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PRASAD ARMSTRONG YEN G E C (P) LTD.
821 (Old No. 439/4) Poonamallee High Road, Arumbakkam, Chennai 600 106.
Phone: 044 - 2363 7146; e-mail: paygec@yahoo.com
CIN: U74210TN1992PTC023645

Ref. No. 067/GI/24-25.
July 27, 2024.

**M/s. Radiance Realty Developers India Ltd.**
1st Floor, Old D. No. 110, New D. No. 111
33 Feet Road, Anna Salai
Guindy, Chennai 600 032, TN.

**Attention:** **Mr. K. Ravishankar**
**Chief Operation Officer (EPC)**

Subject: Letter Report for the Combined Raft Foundation for the Proposed Multi-Storied Residential Apartments Buildings Complex Site, S. F. No. 226, 227, 228, Siruvani Main Road, Komarapalayam Village, Perur Taluk, Selvapuram, Coimbatore 641 026, TN.

Reference: 1.) Telecomm discussion and e-mail received on 26-07-2024 with details and requesting recommendations for Combined Raft foundation.
2.) Our Report No. 195/GI/23-24 dated April 5, 2024.

**Dr. Mr. Ravishankar:**

We were informed over phone and e-mail if Combined Raft foundation at about 1.5-M below EGL is feasible. If so, we were asked to provide the recommendations for the same.

We are herewith sending the combined raft foundation recommendations for the proposed buildings along with the supporting calculations.

We appreciate the opportunity to be of service to you on this project. Please call us if you have any questions or when we can be of further assistance.

Sincerely,

**PRASAD ARMSTRONG YEN GEC (P) Ltd.**

**B. Ram Prasad ME, PhD (Texas A&M)**
**Managing Director**
**DTCP Registration No. TVLR/RGTE/2019/06/002**

For PRASAD ARMSTRONG YEN
GEOTECH ENGINEERING CONSULTANTS (P) LTD.

Dr. B. Ramprasad
ME, PhD, (Texas A&M)
Reg. No.TVLR/RGTE/2019/06/002
Managing Director

**Ref. No. 067/GI/24-25.**

As per the client data received through e-mail and telecomm discussions for the proposed B + Stilt + 13 storied residential apartments building bottom of the combined raft foundation was expected to be at about 1.5-M below EGL. The typical expected average and maximum bearing pressures will be about 20 and 40 tons/$M^2$, respectively.

**Combined Raft** foundation of about 25- by 50-M was considered at 1.5-M below EGL. At 1.5-M below EGL lowest SPT "N" value was 18 with angle of internal friction ($\phi$) was 32° and total unit weight $\gamma_{total}$ of 1.7 tons/$M^3$ below raft base. Ultimate bearing capacity of the soil was estimated as per IS: 6403 Code of Practice Method using the following equation and soil parameters presented above sections:

$$q_{ult} = CN_c s_c d_c i_c + q(N_q - 1)s_q d_q i_q + 0.5B\gamma' N_\gamma s_\gamma d_\gamma i_\gamma$$

Where

| | | | |
|---|---|---|---|
| B | = Width of Footing; | $\gamma'$ | = Eff. Unit Weight of Soil; |
| $q_{ult}$ | = Ultimate Bearing Capacity of the Soil; | $s_c, s_q, s_\gamma$ | = Shape Factors; |
| C | = Avg. Soil Undrained Shear Strength; | $d_c, d_q, d_\gamma$ | = Depth Factors; |
| $N_c$ , $N_q$ & $N_\gamma$ | = Bearing Capacity Factors; | $i_c, i_q, i_\gamma$ | = Inclination Factors; and |
| q | = Eff. Vertical Pressure at Footing Level | | |

For the considered raft **estimated ultimate and recommended maximum allowable capacities were 238 and 40 tons**, respectively. For the expected average pressure of 20 tons/$M^2$ the estimated total settlement was about 20 mm, less than 75 mm, the IS: 1904 - 2006 code limiting settlement for raft foundations on granular materials. **Raft foundation should be designed for an uplift water pressure of 1.5 tons/$M^2$ as groundwater can reach EGL in worst case.** Foundation capacity calculations were presented on following sheets.

As per IS code in case of granular material in saturated condition (N = 10 to 30) recommended **Sub-Grade Modulus "$K_s$" was 0.9 to 2.90 kg/$cm^3$ (900 to 2,900 tons/$M^3$.)** Therefore, for considered soils for the proposed raft design for SPT "N" = 18 **Sub-Grade Modulus "$K_s$" of 1.70 kg/$cm^3$ (1,700 tons/$M^3$)** can be adopted.

Sincerely,

**PRASAD ARMSTRONG YEN GEC (P) Ltd.**

**B. Ram Prasad ME, PhD (Texas A&M)**
**Managing Director**
**DTCP Registration No. TVLR/RGTE/2019/06/002**

For PRASAD ARMSTRONG YEN
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## SAMPLE CALCULATIONS FOR RECOMMENDED FOUNDATION

Following is a list of design considerations:

| | | |
|---|---|---|
| Type of Foundation | = | Combined Raft Foundation; |
| Foundation Depth below EGL | = | 1.5-M below EGL; |
| Worst Case Ground Water Level | = | At EGL; |
| Minimum Combined Raft Size | = | 25- by 50-M; |
| Max. Expected Column Load | = | 350 tons; and |
| Expected Avg. Bearing Pressure | = | 20 tons/$M^2$. |

Bearing Capacity Calculations:

Ultimate Bearing Pressure $q_{ult} = C_u*N_c*S_c*D_c + q'(N_q - 1)*S_q*d_q + 0.5*B*\gamma'*N_\gamma* S_\gamma*d_\gamma$

| | | |
|---|---|---|
| $\phi$ (avg) | = | $32^o$ |
| $C_u$ (Undrained Shear Strength) | = | 0 tons/$M^2$ |
| $N_c$ (Bearing Capacity Factor) | = | N/A |
| $N_q$ (Bearing Capacity Factor) | = | 24.36 |
| $N_\gamma$ (Bearing Capacity Factor) | = | 32.66 |
| $S_q$ (Shape Factor) | = | $1 + 0.2*(B/L) = 1.0 + 0.2*(25.0/50.0) = 1.10$ |
| $d_q$ (Depth Factor) | = | $1 + 0.1*D_f/B*\tan(45 + \phi/2)$ for $\phi > 10^o$ and |
| | = | 1.0 for $\phi < 10^o = 1.04$ |
| $S_\gamma$ (Shape Factor) | = | $1 - 0.4*(B/L) = 1 - 0.4*(25.0/50.0) = 0.80$; |
| $d_\gamma$ (Depth Factor) | = | $1 + 0.1*D_f/B*\tan(45 + \phi/2)$ for $\phi > 10^o$ and |
| | = | 1.0 for $\phi < 10^o = 1.04$ |
| q'(O B @ Footing) | = | Neglected |

**Note: Ground water is assumed to rise to EGL of the site.**

$q_{ult} = 0 + 0 + 0.5*0.7*25.0*32.66*0.8*1.04 = 237.77 \sim 238$ tons/$M^2$

$q_{all} = q_{ult} / 2.5 = 238 / 2.5 =$ 95.2 tons/$M^2$ **Use and Limit $q_{all}$ = 40 tons/$M^2$**

**Settlement Calculations:**

Elastic or Immediate Settlement

Zone of Influence from foundation level = 2*25 = 50-M below raft or up to hard strata level, whichever is earlier. There will be only elastic (immediate) and no consolidation (long term) settlements as profile had only sandy soil in the influence zone.

Elastic or Immediate Settlement: (Boring 1 and 2 Soil Profile)

1. 1.5- to 2.5-M = $H_1$ = 1.0-M; SPT "N" ~ 24; (Silty Sand); $E_s$ = 3,000 tons/$M^2$
2. 2.5- to 8.75-M = $H_2$ = 6.25-M; SPT "N" > 75; (Silty Sand); $E_s$ = 7,500 tons/$M^2$
3. 8.75- to 10.0-M = $H_3$ = 1.25-M; SPT "N" = 49; (Silty Sand); $E_s$ = 5,000 tons/$M^2$

$E_{savg} = (3000*1.0 + 7500*6.25 + 1.25*5000) / 8.5 = 6,602.94 \sim 6,600$ tons/$M^2$

$q_{avg}$ = 20 tons/$M^2$; B = 25-M; L = 50-M; L/B = 50/25 = 2; H = 8.5-M; H/B' = 8.5/12.5 = 0.68;
$\mu$ = 0.20; $E_s$ = 6,600 tons/$M^2$; $I_f$ = 0.95; $I_1$ = 0.073; $I_2$ = 0.098; $I_s$ = 0.146;
$\Delta H_E = 4*20.0*12.50*(1-0.2^2)/6600 * 0.95 * 0.146 * 1000 = 20.17$ mm
Total Elastic Settlement $\Delta H_E$ = 20.17 mm.

For PRASAD ARMSTRONG YEN
GEOTECH ENGINEERING CONSULTANTS (P) LTD.

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Managing Director

PLATE 1

Consolidation Settlement: None.

Total Consolidation Settlement $\Delta H_C \sim 0.00$ mm.

Total Combined Settlement $\mathbf{\Delta H} = \Delta H_E + \Delta H_C = 20.17 + 0.00 = \mathbf{20.17 \sim 20\ mm}$.

Estimated total settlement for a 25- by 50-M combined raft foundation at 1.5-M below EGL was about 20 mm for an average bearing pressure of 20 tons/$M^2$ less than 75 mm – allowable limits for the total settlements for raft foundations on granular material as per IS: 1904 - 1978 code. Hence, combined raft foundation can be considered for the proposed building at this site if liquefaction aspect was not considered.

## SUB-GRADE MODULUS OF SOIL

Site lower bound soil profile infers presence of sand and weathered rock with lowest $N_{avg}$ ~ 18 between 1.5- and 2.5-M below EGL. Actual "Sub-Grade Modulus" value is influenced by thickness of soil in the influence zone, size and rigidity of foundation. Since it is not possible to estimate the same with variable strata, as a general guideline following sub-grade modulus values as per IS: 2950 - 1998 were presented. As per IS code in case of granular material in saturated condition (N = 10 to 30) recommended **Sub-Grade Modulus "$K_s$"** was **0.9 to 2.90 kg/$cm^3$ (900 to 2,900 tons/$M^3$.)** Therefore, for considered soils for the proposed raft design **Sub-Grade Modulus "$K_s$"** of **1.70 kg/$cm^3$ (1,700 tons/$M^3$)** can be adopted.

Sincerely,

**PRASAD ARMSTRONG YEN GEC (P) Ltd.**

**B. Ram Prasad ME, PhD (Texas A&M)**
**Managing Director**
**DTCP Registration No. TVLR/RGTE/2019/06/002**

For PRASAD ARMSTRONG YEN
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Phone: 044 - 2363 7146; e-mail: paygec@yahoo.com
CIN: U74210TN1992PTC023645

# GEOTECHNICAL SITE INVESTIGATION

## BORING 1 THROUGH 7

## PROPOSED MULTI-STORIED RESIDENTIAL APARTMENTS BUILDING COMPLEX SITE

## T S NO 12/2, 13/2 & 15/1 (O S NO 226 (PT), 227 (PT), 228 (PT)), BLOCK NO 1, WARD AQ, PERUR MAIN ROAD

## KUMARAPALAYAM VILLAGE, PERUR TALUK

## SELVAPURAM, COIMBATORE 641 026, TN.

For PRASAD ARMSTRONG YEN
GEOTECH ENGINEERING CONSULTANTS (P) LTD.

Dr. B. Ramprasad
ME, PhD, (Texas A&M)
Reg. No.TVLR/RGTE/2019/06/002
Managing Director

Report to

**M/s. Radiance Realty Developers India Ltd.**
1st Floor, Old D. No. 110, New D. No. 111
33 Feet Road, Anna Salai
Guindy, Chennai 600 032, TN.

PRASAD ARMSTRONG YEN G E C (P) LTD.
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Phone: 044 - 2363 7146; e-mail: paygec@yahoo.com
CIN: U74210TN1992PTC023645

# THE PROPOSED CONSTRUCTION OF HIGH RISE RESIDENTIAL BUILDING CONSISTS OF 2 TOWERS WITH COMBINED BASEMENT & STILT

## TOWER - 1: STILT FLOOR +13 UPPER FLOORS WITH 182 DWELLING UNITS;

## TOWER-2: STILT FLOOR+13 UPPER FLOORS WITH 195 DWELLING UNITS &

## COMBINED WITH CLUB HOUSE: STILT FLOOR + 4 UPPER FLOORS WITH GYM, INDOOR GAMES, SPA & SWIMMING POOL ON FIRST FLOOR LEVEL

## TOTALLY 377 DWELLING UNITS

## COMPRISED IN T. S. NOS.12/2, 13/2 & 15/1. OLD SURVEY NOS.226 (PT), 227 (PT) & 228 (PT)) IN BLOCK NO.1, WARD-AQ, SOUTH ZONE, KUMARAPALAYAM VILLAGE

## PERUR TALUK, COIMBATORE DISTRICT.

For PRASAD ARMSTRONG YEN
GEOTECH ENGINEERING CONSULTANTS (P) LTD.

Dr. B. Ramprasad
ME, PhD, (Texas A&M)
Reg. No.TVLR/RGTE/2019/06/002
Managing Director

Report to

**M/s. Radiance Realty Developers India Ltd.**
1st Floor, Old D. No. 110, New D. No. 111
33 Feet Road, Anna Salai
Guindy, Chennai 600 032, TN.

PRASAD ARMSTRONG YEN G E C (P) LTD.
821 (Old No. 439/4) Poonamallee High Road, Arumbakkam, Chennai 600 106.
Phone: 044 - 2363 7146; e-mail: paygec@yahoo.com
CIN: U74210TN1992PTC023645

Report No. 195/GI/23-24.
April 5, 2024.

**M/s. Radiance Realty Developers India Ltd.**
1st Floor, Old D. No. 110, New D. No. 111
33 Feet Road, Anna Salai
Guindy, Chennai 600 032, TN.

**Attention: Mr. K. Ravishankar**
**Chief Operation Officer**

**Geotechnical Site Investigation**
**Boring 1 through 7**
**Proposed Multi-Storied Residential Apartments Buildings Complex Site**
**T S No 12/2, 13/2, & 15/1 (O S No 226 (Pt), 227 (Pt), 228 (Pt), Block No 1, Ward AQ**
**Perur Main Road, Kumarapalayam Village, Perur Taluk**
**Selvapuram, Coimbatore 641 026, TN.**

The Prasad Armstrong Yen GEC (P) Ltd., Chennai is pleased to submit this report on our geotechnical site investigation conducted at the above location. This study was authorized by your Work Order Ref: WO: RRDIL:PAYGL/330-A1/2023-24 dated March 22, 2024.

Estimated capacities of the foundations recommended for the proposed buildings were presented here in final form together with a summary of laboratory and field data.

We appreciate the opportunity to be of service to you on this project. Please call us if you have any questions or when we can be of further assistance.

Sincerely,

**PRASAD ARMSTRONG YEN GEC (P) Ltd.**

**B. Ram Prasad ME, PhD (Texas A&M)**
**Managing Director**
**DTCP Registration No. TVLR/RGTE/2019/06/002**

(195brpt)
Copies Submitted: (3)

For PRASAD ARMSTRONG YEN
GEOTECH ENGINEERING CONSULTANTS (P) LTD.

Dr. B. Ramprasad
ME, PhD, (Texas A&M)
Reg. No.TVLR/RGTE/2019/06/002
Managing Director

## O/O.THE ASSISTANT DIRECTOR OF TOWN AND COUNTRY PLANNING, THIRUVALLUR REGION.

No.43/397A, 2nd Floor, Annai Indira Gandhi Road, Rajajipuram Phase-II, Thiruvallur - 602 001.
E-mail : tvlrregion@gmail.com, Phone : 044-27665657.

# *PROFESSIONAL REGISTRATION CERTIFICATE*

This is to certify that **Dr.B.Ramprasad**, has enrolled as **Geo Tech Engineer (RGTE)** with O/o.The Assistant Director of Town and Country Planning, Thiruvallur Region who has the qualification of **B.E., (Civil Engineering), M.E., (Geotechnical Engineering), Ph.D.,** and experience in the relevant field for **30 Years.**

He has been given the Registration No: **TVLR/RGTE/2019/06/002** on **06.06.2019.** He Shall be required to comply with the duties and responsibilities prescribed by the Government of Tamil Nadu in Part V, "Registration of Professionals", Tamil Nadu Combined Development and Building Rules, 2019 approved vide **G.O.(Ms).No.18, MAWS (MA.1) Dept., Dated:04.02.2019.**

This Registration is valid upto **05.06.2024.**




6/6/19
Assistant Director of
Town and Country Planning,
Thiruvallur Region.

6/6/19

For PRASAD ARMSTRONG YEN
GEOTECH ENGINEERING CONSULTANTS (P) LTD.

Dr. B. Ramprasad
ME, PhD, (Texas A&M)
Reg. No.TVLR/RGTE/2019/06/002
Managing Director

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For PRASAD ARMSTRONG YEN
GEOTECH ENGINEERING CONSULTANTS (P) LTD.

Dr. B. Ramprasad
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Reg. No.TVLR/RGTE/2019/06/002
Managing Director

## SUMMARY

Prasad Armstrong Yen GEC (P) Ltd. performed a geotechnical site investigation at the Proposed Multi-Storied Residential Apartments Buildings Complex Site, S. F. No. 226, 227, 228, Siruvani Main Road, Komarapalayam Village, Perur Taluk, Coimbatore 641 026, TN. The primary purpose of this investigation was to obtain data to select suitable foundations for the proposed B + Stilt + 13 floors villa buildings planned at this site. Typical maximum column load for the proposed building type will be about 350 tons. These details were used only for estimating the preliminary foundation size and type of foundation.

