

التقويم الجيوتكنيكي للخواص الفيزيائية والهندسية لتربة مدينة القاسم

محافظة بابل

					2006
					(11)
					(10)
(CH)	(SPT)	(ML)	(MH)	(CL)	
-0.15)	(36-13)	(SPT)	(N)		
	(M.C)	(N.G.S.)			(0.35
	(%30.1-%18.7)				
	(%33-%3)	(%54-%13)	(%77-%41)		
-%13.9)	(PI)	(%42.5-%17.4)	(PL.)	(%63-%38.5)	(LL.)
(5.3-1.29)	(CU)	Dynamic Method	Static Method		(39.6
(14-6.5)		Dynamic method	.static method	(°11-2)	Φ_u 2 /
			. 3		² /

Abstract

This research is carried out on the soil of the city of (Babylon Governorate (Middle) of Iraq, while is based on the investigations carried out by the Al-Mawal company in the year 2006. The aim of this research is the Geotechnical Evaluation of this soil which is important (essential) in the construction design.

This research included the digging of test (11) well, distributed all over the city. The depth of these wells is 10m.

This evaluation is based on the information's obtained from the field work and the results of laboratory test carried out on the compacted and not compacted samples taken from the soil of area.

The results of this research showed that the soil is clay-silt small of sand, and classified to clay with high and low plasticity limits (CL), and silt with high and low plasticity limits (ML) fluctuating with depth.

The number of vales (N) of standard penetration test (SPT) is between (13-36 blow) and water table is between (0.15-0.35)m below normal ground surface (N.G.S).

The moisture content (M.C) is between (18.7%-30.1%) of samples weight. The percentage of clay in the grain distribution is between (41%-77%), and for silt between (13%-54%), and for sand between (3%-33%). The value of the liquid limit (L.L) is (38.5%-63%), the plasticity limit (P.L) is (17.4%-42.5%) and the plasticity index (P.I) is (13.9%-39.9%). The dynamic and static methods are used to estimate the cohesive (CU) and friction angle (Φ_u).

The value of (cu) is (1.29-5.3) ton/m², and (Φ_u) is (2-11) in using the static method while in using dynamic method the value is (0.5-14)ton/m² for all depths less than 3meter. The investigation and lab test showed that soil needs treatments for the sake of constructing engineering Projects on it .

Specific gravity		G.S.
Liquid limit		L.L.
Plasticity limit		P.L.
Plasticity index		P.I.
Activity		A
Dry density		γ_d
Wet density		γ_t
Standard penetration test		SPT
N-vales		N
Water table		W.T.
Bore hole		BH
Unconfined compressive		σ_c
Cohesive		cu
Friction angle		ϕ_u
Water content		M.C.

-1

(Polyphasis)

(1998

) (Porosis)

(Dispersed)

. (2006)

-: (1998)

- . () - . - .

(consistency Index)

(Index properties)

(Toughness Index)

(liquidity Index)

.(Kezdi, 1980)

. (Meunier, 2003. 1990)
(Supporting power)

.(Kezdi, 1980)

-2

()
(1) . (35)

(2)
(1) (0.4 – 0.2)



(1)

(1)

The date of measurement	under ground water elevation (m)	BH.NO
2006-December	0.35	1
=	0.15	2
=	0.45	3
=	0.30	4
=	0.35	5
=	0.20	6
2006-December	0.25	7
=	0.20	8
=	0.25	9
=	0.20	10
=	0.30	11

Methods of Research

-3

-1

() ()
 (Flight Augers) (2006
 . (N.G.S) (10) (2)
 (DS) (Disturbed) (1)
 (Undisturbed) (SS) (S.P.T)
 . (US)
 Split) (S.P.T) (SS)
 (Shelby tube) (US) (spoon
 (S.P.T)

. 24

(2)

		DS
		US
	SPT	SS

In-Site Testing - :

Standard Penetration Test (SPT) - :
(SPT)

(Cohesive Soil)) (Consistency) (Cohesionless
. D158667 ASTM

Ground Water Table Observation - : -
(1)

-2

- :
- : -

Natural Moisture Content •
Grain Size Analysis () •
Atterberge Limits •
Specific Gravity •
Unit Weight •

- : -
Unconfined Compression Test -
.Direct Shear Test -

-4

D- D-2850 ASTMD-2488, 422, 4318 , D-4767

854 4318 2435 2266

-:

(grain size analysis)

1-4

(Hydrometer analysis)

(1) (sieve analysis) 200 ()

(33 - 3) .

