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# SOIL EXPLORATION AND FOUNDATION REPORT

## FOR THE PROPOSED BUILDING

## AT

## SURVEY NO. 157/13, 158/5

## PUDUPAKKAM VILLAGE

## VANDALUR TALUK

## CHENGALPATTU DISTRICT

**PROJECT NO. TJE/002949/2023**



T.J.ENGINEERS


**SOIL EXPLORATION AND FOUNDATION DESIGN DIVISION**
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## EXPLORATION REPORT

**PROJECT NO. TJE/002949/2023**

**1.INTRODUCTION:**

**M/s ISHA HOMES (INDIA) PRIVATE LIMITED** has proposed to construct a Ground Floor + Two Floors Villa & Stilt Floor + Three Floors Club House Building at Survey No. 157/13, 158/5, Pudupakkam Village, Vandalur Taluk, Chengalpattu District. The soil investigation work was entrusted to T.J. Engineers by the promoter. The location is shown in Fig No.1. The object of the soil exploration work done is to determine the soil properties of the proposed area and to arrive at a most suitable type of foundation system for the proposed structure.

**2.0 SCOPE OF WORK**

The Scope of Work includes the following

**Boreholes**

- Drilling of borehole at the proposed borehole locations as per the direction of the client.
- Collection of disturbed and undisturbed soil samples and carrying out the relevant laboratory test on soils.
- Conducting of standard penetration test (SPT) within the borehole at every 1.50m depth interval or as required.
- Collection of soil sample from bore hole.
- Preparation of geotechnical investigation Report.

**3.0. LOCATION & NUMBER OF BORE HOLES**

For this purpose five bore holes were bored up to maximum depth of 9.00m below existing ground level. The bore hole location is shown in Fig No.1 and bore log details



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are given in Fig No. 2,3,4,5&6. The bore holes were terminated in the Very Dense Sandy Gravel-(Disintegrated Rock) layer.

## 4.0. GEOTECHNICAL INVESTIGATIONS

### 4.1. Filed Investigations of Boreholes

Rotary drilling boring technique was adopted for boring in this area. The Standard penetration tests were conducted at change of layers and at specified intervals, commencing the test at 1.50m below the existing ground level. The relative density of different soil layers obtained from the N-Values are given in the Fig No. 2,3,4,5&6. Disturbed and un disturbed samples were collected from all the layers for visual observation, classification tests and strength characteristics of the soil layers.

**Standard Penetration Test (SPT)**

Standard Penetration Tests were conducted using a split spoon sampler, as per relevant codal provision (IS: 2131 – 1981). The SPT is generally conducted in sandy and completely weathered rock strata till 45 cm penetration with number of blows recorded for every 15 cm penetration. The number of blows required for first 15 cm in neglected. The blows for last 30 cm penetration or refusal 'N' value of 100 whichever is earlier is taken as the 'N' value. In the clayey strata, when driving of sampling tube is not possible, SPT was conducted to know the consistency of the soil strata and to retrieve the disturbed soil sample. The soil samples obtained in the split spoon sampler are carefully packed in polythene bags for testing in the laboratory. The SPT values obtained at every 1.50m interval are given in the bore logs.



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### 4.2. Grain Size Analysis

Combined sieve and hydrometer analyses were conducted on the various samples collected. The results are given in Table-1a, 1b, 1c. Based on the proportion of the different soil constituents, the soil is classified.

### 4.3. Laboratory Tests for Borehole samples

The following laboratory tests were conducted on collected Soil Samples.

I. Moisture Content as per IS: 2720 (Part 2)

II. Specific Gravity as per IS: 2720 (Part 2)

III. Sieve Analysis as per IS: 2720 (Part 4)

IV. Hydrometer Analysis as per IS: 2720 (Part 4)

V. Liquid Limit as per IS: 2720 (Part 5)

VI. Plastic Limit as per IS: 2720 (Part 5)

VII. Swelling Index as per IS: 2720 (Part 40)

## 5.0. BORE LOG DATA

The Summary of bore hole log data for BH-01, BH-02, BH-03, BH-04 & BH-05 is given in Fig-2,3,4,5&6. Bore hole location is given in Fig.1.

## 6.0. LABORATORY TEST RESULTS

The laboratory test results of boreholes samples are presented in Table-1a, 1b, 1c and Table-2a, 2b, 2c.

## 7.0. GROUND WATER TABLE

The ground water table was **encountered at the depth of 0.80m** below the existing ground level at the time of soil exploration.



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## 8.0. SUB SOIL PROFILE

From the visual identification from field test results, it is concluding that soil strata is not similar in BH-01, BH-02, BH-03, BH-04 & BH-05 location.

In BH-01 Location the soil strata is made-up of five distinctive layers.

i. Filled Up Soil, 0.00m to 0.50m

ii. Medium Stiff Sandy Silty Clay, 0.50m to 2.60m SPT's N= 7

iii. Dense to Very Dense Silty Clayey Sand, 2.60m to 5.50m

SPT's N= 36->100

iv. Very Dense Clayey Silty Gravelly Sand, 5.50m to 7.00m

SPT's N=>100

v. Very Dense Sandy Gravel, 7.00m to 8.00m SPT's N=>100

In BH-02 Location the soil strata is made-up of five distinctive layers.

i. Filled Up Soil, 0.00m to 0.80m

ii. Stiff Sandy Silty Clay, 0.80m to 2.30m SPT's N= 11

iii. Medium Dense to Very Dense Silty Clayey Sand, 2.30m to 5.10m

SPT's N= 25-59

iv. Very Dense Clayey Silty Gravelly Sand, 5.10m to 7.10m

SPT's N=>100

v. Very Dense Sandy Gravel, 7.10m to 8.00m SPT's N=>100

In BH-03 Location the soil strata is made-up of four distinctive layers.

i. Filled Up Soil, 0.00m to 0.70m

ii. Medium Stiff Sandy Silty Clay, 0.70m to 2.60m SPT's N= 8



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iii. Dense to Very Dense Clayey Silty Gravelly Sand, 2.60m to 7.10m SPT's N=>100

iv. Very Dense Sandy Gravel, 7.10m to 9.00m SPT's N=>100

In BH-04 Location the soil strata is made-up of five distinctive layers.

i. Filled Up Soil, 0.00m to 0.50m

ii. Stiff Sandy Silty Clay, 0.50m to 2.30m SPT's N= 9

iii. Very Stiff Sandy Silty Clay, 2.30m to 4.00m SPT's N= 28

iv. Very Dense Silty Clayey Gravelly Sand, 4.00m to 7.00m SPT's N= >100

v. Very Dense Sandy Gravel, 7.00m to 9.00m SPT's N=>100

In BH-05 Location the soil strata is made-up of five distinctive layers.

i. Filled Up Soil, 0.00m to 0.60m

ii. Medium Stiff Sandy Silty Clay, 0.60m to 2.70m SPT's N= 8

iii. Very Stiff Sandy Silty Clay, 2.70m to 3.90m SPT's N= 23

iv. Very Dense Clayey Silty Gravelly Sand, 3.90m to 6.60m SPT's N= >100

v. Very Dense Sandy Gravel, 6.60m to 8.00m SPT's N=>100

The soil profile details are presented in the Bore logs, Presented in Fig. 2,3.4,5&6.



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## 9.0. FOUNDATION ANALYSIS AND DESIGN

From the bore log data at the top from 0.00m to 0.80m Filled Up Soil layer is present. From 0.80m to 2.70m medium stiff to stiff Sandy Silty Clay layer is present, this layer has got swelling character.

From 2.70m to 6.60m/7.20m medium dense to very dense Silty Clayey Sand/ Silty Clayey Gravelly Sand layer is present. In BH-03 and BH-04 location, from 2.70m to 4.00m very stiff Sandy Silty Clay layer is present, this layer has got swelling character and this layer is not present in BH-01, BH-02 and BH-03 locations.

