



Your trusted partner for buying, selling, and managing property,
ensuring hassle-free service with 100% transparency.

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

hello@verified.realestate

+91 9996 12 9996

Official Property Record

Digitally Verified Record - Powered by Verified  RealEstate™



CLIENT		M/s. MP KUMUDHAM ENCLAVE, CHENNAI	
PROJECT		PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (G+02) AT S.NO: 143/1A, KUMUDHAM ENCLAVE, KUNDRATHUR VILLAGE, KUNDRATHUR TALUK, KANCHEEPURAM DISTRICT.	
TITLE		GEOTECHNICAL INVESTIGATION REPORT	
REV.	DATE	REPORT NUMBER	REMARK
0	16.03.2024	BAG/ M/S. MP KUMUDHAM ENCLAVE /C-1779/23-24	

CONTENTS

CHAPTER	SEC. NO.		PAGE NO.
1		INTRODUCTION	
	1.0	Preamble	1
	1.1	Scope of Work	1
	1.2	Structure of the Report	1
2		INVESTIGATION METHODOLOGY & TEST RESULTS	
	2.0	Field Testing	2
	2.1	Preamble	2
	2.2	Equipment Used and Method of Drilling	2
	2.2.1	Equipment Used	2
	2.2.2	Method of Drilling	2
	2.3	In-situ Strength Tests	2
	2.3.1	Standard Penetration Tests	2
	2.4	Collection of Samples	2
	2.4.1	Disturbed Soil Samples	2
	2.5	Summary of Field Work	3
	2.6	Laboratory Testing	3
	2.6.1	Coarse Grained Soil Samples	3
	2.6.1.1	Grain Size Analysis Tests	3
	2.6.2	Fine Grained Soil Samples	3
	2.6.2.1	Index Property & Free Swell Tests	3
FIGURES	2.0	Site Plan representing the locations of Field investigation points	4
	2.1	Soil Profile at BH-01 Location	5
TABLES	2.1	Laboratory Test Results on the Soil Samples collected from BH-01 Location	6
3		SUB-SURFACE STRATIFICATION	7
	3.0	Preamble	7
	3.1	Sub surface Stratification	7
	3.1.1	Soil Profile at BH-01 Location	7-8
4		FOUNDATION SYSTEM	
	4.0	Preamble	9
	4.1	Bearing Strata Characteristics	9
	4.2	Foundation System	10
	4.2.1	Open Foundation System	10
5		RECOMMENDATIONS	11
ANNEXURE		Design of Open Foundation System (Ref. BH-01)	12-13

CHAPTER-1

INTRODUCTION

1.0 Preamble

M/s. MP Kumudham Enclave, Chennai proposed to construct a **Residential Building (G+02)** at **S. No 143/1A, Kumudham Enclave, Kundrathur Village, Kundrathur Taluk, Kancheepuram District.**

For the purpose of designing the foundations, the responsibility of carrying out suitable soil investigations was entrusted to **M/s. Booshnam Associates Pvt Ltd, Chennai.**

This report contains the field and laboratory test results along with Design computations and recommendations for suitable foundation systems.

1.1 Scope of Work

- ❖ Sinking One Standard Soil investigation bore hole of 150mm diameter up to a depth of below existing ground level or as directed by the engineer-in-charge.
- ❖ Conducting Standard Penetration Test (SPT) at regular depth intervals.
- ❖ Collection of Split Spoon Samples or Disturbed Soil Samples
- ❖ Collection of water samples from each bore hole.
- ❖ Conducting relevant laboratory test results.

1.2 Structure of the Report

- ❖ Contents
- ❖ Introduction
- ❖ Investigation Methodology & Test Results
- ❖ Figures & Tables
- ❖ Sub-Surface Stratification
- ❖ Foundation Systems
- ❖ Recommendations
- ❖ Annexure (Design Computations)

CHAPTER-2

INVESTIGATION METHODOLOGY & TEST RESULTS

2.0 Field Testing:

2.1 Preamble:

One standard soil investigation borehole was put. The equipment used and the methodology adopted to carry out the fieldwork is described below.