The field investigation was performed March 25 through April 1, 2024. Number and location of borings were selected to cover the proposed buildings area. Boring 1 through 7 were drilled to 13-M penetration below the Existing Ground Level (EGL.) Borings were drilled beyond 10-M due to presence of variable SPT "N" values, boring profile was sandy soils, and to have data to at least to a depth of three times of possible footing size. Drilling of the borings was terminated after reaching 13-M depth and encountering hard stratum with SPT "N" $\geq$ 75 in at least 2 / 3 tests. Tests were conducted to determine the pertinent index and engineering properties of the soils encountered. We then performed engineering analyses to develop the required design data.

Natural topography of the site reflects a relatively flat terrain. Visual observation infers that EGL of the site was about 1.5-M below the Existing Road Level (ERL) of road in front of the site. Proposed site had fencing along three sides including road facing side, and compound wall along the adjacent apartment complex. Proposed site had a few trees near Boring 6. Site was cleared of grass, shrubs, and bushes days before this investigation field work. Proposed construction will be the first major construction activity to cover this site. Typical site soil stratigraphy at the borings is tabulated below:

**Typical Soil Profiles of the Borings:**

| | Penetration, M | | |
|---|---|---|---|
| Stratum | From | To | Description |
| I | 0 | 13.0+ | Brown Silty Fine to Medium Sand |

Data from borings indicate presence of mainly silty sand profile. EGL of the site was at about 1.5-M below ERL of road in front of the site. For the site's surface drainage it will be necessary to raise the site level at least 1-M above ERL of road in front of the site. Therefore, from EGL itself for the basement floor nearly 2.5-M height will be available. Bottom of the basement excavation has to reach about 1-M below EGL to account for PCC, basement floor slab. With considered levels bottom the basement excavation will be at about 1-M below EGL. In the borings from EGL onwards it was all sandy soils. From 1.75- / 2.5-M below EGL lowest SPT "N" value at 2.5- to 4-M was greater than 65. For the proposed building and site conditions it was **recommend** to provide "**Isolated Column Footing**" foundation at 2.5-M below EGL and minimum 1.5-M below basement floor bottom level. A minimum footing size of 2.5- by 2.5-M was considered in the analysis. For considered foundation **estimated ultimate and allowable bearing capacities were 139 and 35 tons/M$^2$**, respectively. Estimated total settlement was about 11 mm. Estimated total settlement was less than 60 mm, the IS: 1904 - 2006 code limiting settlement for isolated column footing foundations for framed structure with

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panel walls. Hence, isolated column footing foundation can be used for the proposed buildings at this site. All the footings should be interconnected in both directions. It was also recommended to provide continuous lintels in each floor for better resistance to seismic forces and differential settlements. The basement floor slab should be designed for an uplift pressure of 2 tons/$M^2$.

Groundwater was not seen in the borings. There was no groundwater source in the site. In the adjacent plot a bore well of unknown depth was present at a distance of about 100-M from Boring 6. Groundwater sample was collected from this bore well for construction suitability test as per IS: 456 - 2000 guidelines. Test results indicate that groundwater from the bore well was **not suitable** for construction purposes due to high alkalinity as inferred by the methyl orange titration test. After installation of a bore well in the site, groundwater from the site should be checked at regular intervals from the beginning and during construction period to confirm groundwater's construction suitability. **If necessary, suitable groundwater treatment should be provided to make groundwater suitable for construction activities**. **One soil sample per bore** either 1.75- or 2.5- or 3.25-M depths were tested for pH, chlorides and sulphates to check if soils can affect the planned foundation elements in contact with site soils. Test results infer that the tested soils except Boring 1 1.75-M sample had acceptable pH and acceptable concentration (but nearer to the limit value) of chlorides, and sulphates as per IS: 456 - 2000 for construction water. Boring 1 1.75-M had high chlorides and high sulphates. Therefore, **as an abundant precaution upto stilt floor roof level use of steel and cement resistant to chlorides and sulphates should be used**.

We do not expect construction problems at this site due to soil and groundwater conditions. Site's EGL was at about 1.5-M above ERL of road in front of the site. FGL of the site should be at least 1-M above the ERL of public road near the site with proper design of surface drainage system to drain rain water runoff. Slopes of site's internal roads, rainwater channels, drainage channels should be suitably designed with due consideration to ERL of public road near the site. The Finished Floor Level (FFL) of stilt floor should be at least 0.2-M above FGL of site. This will minimize rainwater road runoff into site and building.

Backfilling of the foundation excavations should be done with granular soil, and fill should be compacted properly to achieve proper densification to avoid settlements in flooring. Exposed bottom surface of the foundation excavation must be properly compacted with heavy duty rammer or heavy roller to compact the exposed surface that gets loosened by mechanical excavation activities. This is to minimize the settlements that can arise if the loosened soil in foundation excavation is not removed or compacted. New foundations should rest on virgin soil and not on old foundations or filled up soils. If any loose pockets of soils are encountered at footing level then the looser material should be replaced till denser material with well compacted PCC. Excavated silty sand soil can be used for foundation and site filling purposes.

**Site appears to be had significant vegetation. All vegetation was cleared just before the investigation. There may be some filled-up water collection ponds or filed up large open wells. Local enquires should be made to know and identify such entities in the site. Also, foundation excavations should be checked if the exposed soils were different or easy to work as compared to other intact soil areas. Extreme care should be taken in this regard to avoid foundations in filled or loose pocket areas of the site.** Site was land with significant vegetation after development there is a high chance of termite and wood damaging insect attacks on wooden items used in the proposed

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buildings. Therefore, suitable preconstruction anti-termite treatment along with double dosage of recommended anti-termite treatment of all wood works of the buildings should provided to protect wood works of the buildings.

All structures have to be designed for higher seismic forces (**Zone III**) due to increased seismic activity in peninsular India in the last decade and half. Seismic events of 3.9 magnitude on March 14, 2024, 5.1 magnitude on August 24, 2021, 5.1 magnitude on February 12, 2019, 7.9 magnitude on April 25, 2015, 6.0 magnitude on May 21, 2014, 8.4 magnitude on April 11, 2012, 7.2 magnitude on June 13, 2010, and 7.6 magnitude on August 11, 2009 with epicenters in Himalayas, Bay of Bengal, and near Andaman Islands were felt at Chennai. It is recommended to provide rigid plinth beams in ground level, columns designed for shear forces or shear walls in the structure, and continuous lintels in each floor. Lintels must be integrated into columns of the structure. Plinth beams must be designed to be rigid to allow redistribution of loads in case of differential settlements. Site's lower bound soil profile with Ground Water Level (GWL) at 1-M below EGL infers "**Nil**" seismic susceptibility. Under a seismic event of **6.0 Richter scale**, and peak ground acceleration of **0.16g** (IS code for **Zone III** guidelines) the total estimated vertical settlement was 0.00 cms and total horizontal displacement was 0.00 cms. Iwasaki liquefaction potential was 0.00 inferring "**No Liquefaction**."

For PRASAD ARMSTRONG YEN
GEOTECH ENGINEERING CONSULTANTS (P) LTD.

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Managing Director

# INTRODUCTION

## Purpose and Scope

Prasad Armstrong Yen GEC (P) Ltd. performed a geotechnical site investigation at the Proposed Multi-Storied Residential Apartments Buildings Complex Site, S. F. No. 226, 227, 228, Siruvani Main Road, Komarapalayam Village, Perur Taluk, Coimbatore 641 026, TN. The primary purpose of this investigation was to obtain data to select suitable foundations for the proposed B + Stilt + 13 floors villa buildings planned at this site. Typical maximum column load for the proposed building type will be about 350 tons. These details were used only for estimating the preliminary foundation size and type of foundation. To accomplish these purposes, the following tasks were performed:

(1) Boring 1 through 7 were drilled 13-M to explore subsurface stratigraphy and obtain samples for laboratory testing;

(2) Field and laboratory tests were conducted to evaluate the pertinent index and engineering properties of the foundation materials; and

(3) Engineering analyses were performed to develop foundation design information for the proposed building.

## Report Format

The initial sections of this report contain brief descriptions of the field and laboratory phases of our study. A general soils description is then presented, followed by discussions of foundation design recommendations followed by a brief on construction considerations for this project.

# FIELD AND LABORATORY INVESTIGATIONS

## Exploratory Borings

Soil conditions at the site were explored by Boring 1 through 7. Boring location details are presented on Plate 1. Number and location of borings were selected to cover the proposed buildings area. Boring 1 through 7 were drilled to 13-M penetration below EGL. Borings were drilled beyond 10-m due to presence of variable SPT "N" values, boring profile was sandy soils, and to have data to at least to a depth of three times of possible footing size. Drilling of the borings was terminated after reaching 13-M depth and encountering hard stratum with SPT "N" $\geq$ 75 in at least 2 / 3 tests. Tests were conducted to determine the pertinent index and engineering properties of the soils encountered. We then performed engineering analyses to develop the required design data. Groundwater was not clearly seen in the borings. Log of Boring are presented on Plate 2 through 8.

## Field and Laboratory Tests

Boring was drilled using Calyx drilling unit. In the boring SPT was performed at 0.75-M interval upto 4-M, at 1-M interval upto 10-M, and at 1.5-M interval beyond 10-M. Soil samples for laboratory tests were collected from SPT split spoon sampler. SPT consists of driving a standard split spoon sampler, 50.8-mm outside diameter and 35-mm inside diameter into soil under the blows of a drop hammer of 63.5 kg falling weight freely through 75-cm. The number of blows required for 30-cm of

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penetration of sampler in soil is designated as N value and it is termed as the SPT blow count. Detailed information regarding SPT can be found in the IS: 2131 code of practice.

Soil-testing program was designed to evaluate pertinent index and engineering properties of the foundation soils and rock. During field operations soil samples were collected at 0.75-, 1- and 1.5-M intervals either disturbed or undisturbed as the case may be. All soil and groundwater samples were shipped to our Chennai laboratory where pertinent index properties - grain size analyses, natural water content Atterberg limit tests were performed on collected soil samples. All the test results are tabulated on the Summary of Test Results on Plate 9. Grain size distribution curves of tested soil are presented on Plate 10. Summary of Water and Soil Chemical Test Results are presented on Plate 11.

## GENERAL SOIL CONDITIONS

### Topography

Natural topography of the site reflects a relatively flat terrain. Visual observation infers that EGL of the site was about 1.5-M below ERL of road in front of the site. Proposed site had fencing along three sides including road facing side, and compound wall along the adjacent apartment complex. Proposed site had a few trees near Boring 6. Site was cleared of grass, shrubs, and bushes days before this investigation field work. Proposed construction will be the first major construction activity to cover this site.

### Soil Stratigraphy

Soil stratigraphy disclosed by our field and laboratory investigations of the boring are presented on the Log of Boring on Plate 2 through 8. Soil stratigraphy is based on classification of soil samples recovered from the boring, and our observations during drilling operations. A generalized summary of the major soil strata is tabulated below:

**Boring – 1:**

| Stratum | Penetration, M From | To | Description |
|---|---|---|---|
| I | 0 | 13.0+ | Brown Silty Fine to Coarse Sand |

**Boring – 2:**

| Stratum | Penetration, M From | To | Description |
|---|---|---|---|
| I | 0 | 13.0+ | Brown Silty Fine to Medium Sand |

**Boring – 3:**

| Stratum | Penetration, M From | To | Description |
|---|---|---|---|
| I | 0 | 1.0 | Gray Fine to Medium Sand with Silt |
| II | 1.0 | 13.0+ | Brown Silty Fine to Medium Sand |

**Boring – 4:**

| Stratum | Penetration, M From | To | Description |
|---|---|---|---|
| I | 0 | 13.0+ | Brown Silty Fine to Medium Sand |



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**Boring – 5:**

| Stratum | Penetration, M From | To | Description |
|---|---|---|---|
| I | 0 | 1.0 | Gray Fine to Medium Sand with Silt |
| II | 1.0 | 10.0 | Brown Fine to Medium Sand with Silt |
| III | 10.0 | 13.0+ | Brown Gravely Fine to Medium Sand |

**Boring – 6:**

| Stratum | Penetration, M From | To | Description |
|---|---|---|---|
| I | 0 | 1.75 | Gray Fine to Medium Sand with Silt |
| II | 1.75 | 13.0+ | Brown Silty Fine to Medium Sand |

**Boring – 7:**

| Stratum | Penetration, M From | To | Description |
|---|---|---|---|
| I | 0 | 1.0 | Gray Fine to Medium Sand |
| II | 1.0 | 13.0+ | Brown Silty Fine to Medium Sand |

Detailed soil descriptions that include textural variations and inclusions are noted on the log of boring and log of trial pit presented on Plate 2 through 8.

## Interpretation of Soil Properties

Shear strength parameters for cohesionless soils were selected based on the SPT, and grain size distribution analyses. Shear strength parameters for cohesive soils were selected based on the SPT results. The unit weight (soil density) profiles of the soils in the borings were developed from estimated values based on correlations of unit weight with particle size gradation and field test results (Bowles, 1982.)

Recommendations presented herein for the proposed buildings were based on the soil properties encountered in Boring 2. **There may be a need to drill additional borings to investigate soil variability if encountered during the foundation work.** Based on the field and laboratory test results the following are the properties for soils encountered in the boring.

**Boring – 1:**

| Stratum | Penetration, M From | To | Properties |
|---|---|---|---|
| Ia | 0 | 1.75 | $\phi = 32^{o}$; $\gamma_{sat} = 1.7$ tons/M$^3$ |
| Ib | 1.75 | 2.5 | $\phi = 37^{o}$; $\gamma_{sat} = 2.1$ tons/M$^3$ |
| Ic | 2.5 | 3.25 | $\phi = 39^{o}$; $\gamma_{sat} = 2.3$ tons/M$^3$ |
| Id | 3.25 | 5.0 | $\phi = 37^{o}$; $\gamma_{sat} = 2.1$ tons/M$^3$ |
| Ie | 5.0 | 5.75 | $\phi = 38^{o}$; $\gamma_{sat} = 2.2$ tons/M$^3$ |
| If | 5.75 | 8.0 | $\phi = 36^{o}$; $\gamma_{sat} = 2.0$ tons/M$^3$ |
| Ig | 8.0 | 9.0 | $\phi = 37^{o}$; $\gamma_{sat} = 2.1$ tons/M$^3$ |
| Ih | 9.0 | 11.0 | $\phi = 38^{o}$; $\gamma_{sat} = 2.2$ tons/M$^3$ |
| Ii | 11.0 | 13.0 | $\phi = 37^{o}$; $\gamma_{sat} = 2.1$ tons/M$^3$ |
| Ij | 13.0+ | | $\phi = 40^{o}$; $\gamma_{sat} = 2.3$ tons/M$^3$ |

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**Boring – 2:**

| Stratum | Penetration, M From | To | Properties |
|---|---|---|---|
| Ia | 0 | 1.0 | $\phi = 30^o$; $\gamma_{sat} = 1.6$ tons/M$^3$ |
| Ib | 1.0 | 1.75 | $\phi = 32^o$; $\gamma_{sat} = 1.7$ tons/M$^3$ |
| Ic | 1.75 | 2.5 | $\phi = 34^o$; $\gamma_{sat} = 1.85$ tons/M$^3$ |
| Id | 2.5 | 7.0 | $\phi = 37^o$; $\gamma_{sat} = 2.1$ tons/M$^3$ |
| Ie | 7.0 | 7.75 | $\phi = 38^o$; $\gamma_{sat} = 2.2$ tons/M$^3$ |
| If | 7.75 | 8.75 | $\phi = 37^o$; $\gamma_{sat} = 2.1$ tons/M$^3$ |
| Ig | 8.75 | 10.0 | $\phi = 36^o$; $\gamma_{sat} = 2.0$ tons/M$^3$ |
| Ih | 10.0 | 13.0 | $\phi = 37^o$; $\gamma_{sat} = 2.1$ tons/M$^3$ |
| Ii | 13.0+ | | $\phi = 39^o$; $\gamma_{sat} = 2.25$ tons/M$^3$ |

**Boring – 3:**

| Stratum | Penetration, M From | To | Properties |
|---|---|---|---|
| I | 0 | 1.0 | $\phi = 30^o$; $\gamma_{sat} = 1.65$ tons/M$^3$ |
| IIa | 1.0 | 1.75 | $\phi = 34^o$; $\gamma_{sat} = 1.8$ tons/M$^3$ |
| IIb | 1.75 | 2.5 | $\phi = 35^o$; $\gamma_{sat} = 1.95$ tons/M$^3$ |
| IIc | 2.5 | 5.75 | $\phi = 37^o$; $\gamma_{sat} = 2.1$ tons/M$^3$ |
| IId | 5.75 | 7.0 | $\phi = 36^o$; $\gamma_{sat} = 2.0$ tons/M$^3$ |
| IIe | 7.0 | 7.75 | $\phi = 38^o$; $\gamma_{sat} = 2.2$ tons/M$^3$ |
| IIf | 7.75 | 8.75 | $\phi = 37^o$; $\gamma_{sat} = 2.1$ tons/M$^3$ |
| IIg | 8.75 | 10.0 | $\phi = 36^o$; $\gamma_{sat} = 2.05$ tons/M$^3$ |
| IIh | 10.0 | 11.5 | $\phi = 37^o$; $\gamma_{sat} = 2.1$ tons/M$^3$ |
| IIi | 11.5 | 12.5 | $\phi = 38^o$; $\gamma_{sat} = 2.2$ tons/M$^3$ |
| IIj | 12.5 | 13.0+ | $\phi = 37^o$; $\gamma_{sat} = 2.1$ tons/M$^3$ |

