17	16	15	1899	17					12	90	0.15							KAREN
																		21	95	0.24							
																		30	100	0.29							
4580	37	11	5		58	49	37	22	14	11	10	[illegible]	15					23	90	0.11							KAREN
																		95	95	0.22							
																		110	100	0.23							
4579	38	12	6	204										L	2				96		95	< 1					KAREN
	36	11	5	187								1910	17	L	4				95		140	< 1					
	40	10	5	170										L	6				95		190	< 1					
	38	10	5	170										C	2				95		140	< 1					
	37	8	4	136								1900	18	C	4				95		330	< 1					
		NP	2	0										C	6				95		370+	< 1					

FOR QUARRY PLAN SEE FIG. No.

WANJOHI CONSULTING ENGINEERS

TABLE No.

SAMPLE No.	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	LINEAR SHRINKAGE %	PLASTICITY MODULUS	GRADING - % PASSING BS SIEVE 3/4"	3/8"	3/16"	No. 7	No. 36	No. 100	No. 200	COMPACTION B.S.S. M.D.D. kg/m³	COMPACTION B.S.S. O.M.C %	STRENGTH TESTS STABILISER TYPE	STABILISER %	C.B.R. % 1 DAY CURE	% MDD	4 DAY SOAK	% MDD	SWELL %	7 D.C.-7 D.S. SWELL %	7 D.C.-7 D.S. % M.D.D.	U.C.S. kN/m² 7 D.C.-7 D.S.	% M.D.D.	NODULE HARDNESS G = GOOD A = ADEQUATE P = POOR	P.R. CLASSIFICATION	SAMPLE LOCATION
4519	41	13	6	65	58	45	28	14	5	3	3	2000	14			1.10	.95	4.0	90	0.1							CARNIVORE
																		5.0	95	0.2							
																		17.0	101	0.2							
4520	45	18	9	342	85	70	50	29	19	16	15	1.300	13			.85	95	24	91	0.2							CARNIVORE
																		45	95	0.3							
																		65	101	0.3							
4556	51	15	8	615	100	97	85	47	41	40	39	1630	20					6	90	0.3							CARNIVORE
																		7	95	0.6							
																		10	100	1.1							
4519	38	12	6	60										L	2				95		95	< 1					CARNIVORE
	39	10	5	50								2020	15	L	4				95		110	< 1					
		NP	2	0										L	6				94		130	< 1					
		NP	2	0										C	2				95		210	< 1					
		NP	1	0								2050	15	C	4				96		270	< 1					
		NP	1	0										C	6				96		370	< 1					

FOR QUARRY PLAN SEE FIG. No.

WANTON CONSULTING ENGINEERS

TABLE No.

A-281

3.1/9

SAMPLE No.	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	LINEAR SHRINKAGE %	PLASTICITY MODULUS	GRADING - % PASSING BS SIEVE 3/4"	3/8"	3/16"	No. 7	No. 36	No. 100	No. 200	COMPACTION B.S.S. M.D.D. kg/m³	O.M.C. %	STABILISER TYPE & %	STRENGTH TESTS C.B.R. % 1 DAY CURE	% MDD	4 DAY SOAK	% MDD	SWELL %	7 D.C. 7 D.S.	SWELL %	U.C.S. kN/m² 7 D.C. 7 D.S.	% M.D.D.	NODULE HARDNESS G = GOOD A=ADEQUATE P = POOR	P.R. CLASSIFICATION	SAMPLE LOCATION
4523	46	11	6	143	47	35	28	21	13	9	7	1570	20	C 2	75	95	15	95	1.1							GALSHEET
4524	65	20	10	440	56	45	35	27	22	20	20	1560	23	C 2	85	95	30	95	0.4							GALSHEET
4557	67	23	12	391	50	34	26	21	17	15	15	1540	28	C 2			3	91	0.7							GALSHEET
														C 4			3	95	1.0							
														C 6			5	100	1.1							
4558	72	31	15	558	43	30	24	20	18	17	17	1710	24	C 2			3	90	0.5							GALSHEET
														C 4			4	96	1.8							
														C 6			5	100	3.4							
4523	52	10	5	130										L 2				94		120	< 1					GALSHEET
	49	8	4	104								1640	21	L 4				94		140	< 1					
		NP	2	0										L 6				95		220	< 1					
	49	8	4	104										C 2				94		100	< 1					
		NP	2	0								1630	21	C 4				95		250	< 1					
		NP	1	0										C 6				95		370+	< 1					
4557	67	22	11	374										L 2				96		50	< 1					GALSHEET
	66	21	10	357								1550	25	L 4				95		95	< 1					
	65	17	9	289										L 6				95		110	< 1					
	65	19	9	323										C 2				94		55	< 1					
	64	16	8	272								1580	26	C 4				95		150	< 1					
	62	14	7	238										C 6				95		210	< 1					

FOR QUARRY PLAN SEE FIG. No.

WANIOHI CONSULTING ENGINEERS

A-282

3.1/10

1 1. LABORATORY TEST RESULTS OF HARD STONE MATERIAL SITE

CTL CENTRAL TESTING LABORATORIES Ltd.

P.O. Box 18507 Tel. 559422/23

Nairobi

Client MOWLEM CONSTRUCTION CO (E.A.) LTD

Location NAIROBI SOUTHERN BY PASS

Job No.....