2.2 Equipment Used and Method of Drilling:

2.2.1 Equipment Used

The equipment used for performing the drilling operations is a Manual Rotary Drill Rig with direct mud circulation technique. The drill mud used was made out of Sodium Bentonite.

2.2.2 Methodology of drilling

In the soil strata, the drilling operations have been carried out using special drill bits with direct mud circulation.

2.3 In-Situ Strength Tests:

2.3.1 Standard Penetration Test:

Standard penetration tests were conducted at the borehole location, in accordance with IS: 2131. The tests were conducted at every change of strata up to the depth of termination of the borehole as directed by the engineer-in-charge.

2.4. Collection of Samples:

2.4.1 Disturbed Soil Samples

The SPT-samples collected were used as disturbed soil samples. These samples were used for visual and physical identification and for conducting laboratory classification tests as per I.S.1498-1970.

2.5 Summary of Field Work

The locations of the boreholes are shown in site plan given in Fig.2.0. The soil profiles obtained at each location is shown in Figs.2.1.

2.6 Laboratory Testing:

2.6.1 Coarse Grained Samples:

2.6.1.1 Grain size Analysis Tests:

On the coarse-grained samples, grain size distribution tests were conducted as per I.S.2720 (Part 4)-1985, to know the gradation characteristics and to classify them.

These results are presented in Tables 2.1.

2.6.2 Fine Grained Samples:

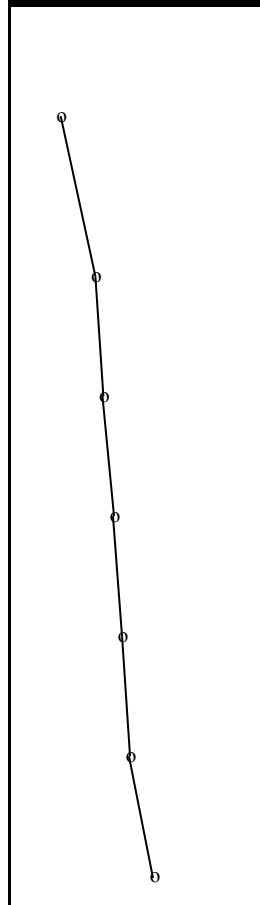
2.6.2.1 Index Property – Free Swell Tests:

Atterberg Limits were carried out on fine grained soil samples to evaluate the limits of different consistency states. Generally Liquid limits, Plastic limits and Shrinkage Limits tests were conducted as per I.S.2720 (Part-5)-1985 and I.S.2720 (Part 6)-1972. On such type of soil strata encountered at the investigation locations, such tests were conducted and the test results are presented in Tables 2.1.

Project : Proposed Construction of Residential Building (G+02) at S.No 143/1A, Kumudham Enclave, Kundrathur Village, Kundrathur Taluk, Kancheepuram District.

Location: BH-01

Started On : 15/03/2024; Ended On : 15/03/2024 G.W.T: 2.40m below existing ground level

R.L of Layer (m)	G.W.T. (m)	Soil Profile	Engineering Description of Soil	SPT - Details			Physical Representation of SPT										Relative Density/Consistency	Type of Sample			
				Depth of SPT below E.G.L (m)	0-15 cm	15-30 cm	30-45 cm	N-Value	#	1	2	3	4	5	6	7			8	9	10
1.70			Brownish Very Silty Clay	1.50	5	7	10	17											V.Stiff	SS	
G.W.T			Brownish Dense Silty Fine Sand	3.00	9	14	16	30											Dense	SS	
				4.50	12	15	18	33											Dense	SS	
				6.00	14	17	20	37											Dense	SS	
				7.50	15	18	22	40											Dense	SS	
				9.00	17	20	23	43											Dense	SS	
9.20			Brownish Very Dense Silty Fine Sand	10.00	19	24	28	52											V.Dense	SS	
10.20																					