.(77 - 41) (54 - 13)

(Clayey silt)

. (3)

(Atterberg limits)

-2-4

(48.0-17.4) (P.L.) (48.0 -61.2) (LL.)

(1) . (39.6 – 13.9) (P.I)

(CL) (CH) (USCS)

.

Water content

-3-4

:

(1990) (pore pressure)

.

(1) (18.7 – 30.1)

.

(Activity of soil)

-4-4

: (0.48 – 0.52)

BH.1=0.52, BH.2=0.50, BH.3=0.46, BH.4=0.49, BH.5=0.49, BH.6=0.45, BH.7=0.50, BH.8=0.49, BH.9=0.50, BH.10=0.48, BH.11=0.52

. (1991 Skemptom, 1953)

. 0.65

	(A)
(Non active)	0.75
Normally Active	1.25-0.7
Active	2.0 -1.25

(Bearing capacity) -5-4

Dynamic Method - :

(13 – 35) (SPT) (N)

(3.5 -10) ² / (6.5-14)

(3) (Meyerhof ,1965) , $q_{ult}=N/0.08 [(B+0.3)/B]^2(1+0.33 D_f/B)$

(3)

Depth (m)	BH.1 SPT Total for 300mm	B.C T/m ²	Depth (m)	BH.2 SPT Total for 300mm	B.C T/m ²	Depth (m)	BH.3SPT Total for 300mm	B.C T/m ²
7.5	21	9.0	5.5	13	6.5	-	-	-
-	-	-	7.5	24	10.0	7.5	23	9.5
10.0	26	10.0	10	31	11.5	10.0	27	10.5

Depth (m)	BH.4SPT Total for 300mm	B.C T/m ²	Depth (m)	BH.5 SPT Total for 300mm	B.C T/m ²	Depth (m)	BH.6SPT Total for 300mm	B.C T/m ²
5.0	13	6.5	6.5	23	9.5	-	-	-
7.5	24	10.0	-	-	-	6.5	22	9.0
10.0	35	12.5	10.0	29	11.0	9.0	35	12.5

Depth (m)	BH.7SPT Total for 300mm	B.C T/m ²	Depth (m)	BH.8 SPT Total for 300mm	B.C T/m ²	Depth (m)	BH.9SPT Total for 300mm	B.C T/m ²
6.5	22	9.0	6.5	20	9.0	6.5	19	8.5
10.0	30	11.0	9.0	36	13.0	9.0	26	10.0

Depth (m)	BH.10 SPT Total for 300mm	B.C T/m ²	Depth (m)	BH.11SPT Total for 300mm	B.C T/m ²
5.5	18	8.0	6.5	16	8.0
9.5	34	12.0	10.0	42	14.0

S.2) (Cn)

Static method

$$. (3) \quad (3 - 11) \quad \phi 4 \quad (1.29 -)^2$$

The allowable bearing capacity for foundation:-

$$q_a = C_u N_c + \gamma D_f N_q + 0.5 \gamma_{sub} B N_\gamma$$

At depth (1.5)m =

Choose the allowable bearing capacity (5.0 T/m²)

At depth (2.0)m =

Choose the allowable bearing capacity (5.8 T/m²)

At depth (3.0)m =

Choose the allowable bearing capacity (8.0 T/m²)

:

: Cu

:Nc

:γ

:Nq

:γsub

:B

:Df

:Nγ

Df= the depth of foundation (m)	allowable bearing capacity T/m ²
(1.5) m	(5.0)T/m ²
(2.0) m	(5.8)T/m ²
(3.0) m	(8.0) T/m ²

(4)

BH.NO	Depth (m)	Undrained Cu T/m ²	Undrained φu
BH.1	6-6.5	3.4	3
=	8.5-9	1.80	10
BH.2	6-6.5	3.8	4
=	8-8.5	5.2	2
BH.3	6-6.5	3.4	5
=	8-8.5	2.2	7
BH.4	5.5-6	2.1	6
=	8.5-9	5.0	4
BH.5	5-5.5	2.3	7
=	8.5-9	4.2	4
BH.6	7-7.5	3.8	5
=	9.5-10	2.4	7
BH.7	5-5.5	2.1	8
=	8.5-9	4.9	3