Sheet No 1 of 1

Date 15/8/1990

AGGREGATE TEST RESULTS SUMMARY SHEET

SAMPLE No.	SITE MARKING	GRADING % PASSING																					SILT CONTENT %	A.C.V. %	10% FINES KN	LAA %	P.I. on LAA FINES	FLAKINESS INDEX %	BITUMEN AFFINITY %			1½"–¾" S.S.S. %	SULPHATE SOUNDNESS %		SPECIFIC GRAVITY			WATER ABS %
		75 mm	63 mm	50 mm	37.5 mm	28 mm	25 mm	20 mm	14 mm	10 mm	6.3 mm	5 mm	4 mm	2.36 mm	2 mm	1.18 mm	1 mm	600 µm	500 µm	425 µm	300 µm	150 µm	75 µm							KE-60	MC 3000	80/100	CRUMBLING	-No 4 SIEVE	-No 4 SIEVE	S.B.	S.S.S.	APP	
4515	DBT KKI				100	–	93	73	44	31	20	17	14	10	–	7	–	5	–	4	3	2	1		22		27	NP	36	>95	>95	>95		4.3	4.9	4.9	2.42	2.49	2.60	3.2
4516	KIT KKI				100	–	93	69	40	29	16	13	11	7	–	4	–	2	–	2	1	1	1		17		18	NP	26	>95	>95	>95		5.1	3.6	3.1	2.39	2.44	2.51	2.0
4517	RUN GK 1				100	–	94	80	47	33	21	18	15	11	–	8	–	6	–	5	4	3	3		34		45	NP	17	>95	>95	>95		30.8	26.4	21.7	2.40	2.50	2.68	4.6
4518	MUT GKI				100	–	94	79	49	35	23	19	16	12	–	8	–	5	–	4	4	3	1		37		55	NP	20	>95	>95	>95		39.5	37.1	28.1	2.45	2.59	2.82	5.1
4553	KIB KKI				100	–	96	81	56	43	31	27	24	18	–	12	–	8	–	6	5	4	1		42		47	NP	20	<95	<95	<95		22.0	24.2	26.0	1.95	2.19	2.62	16.4
4554	KIB KK 2				100	–	96	88	66	53	41	37	34	27	–	20	–	14	–	12	11	7	2		48		63	NP	10	<95	<95	<95		33.3	48.2	43.3	1.53	1.89	2.39	24.3
4570	MAX KKI				100	–	86	67	39	27	15	13	10	7	–	4	–	2	–	2	1	1	0		23		22	NP	39	>95	>95	>95			3.1	2.9	2.43	2.52	2.65	2.9
4625	CAR KKI				100	–	94	81	54	41	30	26	23	18	–	13	–	10	–	9	8	6	3		31		46	NP	22	>95	>95	>95		59.5	55.8	37.7	2.40	2.53	2.77	4.9

DBT – DBT – EXISTING QUARRY
KIT – KITENGELA – NEW QUARRY
RUN – RUNGIRI " "
MUT – MUTHIGA " "
KIB – KIBERA " "
MAX – Max-INN " "
CAR – CARNIVORE " "

CTL CENTRAL TESTING LABORATORIES Ltd.

P.O. Box 10807 Tel. 569432/23

Nairobi

Client THE MOWLEM CONSTRUCTION CO. (E.A) LTD

Location NAIROBI BY PASS

Job No.....

Sheet No. 1 of 1

Date 27/8/1990

AGGREGATE TEST RESULTS SUMMARY SHEET

SAMPLE No.	SITE MARKING	GRADING % PASSING																					BIT. CONTENT %	A.C.V. %	10% FINES kN	LAA %	P.I. on LAA FINES	FLAKINESS INDEX %	A.I.D. mm	BITUMEN AFFINITY %				SULPHATE SOUNDNESS %		SPECIFIC GRAVITY			WATER ABS %
		75 mm	63 mm	50 mm	37.5 mm	28 mm	25 mm	20 mm	14 mm	10 mm	6.3 mm	5 mm	4 mm	2.36 mm	2 mm	1.18 mm	1 mm	600 µm	500 µm	425 µm	300 µm	150 µm	75 µm								MC 3000	KI-60	80/100		+No. 4 SIEVE	-No. 4 SIEVE	B.D.	S.S.D.	APP	
4794	BK2			100	90	-	59	55	45	31	17	15	12	8	-	4	-	1	-	0					18		22		35		>95	<95	>95		2.0	4.3	2.35	2.48	2.71	4.4
7.75-13.20m																																							

1 2. EXISTIING HARD STONE QUARRY QUESTIONNAIRE

NAIROBI BYPASS PROJECT

SOURCES AROUND NAIROBI

QUARRY NAME/OWNER M/S ROCKSIZERS LTD

~~COMMERCIAL~~/PRIVATE * delete as appropriate

1. Year opened 1978
2. Is site leased or owned by operator Leased
3. If leased, name and address of lessor MR. G.K. KIRIMA & SONS
4. If leased, number of years remaining unexpired 40 YRS
5. Type of crusher on site AJN CRUSHERS (PRIMARY) & 2 STAGE SECONDARY
6. Capacity of the crusher in tonnes per day or m^3/day 800 TONS /DAY
7. Potential of the site (estimate) EXCESSIVE
8. Rock type products BLACK TRAP
9. If material has been used previously in a road project, state project name, year and how used.

Project	Year	Surfacing/Base/Subbase
KAYOLE PH II	1984 - 86	SURFACING /BASE
UMOJA II	89	SURFACING
DANDORA PH II	1978 - 83	BASE / SURFACING

10. State the present prices per tonne

Material	Price	
Chippings	250/=	EX-QUARRY
Graded Crushed Stone	250/=	
Aggregates	250/=	

11. Is the owner willing to accept order for supplying materials to the Nairobi Bypass Project? YES

12. Is the owner willing to accept special quality specifications Yes/~~No~~ * delete appropriately

13. If yes, what extra charge would he demand Ksh. 50/= / TON

14. Are there any laboratory tests carried out on materials from this source Yes/~~No~~ * delete appropritely

15. If yes, from 14 state where and from whom to get them KENYA BUREAU OF STANDARDS

16. State the proposed development proposals for the site if any NONE AT PRESENT

NAIROBI BYPASS PROJECT

SOURCES AROUND NAIROBI

QUARRY NAME/OWNER KARSAN MULJI & CO. LTD

~~COMMERCIAL~~/PRIVATE * delete as appropriate

1. Year opened 1988
2. Is site leased or owned by operator OWNED
3. If leased, name and address of lessor -
4. If leased, number of years remaining unexpired -
5. Type of crusher on site BAXTER, PARKER
6. Capacity of the crusher in tonnes per day or m^3/day 400 TONNES PER DAY
7. Potential of the site (estimate) 20 ACRES (ABUNDANT)
8. Rock type products $\frac{3}{8}$" $\frac{1}{2}$" $\frac{3}{4}$" & STONE DUST
9. If material has been used previously in a road project, state project name, year and how used.