Bore Hole Terminated at a depth of 10.20m below the existing ground level

Fig. 2.1 Soil Profile at BH-01 Location

Table 2.1: Laboratory Test Result on the Soil Sample Collected from BH-01

Depth of Sample below E.G.L. (m)	SPT of Sample	Type of Sample	Engineering Description of Soil	NMC(%)	Natural Density (g/cc)	Clay					Relative Density/ Consistency	Sieve Analysis						IS-Classification
						LL (%)	PL (%)	PI	I _c	FS		Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)	
0.00 to 1.70	17	SS	Silty Clay	27	1.9	73	24	49	0.94	-	V.Stiff	0	0	0	0	19	81	CI
1.70 to 9.20	37	SS	Silty Fine Sand	-	1.7	-	-	-	-	-	Dense	0	0	0	69	31	0	SM
9.20 to 10.20	52	SS	Silty Fine Sand	-	1.9	-	-	-	-	-	V.Dense	0	0	0	66	34	0	SM

CHAPTER-3

SUB-SURFACE STRATIFICATION

3.0 Preamble

The sub surface stratification at borehole location, with respect to foundation/geotechnical engineering application are derived based on the visual identification, laboratory classification tests and field in-situ strength tests. Further, the strength parameters are estimated based on the in-situ strength test results as per the following correlation.

- * **For Coarse Grained Samples, Ref. Fig.1, IS: 6403 to estimate Angle of Shearing Resistance.**
- * **For Fine Grained Samples, Ref. Terzaghi & Peck, 1948, to estimate Unconfined Compressive Strength.**

3.1 Sub Surface Stratification:

3.1.1 Soil Profile at BH-01 Location

(At BH-01 Location, as presented in Site plan)

- * **Layer-1 (from E.G.L to 1.70m depth)**

Type of Strata	Silty Clay
Colour	Brownish
Thickness of Layer	1.70m
SPT of the layer	17
Consistency	Very Stiff
Un-drained Cohesion, C_u	113.33kPa
- * **Layer-2 (from 1.70m to 9.20m depth)**

Type of Strata	Silty Fine Sand
Colour	Brownish
Thickness of Layer	7.50m
SPT of the layer	37
Relative Density	Dense
Angle of Shearing Resistance, ϕ	37.925°
- * **Layer-3 (from 9.20m to 10.20m depth)**

Type of Strata	Silty Fine Sand
Colour	Brownish
Thickness of Layer	1.00m
SPT of the layer	52
Relative Density	Very Dense
Angle of Shearing Resistance, ϕ	41.30°

Ground Water

Ground water table was encountered at a depth of 3.00m below the existing ground level during the Third week of February 2024.

CHAPTER-4

FOUNDATION SYSTEM

4.0 Preamble

The foundation system design is an interface between super structure and the sub soil bearing strata characteristics. A sound foundation system should be safe against bearing strata shear response under the super structure load intensity. Similarly, the stability of the foundation system is governed by the bearing strata deformation response under the super structure load intensity. In addition, as a combined system of super structure and foundation, the overall stability is also governed by the super structure arrangement.

Considering the above aspects of foundation design, the suitable type of foundation system with respect to the sub soil conditions encountered at the borehole locations is presented in the subsequent sections.

4.1 Bearing Strata Characteristics

From field investigations, it can be observed that the sub-soil strata encountered at shallow depths are uniformly stratified from type but possess non-uniform shear strength characteristics, BH-01 being relatively weak from deformation considerations and hence shall be considered as design borehole to determine the bearing strata and its safe bearing capacity.

Considering BH-01 as design borehole, it can be further envisaged that the medium plastic fine-grained soil strata encountered at shallow depths will hold good to act as bearing strata from shear strength characteristics and deformation considerations for nominal column loads in the range of 650kN to 750kN respectively.