Below 7.20m very dense Sandy Gravel-(Disintegrated Rock) layer is present, this layer is fair to rest pile foundation for heavy loaded structure.

The soil layer up to 5.10m is the critical zone for open foundation system, with in the critical zone medium stiff to very stiff Clayey layer and medium dense to very dense Sandy layers are present. For the proposed structure open foundation of **Isolated Footing or Continues Strip Raft Footing or Raft Foundation** can be adopted. The open foundation can be placed at the **minimum depth of 2.00m** below the existing ground level. The existing ground level was same as the road level. The soil strata below 3.00m are very stiff to very dense in consistency and it has got better SBC. If possible to place the foundation at 3.00m depth it is advisable to place it at 3.00m depth. The open foundation should rest on the **natural, un disturbed** layer. The SBC at 2.00m and 3.00m depth has been worked out and given below.

**For heavy loaded structure**, if the Safe Bearing Capacity (SBC) is not sufficient for the expected loading intensity, it is advisable to provide **deep foundation of pile foundation.** The pile foundation can be terminated at the minimum **depth of 9.00m**



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**(Including Anchorage depth)** below the exiting ground level (Ground level at the time of soil investigation). The existing ground level was same as the road level at the time of soil investigation.

## 9.1. COMPUTATION OF THE SAFE BEARING CAPACITY AT 2.00m DEPTH

Based on the standard penetration test value the ultimate net bearing capacity ($q_u$) could be calculated from the following formula.

$q_u = 1.2\ C\ Nc + \gamma\ D_f\ N_q$

The minimum observed N-Value is taken as 7 from Fig. 2,3,4,5&6.

The corresponding bearing capacity factors are,

$Nc = 5.7$

$N_q = 1$

Where,

C = Un drained shear strength = 3.57 t/m$^2$

$\gamma$ = Unit weight of the soil = 1.50 t/m$^3$

$\gamma'$ = Submerged unit weight of the soil = 0.50 t/m$^3$

$D_f$ = Depth of footing = 2.00 m

$D_w$ = Depth of water table = 0.80 m

Substitute all the above values in the formula,

$q_u = 1.2 \times 3.57 \times 5.7 + (1.50 \times 0.80 + 1.20 \times 0.50) \times 1$

$= 24.418 + 1.80 = 26.218$ t/m$^2$

Safe bearing capacity could be considered with a factor of safety of 2.5

Hence, safe bearing capacity $q_s = 26.218/2.50 = 10.487$ t/m$^2$. Say 10.50 t/m$^2$.

**Therefore, safe bearing capacity of the soil at 2.00m is 10.50 t/m$^2$**



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## 9.2. COMPUTATION OF THE SAFE BEARING CAPACITY AT 3.00m DEPTH

Based on the standard penetration test value the ultimate net bearing capacity ($q_u$) could be calculated from the following formula.

$q_u = 1.2\ C\ Nc + \gamma\ D_f\ N_q$

The minimum observed N-Value is taken as 23 from Fig. 2,3,4,5&6.

The corresponding bearing capacity factors are,

$Nc = 5.7$

$N_q = 1$

Where,

C = Un drained shear strength = 7.34 t/m$^2$

$\gamma$ = Unit weight of the soil = 1.50 t/m$^3$

$\gamma'$ = Submerged unit weight of the soil = 0.50 t/m$^3$

$D_f$ = Depth of footing = 3.00 m

$D_w$ = Depth of water table = 0.80 m

Substitute all the above values in the formula,

$q_u = 1.2 \times 7.34 \times 5.7 + (1.50 \times 0.80 + 2.20 \times 0.50) \times 1$

$= 50.205 + 2.30 = 52.505$ t/m$^2$

Safe bearing capacity could be considered with a factor of safety of 2.5

Hence, safe bearing capacity $q_s = 52.505/2.50 = 21.002$ t/m$^2$. Say 21.00 t/m$^2$.

**Therefore, safe bearing capacity of the soil at 3.00m is 21.00 t/m$^2$**



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## 9.3. SETTLEMENT ANALYSIS FOR THE INTENSITY OF 21.00 t/m $^2$

### LAYER -1, SANDY SILTY CLAY

The Consolidation Settlement of the Clay layer can be calculated using the following formula.

$$S_1 = (C_c / 1 + e_0) H \quad Log_{10} (\sigma'_0 + \Delta\sigma / \sigma'_0)$$

Where

$C_c$ = Coefficient of compression index

= 0.22

$e_0$ = The initial void ratio

= 1.00

H =The thickness of the compressible clay layer

= 1.00m

$\sigma'_0$ = The original effective over burden pressure at the centre of the clay layer

= 2.55 t/m$^2$

$\Delta\sigma$ = The stress increases at the centre of the clay layer due to foundation loads (or) pressure

= 1.037 t/m$^2$

$S_1$ = (0.22/1+1.00) 1.00 $Log_{10}$ (2.55 + 1.037 /2.55)

= 0.11 x 1.00 x 0.148 x $10^{-3}$m

= 0.016301m

= 16.301mm

**TOTAL SETTLEMENT**

**= 16.301mm < 50mm**

The maximum allowable settlement as per IS: 1904-1986 for R.C.C structure with Isolated footing foundation is 50mm. **The settlement is within the permissible limit. Hence it is Safe.**



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## 9.4. LOAD CARRYING CAPACITY OF THE CONVENTIONAL PILE

Based on the standard penetration test value the ultimate load carrying capacity ($q_u$) could be calculated from the following formula.

$$Qu = Qb + Qs$$

Qs = Ultimate unit skin friction on an individual layer

$$= Ks\ \sigma'_{vo} \tan\delta\ \ \pi D L$$

Where

Ks = Co-efficient of horizontal soil stress = 0.471

$\sigma'_{vo}$ = average effective overburden pressure = 4.125 $t/m^2$

$\delta$ = angle of wall friction = 32

D = Dia meter of pile = 0.40m

L = Length of individual layer = 1.50m

= 0.471 x 4.125 x 0.624 x 3.14 x 0.40 x 1.50

= 2.284 t

$q_b = Nq\ \sigma'_{vo}\ Ab$

where

Nq = Bearing Capacity Factor = 125

$\sigma'_{vo}$ = effective overburden pressure at the toe = 4.50 $t/m^2$

Ab = Cross sectional area at the base

D = Dia of Pile = 0.40m



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$= 125 \times 4.50 \times 3.14 \times 0.40^2 / 4$

$= 70.65$ t

**Qu = Qb + Qs**

$= 70.65 + 2.284 = 72.934$ t

**Q safe** = Qu/F.S = 72.934/2.5 = 29.173 say **29.00 t**

The safe load carrying capacity for five different diameter of piles for the **depth of 9.00m** are worked out and are given below.

| Dia of Pile | Depth of Pile | Safe Load (Tones) |
|---|---|---|
| **400mm** | **9.00m** | **29** |
| **450mm** | **9.00m** | **37** |
| **500mm** | **9.00m** | **45** |
| **600mm** | **9.00m** | **65** |
| **750mm** | **9.00m** | **101** |

The above safe loads are provisional and shall be confirmed by conducting pile load test as per the guide line laid down in IS: 2911 (Part: IV).



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## 10.0. CONCLUSIONS

1. Soil in the shallow depth is fair to adopt open foundation system for light loaded structure.
2. For the propose Ground Floor + Two Floors Villa & Stilt Floor + Three Floors Club House structure open foundation of **Isolated Footing** or **Continues Strip Raft Footing or Raft Foundation** can be adopted.
3. The open foundation can be placed at the **minimum depth of 2.00m** below the existing ground level. The existing ground level was same as the road level. The soil strata below 3.00m are very stiff to very dense in consistency and it has got better SBC. If possible to place the foundation at 3.00m depth it is advisable to place it at 3.00m depth. The open foundation should rest on the **natural, un disturbed** layer. The SBC at 2.00m and 3.00m depth has been worked out and given below.

| Sl.No. | DEPTH (m) | SBC ($t/m^2$) |
|---|---|---|
| 1. | 2.00 | 10.50 |
| 2. | 3.00 | 21.00 |

4. The **minimum width** of footing should be maintained as **1.00m** to avoid any punching shear failure and to achieve suggested SBC.
5. If open foundation of **Isolated footing provided** it is advisable to make the structure as rigid as possible by providing **continues plinth beam on both direction, Continues Sill Slab** and **continues lintel beam.**
6. All the foundation should rest on 100 mm thick 1:4:8 concrete mat, over 100mm thick river sand or M Sand layer.