Project	Year	Surfacing/Base/Subbase

10. State the present prices per tonne or m^3

Material	Price
Chippings	
Graded Crushed Stone	
Aggregates	

EX - QUARRY RATES

$\frac{3}{8}$" - 150/= per ton
$\frac{1}{2}$" - 200/= per ton
$\frac{3}{4}$" - 200/= per ton
S/Dust- 190/= per ton

11. Is the owner willing to accept order for supplying materials to the Nairobi Bypass Project? WE CAN SUPPLY MATERIALS AS EX - QUARRY

12. Is the owner willing to accept special quality specifications Yes/~~No~~ * delete appropriately

13. If yes, what extra charge would he demand WILL DEPEND ON SIZES

14. Are there any laboratory tests carried out on materials from this source Yes/~~No~~ * delete appropritely

15. If yes, from 14 state where and from whom to get them KENYA BUREAU OF STANDARDS

16. State the proposed development proposals for the site if any NONE

NAIROBI BYPASS PROJECT

SOURCES AROUND NAIROBI

QUARRY NAME/OWNER KOMOROCK QUARRY LIMITED

~~COMMERCIAL~~/PRIVATE * delete as appropriate

1. Year opened 1988
2. Is site leased or owned by operator OWNED
3. If leased, name and address of lessor N/A
4. If leased, number of years remaining unexpired N/A
5. Type of crusher on site BAXTER, PARKER
6. Capacity of the crusher in tonnes per day or m^3/day 400 TON/DAY
7. Potential of the site (estimate) 20 ACRES APPROX. 1,000,000m^3
8. Rock type products BLACK TRAP (IN STOCK $\frac{1}{2}$", $\frac{3}{4}$", STONE DUST & $\frac{3}{8}$")
9. If material has been used previously in a road project, state project name, year and how used.

Project	Year	Surfacing/Base/Subbase
FIRESTONE CAR PARK	1989/90	BASE HARDCORE
(SAMMER INDUSTRIAL PARK)		SUB-BASE GRADED CRUSHED STONE
		SURFACING - CABRO BLOCKS

10. State the present prices per tonne or m^3

Material	Price	Ex-QUARRY/ADVANCE CASH PAYMENT
Chippings	230/= per ton	Plus 5% V.A.T.
Graded Crushed Stone	200/= per ton	
Aggregates	250/= per ton	

11. Is the owner willing to accept order for supplying materials to the Nairobi Bypass Project? YES

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12. Is the owner willing to accept special quality specifications Yes/~~No~~ * delete appropriately

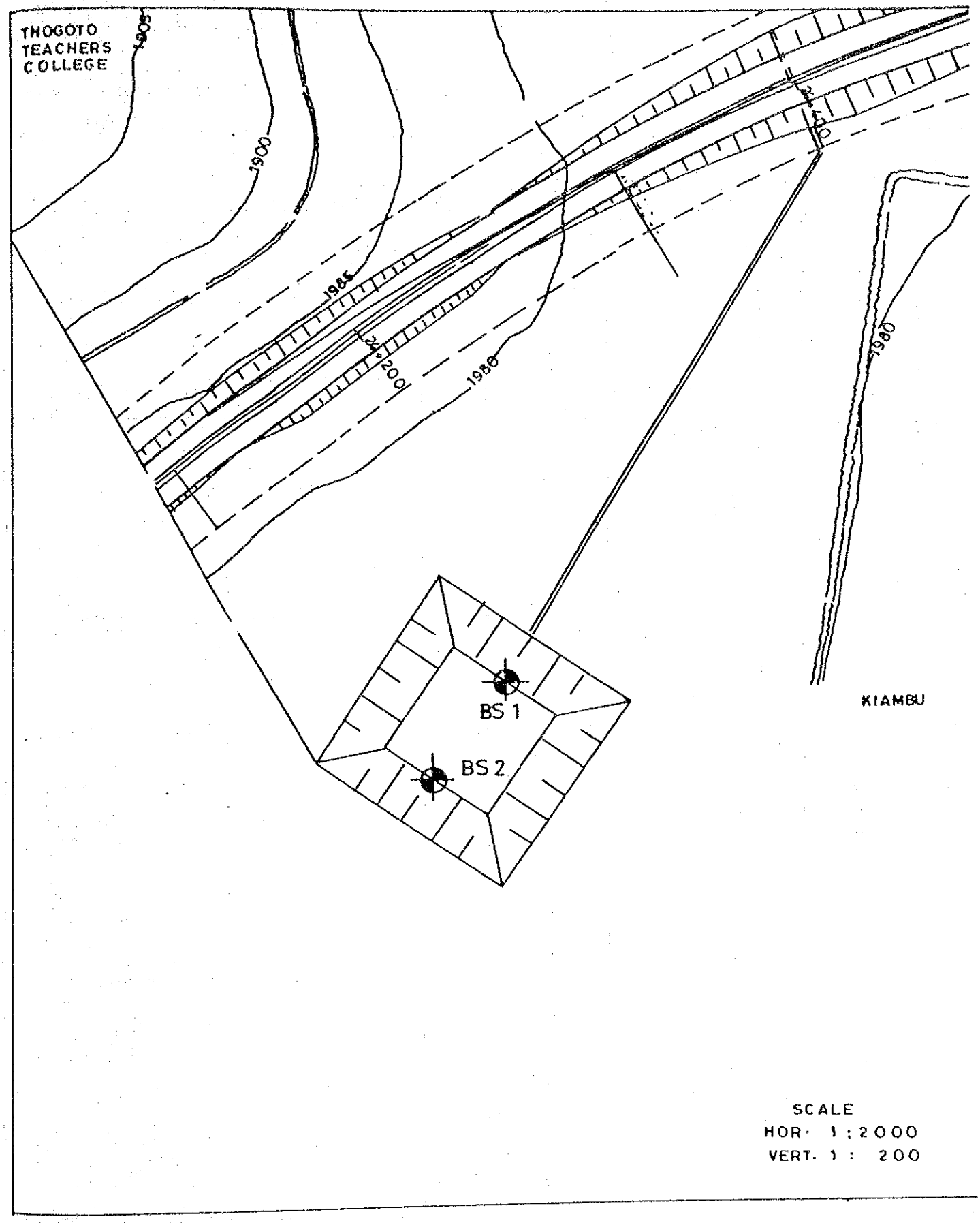
13. If yes, what extra charge would he demand 25% OVER AND ABOVE PRICES IN ITEM 10

14. Are there any laboratory tests carried out on materials from this source Yes/~~No~~ * delete appropritely

15. If yes, from 14 state where and from whom to get them CENTRAL TESTING LABORATORIES

16. State the proposed development proposals for the site if any NONE

1 3. SOAK PIT SURVEY RESULTS



LOCATION MAP OF DRILLING FOR SOAK PIT

Mowlem Construction Co. Ltd.

