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No:22, P.T. Rajan Road 3rd Street (Thomas Street), Narimedu, Madurai-625002,
E-mail:geomatrixconsultancy@gmail.com, Phone: 0452-2905566, 7598031360, 7708758598, 6379128191







SOIL INVESTIGATION REPORT

SOIL INVESTIGATION WORKS AND LABORATORY TESTING SERVICES FOR THE CONSTRUCTION OF **APARTMENT BUILDING** AT **B.B.KULAM IN MADURAI NORTH TALUK OF MADURAI DISTRICT.**

REPORT No: 64/ OP / GMC / 23 -24	DATE : 24.07.2023	REV : 0

LOCATION : **T.S.NO : 12/1&2,WARD NO : X,BLOCK NO : 73**
VILLAGE : B.B.KULAM
TALUK : MADURAI NORTH
DISTRICT : MADURAI

CLIENT : **Mrs.O.JANSI RANI,**
W/O.Mr.OVU REDDY
DOOR NO : 4/184,BHARATHITHASAN STREET,
E.B.COLONY,IYYERBUNGALOW,MADURAI-625014.

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No.22, P.T.Rajan Road 3rd Street (Thomas Street)
Narimedu, Madurai - 625 002.

E-mail : geomatrixconsultancy@gmail.com, GSTIN : 33AFIPG8690P1ZR, PAN : AFIPG8690P

TC-9297

✆ : (0452)-2905566, Mobile : 7598031360, 7708758598, 6379128191

TEST RESULTS ON SOIL SAMPLE

RESULT NO:64 / 23-24 / GMC / DATED: 24.07.2023

CLIENT: Mrs.O.JANSI RANI, W/O. Mr.OVU REDDY, Door No : 4/184, Bharathithasan Street, E.B.Colony, Iyyerbungalow, Madurai-625014.

NAME OF WORK: Construction of APARTMENT BUILDING at B.B.Kulam in Madurai North Taluk of Madurai District.

DEPTH OF SAMPLE COLLECTED: 3.00 m FROM THE EXISTING GROUND LEVEL.

TEST RESULTS ON SOIL SAMPLES

Sl.NO	Details of Tests	Units	Sample @ 2.90 m
1	Specific Gravity	-----	2.67
2	Moisture Content	%	8
3	Bulk Density	g/ cc	1.836
4	Liquid Limit	%	NP
5	Plastic Limit	%	NP
6	Plasticity Index	%	NP
7	Cohesion	KN / m2	0
8	Angle of internal Friction	Degree	36

Note:

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2. Any clarifications / complaints of this report should be made in written within 30 days from the date of issue of this report.
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P.N.GANAPATHI, B.E.,M.E(Soil Mech), F.I.E.,F.I.V.,D.Litt.,(USA
(REGISTERED Civil Engineer / Chartered Engineer
(CMDA Regn No. GTE / 19 / 04 / 022)
(DTCP Regn No. CGLRGN RGTE / 2019 / 08 / 012)
MURAI with out written permission of this laboratory.

Madurai - 625 002. Ph: 7598031360, 7708758598
Email: geomatrixconsultancy@gmail.com

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No.22, P.T.Rajan Road 3rd Street (Thomas Street)
Narimedu, Madurai - 625 002.

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10	**Particle Size Distribution**		
a)	Gravel > 4.75mm	%	18.71
b)	Coarse Sand 4.75 to 2.00mm	%	5.93
c)	Medium Sand 2.00 to 0.425 mm	%	34.05
d)	Fine Sand 0.425 to 0.075 mm	%	30
e)	Silt & Clay < 0.075 mm	%	11.31
11	Ultimate Bearing capacity	kN / m2	1166.24
12	Factor of Safety		3
13	Calculated Safe Bearing capacity (SBC)	kN / m2	388.75
14	**Recommended Safe Bearing capacity (SBC)**	**kN / m2**	**388**
15	Maximum Settlement of Samples	mm	4
16	Allowable Settlement	mm	50

CONCLUSION:

The recommended Safe Bearing Capacities of the given soil samples **is 388 KN / m2** at **3.00 m depth.** The allowable limits of differential Settlement are **50 mm**. The maximum Settlement of soil sample is **4 mm only** (Within the allowable limits). Hence it's concluded that the soil is **SAFE** against differential settlement for the recommended SBC.

25/07/23

Er.K.GANAPATHI,B.E.,M.E(Soil Mech),F.I.E.,F.I.V.,D.Litt.,(USA),
REGISTERED Geo-Tech Engineer / Chartered Engineer
(CMDA Regn No. GTE / 19 / 04 / 022)
(DTCP Regn No. CGLRGN RGTE / 2019 / 08 / 012)
(MLPA Regn No. GTE 002 / 2019)
GEOMATRIX CONSULTANCY, Geo-Technical Investigation Consultants,
No.22, Thomas Street, Narimedu,
Madurai - 625 002, Ph: 7598031360 7708758598
Email: geomatrixconsultancy@gmail.com

Note: **Place:** Madurai
Date: 26.07.2023

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Geo-Tech. Consultants & Engineers

Name of Project : **Sub Soil Investigation for the Construction of RESIDENTIAL BUILDING at Anaiyur,Madurai.**