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7. **For heavy loaded structure,** the Safe Bearing Capacity (SBC) is not sufficient for the expected loading intensity, it is advisable to provide **deep foundation of pile foundation.** The pile foundation can be Bored Cast in situ pile. The pile foundation can be terminated at the minimum depth of **9.00m (Including Anchorage depth)** below existing ground level.

8. The safe load carrying capacity for five different diameter of piles for the **depth of 9.00m** are worked and are given below.

| Dia of Pile | Depth of Pile | Safe Load (Tones) |
|---|---|---|
| 400mm | 9.00m | 29 |
| 450mm | 9.00m | 37 |
| 500mm | 9.00m | 45 |
| 600mm | 9.00m | 65 |
| 750mm | 9.00m | 101 |

The above safe loads are provisional and shall be confirmed by conducting pile load test as per the guide line laid down in IS: 2911 (Part: IV)

9. The pile should be anchored in to the very dense Sandy Gravel (Disintegrated Rock) layer for minimum 1.00m depth to achieve the suggested load carrying capacity. The depth of pile may vary slightly according to site condition. **(Anchorage depth included in the total length of pile depth 9.00m).**

10. The pile boring can be done with Percussion drilling or Hydraulic Rotary Drilling with DMC method.



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11. Proper precaution should be taken while boring the pile against sliding of bore hole, by maintaining the proper dense bentonite slurry or providing temporary casing or permanent casing and pile concreting should be done as soon as boring is over.
12. The bore hole should be flushed properly before laying concrete. It has to be ensured by comparing the depth of pile bore hole and Tremie Pipe. The depth of Tremie Pipe lowered can be 300mm less than borehole depth. If the gap between bore hole bottom and Tremie Pipe bottom is more than 300mm, there is a possibility of slush deposit in the bore hole.
13. For foundation design stress due to any eccentricity and horizontal force should be considered and stability should be checked.
14. It is advisable not to mix deep foundation and shallow foundation in same building. Combined pile and Raft can be adopted.
15. All suggested foundation recommendations and precautions should be adopted while undertaking the design aspects and construction activities.

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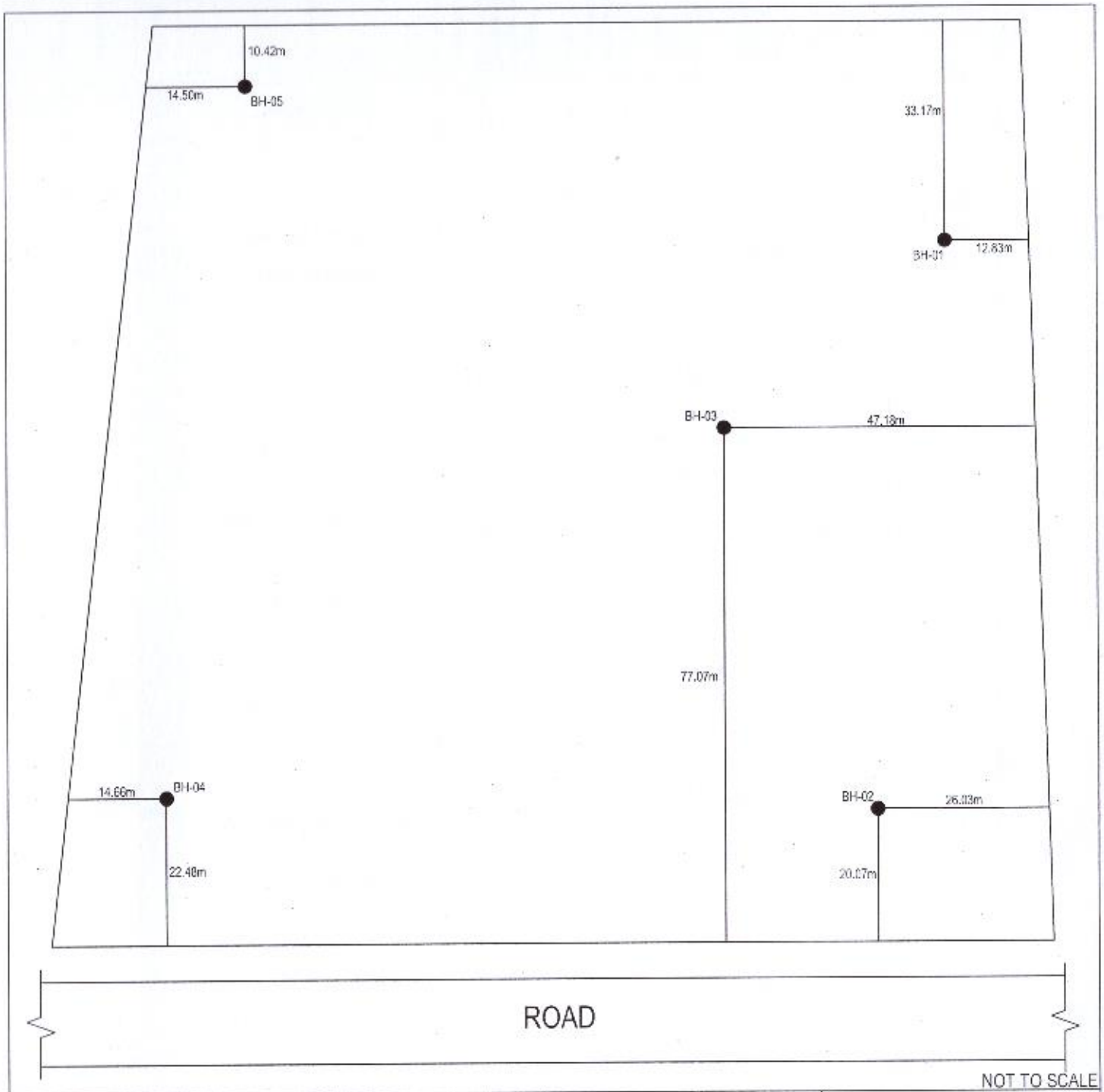
**For T.J. Engineers**

**05 - 10 - 2023**

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DTCP Reg. No: CGLRGN/RGTE/2019/07/010



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NOT TO SCALE

| CLIENT:- | PROJECT:- | | |
|---|---|---|---|
| M/S ISHA HOMES (INDIA) PRIVATE LIMITED CHENNAI. | PROPOSED BUILDING AT SURVEY NO. 157/13, 158/5, PUDUPAKKAM VILLAGE, VANDALUR TALUK, CHENGALPATTU DISTRICT. | SITE PLAN FIG.1 | T.J. ENGINEERS soil investigation and foundation design division T.J. HOUSE PLOT NO. 4, ANNA NAGAR, 1ST STREET, VELACHERY, CHENNAI-42. |

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# BORE LOG

PROJECT : Proposed Building at Survey No. 157/13, 158/5, Pudupakkam Village, Vandalur Taluk, Chengalpattu District.