**Boring – 4:**

| Stratum | Penetration, M From | To | Properties |
|---|---|---|---|
| Ia | 0 | 1.0 | $\phi = 31^o$; $\gamma_{sat} = 1.65$ tons/M$^3$ |
| Ib | 1.0 | 1.75 | $\phi = 32^o$; $\gamma_{sat} = 1.7$ tons/M$^3$ |
| Ic | 1.75 | 5.0 | $\phi = 37^o$; $\gamma_{sat} = 2.1$ tons/M$^3$ |
| Id | 5.0 | 8.75 | $\phi = 38^o$; $\gamma_{sat} = 2.2$ tons/M$^3$ |
| Ie | 8.75 | 11.5 | $\phi = 36^o$; $\gamma_{sat} = 2.05$ tons/M$^3$ |
| If | 11.5 | 13.0 | $\phi = 37^o$; $\gamma_{sat} = 2.1$ tons/M$^3$ |
| Ig | 13.0+ | | $\phi = 38^o$; $\gamma_{sat} = 2.2$ tons/M$^3$ |

**Boring – 5:**

| Stratum | Penetration, M From | To | Properties |
|---|---|---|---|
| I | 0 | 1.0 | $\phi = 33^o$; $\gamma_{sat} = 1.75$ tons/M$^3$ |
| IIa | 1.0 | 2.5 | $\phi = 34^o$; $\gamma_{sat} = 1.8$ tons/M$^3$ |
| IIb | 2.5 | 3.25 | $\phi = 37^o$; $\gamma_{sat} = 2.1$ tons/M$^3$ |
| IIc | 3.25 | 4.0 | $\phi = 38^o$; $\gamma_{sat} = 2.2$ tons/M$^3$ |
| IId | 4.0 | 5.0 | $\phi = 37^o$; $\gamma_{sat} = 2.1$ tons/M$^3$ |
| IIe | 5.0 | 6.75 | $\phi = 38^o$; $\gamma_{sat} = 2.2$ tons/M$^3$ |
| IIf | 6.75 | 8.0 | $\phi = 37^o$; $\gamma_{sat} = 2.1$ tons/M$^3$ |



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| | | | |
|---|---|---|---|
| IIg | 8.0 | 8.75 | $\phi = 38^o$; $\gamma_{sat} = 2.2$ tons/M$^3$ |
| IIh | 8.75 | 10.0 | $\phi = 37^o$; $\gamma_{sat} = 2.1$ tons/M$^3$ |
| IIIa | 10.0 | 13.0 | $\phi = 38^o$; $\gamma_{sat} = 2.2$ tons/M$^3$ |
| IIIb | 13.0+ | | $\phi = 39^o$; $\gamma_{sat} = 2.25$ tons/M$^3$ |

**Boring – 6:**

| Stratum | Penetration, M From | To | Properties |
|---|---|---|---|
| Ia | 0 | 1.0 | $\gamma_{sat} = 1.7$ tons/M$^3$ |
| Ia | 1.0 | 1.75 | $\phi = 34^o$; $\gamma_{sat} = 1.8$ tons/M$^3$ |
| IIa | 1.75 | 2.5 | $\phi = 36^o$; $\gamma_{sat} = 2.0$ tons/M$^3$ |
| IIb | 2.5 | 4.75 | $\phi = 38^o$; $\gamma_{sat} = 2.2$ tons/M$^3$ |
| IIc | 4.75 | 8.75 | $\phi = 37^o$; $\gamma_{sat} = 2.1$ tons/M$^3$ |
| IId | 8.75 | 10.0 | $\phi = 36^o$; $\gamma_{sat} = 2.05$ tons/M$^3$ |
| IIe | 10.0 | 13.0+ | $\phi = 37^o$; $\gamma_{sat} = 2.1$ tons/M$^3$ |

**Boring – 7:**

| Stratum | Penetration, M From | To | Properties |
|---|---|---|---|
| I | 0 | 1.0 | $\phi = 30^o$; $\gamma_{sat} = 1.6$ tons/M$^3$ |
| IIa | 1.0 | 1.75 | $\phi = 31^o$; $\gamma_{sat} = 1.7$ tons/M$^3$ |
| IIb | 1.75 | 2.5 | $\phi = 35^o$; $\gamma_{sat} = 1.95$ tons/M$^3$ |
| IIc | 2.5 | 4.75 | $\phi = 38^o$; $\gamma_{sat} = 2.2$ tons/M$^3$ |
| IId | 4.75 | 8.0 | $\phi = 37^o$; $\gamma_{sat} = 2.1$ tons/M$^3$ |
| IIe | 8.0 | 8.75 | $\phi = 38^o$; $\gamma_{sat} = 2.2$ tons/M$^3$ |
| IIf | 8.75 | 11.5 | $\phi = 36^o$; $\gamma_{sat} = 2.05$ tons/M$^3$ |
| IIg | 11.5 | 13.0+ | $\phi = 37^o$; $\gamma_{sat} = 2.1$ tons/M$^3$ |

## DESIGN INFORMATION

Data from borings indicate presence of mainly silty sand profile. EGL of the site was at about 1.5-M below ERL of road in front of the site. For the site's surface drainage it will be necessary to raise the site level at least 1-M above ERL of road in front of the site. Therefore, from EGL itself for the basement floor nearly 2.5-M height will be available. Bottom of the basement excavation has to reach about 1-M below EGL to account for PCC, basement floor slab. With considered levels bottom the basement excavation will be at about 1-M below EGL. In the borings from EGL onwards it was all sandy soils. From 1.75- / 2.5-M below EGL lowest SPT "N" value at 2.5- to 4-M was greater than 65. For the proposed building and site conditions it was **recommend** to provide "**Isolated Column Footing**" foundation at 2.5-M below EGL and minimum 1.5-M below basement floor bottom level. A minimum footing size of 2.5- by 2.5-M was considered in the analysis. The ultimate bearing capacity of the soil was estimated as per IS: 6403 Code of Practice Method using the following equation and soil parameters presented above sections:

$$q_{ult} = CN_c s_c d_c i_c + q(N_q - 1)s_q d_q i_q + 0.5B\gamma' N_\gamma s_\gamma d_\gamma i_{\gamma\delta}$$

Where

B = Width of Footing;
$q_{ult}$ = Ultimate Bearing Capacity of the Soil;
$\gamma'$ = Eff. Unit Weight of Soil;
$s_c, s_q, s_\gamma$ = Shape Factors;



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C = Avg. Soil Undrained Shear Strength; $d_c, d_q, d_\gamma$ = Depth Factors;
$N_c$ , $N_q$ & $N_\gamma$ = Bearing Capacity Factors; $i_c, i_q, i_\gamma$ = Inclination Factors; and
q = Eff. Vertical Pressure at Footing Level

For considered foundation **estimated ultimate and allowable bearing capacities were 139 and 35 tons/M$^2$**, respectively. Estimated total settlement was about 11 mm. Estimated total settlement was less than 60 mm, the IS: 1904 - 2006 code limiting settlement for isolated column footing foundations for framed structure with panel walls. Hence, isolated column footing foundation can be used for the proposed buildings at this site. All the footings should be interconnected in both directions. It was also recommended to provide continuous lintels in each floor for better resistance to seismic forces and differential settlements. The basement floor slab should be designed for an uplift pressure of 2 tons/M$^2$. Foundation capacity calculations were presented on Plate 12.

## GROUNDWATER AND SOIL CHEMICAL ANALYSIS

Groundwater was not seen in the borings. There was no groundwater source in the site. In the adjacent plot a bore well of unknown depth was present at a distance of about 100-M from Boring 6. Groundwater sample was collected from this bore well for construction suitability test as per IS: 456 - 2000 guidelines. Test results indicate that groundwater from the bore well was **not suitable** for construction purposes due to high alkalinity as inferred by the methyl orange titration test. After installation of a bore well in the site, groundwater from the site should be checked at regular intervals from the beginning and during construction period to confirm groundwater's construction suitability. **If necessary, suitable groundwater treatment should be provided to make groundwater suitable for construction activities**. **One soil sample per bore** either 1.75- or 2.5- or 3.25-M depths were tested for pH, chlorides and sulphates to check if soils can affect the planned foundation elements in contact with site soils. Test results infer that the tested soils except Boring 1 1.75-M sample had acceptable pH and acceptable concentration (but nearer to the limit value) of chlorides, and sulphates as per IS: 456 - 2000 for construction water. Boring 1 1.75-M had high chlorides and high sulphates. Therefore, **as an abundant precaution upto stilt floor roof level use of steel and cement resistant to chlorides and sulphates should be used**. Summary of ground water test results is presented on Plate 11.

## CONSTRUCTION CONSIDERATIONS

We do not expect construction problems at this site due to soil and groundwater conditions. Site's EGL was at about 1.5-M above ERL of road in front of the site. FGL of the site should be at least 1-M above the ERL of public road near the site with proper design of surface drainage system to drain rain water runoff. Slopes of site's internal roads, rainwater channels, drainage channels should be suitably designed with due consideration to ERL of public road near the site. FFL of stilt floor should be at least 0.2-M above FGL of site. This will minimize rainwater road runoff into site and building.

Backfilling of the foundation excavations should be done with granular soil, and fill should be compacted properly to achieve proper densification to avoid settlements in flooring. Exposed bottom surface of the foundation excavation must be properly compacted with heavy duty rammer or heavy roller to compact the exposed surface that gets loosened by mechanical excavation activities. This is to minimize the settlements that can arise if the loosened soil in foundation

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compacted. New foundations should rest on virgin soil and not on old foundations or filled up soils. If any loose pockets of soils are encountered at footing level then the looser material should be replaced till denser material with well compacted PCC. Excavated silty sand soil can be used for foundation and site filling purposes.

**Site appears to be had significant vegetation. All vegetation was cleared just before the investigation. There may be some filled-up water collection ponds or filed up large open wells. Local enquires should be made to know and identify such entities in the site. Also, foundation excavations should be checked if the exposed soils were different or easy to work as compared to other intact soil areas. Extreme care should be taken in this regard to avoid foundations in filled or loose pocket areas of the site.** Site was land with significant vegetation after development there is a high chance of termite and wood damaging insect attacks on wooden items used in the proposed buildings. Therefore, suitable preconstruction anti-termite treatment along with double dosage of recommended anti-termite treatment of all wood works of the buildings should provided to protect wood works of the buildings.

All structures have to be designed for higher seismic forces (**Zone III**) due to increased seismic activity in peninsular India in the last decade and half. Seismic events of 3.9 magnitude on March 14, 2024, 5.1 magnitude on August 24, 2021, 5.1 magnitude on February 12, 2019, 7.9 magnitude on April 25, 2015, 6.0 magnitude on May 21, 2014, 8.4 magnitude on April 11, 2012, 7.2 magnitude on June 13, 2010, and 7.6 magnitude on August 11, 2009 with epicenters in Himalayas, Bay of Bengal, and near Andaman Islands were felt at Chennai. It is recommended to provide rigid plinth beams in ground level, columns designed for shear forces or shear walls in the structure, and continuous lintels in each floor. Lintels must be integrated into columns of the structure. Plinth beams must be designed to be rigid to allow redistribution of loads in case of differential settlements. Site's lower bound soil profile with Ground Water Level (GWL) at 1-M below EGL infers "**Nil**" seismic susceptibility. Under a seismic event of **6.0 Richter scale**, and peak ground acceleration of **0.16g** (IS code for **Zone III** guidelines) the total estimated vertical settlement was 0.00 cms and total horizontal displacement was 0.00 cms. Iwasaki liquefaction potential was 0.00 inferring "**No Liquefaction**." Liquefaction Analysis results are presented on Plate 13.

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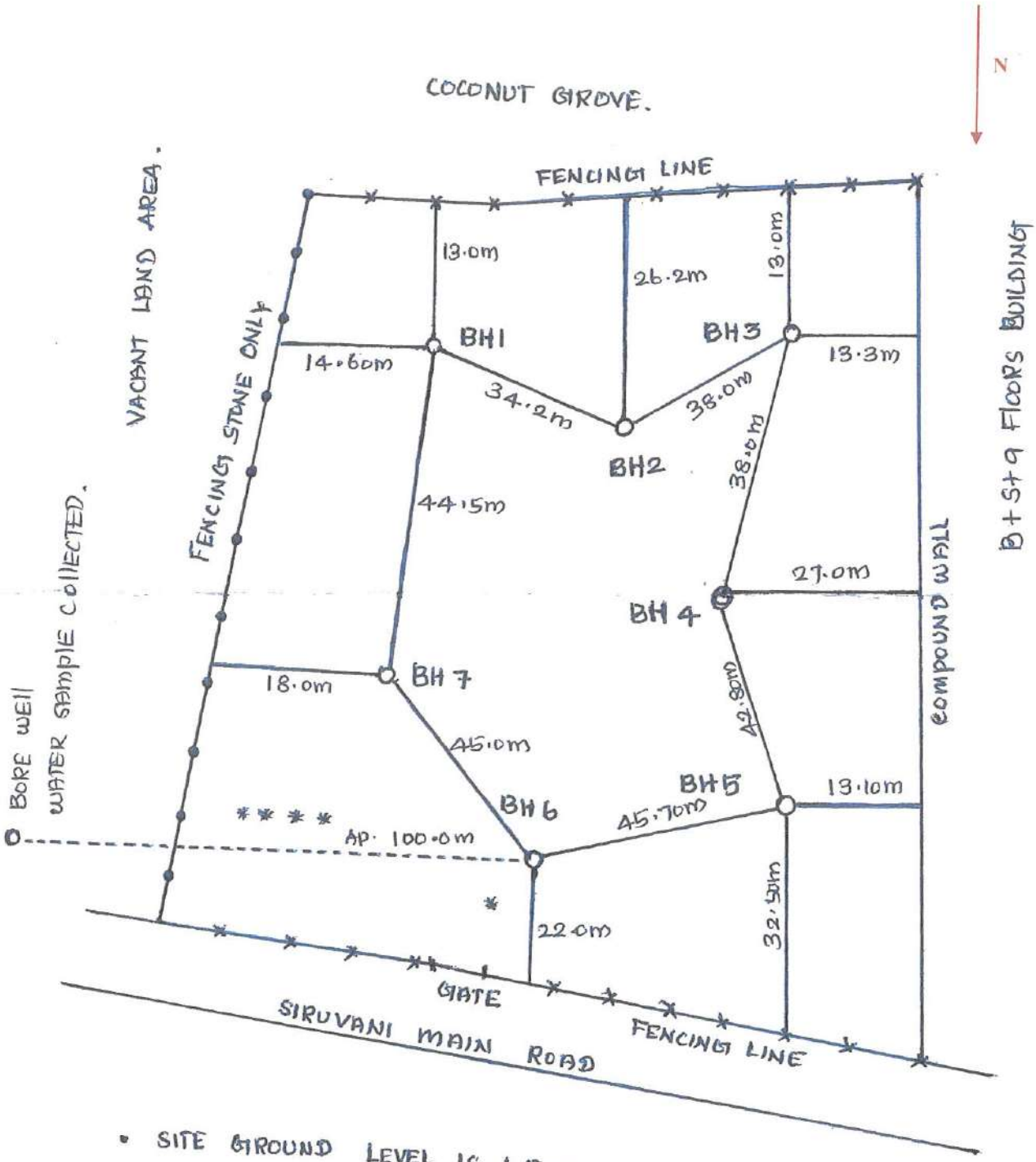
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- SITE GROUND LEVEL IS 1.50m BELOW FROM THE ROAD LEVEL.
- UNKNOWN TREES.
- BH6 TO BORE WELL DISTANCE = AP. 100.0m
- BORE WELL WATER SAMPLE COLLECTED.

(Not To Scale)

**Site EGL = 1.5-M Below ERL of Public Road Near Site.**

**SITE PLAN WITH BORE LOCATION DETAILS**

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PLATE 1

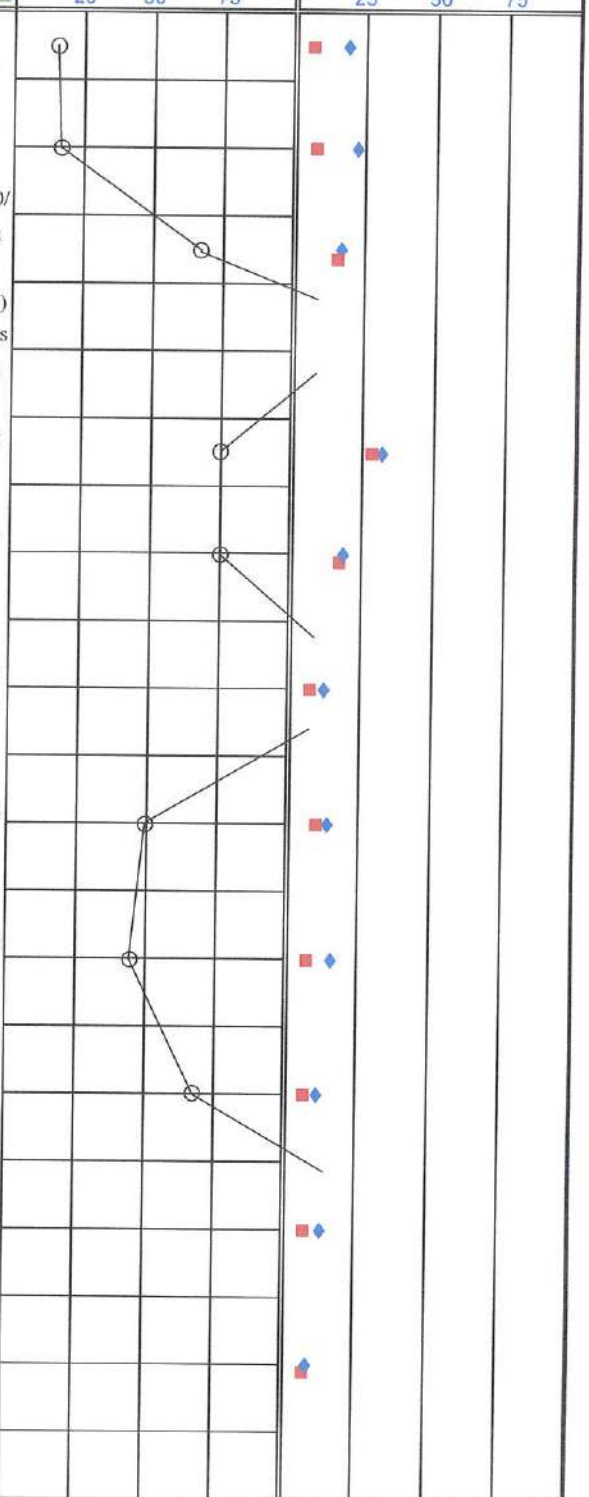
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# LOG OF BORING

**Project:** Proposed Multi-Storied Residential Apartments Buildings Complex Site, S. F. No. 226, 227, 228, Siruvani Main Road, Komarapalayam Village, Perur Taluk, Coimbatore 641 026, TN.