BH.8	6-6.5	4.1	4
=	8-8.5	3.7	6
BH.9	7-7.5	3.5	5
=	9.5-10	1.29	11
BH10	6-6.5	3.4	5
=	8-8.5	2.6	7
BH.11	6-6.5	2.2	10
=	8.5-9	5.3	4

-5

-1

-2

-3

.(non active)

-4

-6

-1

-2

-3

-7

) - 2006

.172

.(

(1998)

.574

(1991)

(1989)

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(1)

**Table (3) Physical properties of soil for AL-Kassem District site
B.H.1**

Type of sample	Depth (m)	System of classification				Properties index				Unit weight gm/cm ³		Layers – Description	Gs	Spt
		Clay %	Silt %	sand %	Grav. %	Mc %	LL %	PL %	Pl %	dry	wet			
DS	0-1	58	38	4	0	–	–	–	-	–	–	Red silty clay soil , soft consistency	–	–
DS	1-1.5	63	30	7	0	-	56.2	32.0	24.2	-	-	=	–	-
DS	2-3.5	59	17	24	0	27.1	55.2	31.0	24.2	-	-	Grey silty sandy clay soil ,soft consistency	2.68	-
DS	3.5-5	60	19	21	0	-	54.0	32.0	22.0	–	–	=	-	-
DS	5-5.5	73	21	6	0	-	53.0	30.5	22.5	-	-	Red silty clay soil , medium consistency	2.73	-
US	6-6.5	70	23	7	0	26.2	52.0	38.1	13.9	1.45	1.83	=	-	-
SS	7-7.5	46	24	30	0	-	55.0	32.0	23.0	-	-	Grey silty sandy clay soil ,medium consistency	-	21
US	8.5-9	50	23	27	0	26.2	55.0	28.0	27.0	1.44	1.82	=	2.68	-
SS	9.5-10	57	20	23	0	-	52.0	24.0	28.0	-	-	=	-	26

**Table (4) Physical properties of soil for AL-Kassem District site
B.H.2**

Type of sample	Depth (m)	System of classification				Properties index				Unit weight gm/cm ³		Layers – Description	Gs	Spt
		Clay %	Silt %	sand %	Grav. %	Mc %	LL %	PL %	PI%	dry	wet			
DS	0-0.5	60	18	22	0	-	-	-	-	-	-	Grey silty sandy clay soil , soft consistency	-	-
DS	0.5-1	54	21	25	0	30.1	51.0	28.1	22.9	-	-	=	2.70	-
DS	1-1.5	53	19	28	0	-	52.0	27.0	25.0	-	-	=	-	-
DS	2-2.5	62	16	22	0	27.3	53.0	26.7	26.3	-	-	=	2.71	-
DS	3-4.5	67	26	7	0	-	53.0	27.0	26.0	-	-	Red silty clay soil ,soft consistency	-	-
SS	5-5.5	70	25	5	0	-	53.0	30.4	22.6	-	-	=	-	13
US	6-6.5	71	23	6	0	23.6	55.0	36.1	18.9	1.48	1.83	Red silty clay soil , medium consistency	2.73	-
SS	7-7.5	67	28	5	0	-	54.0	35.0	19.0	-	-	=	-	24
US	8-8.5	70	26	4	0	25.8	49.0	31.0	18.0	1.45	1.82	Red silty clay soil ,medium consistency	2.72	-
SS	9-10	75	22	3	0	-	50.0	32.0	18.0	-	-	=	2.73	31

**Table (5) Physical properties of soil for AL-Kassem District site
B.H. 3**

Type of sample	Depth (m)	System of classification				Properties index				Unit weight gm/cm ³		Layers – Description	Gs	Spt
		Clay %	Silt %	sand %	Grav .%	Mc %	LL %	PL %	PI%	dry	wet			
DS	0-1	-	-	-	-	-	-	-	-	-	-	Fill material	-	-
DS	1-2.5	58	18	24	0	-	51.0	27.6	23.4	-	-	Grey silty sandy clay soil , soft consistency	-	-
DS	3-3.5	59	20	21	0	26.0	50.0	27.0	23	-	-	=	2.71	-
DS	3.5-4	66	27	7	0	-	56.0	33.3	22.7	-	-	Grey silty clay soil ,soft consistency	-	-
DS	4.5-5	70	22	8	0	-	56.9	35.6	21.3	-	-	=	2.72	-
DS	5-5.5	73	21	6	0	-	56.0	37	21	-	-	Grey silty clay soil , medium consistency	-	-
US	6-6.5	68	27	5	0	25.5	55.0	32.1	22.9	1.47	1.84	=	2.72	-
SS	7-7.5	71	22	7	0	-	55.4	29.0	26.4	-	-	=	-	23
US	8-8.5	67	13	20	0	26.1	52.7	24.0	28.7	1.45	1.83	Grey silty sandy clay soil ,medium consistency	2.71	-
DS	9-9.5	69	25	6	0	-	51.6	26.9	24.1	-	-	Red silty clay soil ,medium consistency	-	-
SS	9.5-10	72	21	7	0	28.5	50.0	30.0	20	1.40	1.80	=	2.73	27