BORE HOLE NO : B.H:01

TYPE OF BORING : Rotary Drilling

DATE OF COMMENCEMENT : 22 - 09 - 2023

DATE OF COMPLETION : 23 - 09 - 2023

G.W.L : 0.80m

| Depth below G.L | Soil profile | Description of soil | Thickness of layer | Depth at which samples are collected D.S | Depth at which samples are collected U.D.S | Standard penetration test data: Depth at which test is conducted | Standard penetration test data: N-Value | Standard penetration test data: Relative density/ Consistency | Graphical representation of penetration resistance |
|---|---|---|---|---|---|---|---|---|---|
| 0.00 | | Filled Up Soil | 0.50 | 0.50 | | | | | |
| 1.00 | | Sandy Silty Clay-SSLC1 ( Whitish Gray ) | 2.10 | | | 1.50 | 7 | Medium Stiff | |
| 2.00 | | | | 2.60 | | | | | |
| 3.00 | | | | | | 3.00 | 36 | Dense | |
| 4.00 | | Silty Clayey Sand-SLCS1 ( Whitish Gray Yellowish Brown ) | 2.90 | | | 4.50 | >100 | Very Dense | |
| 5.00 | | | | 5.50 | | | | | |
| 6.00 | | Clayey Silty Gravelly Sand-CSLGS1 ( Yellowish Brown ) | 1.50 | | | 6.00 | >100 | Very Dense | |
| 7.00 | | | | 7.00 | | | | | |
| | | Sandy Gravel-SG1 ( Disintegrated Rock ) | | | | 7.50 | >100 | Very Dense | |
| 8.00 | | ( Whitish Gray Brown ) | | | | 8.00 | >100 | Very Dense | |
| 9.00 | | | | | | | | | |
| 10.00 | | | | | | | | | |

Graphical representation of penetration resistance: 10 20 30 40 50

Remark: All Dimensions in meters

→ End of Boring

FIG: 2

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# BORE LOG

PROJECT : Proposed Building at Survey No. 157/13, 158/5, Pudupakkam Village, Vandalur Taluk, Chengalpattu District.

BORE HOLE NO : B.H:02

TYPE OF BORING : Rotary Drilling

DATE OF COMMENCEMENT : 23 - 09 - 2023

DATE OF COMPLETION : 23 - 09 - 2023

G.W.L : 0.80m

| Depth below G.L | Soil profile | Description of soil | Thickness of layer | Depth at which samples are collected D.S | Depth at which samples are collected U.D.S | Standard penetration testdata: Depth at which test is conducted | Standard penetration testdata: N-Value | Standard penetration testdata: Relative density/ Consistency |
|---|---|---|---|---|---|---|---|---|
| 0.00 | | Filled Up Soil | 0.80 | 0.80 | | | | |
| 1.00 | | Sandy Silty Clay-SSLC1 ( Whitish Gray ) | 1.50 | 2.30 | | 1.50 | 11 | Stiff |
| 2.00 | | | | | | | | |
| 3.00 | | Silty Clayey Sand-SLCS1 ( Whitish Gray Yellowish Brown ) | 2.80 | 5.10 | | 3.00 | 25 | Medium Dense |
| 4.00 | | | | | | | | |
| 5.00 | | | | | | 4.50 | 59 | Very Dense |
| 6.00 | | Clayey Silty Gravelly Sand-CSLGS1 ( Yellowish Brown ) | 2.00 | 7.10 | | 6.00 | >100 | Very Dense |
| 7.00 | | | | | | | | |
| 8.00 | | Sandy Gravel-SG1 ( Disintegrated Rock ) ( Whitish Gray Brown ) | | | | 7.50 | >100 | Very Dense |
| 9.00 | | | | | | 8.00 | >100 | Very Dense |
| 10.00 | | | | | | | | |

Graphical representation of penetration resistance: 10 20 30 40 50

Remark: All Dimensions in meters

→ End of Boring

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FIG: 3

# BORE LOG

PROJECT : Proposed Building at Survey No. 157/13, 158/5, Pudupakkam Village, Vandalur Taluk, Chengalpattu District.

BORE HOLE NO : B.H:03

TYPE OF BORING : Rotary Drilling

DATE OF COMMENCEMENT : 23 - 09 - 2023

DATE OF COMPLETION : 23 - 09 - 2023

G.W.L : 0.80m

| Depth below G.L | Soil profile | Description of soil | Thickness of layer | Depth at witch samples are collected D.S | Depth at witch samples are collected U.D.S | Standard penetration testdata: Depth at witch test is conducted | Standard penetration testdata: N-Value | Standard penetration testdata: Relative density/ Consistency | Graphical representation of penetration resistance |
|---|---|---|---|---|---|---|---|---|---|
| 0.00 | | Filled Up Soil | 0.70 | 0.70 | | | | | |
| 1.00 | | Sandy Silty Clay-SSLC1 ( Whitish Gray ) | 1.90 | | | 1.50 | 8 | Medium Stiff | |
| 2.00 | | | | 2.60 | | | | | |
| 3.00 | | | | | | 3.00 | 38 | Dense | |
| 4.00 | | Clayey Silty Gravelly Sand-CSLGS1 ( Yellowish Brown ) | 4.60 | | | 4.50 | >100 | Very Dense | |
| 5.00 | | | | | | | | | |
| 6.00 | | | | | | 6.00 | >100 | Very Dense | |
| 7.00 | | | | 7.20 | | | | | |
| 8.00 | | Sandy Gravel-SG1 ( Disintegrated Rock ) ( Whitish Gray Brown ) | | | | 7.50 | >100 | Very Dense | |
| 9.00 | | | | | | 9.00 | >100 | Very Dense | |
| 10.00 | | | | | | | | | |

Graphical representation of penetration resistance: 10 20 30 40 50

Remark: All Dimensions in meters

End of Boring

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FIG: 4

# BORE LOG

PROJECT : Proposed Building at Survey No. 157/13, 158/5, Pudupakkam Village, Vandalur Taluk, Chengalpattu District.

BORE HOLE NO : B.H:04

TYPE OF BORING : Rotary Drilling

DATE OF COMMENCEMENT : 23 - 09 - 2023

DATE OF COMPLETION : 24 - 09 - 2023

G.W.L : 0.80m

| Depth below G.L | Soil profile | Description of soil | Thickness of layer | Depth at which samples are collected D.S | Depth at which samples are collected U.D.S | Standard penetration testdata: Depth at which test is conducted | Standard penetration testdata: N-Value | Standard penetration testdata: Relative density/ Consistency |
|---|---|---|---|---|---|---|---|---|
| 0.00 | | Filled Up Soil | 0.50 | 0.50 | | | | |
| 1.00 | | Sandy Silty Clay-SSLC1 ( Whitish Gray ) | 1.80 | | | 1.50 | 9 | Stiff |
| 2.00 | | | | 2.30 | | | | |
| 3.00 | | Sandy Silty Clay-SSLC2 ( Yellowish Brown Whitish Gray ) | 1.70 | | | 3.00 | 28 | Very Stiff |
| 4.00 | | | | 4.00 | | | | |
| 5.00 | | Silty Clayey Gravelly Sand-SLCGS1 ( Yellowish Brown Whitish Gray ) | 3.00 | | | 4.50 | >100 | Very Dense |
| 6.00 | | | | | | 6.00 | >100 | Very Dense |
| 7.00 | | | | 7.00 | | | | |
| 8.00 | | Sandy Gravel-SG1 ( Disintegrated Rock ) ( Brown Gray ) | | | | 7.50 | >100 | Very Dense |
| 9.00 | | | | | | 9.00 | >100 | Very Dense |
| 10.00 | | | | | | | | |

Graphical representation of penetration resistance: 10 20 30 40 50

Remark: All Dimensions in meters

→ End of Boring

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FIG: 5

# BORE LOG

PROJECT : Proposed Building at Survey No. 157/13, 158/5, Pudupakkam Village, Vandalur Taluk, Chengalpattu District.