**Bore Hole No.:** 1 **Type of Boring:** Calyx Drill **Dia. of Hole:** 150 mm
**Started on:** 25-03-'24 **Ended on:** 26-03-'24 **Field Work In Charge:** R Murugesan
**Final Depth:** 13.0-M **Depth to G W S:** Not Seen **Remarks:** None.

| DEPTH, M | SOIL DESCRIPTION | SPT / VANE & SAMPLE TYPE |
|---|---|---|
| | BROWN SILTY FINE TO COARSE SAND (Below 0.0-M) | SPT @ 0.25 M 4/7/9 = 16 Blows |
| 1.0 | 0.0- to 1.75-m – $\phi = 32°$; $\gamma_t = 1.7$ tons/M$^3$ ($N_{avg} = 16$) | SPT @ 1 M 7/8/9 = 17 Blows |
| | -silty, 1.75- to 5-m | SPT @ 1.75M 20/30/ 8 cms for 20 Blows |
| 2.0 | 1.75- to 2.5-m – $\phi = 37°$; $\gamma_t = 2.1$ tons/M$^3$ ($N_{avg} \sim 67$) | SPT @ 2.5 M (SNR) 0.5 cms for 10 Blows |
| | -NX Diamond bit drilling from 2.5-m | |
| 3.0 | 2.5- to 3.25-m – $\phi = 39°$; $\gamma_t = 2.3$ tons/M$^3$ ($N_{avg} >> 100$) | 0 cms for 10 Blows SPT @ 3.25 M 8 cms for 20 Blows |
| | -white brown cemented sand at 3.25-m | |
| | -15 cms core pieces recovered drilling to 3.25-m | |
| 4.0 | -silty fine to medium sand at 4-m 3.25- to 5.0-m – $\phi = 37°$; $\gamma_t = 2.1$ tons/M$^3$ ($N_{avg} = 75$) | SPT @ 4 M 8 cms for 20 Blows |
| | -drilled from 3.25- to 4-m in 25 minutes | |
| 5.0 | -drilled from 4- to 5-m in 35 minutes -NX TC bit drilling from 5-m | SPT @ 5 M 28/ 3 cms for 10 Blows |
| | 5.0- to 5.75-m – $\phi = 38°$; $\gamma_t = 2.2$ tons/M$^3$ ($N_{avg} > 100$) | 2 cms for 10 Blows |
| 6.0 | -drilled from 5- to 6-m in 25 minutes -silty fine to medium sand at 6-m | SPT @ 6 M 20/25/25 = 50 Blows |
| 7.0 | 5.75- to 8.0-m – $\phi = 36°$; $\gamma_t = 2.0$ tons/M$^3$ ($N_{avg} = 48$) | SPT @ 7 M 18/23/24 = 47 Blows |
| | -drilled from 6- to 7-m in 20 minutes | |
| 8.0 | -drilled from 7- to 8-m in 25 minutes | SPT @ 8 M 25/30/ 8 cms for 20 Blows |
| | 8.0- to 9.0-m – $\phi = 37°$; $\gamma_t = 2.1$ tons/M$^3$ ($N_{avg} \sim 67$) | |
| 9.0 | -drilled from 8- to 9-m in 20 minutes | SPT @ 9 M 30/ 3 cms for 20 Blows |
| | | 2 cms for 20 Blows (Hammer Rebound) |
| 10.0 | -drilled from 9- to 10-m in 25 minutes 9.0- to 11.0-m – $\phi = 38°$; $\gamma_t = 2.2$ tons/M$^3$ ($N_{avg} > 100$) | SPT @ 10 M 32/ 4 cms for 20 Blows (Hammer Rebound) |
| 11.0 | -drilled from 10- to 11.5-m in 30 minutes | |




CONTINUED ON PLATE 2b.

SPT=Standard Penetration Test; DS=Disturbed Sample; UDS = UnDisturbed Sample; WS=Water Sample; SNR=Sample Not Recovered; LS = Liner Sample; +----+ = Plastic and Liquid Limits; ♦ = N M C; ■ = % -75μ Size

For PRASAD ARMSTRONG YEN
GEOTECH ENGINEERING CONSULTANTS (P) LTD.

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Reg. No.TVLR/RGTE/2019/06/002
Managing Director

PLATE 2a

# LOG OF BORING

**Project:** Proposed Multi-Storied Residential Apartments Buildings Complex Site, S. F. No. 226, 227, 228, Siruvani Main Road, Komarapalayam Village, Perur Taluk, Coimbatore 641 026, TN.

**Bore Hole No.:** 1 **Type of Boring:** Calyx Drill **Dia. of Hole:** 150 mm
**Started on:** 25-03-'24 **Ended on:** 26-03-'24 **Field Work In Charge:** R Murugesan
**Final Depth:** 13.0-M **Depth to G W S:** Not Seen **Remarks:** Continued from Plate 2a.

| DEPTH, M | SOIL DESCRIPTION | SPT / VANE & SAMPLE TYPE | SPT "N" PROFILE 25 50 75 | INDEX TEST DATA 25 50 75 |
|---|---|---|---|---|
| | **BROWN SILTY FINE TO COARSE SAND** | SPT @ 11.5 M 30/ | | |
| | **(Below 0.0-M)** | 4 cms for 10 Blows | | |
| 12.0 | -drilled from 11.5- to 12.2-m in 25 minutes | 3 cms for 10 Blows | | |
| | 11.0- to 13.0-m – $\phi = 37^{o}$; $\gamma_t = 2.1$ tons/M$^3$ | (Hammer Rebound) | | |
| | ($N_{avg} \sim 100$) | | | |
| | -NX Diamond bit drilling from 12.2-m | | | |
| 13.0 | -drilled from 12.2- to 13-m in 30 minutes | SPT @ 13 M (SNR) | | |
| | 13.0-m+ – $\phi = 40^{o}$; $\gamma_t = 2.3$ tons/M$^3$ | 1 cm for 10 Blows | | |
| | ($N_{avg} >> 100$) | 0.5 cms for 10 Blows | | |
| 14.0 | | (Hammer Rebound) | | |
| 15.0 | | | | |
| 16.0 | | | | |
| 17.0 | | | | |
| 18.0 | | | | |
| 19.0 | | | | |
| 20.0 | | | | |
| 21.0 | | | | |
| 22.0 | | | | |

BORE HOLE TERMINATED AT 13.0-M.

SPT=Standard Penetration Test; DS=Disturbed Sample; UDS = UnDisturbed Sample; WS=Water Sample; SNR=Sample Not Recovered; LS = Liner Sample; +----+ = Plastic and Liquid Limits; ♦ = N M C; ■ = % -75μ Size

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PLATE 2b

# LOG OF BORING

**Project:** Proposed Multi-Storied Residential Apartments Buildings Complex Site, S. F. No. 226, 227, 228, Siruvani Main Road, Komarapalayam Village, Perur Taluk, Coimbatore 641 026, TN.

**Bore Hole No.:** 2 **Type of Boring:** Calyx Drill **Dia. of Hole:** 150 mm

**Started on:** 27-03-'24 **Ended on:** 28-03-'24 **Field Work In Charge:** R Murugesan

**Final Depth:** 13.0-M **Depth to G W S:** Not Seen **Remarks:** None.

| DEPTH, M | SOIL DESCRIPTION | SPT / VANE & SAMPLE TYPE |
|---|---|---|
| | **BROWN SILTY FINE TO MEDIUM SAND (Below 0.0-M)** | SPT @ 0.25 M 4/5/5 = 10 Blows |
| | 0.0- to 1.0-m – $\phi = 30°$; $\gamma_t = 1.6$ tons/M$^3$ ($N_{avg} = 10$) | SPT @ 1 M 5/7/9 = 16 Blows |
| 1.0 | | |
| | gray color, 0- to 1.75-m | |
| | 1.0- to 1.75-m – $\phi = 32°$; $\gamma_t = 1.7$ tons/M$^3$ ($N_{avg} = 16$) | SPT @ 1.75 M 10/15/16 = 31 Blows |
| 2.0 | | |
| | 1.75- to 2.5-m – $\phi = 34°$; $\gamma_t = 1.85$ tons/M$^3$ ($N_{avg} = 31$) | SPT @ 2.5 M 28/31/ 8 cms for 20 Blows |
| 3.0 | | SPT @ 3.25 M 32/ 6 cms for 20 Blows |
| | | |
| 4.0 | | SPT @ 4 M 6 cms for 20 Blows |
| | | |
| 5.0 | 2.5- to 7.0-m – $\phi = 37°$; $\gamma_t = 2.1$ tons/M$^3$ ($N_{avg} > 75$) | SPT @ 5 M 32/ 6 cms for 20 Blows |
| | | |
| 6.0 | | SPT @ 6 M 4 cms for 10 Blows 3 cms for 10 Blows (Hammer Rebound) |
| | | |
| 7.0 | | SPT @ 7 M 3 cms for 10 Blows 2 cms for 10 Blows (Hammer Rebound) |
| | 7.0- to 7.75-m – $\phi = 38°$; $\gamma_t = 2.2$ tons/M$^3$ ($N_{avg} > 100$) | |
| 8.0 | | SPT @ 8 M 8 cms for 20 Blows |
| | 7.75- to 8.75-m – $\phi = 37°$; $\gamma_t = 2.1$ tons/M$^3$ ($N_{avg} = 75$) | |
| 9.0 | | SPT @ 9 M 20/24/25 = 49 Blows |
| | 8.75- to 10.0-m – $\phi = 36°$; $\gamma_t = 2.0$ tons/M$^3$ ($N_{avg} = 49$) | |
| 10.0 | | SPT @ 10 M 30/ 4 cms for 10 Blows 3 cms for 10 Blows |
| | 10.0- to 13.0-m – $\phi = 37°$; $\gamma_t = 2.1$ tons/M$^3$ ($N_{avg} > 75$) | |
| 11.0 | | |

SPT "N" PROFILE: 25 50 75

INDEX TEST DATA: 25 50 75

CONTINUED ON PLATE 3b.

SPT=Standard Penetration Test; DS=Disturbed Sample; UDS = UnDisturbed Sample; WS=Water Sample; SNR=Sample Not Recovered; LS = Liner Sample; +—+ = Plastic and Liquid Limits; ♦ = N M C; ■ = % -75µ Size

For PRASAD ARMSTRONG YEN
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PLATE 3a

# LOG OF BORING

**Project:** Proposed Multi-Storied Residential Apartments Buildings Complex Site, S. F. No. 226, 227, 228, Siruvani Main Road, Komarapalayam Village, Perur Taluk, Coimbatore 641 026, TN.

**Bore Hole No.:** 2 **Type of Boring:** Calyx Drill **Dia. of Hole:** 150 mm
**Started on:** 27-03-'24 **Ended on:** 28-03-'24 **Field Work In Charge:** R Murugesan
**Final Depth:** 13.0-M **Depth to G W S:** Not Seen **Remarks:** Continued from Plate 3a.

| DEPTH, M | SOIL DESCRIPTION | SPT / VANE & SAMPLE TYPE | SPT "N" PROFILE 25 50 75 | INDEX TEST DATA 25 50 75 |
|---|---|---|---|---|
| | BROWN SILTY FINE TO MEDIUM SAND (Below 0.0-M) | SPT @ 11.5 M 8 cms for 20 Blows | | |
| 12.0 | -NX Diamond bit drilling from 11.5-m 10.0- to 13.0-m – $\phi = 37°$, $\gamma_t = 2.1$ tons/M$^3$ ($N_{avg} > 75$) | | | |
| 13.0 | -drilled from 11.5- to 13-m in 50 minutes | SPT @ 13 M 2 cms for 10 Blows | | |
| | 13.0-m+ – $\phi = 39°$, $\gamma_t = 2.25$ tons/M$^3$ ($N_{avg} >> 100$) | 1 cm for 10 Blows (Hammer Rebound) | | |
| 14.0 | | | | |
| 15.0 | | | | |
| 16.0 | | | | |
| 17.0 | | | | |
| 18.0 | | | | |
| 19.0 | | | | |
| 20.0 | | | | |
| 21.0 | | | | |
| 22.0 | | | | |

For PRASAD ARMSTRONG YEN
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BORE HOLE TERMINATED AT 13.0-M.

SPT=Standard Penetration Test; DS=Disturbed Sample; UDS = UnDisturbed Sample; WS=Water Sample; SNR=Sample Not Recovered; LS = Liner Sample; +---+ = Plastic and Liquid Limits; ♦ = N M C; ■ = % -75μ Size

PLATE 3b

# LOG OF BORING

**Project:** Proposed Multi-Storied Residential Apartments Buildings Complex Site, S. F. No. 226, 227, 228, Siruvani Main Road, Komarapalayam Village, Perur Taluk, Coimbatore 641 026, TN.

**Bore Hole No.:** 3 **Type of Boring:** Calyx Drill **Dia. of Hole:** 150 mm
**Started on:** 28-03-'24 **Ended on:** 28-03-'24 **Field Work In Charge:** R Murugesan
**Final Depth:** 13.0-M **Depth to G W S:** Not Seen **Remarks:** None.

| DEPTH, M | SOIL DESCRIPTION | SPT / VANE & SAMPLE TYPE |
|---|---|---|
| | GRAY FINE TO MEDIUM SAND with silt (To 1.0-M) | SPT @ 0.25 M 3/5/5 = 10 Blows |
| 1.0 | 0.0- to 1.0-m – $\phi = 30°$; $\gamma_t = 1.65$ tons/M$^3$ ($N_{avg} = 10$) | SPT @ 1 M 8/12/14 = 26 Blows |
| | BROWN SILTY FINE TO MEDIUM SAND (Below 1.0-M) ($N_{avg} = 26$) | |
| 2.0 | 1.0- to 1.75-m – $\phi = 34°$; $\gamma_t = 1.8$ tons/M$^3$ | SPT @ 1.75 M 11/16/23 = 39 Blows |
| | 1.75- to 2.5-m – $\phi = 35°$; $\gamma_t = 1.95$ tons/M$^3$ ($N_{avg} = 39$) | SPT @ 2.5 M 32/ 4 cms for 10 Blows |
| 3.0 | | 3 cms for 10 Blows SPT @ 3.25 M |
| | | 4 cms for 10 Blows 3 cms for 10 Blows |
| 4.0 | | SPT @ 4 M 8 cms for 20 Blows |
| | 2.5- to 5.75-m – $\phi = 37°$; $\gamma_t = 2.1$ tons/M$^3$ ($N_{avg} > 75$) | |
| 5.0 | | SPT @ 5 M 25/30/ 4 cms for 10 Blows |
| | | 3 cms for 10 Blows |
| 6.0 | | SPT @ 6 M 18/20/23 = 43 Blows |
| | 5.75- to 7.0-m – $\phi = 36°$; $\gamma_t = 2.0$ tons/M$^3$ ($N_{avg} = 43$) | |
| 7.0 | | SPT @ 7 M 32/ 4 cms for 10 Blows |
| | 7.0- to 7.75-m – $\phi = 38°$; $\gamma_t = 2.2$ tons/M$^3$ ($N_{avg} > 100$) | 2 cms for 10 Blows (Hammer Rebound) |
| 8.0 | | SPT @ 8 M 34/ 4 cms for 10 Blows |
| | 7.75- to 8.75-m – $\phi = 37°$; $\gamma_t = 2.1$ tons/M$^3$ ($N_{avg} > 75$) | 3 cms for 10 Blows (Hammer Rebound) |
| 9.0 | | SPT @ 9 M 30/31/32 = 63 Blows |
| | 8.75- to 10.0-m – $\phi = 36°$; $\gamma_t = 2.05$ tons/M$^3$ ($N_{avg} = 63$) | |
| 10.0 | | SPT @ 10 M 28/32/ 4 cms for 10 Blows |
| | 10.0- to 11.5-m – $\phi = 37°$; $\gamma_t = 2.1$ tons/M$^3$ ($N_{avg} > 75$) | 3 cms for 10 Blows |
| 11.0 | | |

SPT "N" PROFILE: 25 50 75

INDEX TEST DATA: 25 50 75

CONTINUED ON PLATE 4b.

SPT=Standard Penetration Test; DS=Disturbed Sample; UDS = UnDisturbed Sample; WS=Water Sample; SNR=Sample Not Recovered; LS = Liner Sample; +---+ = Plastic and Liquid Limits; ● = NMC; ■ = % Fine Size

PLATE 4a

For PRASAD ARMSTRONG YEN
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# LOG OF BORING

**Project:** Proposed Multi-Storied Residential Apartments Buildings Complex Site, S. F. No. 226, 227, 228, Siruvani Main Road, Komarapalayam Village, Perur Taluk, Coimbatore 641 026, TN.