**Table (6) Physical properties of soil for AL-Kassem District site
B.H.4**

Type of sample	Depth (m)	System of classification				Properties index				Unit weight gm/cm ³		Layers – Description	Gs	Spt
		Clay%	Silt %	sand%	Grav. %	Mc %	LL %	PL %	PI %	dry	wet			
DS	0-0.5	-	-	-	-	-	-	-	-	-	-	Fill material	-	-
DS	0.5-1.5	52	22	26	0	29.0	57.0	28.0	29.0	-	-	Brown silty sandy clay soil , soft consistency	2.71	-
DS	2-3	46	25	29	0	28.0	52.0	20.3	31.7	-	-	=	-	-
DS	3.5-4.5	41	26	33	0	-	57.0	17.4	39.6	-	-	Grey silty sandy clay soil , soft consistency	-	-
SS	4.5-5	52	21	27	0	-	49.7	33.0	16.7	-	-	=	2.73	13
US	5.5-6	57	19	24	0	26.8	58	36.2	21.8	1.45	1.84	=	-	-
DS	6.5-7	64	30	6	0	-	60.3	37.0	23.3	-	-	Red silty clay soil , medium consistency	2.72	-
SS	7-7.5	69	26	5	0	-	56.3	34.7	21.6	-	-	=	-	24
US	8.5-9	75	18	7	0	23.5	58.0	37.3	20.7	1.50	1.85	=	-	-
SS	9-10	77	20	3	0	-	58.0	35.0	23.0	-	-	=	2.74	35

**Table (7) Physical properties of soil for AL-Kassem District site
B.H.5**

Type of sample	Depth (m)	System of classification				Properties index				Unit weight gm/cm ³		Layers – Description	Gs	Spt
		Clay %	Silt %	sand %	Grav. %	Mc %	LL %	PL %	PI %	dry	wet			
DS	0-0.5	-	-	-	-	-	-	-	-	-	-	Fill material	-	-
DS	0.5-1	62	35	3	0	-	54.2	30.0	24.2	-	-	Grey silty clay soil , soft consistency	2.72	-
DS	1-1.5	67	28	5	0	29.1	54.0	33.0	21.0	-	-	=	-	-
DS	2-4	70	22	3	0	-	57.3	35.0	22.3	-	-	=	-	-
DS	4.5-5	68	27	5	0	26.3	58.1	35.2	22.9	-	-	=	2.74	-
US	5-5.5	64	25	11	0	23.5	56.0	32.7	18.5	1.49	1.84	Red sandy silty clay soil , medium consistency	-	-
SS	6-6.5	62	24	14	0	-	51.5	33.0	19.2	-	-	=	2.73	23
DS	7-7.5	65	29	6	0	24.1	53.0	33.8	20.0	-	-	Grey silty clay soil ,medium consistency	-	-
US	8.5-9	70	26	4	0	26.3	46.5	26.0	20.5	1.44	1.82	Red silty clay soil , medium consistency	2.72	-
SS	9.5-10	67	30	3	0	28.7	49.3	27.0	22.3				-	29