BORE HOLE NO : B.H:05

TYPE OF BORING : Rotary Drilling

DATE OF COMMENCEMENT : 24 - 09 - 2023

DATE OF COMPLETION : 24 - 09 - 2023

G.W.L : 0.80m

| Depth below G.L | Soil profile | Description of soil | Thickness of layer | Depth at witch samples are collected D.S | Depth at witch samples are collected U.D.S | Standard penetration testdata: Depth at witch test is conducted | Standard penetration testdata: N-Value | Standard penetration testdata: Relativet density/ Consistency | Graphical representation of penetration resistance |
|---|---|---|---|---|---|---|---|---|---|
| 0.00 | | Filled Up Soil | 0.60 | 0.60 | | | | | |
| 1.00 | | Sandy Silty Clay-SSLC1 ( Whitish Gray ) | 2.10 | 2.70 | | 1.50 | 8 | Medium Stiff | |
| 3.00 | | Sandy Silty Clay-SSLC2 ( Yellowish Brown Whitish Gray ) | 1.20 | 3.90 | | 3.00 | 23 | Medium Dense | |
| 4.00 | | Clayey Silty Gravelly Sand-CSLGS1 ( Whitish Gray Yellowish Brown ) | 2.70 | 6.60 | | 4.50 | >100 | Very Dense | |
| 6.00 | | | | | | 6.00 | >100 | Very Dense | |
| 7.00 | | Sandy Gravel-SG1 ( Disintegrated Rock ) ( Whitish Gray Brown ) | | | | 7.50 | >100 | Very Dense | |
| 8.00 | | | | | | 8.00 | >100 | Very Dense | |
| 9.00 | | | | | | | | | |
| 10.00 | | | | | | | | | |

Graphical representation of penetration resistance: 10 20 30 40 50

Remark: All Dimensions in meters

End of Boring

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FIG: 6

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Project: Proposed Building at Survey No. 157/13, 158/5, Pudupakkam Village, Vandalur Taluk, Chengalpattu District.

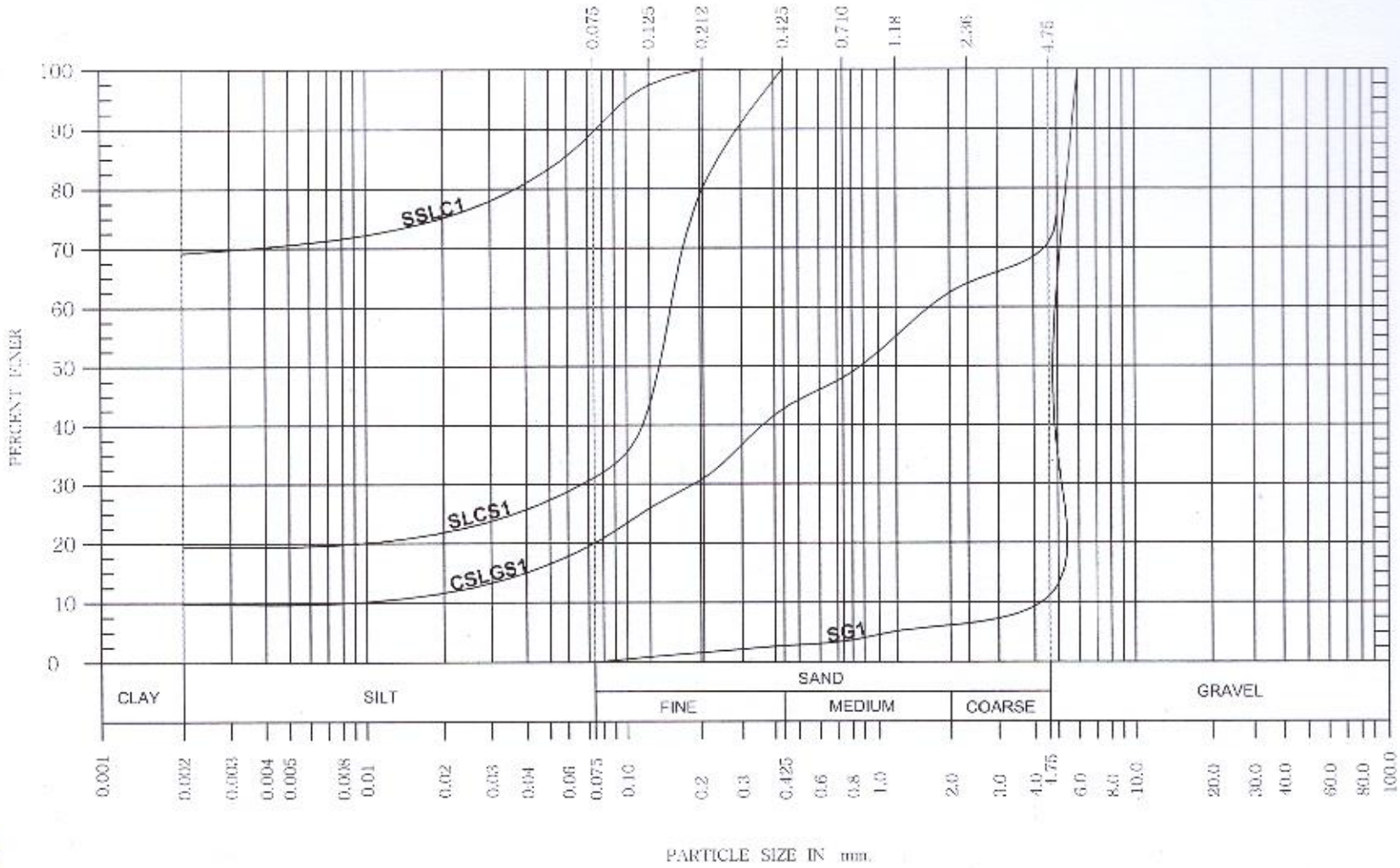



FIG. 7 GRAIN SIZE DISTRIBUTION CURVE-BH-01

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Project: Proposed Building at Survey No. 157/13, 158/5, Pudupakkam Village, Vandalur Taluk, Chengalpattu District.