**Bore Hole No.:** 3 **Type of Boring:** Calyx Drill **Dia. of Hole:** 150 mm
**Started on:** 28-03-'24 **Ended on:** 28-03-'24 **Field Work In Charge:** R Murugesan
**Final Depth:** 13.0-M **Depth to G W S:** Not Seen **Remarks:** Continued from Plate 4a.

| DEPTH, M | SOIL DESCRIPTION | SPT / VANE & SAMPLE TYPE | SPT "N" PROFILE 25 50 75 | INDEX TEST DATA 25 50 75 |
|---|---|---|---|---|
| | BROWN SILTY FINE TO MEDIUM SAND (Below 1.0-M) | SPT @ 11.5 M 3 cms for 10 Blows | | |
| 12.0 | -NX Diamond bit drilling from 11.5-m<br>11.5- to 12.5-m – $\phi = 38°$; $\gamma_t = 2.2$ tons/M$^3$<br>($N_{avg} > 100$) | 2 cms for 10 Blows (Hammer Rebound) | | |
| 13.0 | 12.5- to 13.0-m – $\phi = 37°$; $\gamma_t = 2.1$ tons/M$^3$<br>($N_{avg} = 100$) | SPT @ 13 M 4 cms for 10 Blows | | |
| | -silty at 13-m<br>-drilled from 11.5- to 13-m in 45 minutes | 3 cms for 10 Blows | | |
| 14.0 | | | | |
| 15.0 | | | | |
| 16.0 | | | | |
| 17.0 | | | | |
| 18.0 | | | | |
| 19.0 | | | | |
| 20.0 | | | | |
| 21.0 | | | | |
| 22.0 | | | | |

For PRASAD ARMSTRONG YEN
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BORE HOLE TERMINATED AT 13.0-M.

SPT=Standard Penetration Test; DS=Disturbed Sample; UDS = UnDisturbed Sample; WS=Water Sample; SNR=Sample Not Recovered; LS = Liner Sample; +---+ = Plastic and Liquid Limits; ♦ = N M C; ■ = % -75μ Size

PLATE 4b

# LOG OF BORING

**Project:** Proposed Multi-Storied Residential Apartments Buildings Complex Site, S. F. No. 226, 227, 228, Siruvani Main Road, Komarapalayam Village, Perur Taluk, Coimbatore 641 026, TN.

**Bore Hole No.:** 4 **Type of Boring:** Calyx Drill **Dia. of Hole:** 150 mm
**Started on:** 29-03-'24 **Ended on:** 29-03-'24 **Field Work In Charge:** R Murugesan
**Final Depth:** 13.0-M **Depth to G W S:** Not Seen **Remarks:** None.

| DEPTH, M | SOIL DESCRIPTION | SPT / VANE & SAMPLE TYPE |
|---|---|---|
| | **BROWN SILTY FINE TO MEDIUM SAND (Below 0.0-M)** | SPT @ 0.25 M 4/6/6 = 12 Blows |
| 1.0 | 0.0- to 1.0-m – $\phi = 31°$; $\gamma_t = 1.65$ tons/M$^3$ ($N_{avg} = 12$) | SPT @ 1 M 5/8/9 = 17 Blows |
| | 1.0- to 1.75-m – $\phi = 32°$; $\gamma_t = 1.7$ tons/M$^3$ ($N_{avg} = 17$) | SPT @ 1.75 M 25/ |
| 2.0 | | 3 cms for 10 Blows |
| | | 2 cms for 10 Blows |
| | | SPT @ 2.5 M 30/ |
| 3.0 | | 6 cms for 20 Blows |
| | | SPT @ 3.25 M |
| | 1.75- to 5.0-m – $\phi = 37°$; $\gamma_t = 2.1$ tons/M$^3$ ($N_{avg} > 75$) | 3 cms for 10 Blows |
| 4.0 | | 2 cms for 10 Blows |
| | | SPT @ 4 M 34/ |
| | | 4 cms for 10 Blows |
| 5.0 | | 3 cms for 10 Blows |
| | | SPT @ 5 M 30/ |
| | | 4 cms for 20 Blows |
| | | (Hammer Rebound) |
| 6.0 | | SPT @ 6 M 32/ |
| | | 4 cms for 20 Blows |
| | | (Hammer Rebound) |
| 7.0 | 5.0- to 8.75-m – $\phi = 38°$; $\gamma_t = 2.2$ tons/M$^3$ ($N_{avg} > 100$) | SPT @ 7 M 35/ |
| | | 4 cms for 10 Blows |
| | | 2 cms for 10 Blows |
| 8.0 | | (Hammer Rebound) |
| | | SPT @ 8 M |
| | | 4 cms for 20 Blows |
| 9.0 | | (Hammer Rebound) |
| | | SPT @ 9 M |
| | | 25/27/30 = 57 Blows |
| 10.0 | 8.75- to 11.5-m – $\phi = 36°$; $\gamma_t = 2.05$ tons/M$^3$ ($N_{avg} = 58$) | SPT @ 10 M |
| | | 20/25/34 = 59 Blows |
| 11.0 | | |

CONTINUED ON PLATE 5b.

SPT=Standard Penetration Test; DS=Disturbed Sample; UDS = UnDisturbed Sample; WS=Water Sample; SNR=Sample Not Recovered; LS = Liner Sample; +---+ = Plastic and Liquid Limits; ♦ = N M C; ■ = % -75μ Size

For PRASAD ARMSTRONG YEN
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PLATE 5a

# LOG OF BORING

**Project:** Proposed Multi-Storied Residential Apartments Buildings Complex Site, S. F. No. 226, 227, 228, Siruvani Main Road, Komarapalayam Village, Perur Taluk, Coimbatore 641 026, TN.

**Bore Hole No.:** 4 **Type of Boring:** Calyx Drill **Dia. of Hole:** 150 mm
**Started on:** 29-03-'24 **Ended on:** 29-03-'24 **Field Work In Charge:** R Murugesan
**Final Depth:** 13.0-M **Depth to G W S:** Not Seen **Remarks:** Continued from Plate 5a.

| DEPTH, M | SOIL DESCRIPTION | SPT / VANE & SAMPLE TYPE | SPT "N" PROFILE 25 50 75 | INDEX TEST DATA 25 50 75 |
|---|---|---|---|---|
| | BROWN SILTY FINE TO MEDIUM SAND (Below 0.0-M) | SPT @ 11.5 M 33/ 4 cms for 10 Blows | | |
| 12.0 | | 3 cms for 10 Blows | | |
| | 11.5- to 13.0-m – $\phi = 37^{\circ}$; $\gamma_t = 2.1$ tons/M$^3$ ($N_{avg} > 75$) | | | |
| 13.0 | -white brown gray color at 13-m | SPT @ 13 M 28/ 4 cms for 20 Blows | | |
| | 13.0-m+ – $\phi = 38^{\circ}$; $\gamma_t = 2.2$ tons/M$^3$ ($N_{avg} > 100$) | (Hammer Rebound) | | |
| 14.0 | | | | |
| 15.0 | | | | |
| 16.0 | | | | |
| 17.0 | | | | |
| 18.0 | | | | |
| 19.0 | | | | |
| 20.0 | | | | |
| 21.0 | | | | |
| 22.0 | | | | |

For PRASAD ARMSTRONG YEN
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BORE HOLE TERMINATED AT 13.0-M.

SPT=Standard Penetration Test; DS=Disturbed Sample; UDS = UnDisturbed Sample; WS=Water Sample; SNR=Sample Not Recovered; LS = Liner Sample; +---+ = Plastic and Liquid Limits; ♦ = N M C; ■ = % -75μ Size

PLATE 5b

# LOG OF BORING

**Project:** Proposed Multi-Storied Residential Apartments Buildings Complex Site, S. F. No. 226, 227, 228, Siruvani Main Road, Komarapalayam Village, Perur Taluk, Coimbatore 641 026, TN.

**Bore Hole No.:** 5 **Type of Boring:** Calyx Drill **Dia. of Hole:** 150 mm
**Started on:** 30-03-'24 **Ended on:** 30-03-'24 **Field Work In Charge:** R Murugesan
**Final Depth:** 13.0-M **Depth to G W S:** Not Seen **Remarks:** None.

| DEPTH, M | SOIL DESCRIPTION | SPT / VANE & SAMPLE TYPE | SPT "N" PROFILE 25 50 75 | INDEX TEST DATA 25 50 75 |
|---|---|---|---|---|
| | GRAY FINE TO MEDIUM SAND with silt (To 1.0-M) | SPT @ 0.25 M 7/9/12 = 21 Blows | | |
| | 0.0- to 1.0-m – $\phi$ = 33°; $\gamma_t$ = 1.75 tons/M$^3$ ($N_{avg}$ = 21) | SPT @ 1 M 10/14/15 = 29 Blows | | |
| 1.0 | | | | |
| | BROWN FINE TO MEDIUM SAND with silt (To 10.0-M) | SPT @ 1.75 M 8/9/15 = 24 Blows | | |
| | 1.0- to 2.5-m – $\phi$ = 34°; $\gamma_t$ = 1.8 tons/M$^3$ ($N_{avg}$ = 26) | | | |
| 2.0 | | | | |
| | -silty at 2.5-m | SPT @ 2.5 M 30/ 6 cms for 20 Blows | | |
| | 2.5- to 3.25-m – $\phi$ = 37°; $\gamma_t$ = 2.1 tons/M$^3$ ($N_{avg}$ = 100) | | | |
| 3.0 | | SPT @ 3.25 M 32/ 4 cms for 20 Blows | | |
| | 3.25- to 4.0-m – $\phi$ = 38°; $\gamma_t$ = 2.2 tons/M$^3$ ($N_{avg}$ > 100) | | | |
| 4.0 | | SPT @ 4 M 8 cms for 20 Blows | | |
| | 4.0- to 5.0-m – $\phi$ = 37°; $\gamma_t$ = 2.1 tons/M$^3$ ($N_{avg}$ = 75) | | | |
| 5.0 | -silty, 5- to 8-m | SPT @ 5 M 32/ 4 cms for 20 Blows (Hammer Rebound) | | |
| | 5.0- to 6.75-m – $\phi$ = 38°; $\gamma_t$ = 2.2 tons/M$^3$ ($N_{avg}$ > 100) | | | |
| 6.0 | | SPT @ 6 M 34/ 4 cms for 20 Blows (Hammer Rebound) | | |
| | | SPT @ 7 M 8 cms for 20 Blows | | |
| 7.0 | 6.75- to 8.0-m – $\phi$ = 37°; $\gamma_t$ = 2.1 tons/M$^3$ ($N_{avg}$ = 75) | | | |
| 8.0 | | SPT @ 8 M 4 cms for 20 Blows (Hammer Rebound) | | |
| | 8.0- to 8.75-m – $\phi$ = 38°; $\gamma_t$ = 2.2 tons/M$^3$ ($N_{avg}$ > 100) | | | |
| 9.0 | | SPT @ 9 M 33/ 8 cms for 20 Blows | | |
| | 8.75- to 10.0-m – $\phi$ = 37°; $\gamma_t$ = 2.1 tons/M$^3$ ($N_{avg}$ = 75) | | | |
| 10.0 | | SPT @ 10 M 3 cms for 10 Blows | | |
| | BROWN GRAVELY FINE TO COARSE SAND (Below 10.0-M) | 2 cms for 10 Blows (Hammer Rebound) | | |
| 11.0 | 10.0- to 13.0-m – $\phi$ = 38°; $\gamma_t$ = 2.2 tons/M$^3$ ($N_{avg}$ > 100) | | | |

CONTINUED ON PLATE 6b.

SPT=Standard Penetration Test; DS=Disturbed Sample; UDS = UnDisturbed Sample; WS=Water Sample; SNR=Sample Not Recovered; LS = Liner Sample; +----+ = Plastic and Liquid Limits; ♦ = N M C; ■ = % - 75μ Size

For PRASAD ARMSTRONG YEN
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PLATE 6a

# LOG OF BORING

**Project:** Proposed Multi-Storied Residential Apartments Buildings Complex Site, S. F. No. 226, 227, 228, Siruvani Main Road, Komarapalayam Village, Perur Taluk, Coimbatore 641 026, TN.

**Bore Hole No.:** 5 **Type of Boring:** Calyx Drill **Dia. of Hole:** 150 mm
**Started on:** 30-03-'24 **Ended on:** 30-03-'24 **Field Work In Charge:** R Murugesan
**Final Depth:** 13.0-M **Depth to G W S:** Not Seen **Remarks:** Continued from Plate 6a.

| DEPTH, M | SOIL DESCRIPTION | SPT / VANE & SAMPLE TYPE | SPT "N" PROFILE 25 50 75 | INDEX TEST DATA 25 50 75 |
|---|---|---|---|---|
| | BROWN GRAVELY FINE TO COARSE SAND (Below 10.0-M) | SPT @ 11.5 M | | |
| | -NX Diamond bit drilling from 11.5-m | 4 cms for 20 Blows | | |
| 12.0 | 10.0- to 13.0-m – $\phi = 38°$; $\gamma_t = 2.2$ tons/M$^3$ | (Hammer Rebound) | | |
| | ($N_{avg} > 100$) | | | |
| | -brown gravely fine to coarse sand with silt at 13-m | SPT @ 13 M (SNR) | | |
| 13.0 | -drilled from 11.5- to 13-m in 40 minutes | 2 cms for 10 Blows | | |
| | 13.0-m – $\phi = 39°$; $\gamma_t = 2.25$ tons/M$^3$ | 1 cm for 10 Blows | | |
| | ($N_{avg} >> 100$) | (Hammer Rebound) | | |
| 14.0 | | | | |
| 15.0 | | | | |
| 16.0 | | | | |
| 17.0 | | | | |
| 18.0 | | | | |
| 19.0 | | | | |
| 20.0 | | | | |
| 21.0 | | | | |
| 22.0 | | | | |

For PRASAD ARMSTRONG YEN
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BORE HOLE TERMINATED AT 13.0-M.

SPT=Standard Penetration Test; DS=Disturbed Sample; UDS = UnDisturbed Sample; WS=Water Sample; SNR=Sample Not Recovered; LS = Liner Sample; +---+ = Plastic and Liquid Limits; ♦ = N M C; ■ = % -75μ Size

PLATE 6b

# LOG OF BORING

**Project:** Proposed Multi-Storied Residential Apartments Buildings Complex Site, S. F. No. 226, 227, 228, Siruvani Main Road, Komarapalayam Village, Perur Taluk, Coimbatore 641 026, TN.

**Bore Hole No.:** 6 **Type of Boring:** Calyx Drill **Dia. of Hole:** 150 mm

**Started on:** 31-03-'24 **Ended on:** 31-03-'24 **Field Work In Charge:** R Murugesan

**Final Depth:** 13.0-M **Depth to G W S:** Not Seen **Remarks:** None.

| DEPTH, M | SOIL DESCRIPTION | SPT / VANE & SAMPLE TYPE |
|---|---|---|
| | **GRAY FINE TO MEDIUM SAND with silt (To 1.75-M)** | DS @ 0.5 M |
| 1.0 | 0.0- to 1.0-m – $\gamma_t$ = 1.7 tons/M$^3$ ($N_{avg}$ ~ 20) | SPT @ 1 M 10/13/15 = 28 Blows |
| | 1.0- to 1.75-m – $\phi$ = 34°; $\gamma_t$ = 1.8 tons/M$^3$ ($N_{avg}$ = 28) | SPT @ 1.75 M 14/20/23 = 43 Blows |
| 2.0 | **BROWN SILTY FINE TO MEDIUM SAND (Below 1.75-M)** ($N_{avg}$ = 43) | SPT @ 2.5 M |
| | 1.75- to 2.5-m – $\phi$ = 36°; $\gamma_t$ = 2.0 tons/M$^3$ | 3 cms for 10 Blows 2 cms for 10 Blows |
| 3.0 | | SPT @ 3.25 M 35/ 3 cms for 20 Blows |
| | 2.5- to 4.75-m – $\phi$ = 38°; $\gamma_t$ = 2.2 tons/M$^3$ ($N_{avg}$ > 100) | 2 cms for 20 Blows |
| 4.0 | | SPT @ 4 M 3 cms for 20 Blows 2 cms for 20 Blows (Hammer Rebound) |
| 5.0 | | SPT @ 5 M 28/ 8 cms for 20 Blows |
| 6.0 | | SPT @ 6 M 8 cms for 20 Blows |
| 7.0 | 4.75- to 8.75-m – $\phi$ = 37°; $\gamma_t$ = 2.1 tons/M$^3$ ($N_{avg}$ = 75) | SPT @ 7 M 27/ 8 cms for 20 Blows |
| 8.0 | | SPT @ 8 M 35/ 8 cms for 20 Blows |
| 9.0 | | SPT @ 9 M 20/28/30 = 58 Blows |
| 10.0 | 8.75- to 10.0-m – $\phi$ = 36°; $\gamma_t$ = 2.05 tons/M$^3$ ($N_{avg}$ = 58) | SPT @ 10 M 5 cms for 10 Blows 4 cms for 10 Blows |
| 11.0 | 10.0- to 13.0-m – $\phi$ = 37°; $\gamma_t$ = 2.1 tons/M$^3$ ($N_{avg}$ = 75) | |

SPT "N" PROFILE: 25 50 75

INDEX TEST DATA: 25 50 75

CONTINUED ON PLATE 7b.