Borehole No. BS 1
Sheet 1 of 2

Equipment & Methods. Rotary auger 150mm dia. G.L-10.00m

Location. NAIROBI BYPASS

Carried out for : JAPAN INTERNATIONAL COOPERATION AGENCY

Ground Level | Co ordinates | Date 12, 13/10/90

Description	Reduced Level	Legend	Depth & Thickness	Samples/Tests: Depth	Sample Type	Sample No	Test	Field Records
Firm to stiff brown SILTY CLAY.			(2.00)	0.00 - 1.00		B1		
				1.00 - 1.45		D2	S N=14	
				1.50 - 2.00		B3		
			2.00	2.00 - 2.45		D4	S N=26	
Stiff and hard reddish brown SILTY CLAY.				2.50 - 3.00		B5		
				3.00 - 3.45		D6	S N=19	
			(4.00)	3.50 - 4.00		B7		
				4.00 - 4.45		D8	S N=17	
				4.50 - 5.00		B9		
				5.00 - 5.45		D10	S N=38	
				5.50 - 6.00		B11		
			6.00	6.00 - 6.45		D12	S N=44	
Hard orange brown SILTY CLAY				6.50 - 7.00		B13		
				7.00 - 7.45		D14	S N=47	
			(4.00)	7.50 - 8.00		B15		
				8.00 - 8.45		D16	S N=37	
				8.50 - 9.00		B17		
				9.00 - 9.45		D18	S N=41	
				9.50 - 10.00		B19		

S.P.T: Where full 0·3 m penetration has not been achieved the number of blows for the quoted penetration is given (Not N value)

DEPTHS: All depths and reduced levels in metres. Thickness given in brackets in depth column

W.R.L: Water level observations during boring are given on the last sheet of log.

Sample / Test Key.
D Disturbed sample
B Bulk sample
W Water sample
Piston (P) Tube (U) or core sample length to scale
S Standard Penetration Test
V Vane Test
C Core recovery
r Rock Quality Designation

Remarks

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Logged by J. O.

Scale 1:50

Mowlem Construction Co. Ltd.

Borehole No. BS 1
Sheet 2 of 2

Equipment & Methods.	Location.
See Sheet 1	NAIROBI BYPASS
Carried out for : JAPAN INTERNATIONAL COOPERATION AGENCY	Ground Level / Co ordinates / Date: 12, 13/10/90

Description	Reduced Level	Legend	Depth & Thickness	Samples / Tests: Depth	Sample: Type	Sample: No	Test	Field Records
Hard orange brown SILTY CLAY with sparse black ferruginous spots.			(-45) 10.45	10.00-10.45	●	D20	S N=51	
END AT 10.45 M.								

S.P.T: Where full 0·3 m penetration has not been achieved the number of blows for the quoted penetration is given (Not N value)

DEPTHS: All depths and reduced levels in metres. Thickness given in brackets in depth column

W.R.L: Water level observations during boring are given on the last sheet of log.

Sample / Test Key.
D Disturbed sample
B Bulk sample
W Water sample
P Piston (P) Tube (U) or core sample length to scale
S Standard Penetration Test
V Vane Test
C Core recovery
R Rock Quality Designation (RQD - %)

Remarks

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Logged by: J. O.

Scale: 1:50

Mowlem Construction Co. Ltd.

Borehole No. BS 2
Sheet 1 of 2

Equipment & Methods: Rotary auger 150mm dia. G.L.–14.00m ; Rotary coring 131mm dia. 14.00 – 14.80m

Location: NAIROBI BYPASS

Carried out for: JAPAN INTERNATIONAL COOPERATION AGENCY

Ground Level | Coordinates | Date: 14/15/10/90

Description	Reduced Level	Legend	Depth & Thickness	Samples/Tests: Depth	Sample Type	Sample No	Test	Field Records
Firm to hard reddish brown SILTY CLAY.			(7.00)	0.00–1.00		B1		
				1.00–1.45		D2	S N=9	
				1.50–2.00		B3		
				2.00–2.45		D4	S N=11	
				2.50–3.00		B5		
				3.00–3.45		D6	S N=12	
				3.50–4.00		B7		
				4.00–4.45		D8	S N=17	
				4.50–5.00		B9		
				5.00–5.45		D10	S N=27	
				5.50–6.00		B11		
				6.00–6.45		D12	S N=30	
				6.50–7.00		B13		
			7.00					
Stiff and hard yellow brown with black ferruginous patches SILTY CLAY with soft weathered rock fragments.			(3.00)	7.00–7.45		D14	S N=24	
				7.50–8.00		B15		
				8.00–8.45		D16	S N=25	
				8.50–9.00		B17		
				9.00–9.45		D18	S N=26	
				9.50–10.00		B19		

S.P.T: Where full 0·3m penetration has not been achieved the number of blows for the quoted penetration is given (Not N value)

DEPTHS: All depths and reduced levels in metres

( ): Thickness given in brackets in depth column

W.R.L: Water level observations during boring are given on the last sheet of log.

Sample / Test Key
D Disturbed sample
B Bulk sample
W Water sample
P Piston (P) Tube (U) or core sample length to scale
S Standard Penetration Test
V Vane Test
C Core recovery
r Rock Quality Designation (RQD - %)

Remarks

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Logged by: J. O.

Scale: 1:50

Mowlem Construction Co. Ltd.

Borehole No. BS 2
Sheet 2 of 2

Equipment & Methods.
See Sheet 1

Location.
NAIROBI BYPASS

Carried out for: JAPAN INTERNATIONAL COOPERATION AGENCY

Ground Level | Co ordinates | Date
14, 15/10/90

Description	Reduced Level	Legend	Depth & Thickness	Samples/Tests: Depth	Sample Type	Sample No	Test	Field Records
Completely weathered brown/ orange brown clayey TRACHYTE (as in situ clayey gravel)			(4.55)	10.00_10.45		D20	S N=49	
				10.50_11.00		B21		
				11.00_11.45		D22	S N=55	
				11.50_12.00		B23		
				12.00_12.45		D24	S N=37	
				12.50_13.00		B25		
				13.00_13.45		D26	S N=47	
				13.50_14.00		B27		
Slightly weathered light grey vesicular fine grained TRACHYTE. Vesicles upto 2cm with green earthy material/clay lining.			14.55 (0.45) 15.00	14.00_15.00				
END AT 15.00 M.								

F.I.	TCR	RQD	GRA
NA	100	45	NA
0			11

DATE	TIME	DEPTH (M) HOLE	CASING	W.R.L.	REMARKS
14/10/90	18.00	10.00	NIL	DRY	
15/10/90	10.00	10.00	NIL	DRY	
	18.00	14.60	NIL	0.50	
16/10/90	6.00	14.60	NIL	1.50	
	9.45	15.00	NIL	1.50	

S.P.T: Where full 0.3m penetration has not been achieved the number of blows for the quoted penetration is given (Not N value)

DEPTHS: All depths and reduced levels in metres. Thickness given in brackets in depth column

W.R.L: Water level observations during boring are given on the last sheet of log.

Sample / Test Key.
D Disturbed sample
B Bulk sample
W Water sample
▮ Piston(P) Tube(U) or core sample length to scale
S Standard Penetration Test
V Vane Test
C Core recovery
r Rock Quality Designation (RQD - %)

Remarks

Logged by J. O.