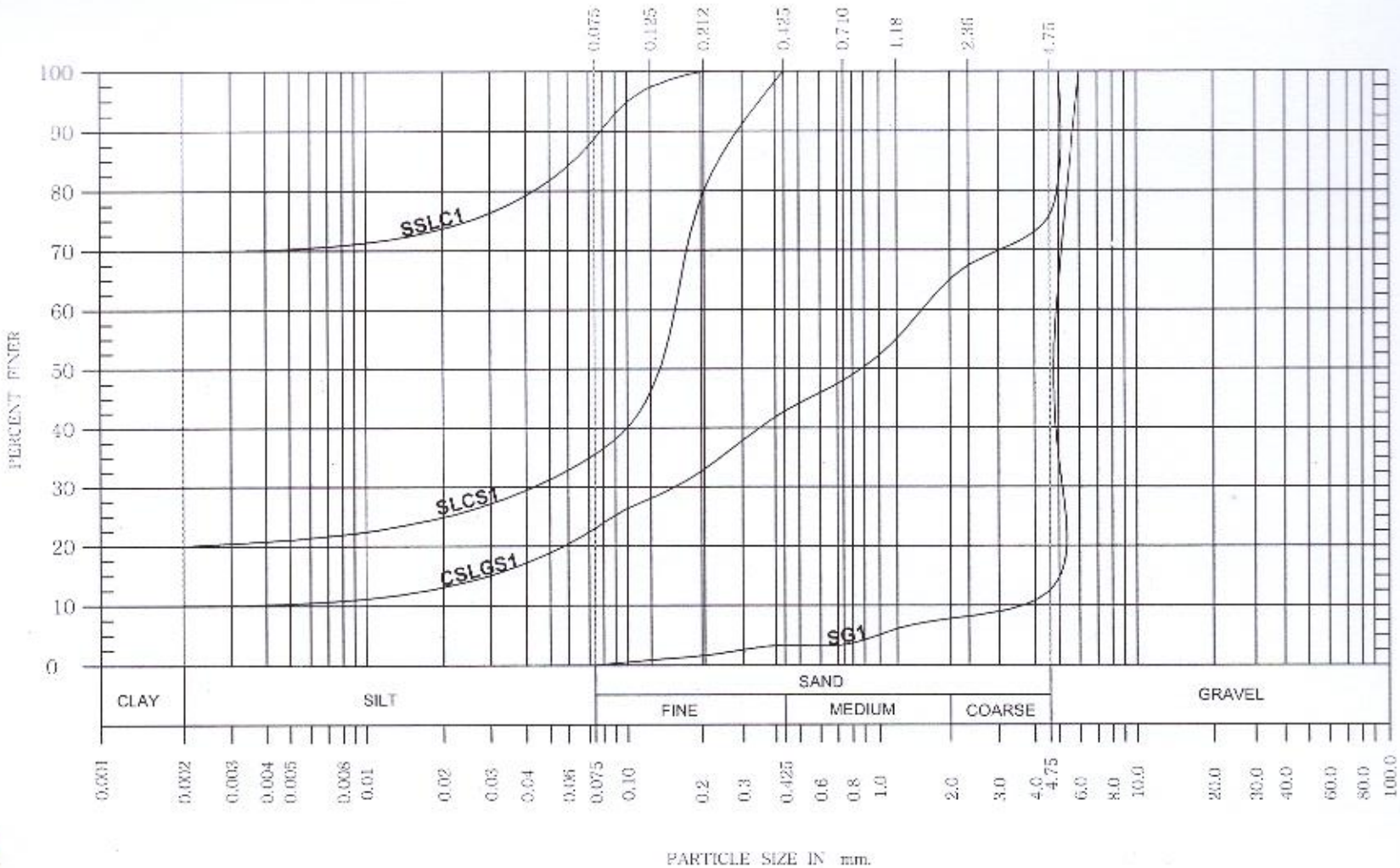



FIG. 8 GRAIN SIZE DISTRIBUTION CURVE-BH-02

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Project: Proposed Building at Survey No. 157/13, 158/5, Pudupakkam Village, Vandalur Taluk, Chengalpattu District.

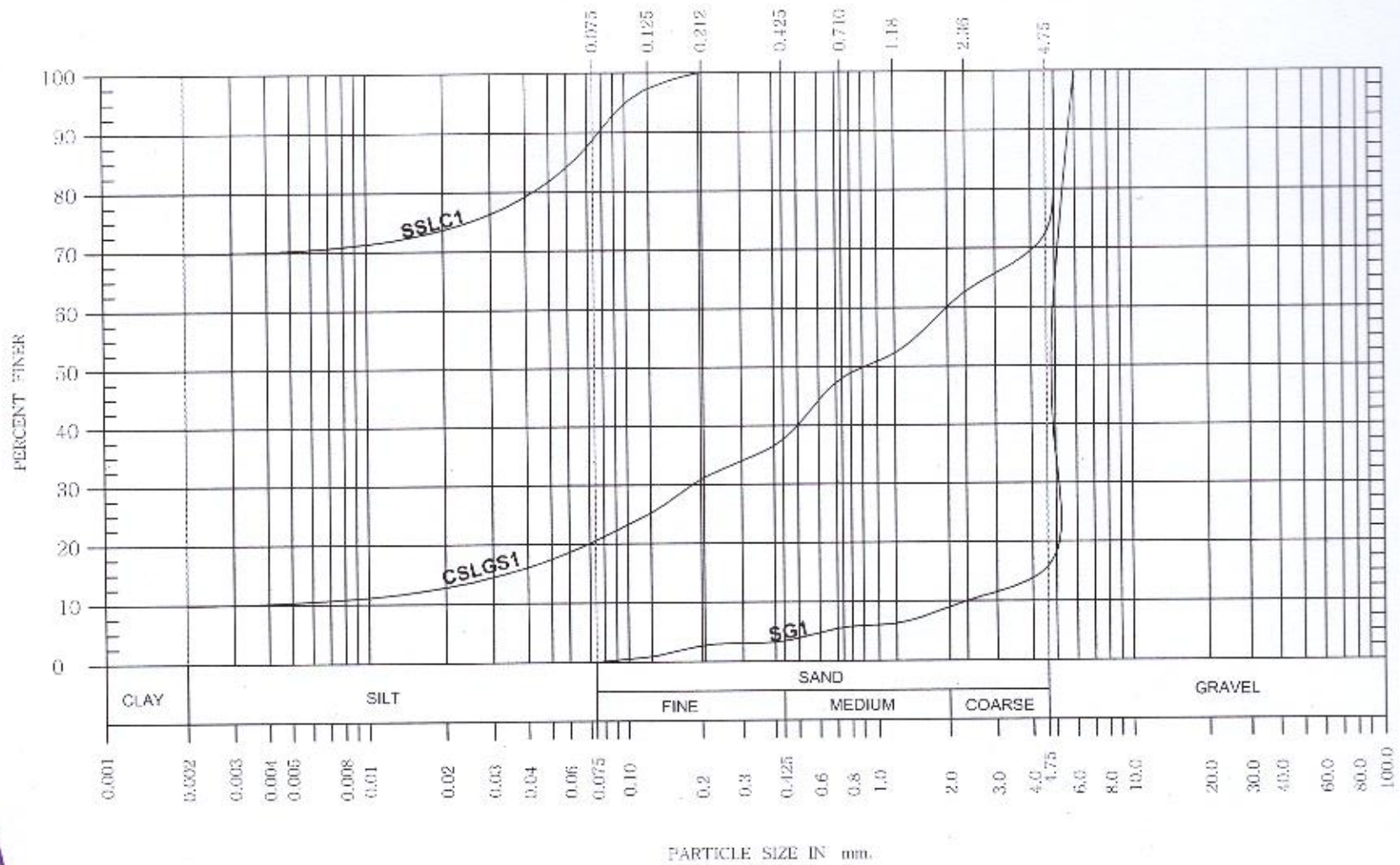



FIG. 9 GRAIN SIZE DISTRIBUTION CURVE-BH-03

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T.J. ENGINEERS

Project: Proposed Building at Survey No. 157/13, 158/5, Pudupakkam Village, Vandalur Taluk, Chengalpattu District.