SPT=Standard Penetration Test; DS=Disturbed Sample; UDS = UnDisturbed Sample; WS=Water Sample; SNR=Sample Not Recovered; LS = Liner Sample; +----+ = Plastic and Liquid Limits; ♦ = N M C; ■ = % -75μ Size

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PLATE 7a

# LOG OF BORING

**Project:** Proposed Multi-Storied Residential Apartments Buildings Complex Site, S. F. No. 226, 227, 228, Siruvani Main Road, Komarapalayam Village, Perur Taluk, Coimbatore 641 026, TN.

**Bore Hole No.:** 6 **Type of Boring:** Calyx Drill **Dia. of Hole:** 150 mm

**Started on:** 31-03-'24 **Ended on:** 31-03-'24 **Field Work In Charge:** R Murugesan

**Final Depth:** 13.0-M **Depth to G W S:** Not Seen **Remarks:** Continued from Plate 7a.

| DEPTH, M | SOIL DESCRIPTION | SPT / VANE & SAMPLE TYPE | SPT "N" PROFILE 25 50 75 | INDEX TEST DATA 25 50 75 |
|---|---|---|---|---|
| | **BROWN SILTY FINE TO MEDIUM SAND (Below 1.75-M)** | SPT @ 11.5 M 24/ 8 cms for 20 Blows | | |
| 12.0 | -NX Diamond bit drilling from 11.5-m 10.0- to 13.0-m – $\phi = 37^{o}$; $\gamma_t = 2.1$ tons/M$^3$ ($N_{avg} = 75$) | | | |
| 13.0 | -white brown gravely fine to coarse sand with silt at 13-m -drilled from 11.5- to 13-m in 45 minutes | SPT @ 13 M 4 cms for 10 Blows 3 cms for 10 Blows (Hammer Rebound) | | |
| 14.0 | | | | |
| 15.0 | | | | |
| 16.0 | | | | |
| 17.0 | | | | |
| 18.0 | | | | |
| 19.0 | | | | |
| 20.0 | | | | |
| 21.0 | | | | |
| 22.0 | | | | |

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BORE HOLE TERMINATED AT 13.0-M.

SPT=Standard Penetration Test; DS=Disturbed Sample; UDS = UnDisturbed Sample; WS=Water Sample; SNR=Sample Not Recovered; LS = Liner Sample; +----+ = Plastic and Liquid Limits; ♦ = N M C; ■ = % -75μ Size

PLATE 7b

# LOG OF BORING

**Project:** Proposed Multi-Storied Residential Apartments Buildings Complex Site, S. F. No. 226, 227, 228, Siruvani Main Road, Komarapalayam Village, Perur Taluk, Coimbatore 641 026, TN.

**Bore Hole No.:** 7 **Type of Boring:** Calyx Drill **Dia. of Hole:** 150 mm

**Started on:** 31-03-'24 **Ended on:** 1-04-'24 **Field Work In Charge:** R Murugesan

**Final Depth:** 13.0-M **Depth to G W S:** Not Seen **Remarks:** None.

| DEPTH, M | SOIL DESCRIPTION | SPT / VANE & SAMPLE TYPE |
|---|---|---|
| 1.0 | **GRAY FINE TO MEDIUM SAND (To 1.0-M)**<br>0.0- to 1.0-m – $\phi = 30°$; $\gamma_t = 1.6$ tons/M$^3$<br>($N_{avg} = 8$) | SPT @ 0.25 M<br>3/4/4 = 8 Blows<br>SPT @ 1 M<br>4/6/9 = 15 Blows |
| 2.0 | **BROWN SILTY FINE TO MEDIUM SAND**<br>**(Below 1.0-M)** ($N_{avg} = 15$)<br>1.0- to 1.75-m – $\phi = 31°$; $\gamma_t = 1.7$ tons/M$^3$ | SPT @ 1.75 M<br>12/17/21 = 38 Blows |
| 3.0 | 1.75- to 2.5-m – $\phi = 35°$; $\gamma_t = 1.95$ tons/M$^3$<br>($N_{avg} = 38$) | SPT @ 2.5 M 28/<br>3 cms for 10 Blows<br>2 cms for 10 Blows<br>SPT @ 3.25M (SNR)<br>1 cm for 10 Blows<br>0.5 cms for 10 Blows |
| 4.0 | 2.5- to 4.75-m – $\phi = 38°$; $\gamma_t = 2.2$ tons/M$^3$<br>($N_{avg} > 100$) | SPT @ 4 M<br>4 cms for 20 Blows<br>(Hammer Rebound) |
| 5.0 | | SPT @ 5 M 35/<br>6 cms for 20 Blows<br>(Hammer Rebound) |
| 6.0 | | SPT @ 6 M 34/<br>8 cms for 20 Blows |
| 7.0 | 4.75- to 8.0-m – $\phi = 37°$; $\gamma_t = 2.1$ tons/M$^3$<br>($N_{avg} > 75$) | SPT @ 7 M<br>8 cms for 20 Blows |
| 8.0 | | SPT @ 8 M 30/<br>4 cms for 10 Blows<br>2 cms for 10 Blows<br>(Hammer Rebound) |
| 9.0 | 8.0- to 8.75-m – $\phi = 38°$; $\gamma_t = 2.2$ tons/M$^3$<br>($N_{avg} > 100$) | SPT @ 9 M<br>20/25/27 = 52 Blows |
| 10.0 | 8.75- to 11.5-m – $\phi = 36°$; $\gamma_t = 2.05$ tons/M$^3$<br>($N_{avg} \sim 56$) | SPT @ 10 M 22/25//<br>8 cms for 20 Blows |
| 11.0 | | |

SPT "N" PROFILE: 25 50 75

INDEX TEST DATA: 25 50 75

CONTINUED ON PLATE 8b.

SPT=Standard Penetration Test; DS=Disturbed Sample; UDS = UnDisturbed Sample; WS=Water Sample; SNR=Sample Not Recovered; LS = Liner Sample; +—+ = Plastic and Liquid Limits; ♦ = NMC; ■ = % 75µ Size

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PLATE 8a

# LOG OF BORING

**Project:** Proposed Multi-Storied Residential Apartments Buildings Complex Site, S. F. No. 226, 227, 228, Siruvani Main Road, Komarapalayam Village, Perur Taluk, Coimbatore 641 026, TN.

**Bore Hole No.:** 7 **Type of Boring:** Calyx Drill **Dia. of Hole:** 150 mm

**Started on:** 31-03-'24 **Ended on:** 1-04-'24 **Field Work In Charge:** R Murugesan

**Final Depth:** 13.0-M **Depth to G W S:** Not Seen **Remarks:** Continued from Plate 8a.

| DEPTH, M | SOIL DESCRIPTION | SPT / VANE & SAMPLE TYPE | SPT "N" PROFILE 25 50 75 | INDEX TEST DATA 25 50 75 |
|---|---|---|---|---|
| | BROWN SILTY FINE TO MEDIUM SAND (Below 1.0-M) | SPT @ 11.5 M 25/ 8 cms for 20 Blows | | |
| 12.0 | -NX Diamond bit drilling from 11.5-m | | | |
| | 11.5- to 13.0-m – $\phi = 37°$; $\gamma_t = 2.1$ tons/M$^3$ ($N_{avg} = 75$) | | | |
| 13.0 | -drilled from 11.5- to 13-m in 40 minutes | SPT @ 13 M 8 cms for 20 Blows | | |
| 14.0 | | | | |
| 15.0 | | | | |
| 16.0 | | | | |
| 17.0 | | | | |
| 18.0 | | | | |
| 19.0 | | | | |
| 20.0 | | | | |
| 21.0 | | | | |
| 22.0 | | | | |

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BORE HOLE TERMINATED AT 13.0-M.

SPT=Standard Penetration Test; DS=Disturbed Sample; UDS = UnDisturbed Sample; WS=Water Sample; SNR=Sample Not Recovered; LS = Liner Sample; +---+ = Plastic and Liquid Limits; ♦ = N M C; ■ = % -75μ Size

PLATE 8b

# SUMMARY OF TEST RESULTS

| Boring No. | Depth, M | w % | PL | LL | -75μ% | SAND | | | GRAVEL | IS CLASS. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Fine% | Medium% | Coarse% | % | |
| 1 | 0.25 | 21 | | | 6 | | | | | |
| | 1.0 | 24 | | | 8 | | | | | |
| | 1.75 | 17 | | | 16 | 33 | 28 | 13 | 10 | SM |
| | 2.5 | SNR | | | | | | | | |
| | 3.25 | 31 | | | 28 | | | | | |
| | 4.0 | 21 | | | 19 | 72 | 9 | 0 | 0 | SM |
| | 5.0 | 12 | | | 8 | | | | | |
| | 6.0 | 15 | | | 12 | 53 | 34 | 1 | 0 | SM |
| | 7.0 | 16 | | | 7 | | | | | |
| | 8.0 | 10 | | | 7 | 21 | 41 | 17 | 14 | SW |
| | 9.0 | 14 | | | 7 | | | | | |
| | 10.0 | 10 | | | 8 | 33 | 44 | 10 | 5 | SP |
| | 11.5 | 18 | | | 8 | 53 | 32 | 4 | 3 | SP |
| | 13.0 | SNR | | | | | | | | |
| 2 | 0.25 | 21 | | | 8 | | | | | |
| | 1.0 | 30 | | | 17 | 55 | 25 | 3 | 0 | SM |
| | 1.75 | 18 | | | 15 | | | | | |
| | 2.5 | 20 | | | 18 | 41 | 23 | 9 | 9 | SM |
| | 3.25 | 22 | | | 19 | | | | | |
| | 4.0 | 20 | | | 10 | 41 | 44 | 5 | 0 | SM-SP |
| | 5.0 | 21 | | | 22 | | | | | |
| | 6.0 | 13 | | | 6 | 21 | 39 | 14 | 20 | SW |
| | 7.0 | 14 | | | 6 | | | | | |
| | 8.0 | 22 | | | 25 | 62 | 12 | 1 | 0 | SM |
| | 9.0 | 18 | | | 7 | | | | | |
| | 10.0 | 19 | | | 16 | 43 | 38 | 3 | 0 | SM |
| | 11.5 | 17 | | | 22 | | | | | |
| | 13.0 | 14 | | | 6 | 35 | 53 | 6 | 0 | SP |
| 3 | 0.25 | 22 | | | 7 | | | | | |
| | 1.0 | 24 | | | 14 | 41 | 24 | 9 | 12 | SM |
| | 1.75 | 24 | | | 10 | | | | | |
| | 2.5 | 23 | | | 21 | 49 | 17 | 6 | 7 | SM |
| | 3.25 | 19 | | | 21 | | | | | |
| | 4.0 | 16 | | | 15 | 72 | 13 | 0 | 0 | SM |
| | 5.0 | 19 | | | 20 | | | | | |
| | 6.0 | 16 | | | 8 | 46 | 42 | 4 | 0 | SP |
| | 7.0 | 16 | | | 9 | | | | | |
| | 8.0 | 13 | | | 5 | 21 | 41 | 21 | 12 | SW |
| | 9.0 | 13 | | | 12 | | | | | |
| | 10.0 | 19 | | | 9 | 30 | 43 | 11 | 7 | SP-SM |
| | 11.5 | 10 | | | 9 | | | | | |
| | 13.0 | 19 | | | 12 | 58 | 27 | 3 | 0 | SM |
| 4 | 0.25 | 13 | | | 6 | | | | | |
| | 1.0 | 24 | | | 6 | 39 | 42 | 7 | 6 | SP |
| | 1.75 | 21 | | | 24 | | | | | |
| | 2.5 | 23 | | | 14 | 61 | 21 | 2 | 2 | SM |
| | 3.25 | 24 | | | 8 | | | | | |
| | 4.0 | 19 | | | 11 | 56 | 28 | 4 | 1 | SP-SM |
| | 5.0 | 18 | | | 13 | | | | | |
| | 6.0 | 14 | | | 6 | 23 | 59 | 11 | 1 | SP |

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PLATE 9a

# SUMMARY OF TEST RESULTS

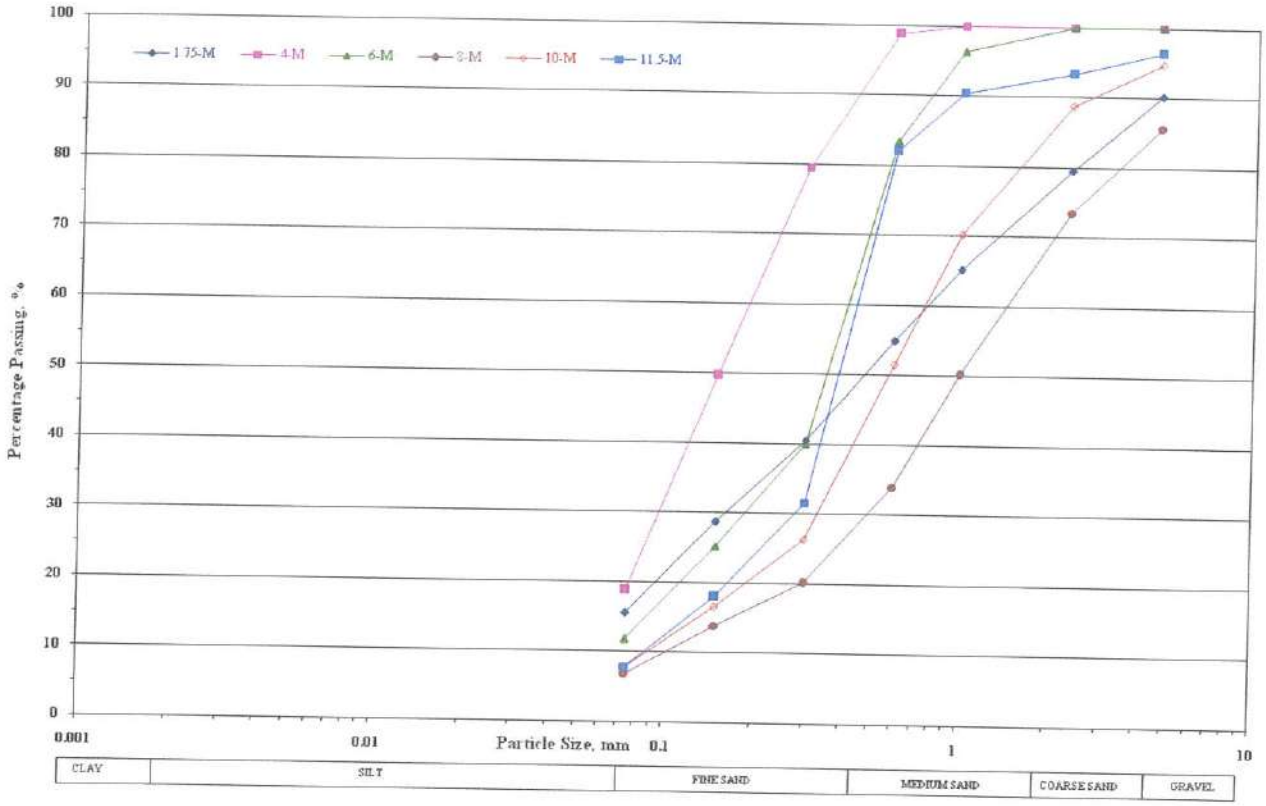
| Boring No. | Depth, M | w % | PL | LL | -75μ% | SAND | | | GRAVEL | IS CLASS. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Fine% | Medium% | Coarse% | % | |
| 4 | 7.0 | 14 | | | 7 | | | | | |
| | 8.0 | 18 | | | 14 | 63 | 22 | 1 | 0 | SM |
| | 9.0 | 16 | | | 14 | | | | | |
| | 10.0 | 9 | | | 3 | 31 | 51 | 9 | 6 | SP |
| | 11.5 | 21 | | | 26 | | | | | |
| | 13.0 | 23 | | | 10 | 58 | 30 | 2 | 0 | SP-SM |
| 5 | 0.25 | 14 | | | 8 | | | | | |
| | 1.0 | 19 | | | 8 | 49 | 34 | 6 | 3 | SP |
| | 1.75 | 16 | | | 8 | | | | | |
| | 2.5 | 18 | | | 15 | 53 | 22 | 5 | 5 | SM |
| | 3.25 | 16 | | | 7 | | | | | |
| | 4.0 | 17 | | | 7 | 34 | 47 | 11 | 1 | SP |
| | 5.0 | 26 | | | 17 | | | | | |
| | 6.0 | 22 | | | 14 | 45 | 24 | 10 | 7 | SM |
| | 7.0 | 23 | | | 20 | | | | | |
| | 8.0 | 24 | | | 9 | 34 | 39 | 11 | 7 | SP-SM |
| | 9.0 | 24 | | | 11 | | | | | |
| | 10.0 | 17 | | | 4 | 25 | 44 | 11 | 16 | SW |
| | 11.5 | 15 | | | 4 | 24 | 37 | 9 | 26 | SW |
| | 13.0 | SNR | | | | | | | | |
| 6 | 0.5 | 9 | | | 5 | | | | | |
| | 1.0 | 14 | | | 6 | 53 | 36 | 4 | 1 | SP |
| | 1.75 | 17 | | | 10 | | | | | |
| | 2.5 | 26 | | | 11 | 39 | 28 | 10 | 12 | SP-SM |
| | 3.25 | 29 | | | 13 | | | | | |
| | 4.0 | 22 | | | 20 | 50 | 21 | 3 | 6 | SM |
| | 5.0 | 23 | | | 15 | | | | | |
| | 6.0 | 32 | | | 25 | 56 | 14 | 2 | 3 | SM |
| | 7.0 | 27 | | | 21 | | | | | |
| | 8.0 | 18 | | | 9 | 40 | 45 | 5 | 1 | SP-SM |
| | 9.0 | 14 | | | 10 | | | | | |
| | 10.0 | 16 | | | 6 | 25 | 51 | 15 | 3 | SP |
| | 11.5 | 21 | | | 12 | | | | | |
| | 13.0 | 14 | | | 5 | 23 | 37 | 14 | 21 | SW |
| 7 | 0.25 | 14 | | | 4 | | | | | |
| | 1.0 | 21 | | | 6 | 51 | 41 | 2 | 0 | SP |
| | 1.75 | 16 | | | 16 | | | | | |
| | 2.5 | 25 | | | 12 | 34 | 29 | 9 | 16 | SM |
| | 3.25 | SNR | | | | | | | | |
| | 4.0 | 24 | | | 24 | 70 | 6 | 0 | 0 | SM |
| | 5.0 | 24 | | | 27 | | | | | |
| | 6.0 | 23 | | | 17 | 68 | 13 | 2 | 0 | SM |
| | 7.0 | 12 | | | 9 | | | | | |
| | 8.0 | 16 | | | 7 | 44 | 42 | 4 | 3 | SP |
| | 9.0 | 16 | | | 5 | | | | | |
| | 10.0 | 17 | | | 5 | 32 | 41 | 13 | 9 | SW |
| | 11.5 | 22 | | | 18 | | | | | |
| | 13.0 | 12 | | | 12 | 61 | 19 | 2 | 6 | SM |