Scale 1:50

MOWLEM CONSTRUCTION COMPANY LTD.
Field Permeability Test

Loc. No. ....

Borehole No. ...BS2...................

Date of test: ...16.10.90.........

Depth of borehole before test: ...15.00...(M)

Depth of borehole after test: ...15.00...(M)

Depth of casing below ground level: ...2.00...(M)

Constant water level above ground level (H_1) (To Top of Casing) ...NIL...(M)

Diameter of casing: ...150...(mm)

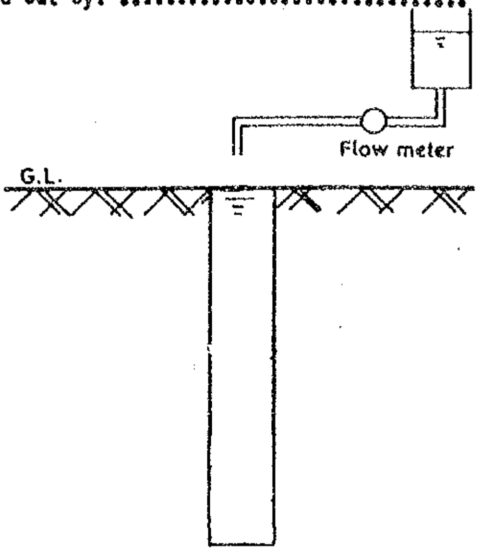
Diameter of boring tool: ...150...(mm)

Depth of ground water (if known) (H_4)...NOT KNOWN...(m)

Name: ...NAIROBI BYPASS...

Reduced level: ....

Carried out by: ...FK...



NOTE:

H_c= ? (m)

Elapsed Time Min. Sec.	Flow Meter Reading m³	Difference m³	Rate of flow m³/min	$\frac{1}{\sqrt{t}}$
0 0	24.376	-	-	
05	24.377	0.001	0.0002	
10	24.378	0.001	0.0002	
15	24.379	0.001	0.0002	
20	24.380	0.001	0.0002	
25	24.380	0.000	0.0000	
30	24.380	0.000	0.0000	
	END OF TEST			