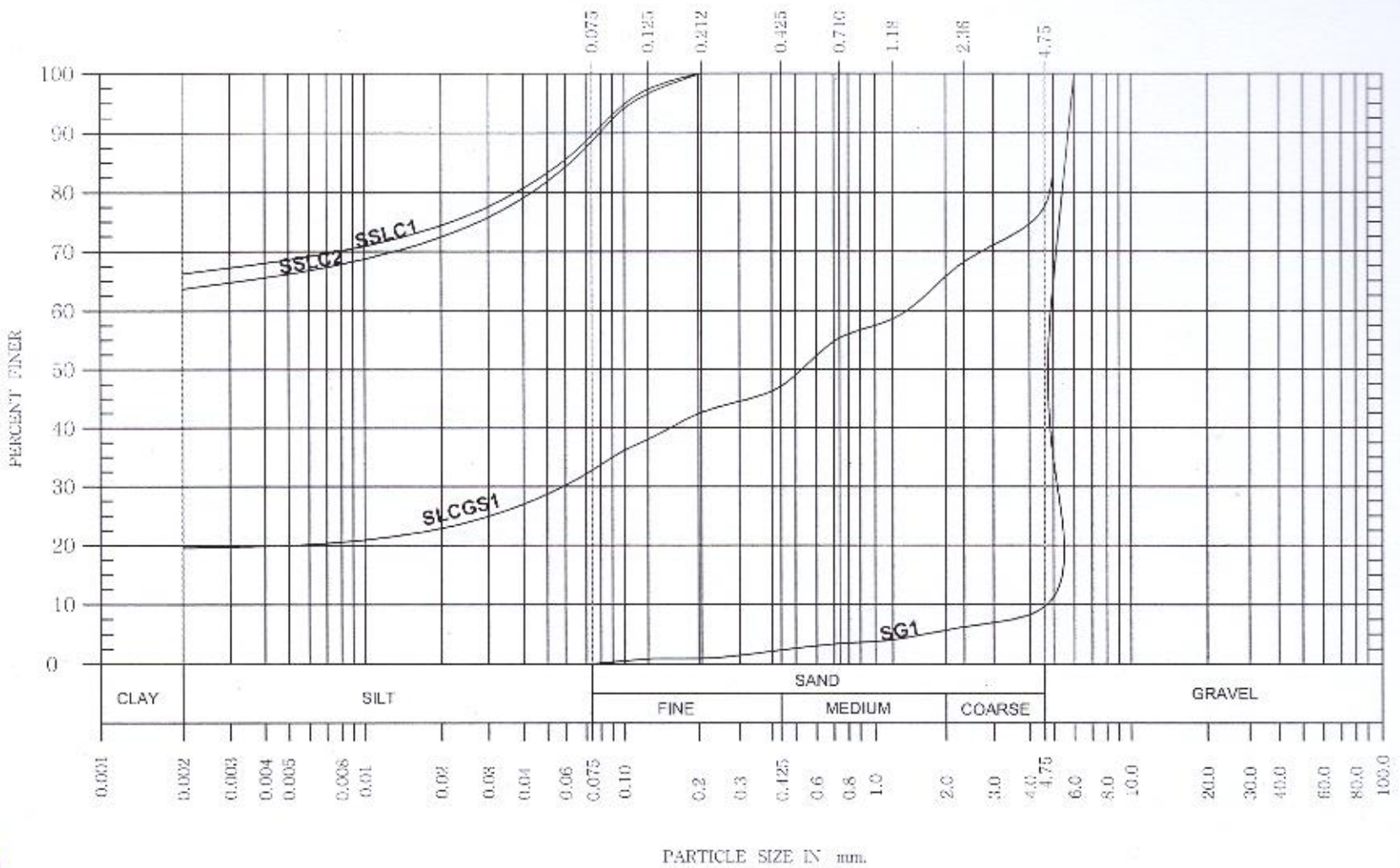



FIG. 10 GRAIN SIZE DISTRIBUTION CURVE-BH-04

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T.J. ENGINEERS

Project: Proposed Building at Survey No. 157/13, 158/5, Pudupakkam Village, Vandalur Taluk, Chengalpattu District.

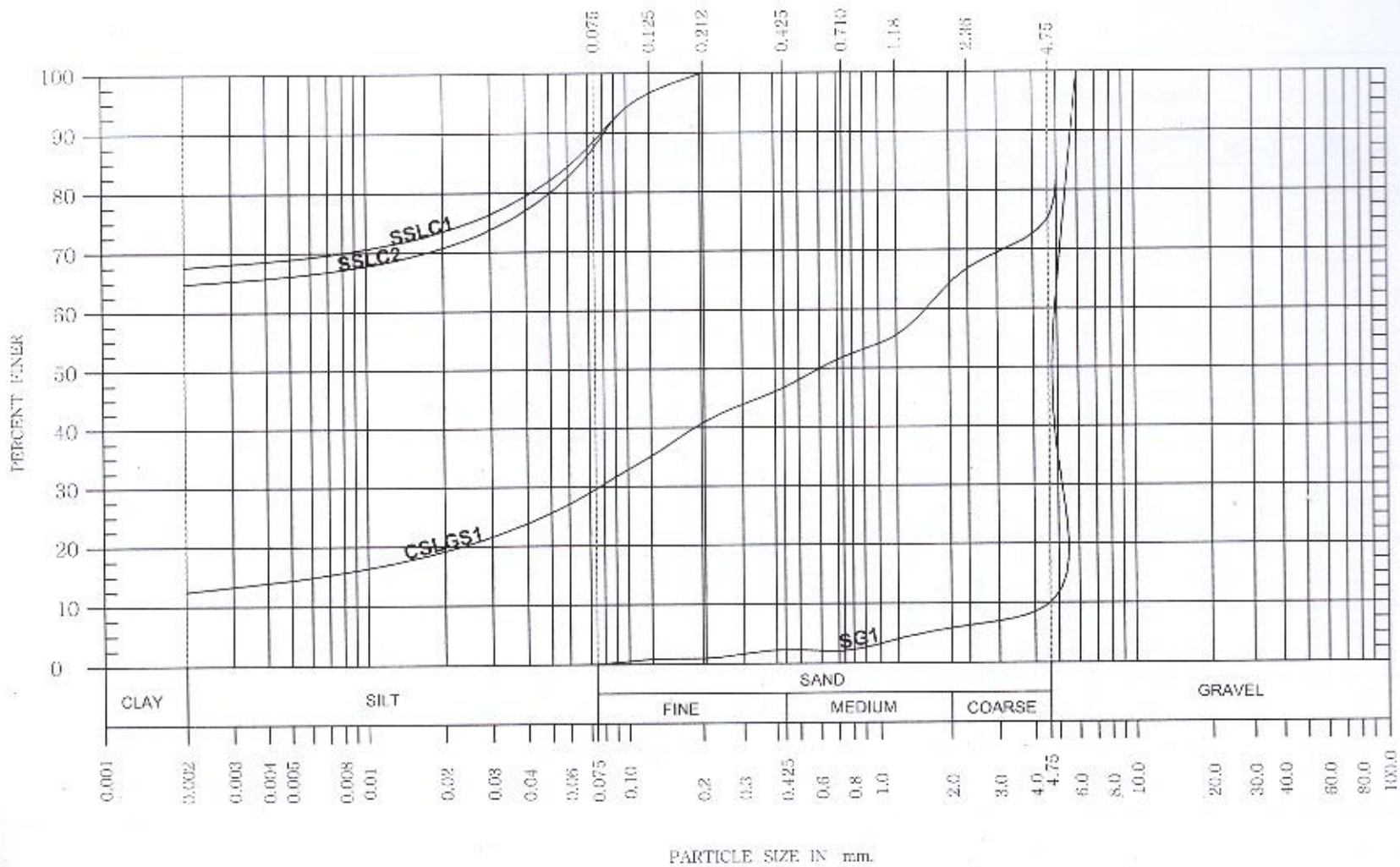



FIG. 11 GRAIN SIZE DISTRIBUTION CURVE-BH-05

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# LABORATARY TEST RESULTS

## TABLE-1a

| B.H No | Layer thickness | Soil classification | Depth of sample collected | | SP. gravity | %of free swell | Grain size distribution | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | DS / SPT | UDS | | | Clay | Silt | Sand | Gravel | |
| | m | | m | m | | % | % | % | % | % | |
| 1 | 0.00 - 0.50 | Filled Up Soil | – | – | – | – | – | – | – | – | – |
| | 0.50 - 2.60 | Sandy Silty Clay-SSLC1 | 1.50 | – | 2.67 | 36 | 68 | 21 | 11 | 0 | – |
| | 2.60 - 5.50 | Silty Clayey Sand-SLCS1 | 3.00 | – | 2.65 | – | 18 | 14 | 68 | 0 | – |
| | 5.50 - 7.00 | Clayey Silty Gravelly Sand-CSLGS1 | 6.00 | – | 2.64 | – | 9 | 11 | 51 | 29 | – |
| | 7.00 - 8.00 | Sandy Gravel-SG1 | 8.00 | – | 2.63 | – | 0 | 0 | 12 | 88 | – |
| 2 | 0.00 - 0.80 | Filled Up Soil | – | – | – | – | – | – | – | – | – |
| | 0.80 - 2.30 | Sandy Silty Clay-SSLC1 | 1.50 | – | 2.67 | 37 | 69 | 19 | 12 | 0 | – |
| | 2.30 - 5.10 | Silty Clayey Sand-SLCS1 | 3.00 | – | 2.65 | – | 20 | 16 | 64 | 0 | – |
| | 5.10 - 7.10 | Clayey Silty Gravelly Sand-CSLGS1 | 6.00 | – | 2.64 | – | 10 | 13 | 53 | 24 | – |
| | 7.10 - 8.00 | Sandy Gravel-SG1 | 8.00 | – | 2.63 | – | 0 | 0 | 13 | 87 | – |