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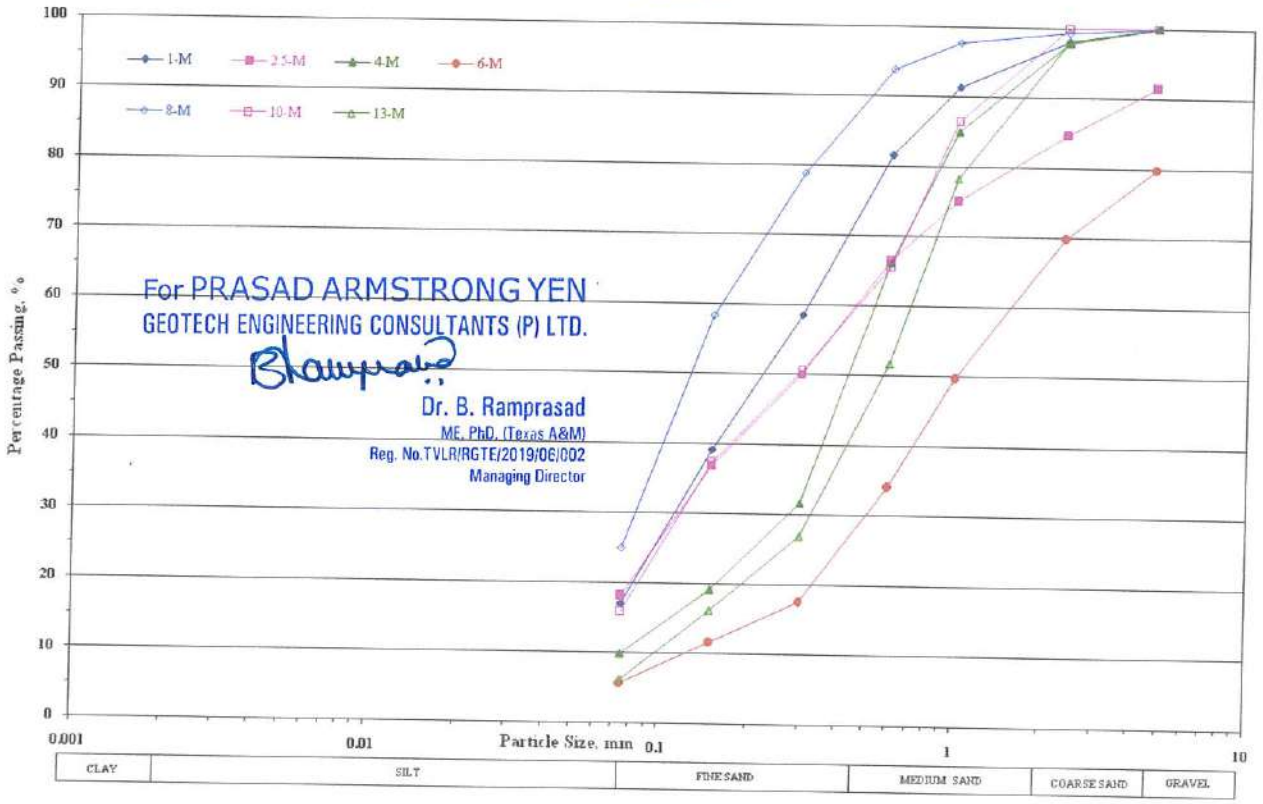
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Managing Director

PLATE 9b

## Grain Size Distribution Curves
### Boring 1




## Grain Size Distribution Curves
### Boring 2

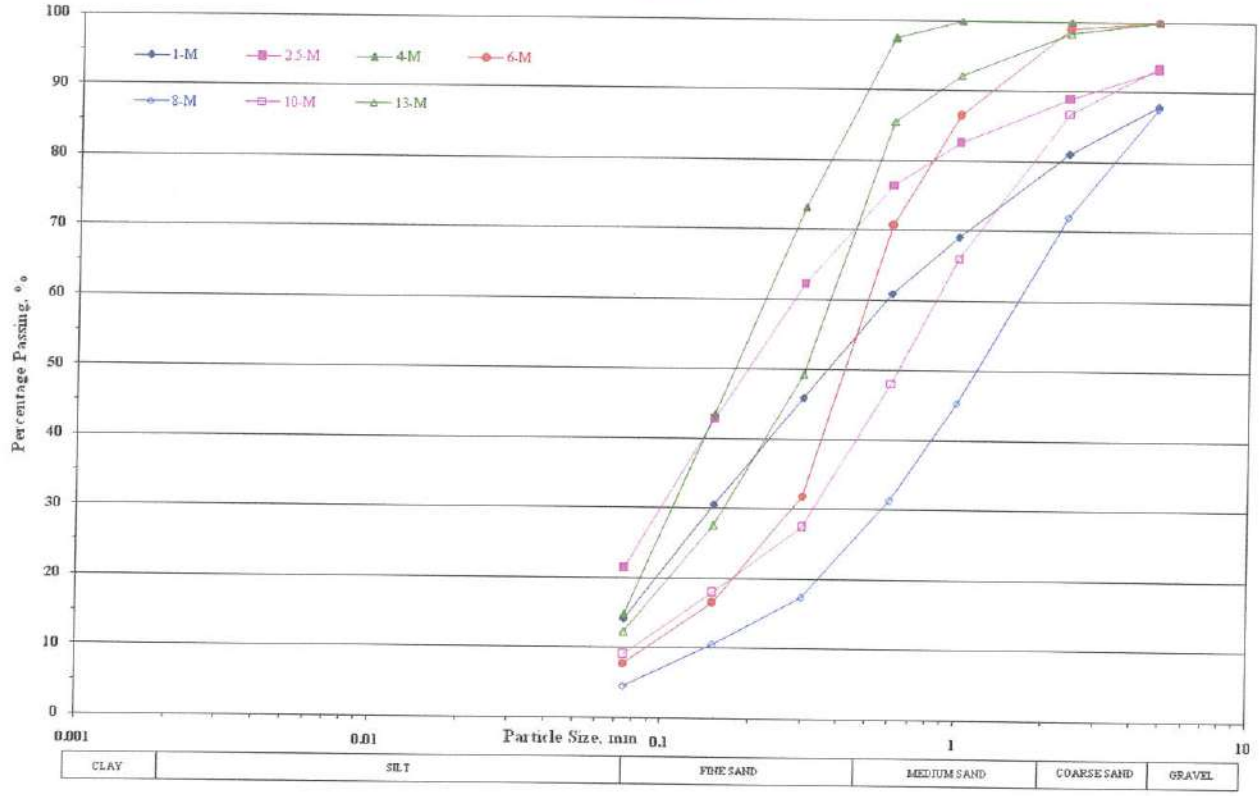



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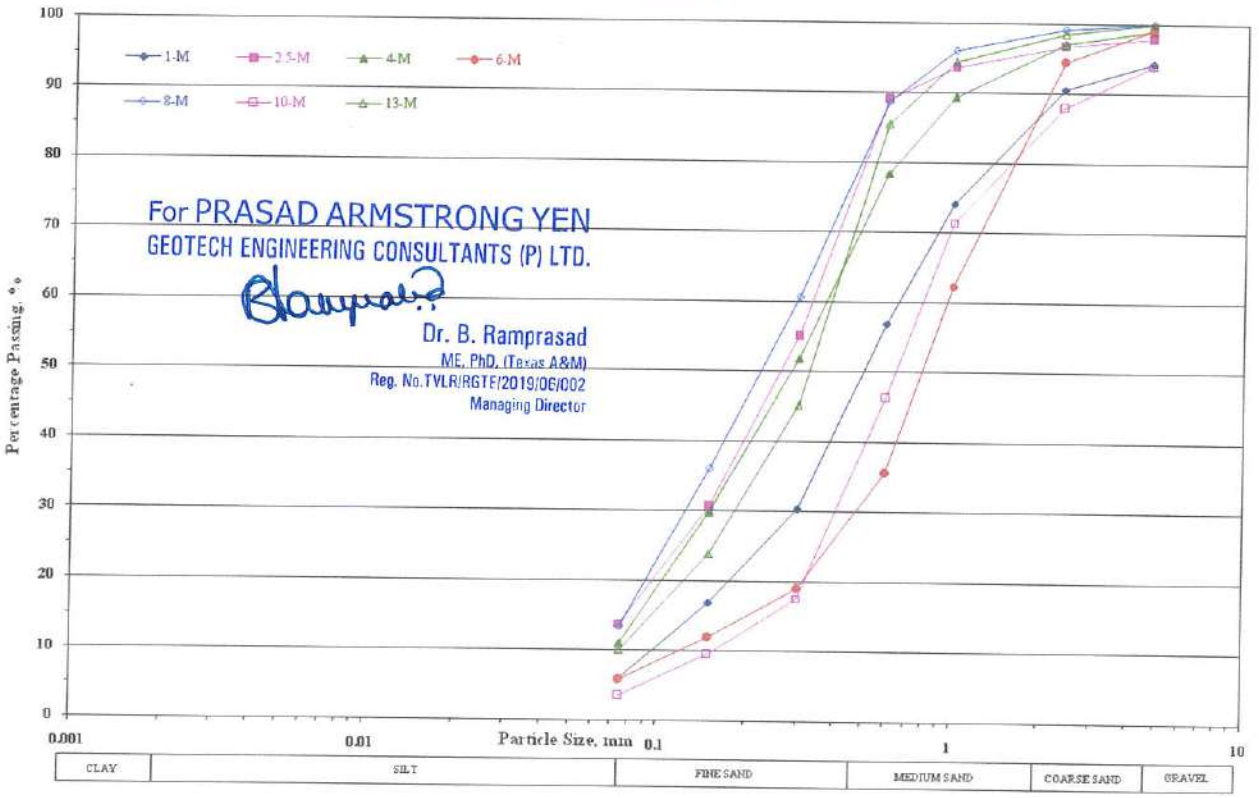
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**PLATE 10a**

## Grain Size Distribution Curves
### Boring 3




## Grain Size Distribution Curves
### Boring 4

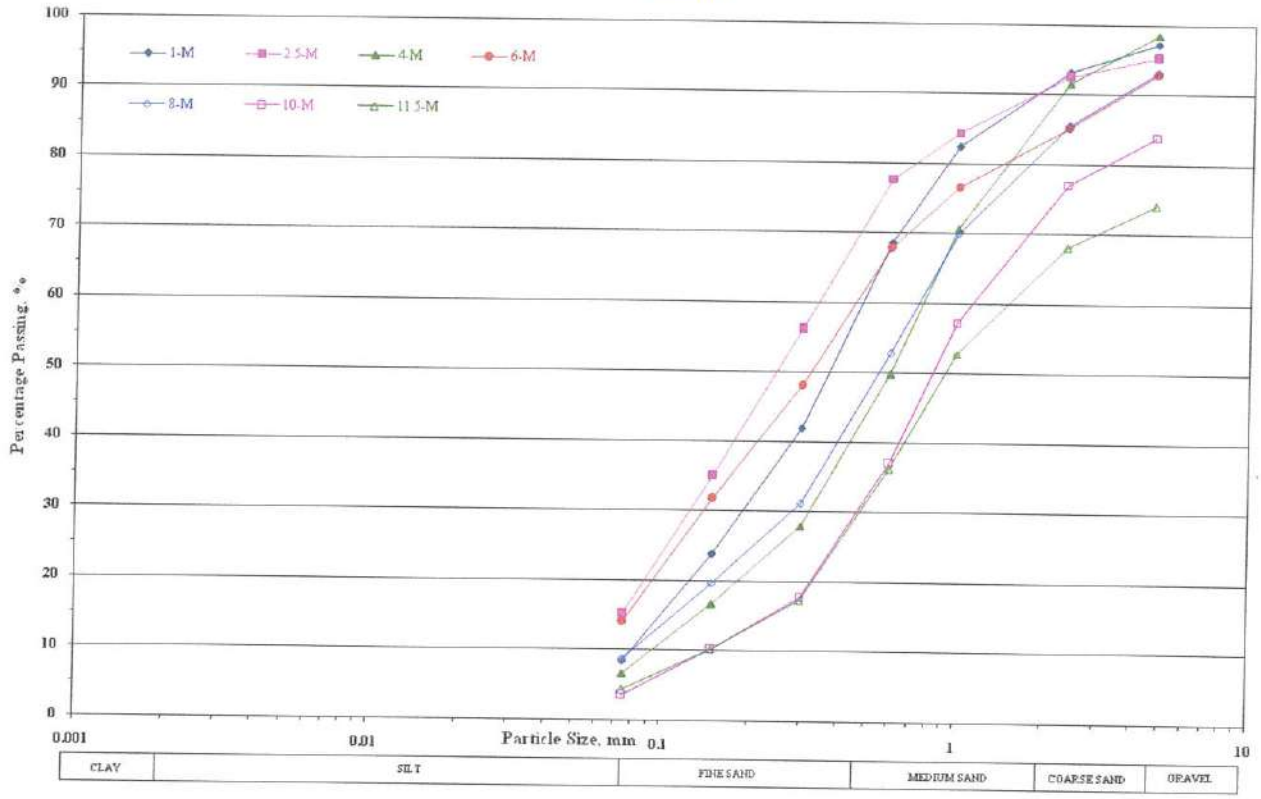



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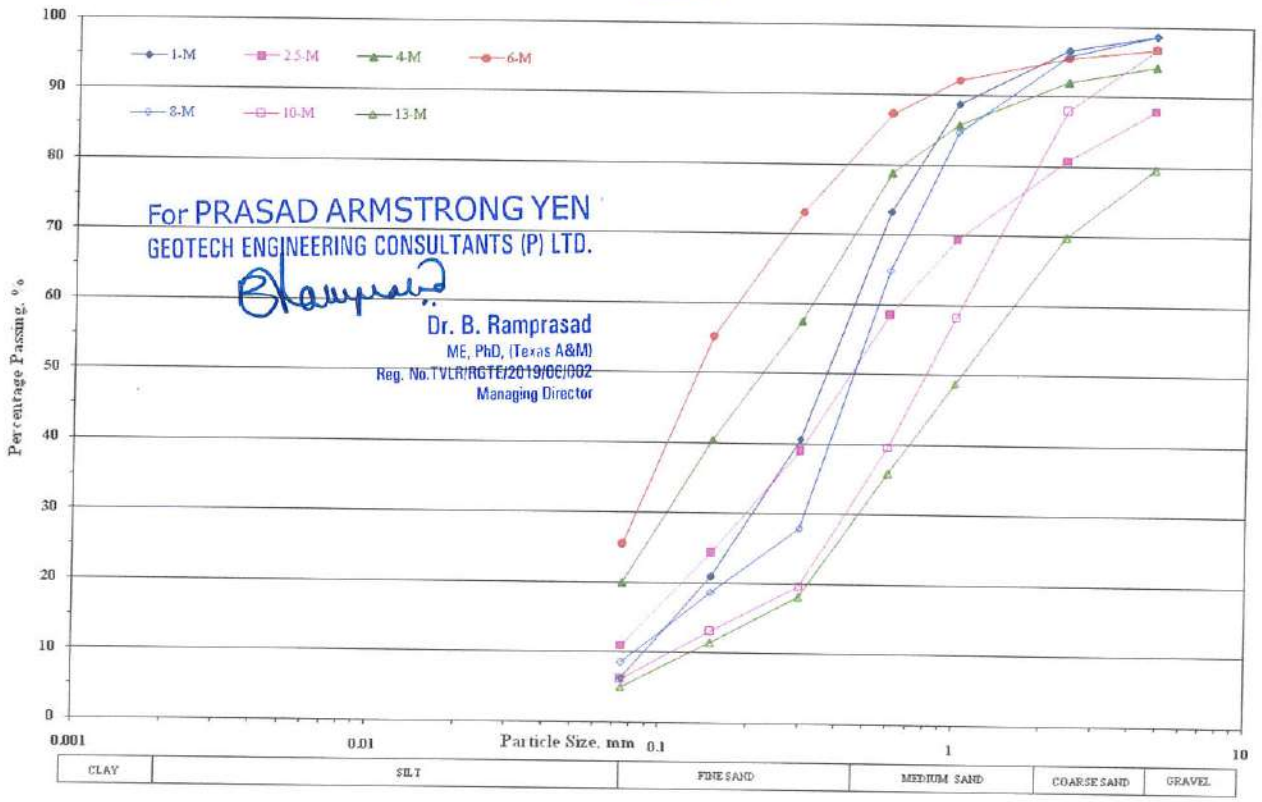
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**PLATE 10b**