1 4. PAVEMENT DESIGN CHARTS

Figure 6 Thickness of sub-base

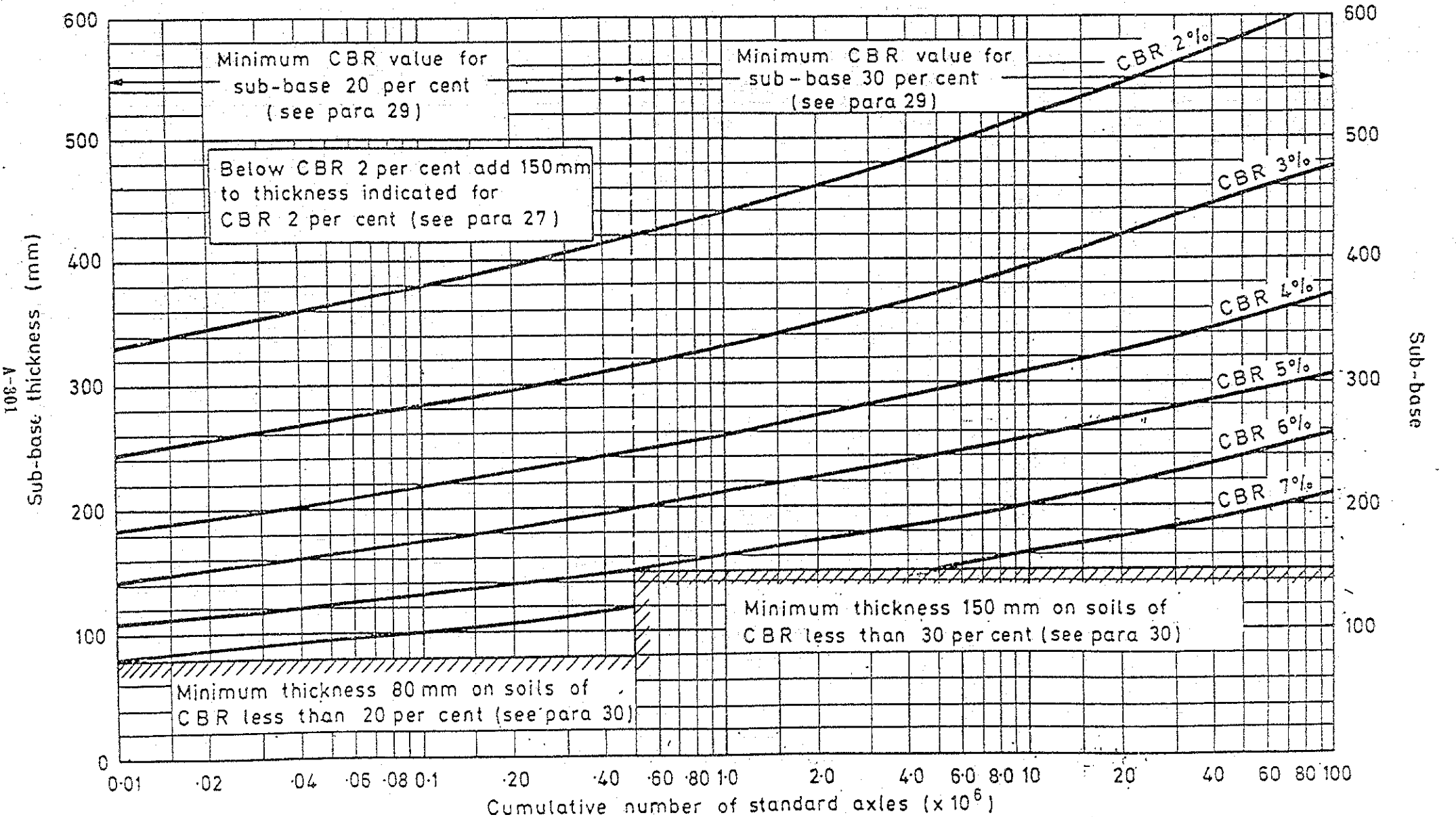


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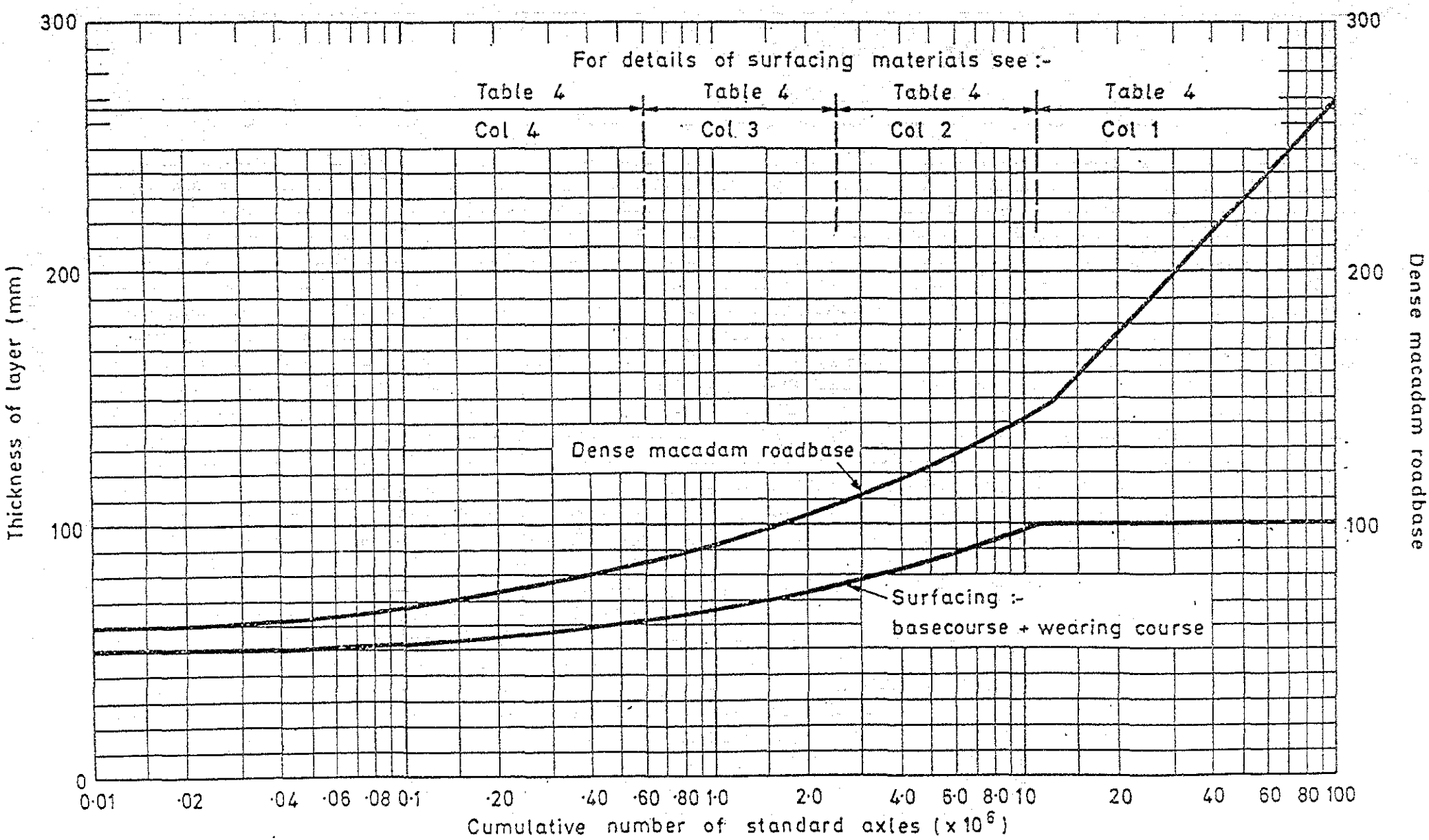
Figure 8 Dense macadam roadbase: minimum thickness of surfacing and roadbase