**Table (8) Physical properties of soil for AL-Kassem District site
B.H.6**

Type of sample	Depth (m)	System of classification				Properties index				Unit weight gm/cm ³		Layers – Description	Gs	Spt
		Clay%	Silt %	sand%	Gra .%	Mc %	LL %	PL%	PI %	dry	wet			
DS	0-1	65	31	4	0	–	–	–	-	–	–	Brown silty clay soil , soft consistency	–	–
DS	1-1.5	67	27	6	0	30.1	53.0	30.4	22.6	-	-	=	–	-
DS	2-4	62	31	7	0	-	53.6	30.0	23.6	-	-	=	2.72	-
DS	4.5-5	57	33	10	0	28.7	54.2	29.8	24.4	1.42	1.83	=	-	-
DS	5-5.5	53	27	16	0	-	51.0	22.6	28.4	-	-	Red sandy silty clay soil , medium consistency	-	-
SS	6-6.5	54	25	21	0	-	51.4	23.1	28.3	-	-	=	2.71	22
US	7-7.5	68	27	5	0	24.2	51.0	22.7	28.3	1.48	1.84	Grey silty clay soil ,medium consistency	-	-
SS	8.5-9	59	14	27	0	-	48.0	27.3	20.7	-	-	Red silty sandy clay soil ,medium consistency	2.71	35
US	9.5-10	62	17	22	0	25.4	51.2	29.2	22.0	1.46	1.83	=	-	-

**Table (9) Physical properties of soil for AL-Kassem District site
B.H.7**

Type of sample	Depth (m)	System of classification				Properties index				Unit weight gm/cm ³		Layers – Description	Gs	Spt
		Clay%	Silt %	sand%	Grav. %	Mc %	LL %	PL %	PI %	dry	wet			
DS	0-0.5	-	-	-	-	-	-	-	-	-	-	Fill mterial	-	-
DS	0.5-1.5	54	34	12	0	-	53.0	31.0	22.0	-	-	Grey sandy silty clay soil ,soft consistency	-	-
DS	2-2.5	61	23	16	0	-	53.4	31.0	22.4	-	-	=	2.71	-
DS	3-3.5	59	28	13	0	27.0	53.1	31.3	21.8	-	-	=	-	-
DS	3.5-4	56	26	18	0	-	51.9	26.4		-	-	=	-	-
DS	4.5-5	57	22	21	0	-	51.0	27.7	25.5	-	-	=	2.70	-
US	5-5.5	60	29	11	0	26.3	53.4	34.2	23.3	1.44	1.82	=	-	-
SS	6-6.5	70	24	6	0	-	61.0	36.6	19.7	-	-	Red silty clay soil ,medium consistency	2.72	22
DS	7-7.5	69	27	4	0	-	60.0	34.0	26.0	-	-	=	2.73	-
US	8.5-9	73	22	5	0	21.0	57.3	37.4	19.9	1.51	1.83	=	-	-
SS	9.5-10	71	26	3	0	-	58.2	37.0	21.2	-	-	=	2.73	30

**Table (10) Physical properties of soil for AL-Kassem District site
B.H.8**

Type of sample	Depth (m)	System of classification				Properties index				Unit weight gm/cm ³		Layers – Description	Gs	Spt
		Clay%	Silt %	sand%	Grav. %	Mc %	LL %	PL %	PI %	dry	wet			
DS	0-1	58	19	23	0	–	–	–	-	–	–	Grey silty sandy clay soil, soft consistency	–	-
DS	1-2.5	55	20	25	0	28.3	54.0	22.3	31.7	-	-	=	2.69	-
DS	3-4	67	28	5	0	-	54.4	25.0	29.4	-	-	Grey silty clay soil , soft consistency	-	-
DS	4.5-5	70	26	4	0	-	56.5	34.0	22.5	-	-	=	2.72	-
US	5.5-6	62	33	5	0	26.1	54.9	30.0	24.9	1.45	1.83	Red silty clay soil , medium consistency	-	-
SS	6-6.5	75	18	7	0	-	61.2	38.0	23.2	-	-	=	2.73	20
DS	7-7.5	73	22	5	0	-	59.3	35.0	24.3	-	-	=	-	-
US	8-8.5	66	26	8	0	21.0	58.0	35.5	22.5	1.54	1.86	Red silty clay soil , stiff consistency	2.72	-
SS	8.5-9	69	21	10	0	-	58.5	34.6	23.1	-	-	=		36
DS	9.5-10	75	19	6	0	19.3	63.0	42.0	21.0	-	-	=	2.73	-