## Grain Size Distribution Curves
### Boring 5




## Grain Size Distribution Curves
### Boring 6

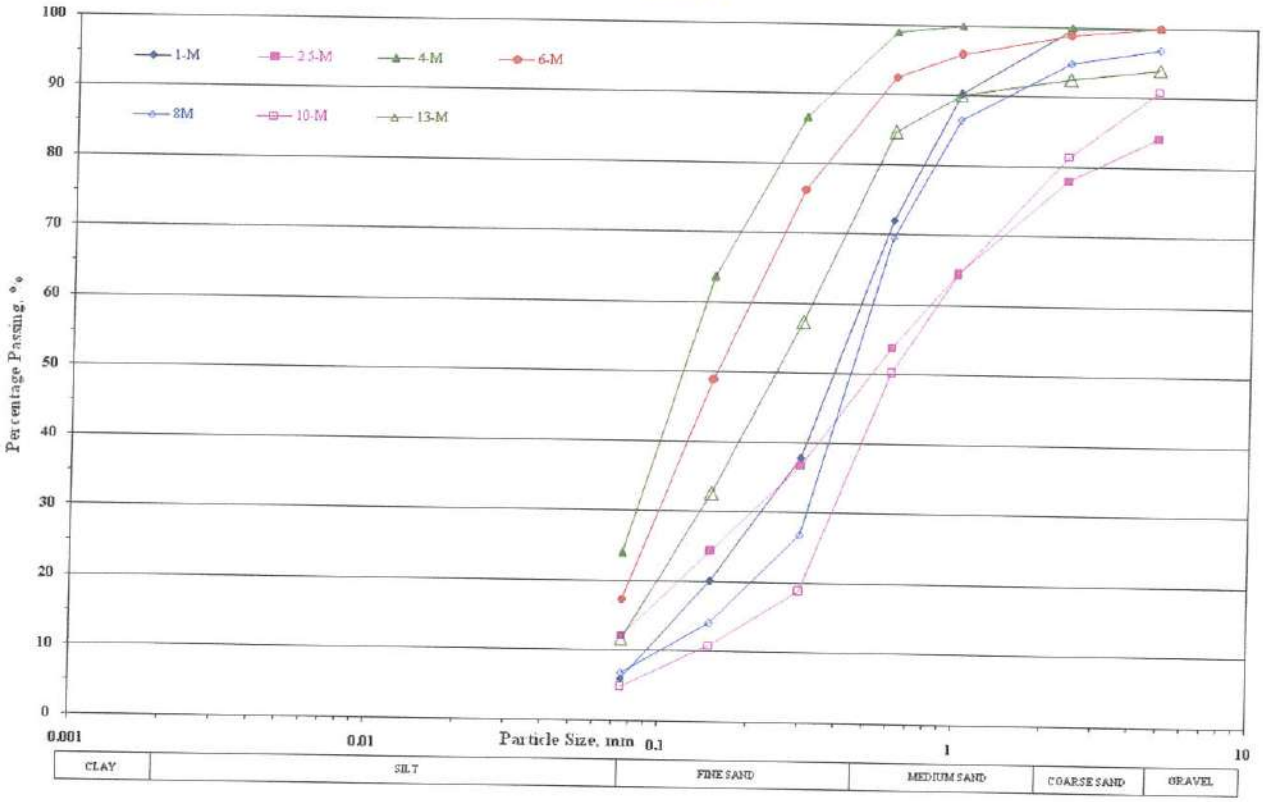



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**PLATE 10c**

## Grain Size Distribution Curves
### Boring 7




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PLATE 10d

## SAMPLE CALCULATIONS FOR RECOMMENDED FOUNDATION

For the existing footings with short pile below load carrying capacity was estimated using soil properties from Boring 2. Following is a list of design assumptions:

| | | |
|---|---|---|
| Type of Foundation | = | Isolated Column Footings; |
| Depth Foundation **below EGL** | = | 2.5-M (Minimum); |
| Basement Excavation Depth | = | 1.0-M below EGL; |
| Depth Foundation **below Basement** | = | 1.5-M (2.5-1.0) Minimum; |
| Minimum Footing Size | = | 2.5- by 2.5-M; |
| Expected Max. Column Load | = | 350 tons. |

Bearing Capacity Calculations:

Ultimate Bearing Pressure $q_{ult} = C_u*N_c*S_c*D_c + q'(N_q - 1)*S_q*d_q + 0.5*B*\gamma'*N_\gamma* S_\gamma*d_\gamma$

| | | |
|---|---|---|
| $\phi$ | = | $37^o$ |
| $C_u$ (Undrained Shear Strength) | = | 0 tons/$M^2$ |
| $N_c$ (Bearing Capacity Factor) | = | N/A |
| $N_q$ (Bearing Capacity Factor) | = | 45.66 |
| $N_\gamma$ (Bearing Capacity Factor) | = | 72.58 |
| $S_c$ (Shape Factor) | = | $1 + 0.2*(B/L) = 1.0 + 0.2*(1.0/1.0) = 1.2$; |
| $D_c$ (Depth Factor) | = | $1 + 0.2*D_f/B * \tan(45 + \phi/2) = 1.24$ |
| $S_q$ (Shape Factor) | = | $1 + 0.2*(B/L) = 1.0 + 0.2*(1.0/1.0) = 1.2$; |
| $d_q$ (Depth Factor) | = | $1 + 0.1*D_f/B * \tan(45 + \phi/2) = 1.12$ |
| $S_\gamma$ (Shape Factor) | = | $1 - 0.4*(B/L) = 1.0 - 0.4*(1.0/1.0) = 0.6$; |
| $d_\gamma$ (Depth Factor) | = | $1 + 0.1*D_f/B * \tan(45 + \phi/2) = 1.12$ |
| q'(O B @ Footing) | = | $0.75*(1.7-1) + 0.75*(1.85-1) = 1.163 \sim 1.2$ tons/$M^2$. |

**Note: Ground water is assumed to rise to EGL of the site.**

$q_{ult} = 0 + 1.20*(45.66-1)*1.2*1.12 + 0.5*1.10*2.5*72.58*0.6*1.12 = 139.09 \sim 139$ tons/$M^2$

$q_{all} = q_{ult} / 2.5 = 139 / 2.5 =$ 55.6 tons/$M^2$ **Use $q_{all}$ = 35 tons/$M^2$**

Footing Size require for 350 tons load = 350/35 = 10-$M^2$ or L = B = 3.17- Say 3.2-M.

**Settlement Calculations**:

Zone of Influence from foundation level = 2*3.2 = 6.4-M below footing or 8.9-M below EGL or upto hard stratum level, whichever is earlier. There will be only elastic (immediate) settlement and no consolidation (long term) settlement as soil profile had granular sand soil only in the influence zone.

Elastic or Immediate Settlement:

1. 2.5- to 8.9-M = $H_1$ = 6.4-M; SPT "N" > 75; (Silty Sand); $E_s$ = 7,500 tons/$M^2$

$E_{savg} = (7500*6.4) / 6.4 = 7{,}500$ tons/$M^2$

$q_{Nett}$ = 35 tons/$M^2$; B = 3.2-M; L = 3.2-M; L/B = 3.2/3.2 = 1; H = 6.4-M; H/B' = 6.4/1.6 = 4.0;

$\mu$ = 0.20; $E_s$ = 7,500 tons/$M^2$; $I_f$ = 0.90; $I_1$ = 0.403; $I_2$ = 0.078; $I_s$ = 0.436;

$\Delta H_E = 4*1.6*35*(1-0.2^2)/7500*0.90*0.436*1000 = 11.25$ mm

Total Elastic Settlement $\Delta H_E$ = 11.25 mm.

Consolidation Settlement: None.

Total Consolidation Settlement $\Delta H_C$ = 0.00 mm.

For PRASAD ARMSTRONG YEN
GEOTECH ENGINEERING CONSULTANTS (P) LTD.

Dr. B. Ramprasad
ME, PhD, (Texas A&M)
Reg. No.TVLR/RGTE/2019/06/002
Managing Director

Total Combined Settlement $\Delta H_T = \Delta H_E + \Delta H_C = 11.25 + 0.00 = 11.25 \sim$ **11 mm.**

Estimated total settlement for a 3.2-M wide isolated column footing at a minimum 1.5-M below basement floor level EGL and at least **2.5-M below EGL** was about 11 mm for a bearing pressure of 35 tons/$M^2$. Estimated settlement was less than 60 mm, the allowable limits for total settlement for isolated column footing foundation as per IS: 1904 - 2006 code. Hence, isolated column footing foundation can be used for the proposed building at this site. For better resistance to differential settlements and seismic forces it was recommended to provide rigid plinth beams in both directions, continuous lintels in each floor, and sill level beams under openings. Site and building basement filling should be completed before casting of first slab of the building.

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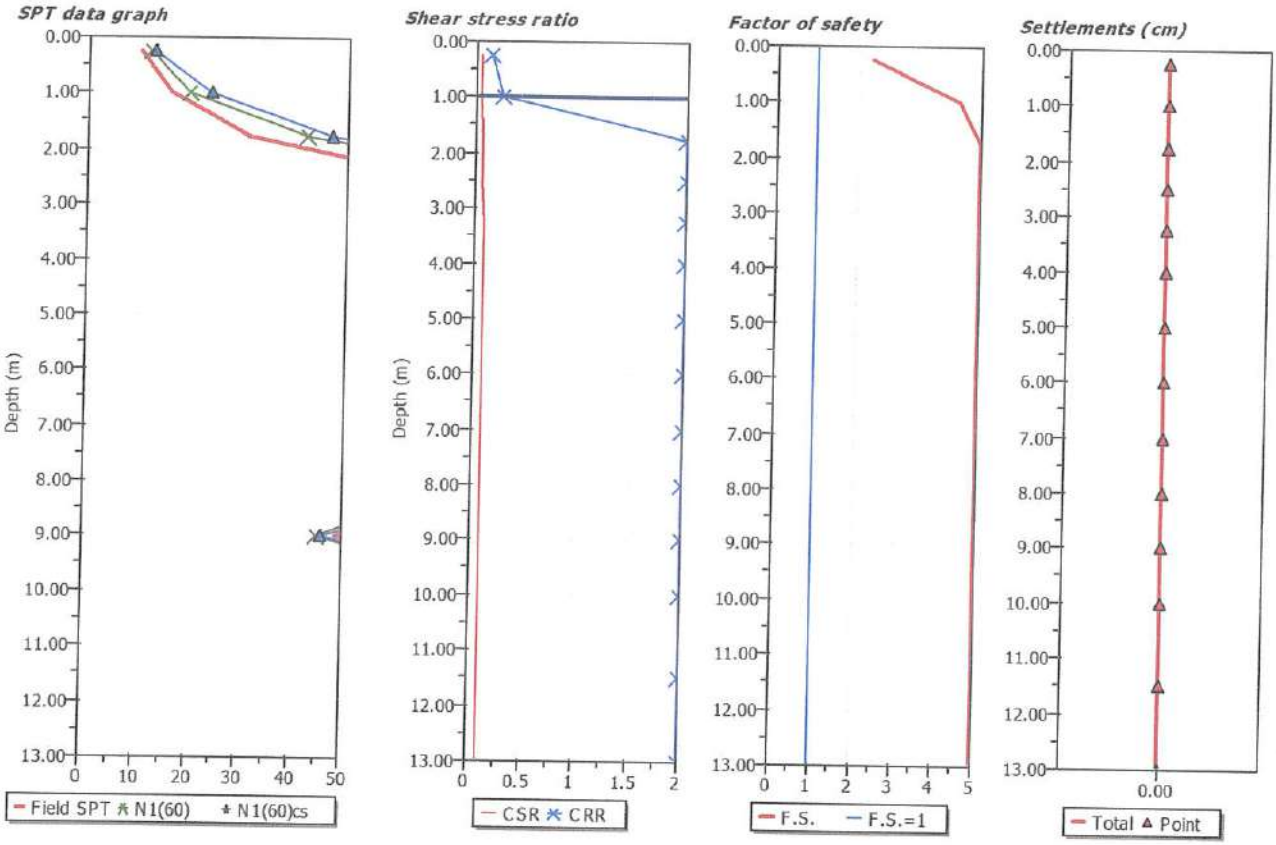
# LIQUEFACTION ANALYSIS REPORT

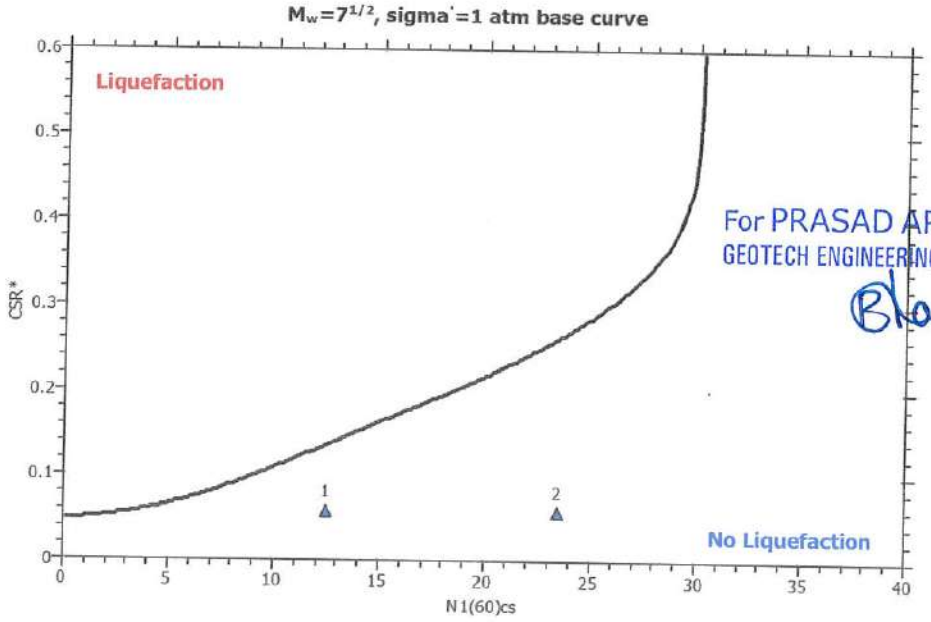
**Project title : S. F. No. 226, 227, 228, Siruvani Main Road, Komarapalayam Village, Perur Taluk, Coimbatore 641 026, TN.**

**Project subtitle : Boring 2 Soil Profile**

**Input parameters and analysis data**

| | | | |
|---|---|---|---|
| In-situ data type: | Standard Penetration Test | Depth to water table: | 1.00 m |
| Analysis type: | Deterministic | Earthquake magnitude $M_w$: | 6.00 |
| Analysis method: | NCEER 1998 | Peak ground accelaration: | 0.16 g |
| Fines correction method: | Idriss & Seed | User defined F.S.: | 1.00 |




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Managing Director

## Horizontal Acceleration, $A_h = 0.16g$

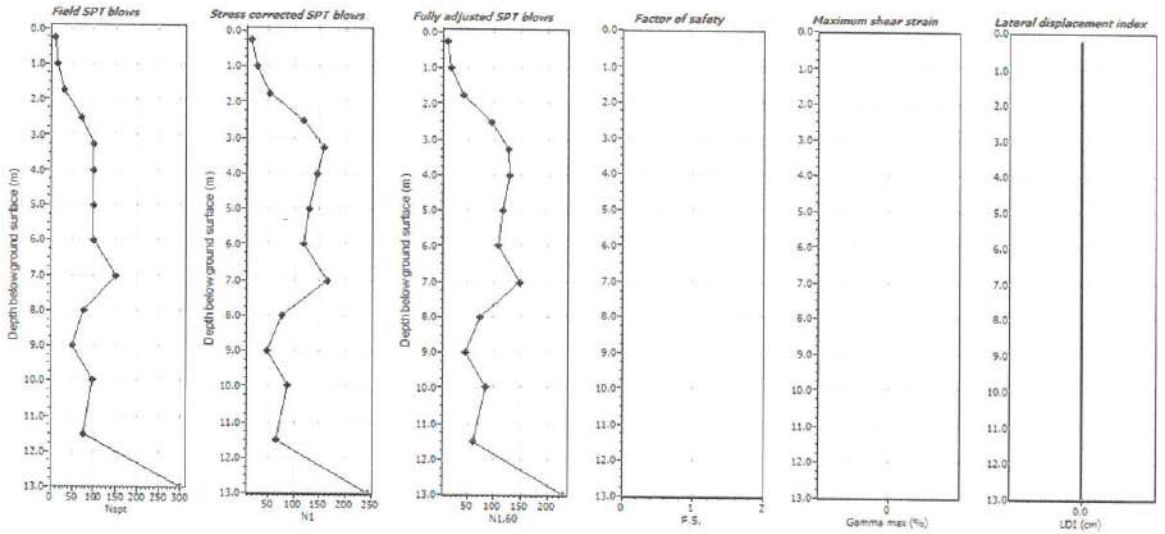
GEOLOGISMIKI Geotechnical Software

Geologismiki - Melissia 56, 621 25 Serres, Greece
Url: http://www.geologismiki.gr - Email: info@geologismiki.gr

LiqIT software v.4.6
Assessment of soil liquefaction potential from SPT, CPT or Vs data

### LATERAL DISPLACEMENTS ESTIMATION DUE TO SOIL LIQUEFACTION[1]

**Geometric parameters: Gently sloping ground without free face**
**Total lateral displacement estimation: 0.00 cm**




$N_{spt}$: Measured SPT blows
$N_1$: Stress adjusted SPT blows
$N_{1,60}$: Fully adjusted SPT blows

F.S.: Factor of safety
Gamma max: Maximum cyclic shear strain
LDI: Lateral displacement index

[1] This method was developed using the NCEER methods (SPT and CPT) and other methods will produce slightly different results



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PLATE 13b



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### Compliance & Special Services

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## 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

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