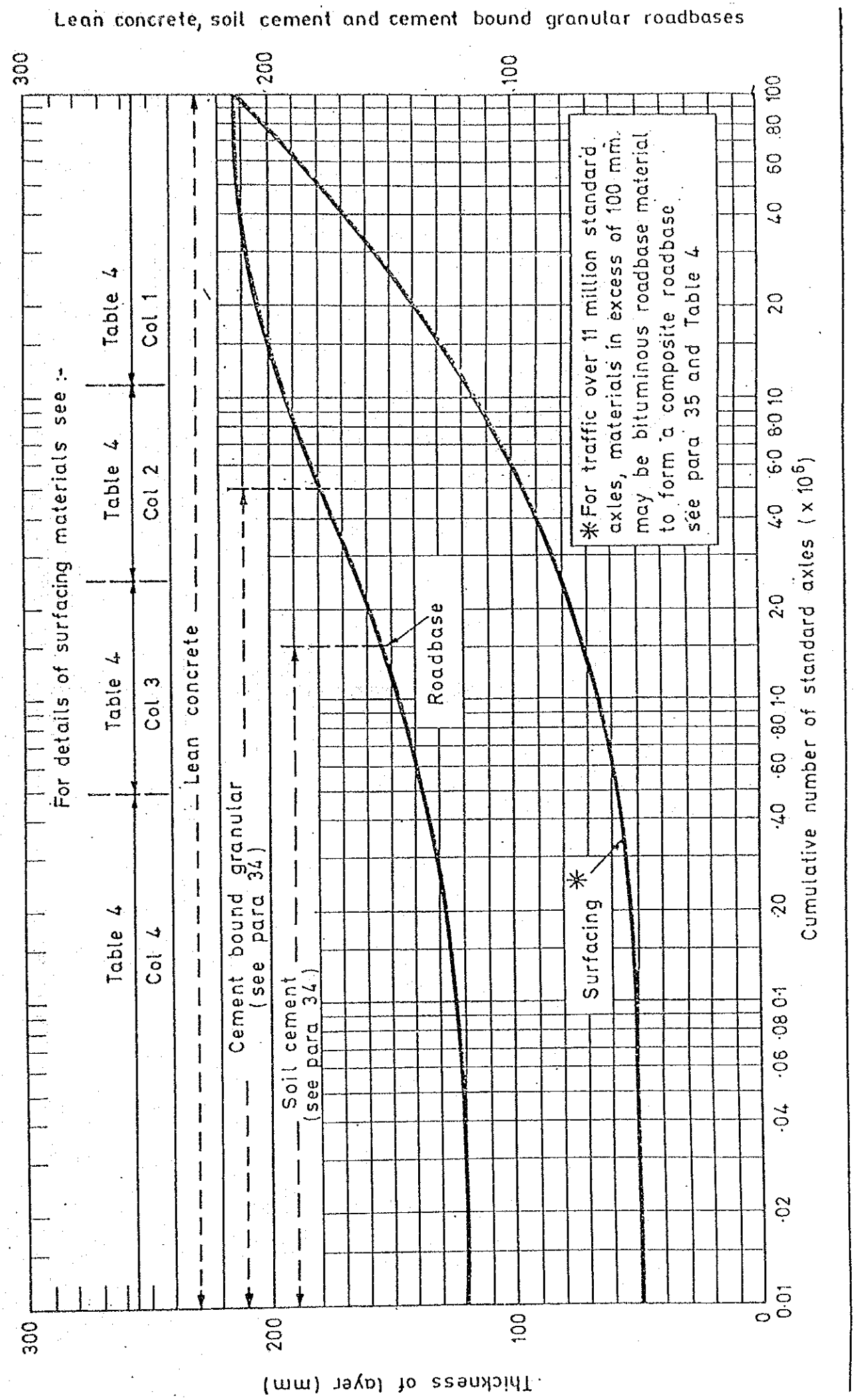
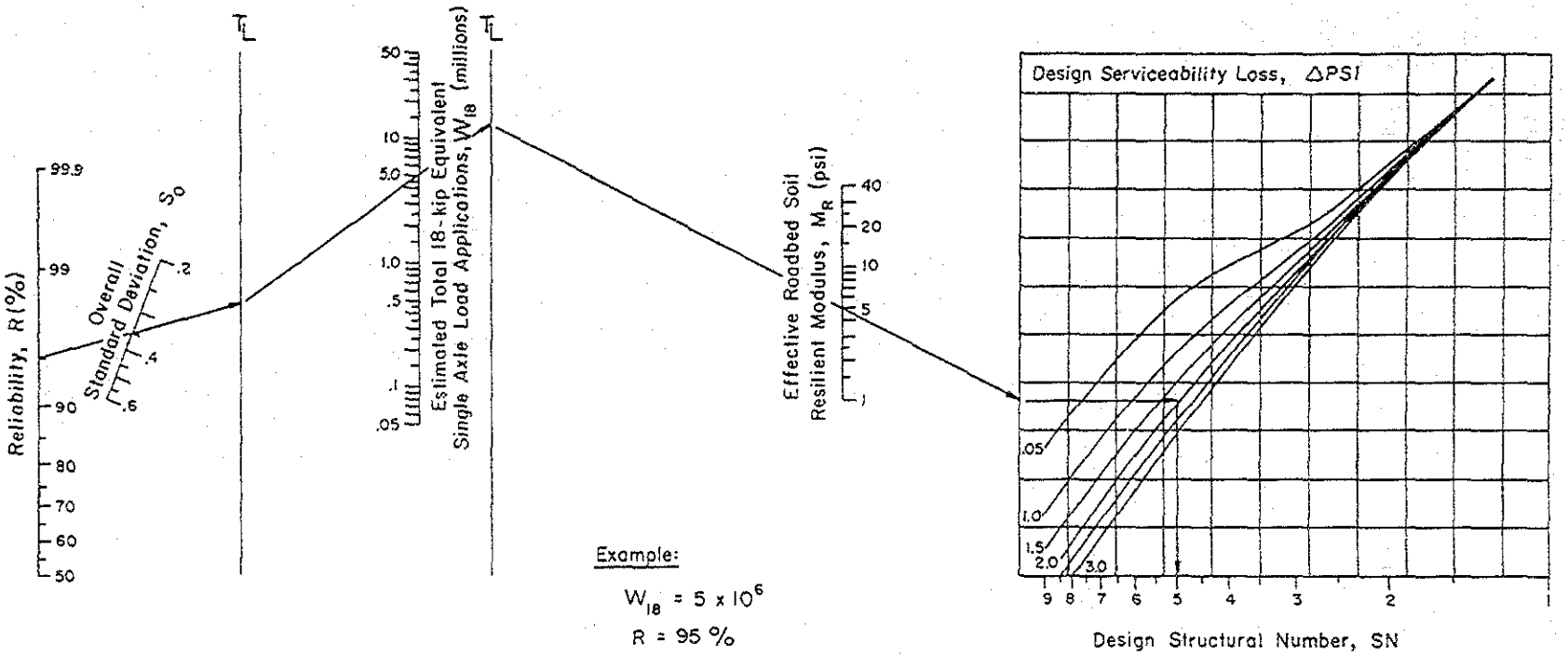


Figure 9 Lean concrete, soil cement and cement-bound granular roadbases: minimum thickness of surfacing and roadbase

NOMOGRAPH SOLVES:

$$\log_{10} W_{18} = Z_R * S_o + 9.36 * \log_{10}(SN+1) - 0.20 + \frac{\log_{10}\left[\frac{\Delta PSI}{4.2 - 1.5}\right]}{0.40 + \frac{1094}{(SN+1)^{5.19}}} + 2.32 * \log_{10} M_R - 8.07$$



Example:

$W_{18} = 5 \times 10^6$

R = 95 %

$S_o = 0.35$

$M_R = 5000$ psi

ΔPSI = 1.9

Solution: SN = 5.0

Design chart for flexible pavements based on using mean values for each input.

Table Suggested levels of reliability for various functional classifications.

Functional Classification	Recommended Level of Reliability	
	Urban	Rural
Interstate and other freeways	85 - 99.9	80 - 99.9
Principal Arterials	80 - 99	75 - 95
Collectors	80 - 95	75 - 95
Local	50 - 80	50 - 80