REPORT NO : 24 / 23-24	SAMPLE-1- 3.00 m	CALCULATION-1

SAFE BEARING CAPACITY CALCULATIONS on SHALLOW FOUNDATIONS

TYPE OF FOOTING : RECTANGULAR FOOTING

Length of footing	(Assumed Value)	L =	**1.50** m
Breadth of footing	(Assumed Value)	B =	**1.50** m
Foundation depth		D_f =	**3.00** m
Correction Factor for Water Table		W' =	**0.50**
Unit weight of soil		γ_{soil} =	**1.836** T/m^3
Cohension		"C" =	**0.00** T/m^2
Angle of shearing resistance(general shear)	φ =		**36.00°**
Angle of shearing resistance(Local shear)	φ' =		**25.77°** (Tan^{-1} (2/3 * tanφ)
Safety factor		F =	**3.00**
Effective Surcharge of Soil above Footing E		q =	**2.51** T/m^2
Type of soil		=	**Gravel mixed with Sand**
Mode of failure		=	**Combined (GSF & LSF) Shear Failure**
Ground Water Table level (Assumed for worst Case - at the Ground level) =			**0** m From NGL

The Bearing Capacity Factors are Given by the following equations

For GENERAL SHEAR FAILURE

$Nq = \tan^2(45° + Ø/2)(e^{\pi \tan Ø})$	=	37.75
$Nc = (Nq - 1)\ Cot\ Ø$	=	50.59
$N\gamma = 2(Nq + 1)\tan Ø$	=	56.31

For LOCAL SHEAR FAILURE

$N'q = \tan^2(45° + Ø'/2)(e^{\pi \tan Ø'})$	=	11.57
$N'c = (Nq - 1)\ Cot\ Ø'$	=	21.89
$N'\gamma = 2(Nq + 1)\tan Ø'$	=	12.13

Er.K.GANAPATHI, B.E.,M.E(Soil Mech), F.I.E.,F.I.V.,D.Litt.,(USA
REGISTERED Geo-Tech Engineer / Chartered Engineer
(CMDA Regn No. GTE / 19 / 04 / 022)
(DTCP Regn No. CGLRGN RGTE / 2019 / 08 / 012)
(MLPA Regn No. GTE 002 / 2019)
GEOMATRIX CONSULTANCY, (Regn. No. 330242233482E,
No.22, Thomas Street, Narimedu,
Madurai - 625 002. Ph: 7598031360, 7708758598
Email: geomatrixconsultancy@gmail.com

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The Shape Factors

Shape of Footing	S_c	S_q	S_γ
CONTINUOUS STRIP FOOTING	1.0	1.0	1.0
SQUARE FOOTING	1.3	1.2	0.8
RECTANGULAR FOOTING	1+0.2B/L	1+0.2B/L	1-0.4B/L

RECTANGULAR FOOTING	
S_c =	1.200
S_q =	1.200
S_γ =	0.600

The Depth Factor

d_c =	1 + 0.2 D_f / B x tan (45° + Ø'/2) =	1.785
$d_q = d_\gamma$ =	1 for Ø'<10° =	1.000
$d_q = d_\gamma$ =	1+0.1D_f/Bxtan(45°+Ø'/2) for Ø'>10° =	1.393

The Inclination Factor

$i_c = i_q$ = 1 - α /90)^2 = 1.00 i_γ = 1 - α / Ø)^2 1.00

α = Inclination of the load to the vertical in degress = 0

Net Ultimate Bearing Capacity, **qd** = ((cxNcxScxdcxic) + (qx(Nq -1)xSqxDqxIq) + (0.5xBxγxNγxSγxDγxIγxW')+ (2/3) (cxN'cxScxdcxic) + (qx(N'q -1)xSqxDqxIq) + (0.5xBxγxN'γxSγxDγxIγxW'))/"2

= **118.88 T/sq.m** **1166.24 kN/m²**

SAFE BEARING CAPACITY :

SBC = qd / F.s = **39.63 T/sq.m** or **388.75 kN/m²**

SETTLEMENT CALCULATIONS AS PER IS-8009-(part-1) 1998

Q_s = Pressure, S_i = Immediate settlemeI = Influence factor

B = width of foundation μ = Poisson's ratio E_s= Elastic Modulus

E_s= 136200 kN/m²

(or) E_s= 13620.00 t/m²

S_i = Immediate settlement = I*Qs*B(1-μ²) / Es

= 0.95*39.23(1.50(1- 0.25²)) /13620

S_i= 0.0039 m

0.0039 x1000

Settlement = **4 mm < 50 mm** Hence SAFE

The Max Allowable Differential Settlement for **Sand & Gravel is** 50mm and for **Silt & Clay is** 75mm.

Er.K.GANAPATHI, B.E.,M.E(Soil Mech). F.I.E..F.I.V..D.Litt.,(USA
REGISTERED Geo-Tech Engineer / Chartered Engineer
(CMDA Regn No. GTE / 19 / 04 / 022)
(DTCP Regn No. CGLRGN RGTE / 2019 / 08 / 012)
(MLPA Regn No. GTE 002 / 2019)
GEOMATRIX CONSULTANCY, (Regn. No. 330242233482E,
No.22, Thomas Street, Narimedu,
Madurai - 625 002. Ph: 7598031360, 7708758598
Email: geomatrixconsultancy@gmail.com

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3/350/2 Mettukuppam,
OMR Thoraipakkam,
Chennai, India

hello@verified.realestate
+91 9996 12 9996
www.verified.realestate