If fine-grained strata encountered at shallow depths are considered as bearing strata, the safe bearing capacity of open foundation system will be a function of un-drained cohesive strength of the bearing strata.

Care shall be taken in locating the foundation system on such type of medium plastic fine-grained strata so that ordinate pressures resulting from its volumetric change phenomenon during variations in seasonal moisture content variations do not impact the structural system of foundation.

Considering the above, suitable foundation system is presented below.

4.2. Foundation System

4.2.1 Open Foundation System (BH-01)

*Considering the medium plastic fine-grained strata encountered at shallow depths and their shear strength characteristics, open foundation system of **isolated column footing** type located at a design depth of 1.70m below present existing ground level over 0.30m thick well compacted CNS (Cohesive Non-Swelling) soil can be adopted.*

CNS can be clean river sand or sand-gravels mix (1:2) or quarry dust or fly ash etc.

The safe bearing capacity of such type of open foundation system is presented below which can be adopted for foundation design purposes.

Type of Open Foundation System	Total Depth of Excavations below existing ground level (m)	Backfill with well compacted CNS (m)	Depth of <u>Isolated Column Footing</u> below Existing Ground Level (m)	Safe Bearing Capacity (t/m ²)	Elastic Settlements (mm)
<u>Isolated Column Footing</u>	2.00	0.30	1.70	18	45

The computations for above are annexed to this report.

CHAPTER-5

CONCLUSIONS & RECOMMENDATIONS

1. Open Foundation system presented in Clause 4.2.1; Chapter-IV can be adopted for foundation design purposes.
2. The safe bearing capacity of open foundation system is computed considering any rise in the ground water table up to or above the level of footing.
3. In case, ground water table is encountered within recommended depth of foundation system, provision shall be made to continuously bail the water out of the foundation pits to keep the surfaces of pit consolidated dry.

Open Foundation Depths

4. Depth of open excavations below present existing ground level shall be 2.00m.
5. Back-fill Thickness with well compacted CNS soil shall be 0.30m.
6. Depth of Isolated column Footing below present existing ground level will be 1.70m.

Usage of Excavated Earth

7. **Excavated fine-grained soil encountered at shallow depths shall be in no case used for back filling purposes.**
8. **No structural units can be in direct contact of medium plastic fine-grained soil strata encountered at shallow depths. A 0.30m thick well compacted CNS is recommended to be sand-witched in between.**

Type of CNS to Use

9. **CNS can be quarry dust or clean river sand or sand: gravels mix (1:2) or fly-ash.**

Other Recommendations

10. It is recommended to connect the grade beams so that the entire structure can act as a single unit against any differential settlements in between the individual footings.
11. As the chlorides and sulphates present in the water samples are within the permissible limits, no special steel or cement is recommended to be used for foundation construction purposes.

DESIGN OF OPEN FOUNDATION SYSTEM (Ref. BH-01)

1 COMPUTATION OF BEARING CAPACITY AS PER IS:6403

1.1 Geometrical Data :

Type of Foundation System: Isolated Column Footing		
R.L of the top of Borehole (m):	0.00	m
Total Depth of Excavations below Existing Ground Level (m) :	2.00	m
Recommended Thickness of CNS Back-Fill (m):	0.30	m
Effective Depth of Foundation below existing ground level (D_f):	1.70	m
Design Width of Foundation (B):	1.00	m
Thickness of Foundation (T) :	0.20	m

1.2 Soil Data :

Type of Bearing Strata : Silty Clay		
Design SPT-value of the Bearing Strata : 17		
(considered based upon the density of the strata)		
Type of Shear Failure: General		
Undrained Cohesion, Cu:	113.33	kPa