Note: Results based on a survey of the AASHTO Pavement Design Task Force

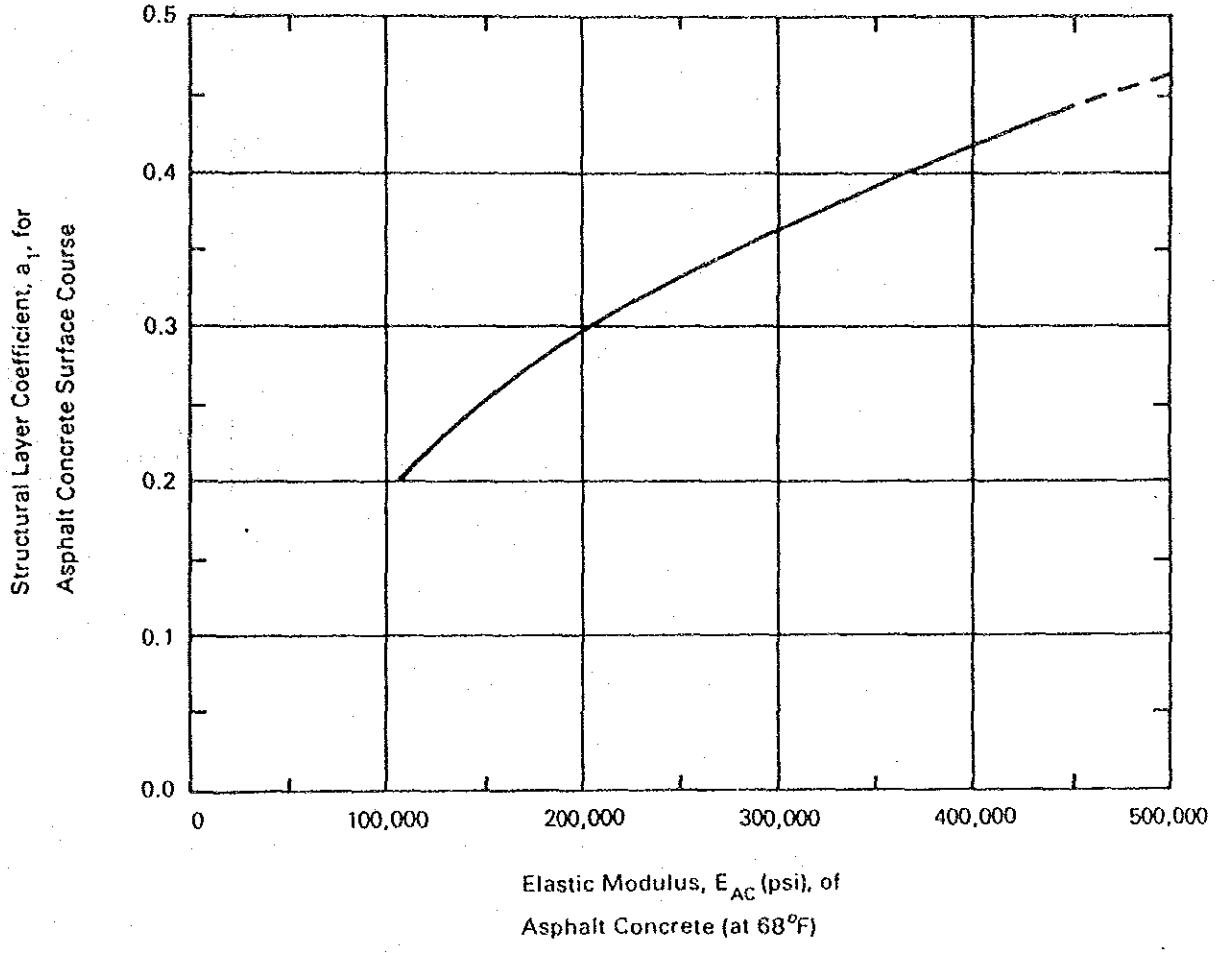
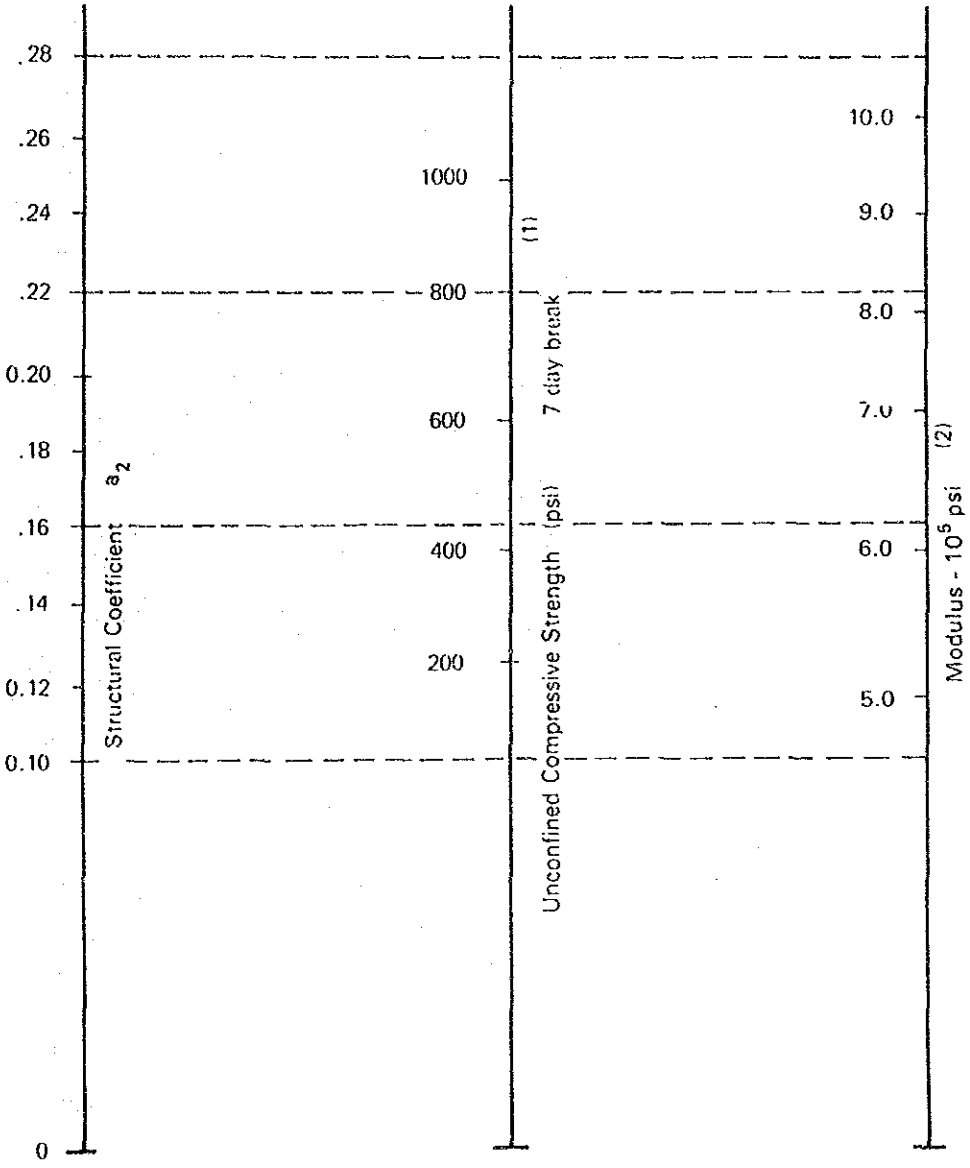


Figure Chart for estimating structural layer coefficient of dense-graded asphalt concrete based on the elastic (resilient) modulus (*3*).



(1) Scale derived by averaging correlations from Illinois, Louisiana and Texas.

(2) Scale derived on NCHRP project (3).

Figure Variation in a for cement-treated bases with base strength parameter (3).