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# LABORATARY TEST RESULTS

TABLE-1b

| B.H No | Layer thickness | Soil classification | Depth of sample collected | | SP. gravity | %of free swell | Grain size distribution | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | DS / SPT | UDS | | | Clay | Silt | Sand | Gravel | |
| | m | | m | m | | % | % | % | % | % | |
| 3 | 0.00 - 0.70 | Filled Up Soil | – | – | – | – | – | – | – | – | – |
| | 0.70 - 2.60 | Sandy Silty Clay-SSLC1 | 1.50 | – | 2.67 | 35 | 67 | 23 | 10 | 0 | – |
| | 2.60 - 7.20 | Clayey Silty Gravelly Sand-CSLGS1 | 3.00 | – | 2.64 | – | 9 | 11 | 52 | 28 | – |
| | 7.20 - 9.00 | Sandy Gravel-SG1 | 9.00 | – | 2.63 | – | 0 | 0 | 15 | 85 | – |
| 4 | 0.00 - 0.50 | Filled Up Soil | – | – | – | – | – | – | – | – | – |
| | 0.50 - 2.30 | Sandy Silty Clay-SSLC1 | 1.50 | – | 2.67 | 35 | 66 | 23 | 11 | 0 | – |
| | 2.30 - 4.00 | Sandy Silty Clay-SSLC2 | 3.00 | – | 2.66 | 31 | 64 | 24 | 12 | 0 | – |
| | 4.00 - 7.00 | Silty Clayey Gravelly Sand-SLCGS1 | 4.50 | – | 2.64 | – | 19 | 14 | 44 | 23 | – |
| | 7.00 - 9.00 | Sandy Gravel-SG1 | 9.00 | – | 2.63 | – | 0 | 0 | 9 | 91 | – |

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# LABORATARY TEST RESULTS

TABLE-1c

| B.H No | Layer thickness | Soil classification | Depth of sample collected | | SP. gravity | %of free swell | Grain size distribution | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | DS / SPT | UDS | | | Clay | Silt | Sand | Gravel | |
| | m | | m | m | | % | % | % | % | % | |
| 5 | 0.00 - 0.60 | Filled Up Soil | – | – | – | – | – | – | – | – | – |
| | 0.60 - 2.70 | Sandy Silty Clay-SSLC1 | 1.50 | – | 2.67 | 36 | 67 | 21 | 12 | 0 | – |
| | 2.70 - 3.90 | Sandy Silty Clay-SSLC2 | 3.00 | – | 2.65 | 32 | 65 | 22 | 13 | 0 | – |
| | 3.90 - 6.60 | Clayey Silty Gravelly Sand-CSLGS1 | 4.50 | – | 2.64 | – | 13 | 16 | 47 | 24 | – |
| | 6.60 - 8.00 | Sandy Gravel-SG1 | 8.00 | – | 2.63 | – | 0 | 0 | 10 | 90 | – |

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# LABORATARY TEST RESULTS

TABLE -2a

| B.H No | Layer thickness | Soil classification | Depth of sample collected | | LL | PL | Bulk density | Consolidation Parameters | | Shear Strength Parmeters | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | DS / SPT | UDS | | | | $e_o$ | Cc | Cu | Ø | |
| | m | | m | m | % | % | t/m³ | | | t/m² | degree | |
| 1 | 0.00 - 0.50 | Filled Up Soil | – | – | – | – | – | – | – | – | – | – |
| | 0.50 - 2.60 | Sandy Silty Clay-SSLC1 | 1.50 | – | 67 | 24 | 1.50 | 1.75 | 0.33 | 3.57 | – | – |
| | 2.60 - 5.50 | Silty Clayey Sand-SLCS1 | 3.00 | – | – | – | 1.56 | – | – | – | 35 | – |
| | 5.50 - 7.00 | Clayey Silty Gravelly Sand-CSLGS1 | 6.00 | – | – | – | 1.58 | – | – | – | 38 | – |
| | 7.00 - 8.00 | Sandy Gravel-SG1 | 8.00 | – | – | – | 1.62 | – | – | – | 42 | – |
| 2 | 0.00 - 0.80 | Filled Up Soil | – | – | – | – | – | – | – | – | – | – |
| | 0.80 - 2.30 | Sandy Silty Clay-SSLC1 | 1.50 | – | 68 | 25 | 1.51 | 1.60 | 0.30 | 5.61 | – | – |
| | 2.30 - 5.10 | Silty Clayey Sand-SLCS1 | 3.00 | – | – | – | 1.55 | – | – | – | 34 | – |
| | 5.10 - 7.10 | Clayey Silty Gravelly Sand-CSLGS1 | 6.00 | – | – | – | 1.58 | – | – | – | 38 | – |
| | 7.10 - 8.00 | Sandy Gravel-SG1 | 8.00 | – | – | – | 1.62 | – | – | – | 42 | – |

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# LABORATARY TEST RESULTS

TABLE -2b

| B.H No | Layer thickness | Soil classification | Depth of sample collected | | LL | PL | Bulk density | Consolidation Parameters | | Shear Strength Parmeters | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | DS / SPT | UDS | | | | $e_o$ | Cc | Cu | Ø | |
| | m | | m | m | % | % | t/m$^3$ | | | t/m$^2$ | degree | |
| 3 | 0.00 - 0.70 | Filled Up Soil | – | – | – | – | – | – | – | – | – | – |
| | 0.70 - 2.60 | Sandy Silty Clay-SSLC1 | 1.50 | – | 65 | 24 | 1.50 | 1.73 | 0.33 | 4.10 | – | – |
| | 2.60 - 7.20 | Clayey Silty Gravelly Sand-CSLGS1 | 3.00 | – | – | – | 1.57 | – | – | – | 36 | – |
| | 7.20 - 9.00 | Sandy Gravel-SG1 | 9.00 | – | – | – | 1.62 | – | – | – | 42 | – |
| 4 | 0.00 - 0.50 | Filled Up Soil | – | – | – | – | – | – | – | – | – | – |
| | 0.50 - 2.30 | Sandy Silty Clay-SSLC1 | 1.50 | – | 65 | 23 | 1.51 | 1.65 | 0.32 | 4.59 | – | – |
| | 2.30 - 4.00 | Sandy Silty Clay-SSLC2 | 3.00 | – | 62 | 21 | 1.54 | 1.00 | 0.22 | 8.51 | – | – |
| | 4.00 - 7.00 | Silty Clayey Gravelly Sand-SLCGS1 | 4.50 | – | – | – | 1.57 | – | – | – | 37 | – |
| | 7.00 - 9.00 | Sandy Gravel-SG1 | 9.00 | – | – | – | 1.62 | – | – | – | 42 | – |



# LABORATARY TEST RESULTS

TABLE -2c

| B.H No | Layer thickness | Soil classification | Depth of sample collected | | LL | PL | Bulk density | Consolidation Parameters | | Shear Strength Parmeters | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | DS / SPT | UDS | | | | $e_o$ | Cc | Cu | ∅ | |
| | m | | m | m | % | % | t/m³ | | | t/m² | degree | |
| 5 | 0.00 - 0.60 | Filled Up Soil | – | – | – | – | – | – | – | – | – | – |
| | 0.60 - 2.70 | Sandy Silty Clay-SSLC1 | 1.50 | – | 66 | 24 | 1.51 | 1.73 | 0.33 | 4.10 | – | – |
| | 2.70 - 3.90 | Sandy Silty Clay-SSLC2 | 3.00 | – | 63 | 22 | 1.54 | 1.00 | 0.22 | 7.34 | – | – |
| | 3.90 - 6.60 | Clayey Silty Gravelly Sand-CSLGS1 | 4.50 | – | – | – | 1.58 | – | – | – | 38 | – |
| | 6.60 - 8.00 | Sandy Gravel-SG1 | 8.00 | – | – | – | 1.62 | – | – | – | 42 | – |

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