1.3 Design Parameters:

Bulk Density of Soil above the foundation depth (γ_{bulk})	18.00	kN/m ³
Effective Overburden pressure at foundation level (q)	13.60	kPa
Water Table Correction Factor (w')	0.50	

Bearing Capacity Factors:

$$N_c = 5.14$$

$$N_q = N/A$$

$$N_\gamma = N/A$$

Shape Factors:

$$S_c = 1.00$$

$$S_q = N/A$$

$$S_\gamma = N/A$$

Depth Factors :

$$D_c = 1.00$$

$$D_q = N/A$$

$$D_v = N/A$$

Inclination Factor:

$$I_c = 1.00$$

$$I_q = N/A$$

$$N/A$$

1.4 Ultimate Bearing Capacity (Qu) :

$$Q_u = C_u * N_c * S_c * D_c * I_{c+q} * (N_q - 1) * S_q * D_q * I_q + 0.5 * B * \gamma * N_\gamma * S_\gamma * D_\gamma * I_{\gamma w}$$

$$Q_u = 582.53 \text{ kPa}$$

1.5 Safe Bearing Capacity (Qsafe) :

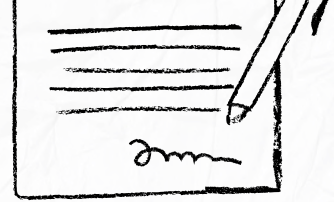
$$\text{Factor of Safety (F.S.)} : 2.50$$

$$Q_{\text{safe}} : 233.01 \text{ kPa}$$

$$\text{Recommended Safe Bearing Capacity} : 180.00 \text{ kPa}$$

1.6 Settlements

Since, the bearing strata are very stiff fine-grained type, the settlements under the allowable safe bearing pressure 180kPa will be of immediate elastic nature. The elastic settlements corresponding to a safe bearing pressure of 180kPa and average SPT of 17 considering extent of pressure bulb below bottom level of footing are computed to be in the order of 45mm which is within the permissible limits of 50mm for isolated column footing as per I.S:1904.



our services doesn't just end there



Buying & Selling Services

Property Buying Assistance, Property Selling Support, Market Price Analysis, Owner Outreach and Negotiation.



Legal & Documentation Services

Certified EC, Patta, legal opinions, property verification, due diligence, litigation solutions, and legal heir certificates.



Property Development & Approvals

Building plan approvals, construction, layout and sub-division approvals, zone conversion, and occupancy certification.



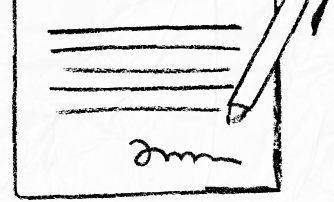
NRI & Investment Services

Escrow Services, Rentals, Litigation Solutions, Property Valuation and Property Management



Compliance & Special Services

Demolition, Vaasthu checks, regularization of unauthorized buildings, and office space solutions.



 **empowering your real estate decisions
with smart tools**



Property Valuation & Cost Estimation

Guideline Value, Apartment Composite Value, Stamp Duty & Registration Fees Calculator, Building Value Calculator, Capital Gains Calculator, Area Unit Converter, Length Unit Converter



Ownership, Compliance & Legal Verification

Encumbrance Certificate (EC) Search, Find Your SRO, Temple Property Check, WAQF Property Check, View Patta/Chitta, View FMB, Patta Analyzer, EC Analyzer



Zoning & Land Use Analysis

Land Use Zone Finder, CRZ Zone Check, Aquifer Zone Check, CBA Check, EWS Check, Road Width Check, Proposed Road Widening Check, FSI Calculator



Property Documentation & Workflow Tools

Forms & Templates, Document Generator, Document Translation, Dictionary



Vastu & Property Management Tools

Home Vastu Shastra, Plot Vastu Shastra, Property Management



We're honored to be part of your
real estate journey

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

hello@verified.realestate
[+91 9996 12 9996](tel:+919996129996)
www.verified.realestate