**Table (11) Physical properties of soil for AL-Kassem District site
B.H.9**

Type of sample	Depth (m)	System of classification				Properties index				Unit weight gm/cm ³		Layers – Description	Gs	Spt
		Clay%	Silt %	sand%	Grav. %	Mc %	LL %	PL %	PI %	dry	wet			
DS	0-1	-	-	-	-	-	-	-	-	-	-	Fill material	-	-
DS	1-2.5	58	35	7	0	27.0	56.0	38.2	17.8	-	-	Grey silty clay soil, soft consistency	-	-
DS	3-3.5	60	32	8	0	-	53.0	35.7	17.3	-	-	=	2.70	-
DS	3.5-4	66	29	5	0	-	52.1	34.0	18.1	-	-	=	-	-
DS	4.5-5	68	26	6	0	25.5	52.5	34.0	18.5	-	-	=	2.72	-
DS	5-5.5	70	22	8	0	-	56.0	32.4	23.6	-	-	=	-	-
SS	6-6.5	69	25	6	0	-	56.0	32.0	24.0	-	-	Red silty clay soil, medium consistency	2.73	19
US	7-7.5	67	28	5	0	23.6	51.0	28.7	22.3	1.49	1.84	=	-	-
SS	8.5-9	65	32	3	0	-	49.4	28.0	21.4	-	-	=	2.72	26
US	9.5-10	35	54	11	0	27.8	38.5	18.0	20.5	1.40	1.79	Grey clayey silt soil, medium consistency	-	-

**Table (12) Physical properties of soil for AL-Kassem District site
B.H.10**

Type of sample	Depth (m)	System of classification				Properties index				Unit weight gm/cm ³		Layers – Description	Gs	Spt
		Clay%	Silt %	sand %	Grav. %	Mc %	LL %	PL %	PI %	dry	wet			
DS	0-0.5	52	15	33	0	—	—	—	-	—	—	Brown sandy silty clay soil, soft consistency	-	-
DS	1-0.5	53	18	29	0	-	49.0	22.5	26.5	—	—	=	2.69	—
DS	1-1.5	61	30	9	0	29.0	56.0	28.0	28.0	-	-	Grey Silty clay soil soft consistency	—	-
DS	2.5-3	58	35	7	0	26.9	54.8	34.0	20.8	-	-	=	2.70	-
DS	3.5-4	60	34	6	0	-	54.0	32.0	22.0	-	-	=	-	-
DS	4.5-5	63	32	5	0	24.0	54.8	30.0	20.8	-	-	=	-	-
SS	5-5.5	67	26	7	0	-	52.3	30.9	21.4	-	-	Red silty clay soil ,medium consistency	2.72	18
US	6-6.5	67	27	6	0	24.4	53.7	30.6	23.1	1.47	1.83	=	-	-
DS	7-7.5	66	30	4	0	-	54.6	30.8	23.8	-	-	=	—	-
US	8-8.5	58	35	7	0	22.0	51.2	28.0	23.2	1.50	1.83	=	2.71	-
SS	9-9.5	73	23	4	0	-	51.0	33.7	17.3	-	-	Red silty clay soil ,stiff consistency	2.73	34
DS	9.5-10	77	20	3	0	18.7	58.0	35.0	23	-	-	=	—	-

**Table (13) Physical properties of soil for AL-Kassem District site
B.H.11**

Type of sample	Depth (m)	System of classification				Properties index				Unit weight gm/cm ³		Layers – Description	Gs	Spt
		Clay%	Silt %	sand%	Grav. %	Mc %	LL %	PL %	PI %	dry	wet			
DS	0-1	54	37	9	0	–	–	–	–	–	–	Grey silty clay soil, soft consistency	–	–
DS	1.5-3	55	30	15	0	–	54.0	34.3	19.7	–	–	Grey sandy silty clay soil, soft consistency	2.69	–
DS	3.5-4	56	27	17	0	26.7	54.0	34.0	20.0	–	–	=	–	–
DS	4.5-5	54	26	20	0	–	50.3	27.5	22.8	–	–	=	2.68	–
US	5-5.5	60	29	21	0	24.7	50.0	29.0	21	1.46	1.82	=	–	–
SS	6-6.5	57	25	18	0	–	51.0	24.2	26.8	–	–	=	2.70	16
DS	7-7.5	71	23	6	0	23.7	54.1	37.8	19.3	–	–	Red silty clay soil, med. To stiff consistency	–	–
US	8.5-9	72	25	3	0	22.5	56.3	37.0	19.3	1.51	1.85	=	2.73	–
SS	9.5-10	75	21	4	0	–	57.0	38.0	19.0	–	–	=	–	42