



GEO-ENGINEERING SERVICES GEOLOGICAL CONSULTANTS

C-303, Matrusri Apartments Hyderguda Hyderabad- 500 029

Office: 23241852; 66824060 Res: 27860371

Our Work Order Ref. No: 9455/SI//MYLGD/NLG/TS

Dt.02.06.2017

Work Order Subject: Soil Investigations carried out at the Site Proposed for

Construction of Simplex & Duplex Villas 'AVR Gulmohar
Homes' at Miryalaguda, Nalgonda, T.S

To,
M/s.Modi Properties Pvt.Ltd
Off: 5-4-187/3&4, IInd Floor
Secunderabad-500003
Site : Sy.No.786, 'AVR Gulmohar Homes'
Miryalaguda, Nalgonda (Dt), T.S

INVOICE NO: 6528/SI/2017

DATE : 07.06.2017.

A/C CODE : SI

S.No.	PARTICULARS	Unit	Rate Rs.	Quantity	Amount Rs
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Soil Investigations carried out at the site
Proposed for construction of Simplex & Duplex
Villas, Situated at Sy.No. 786, Miryalaguda,
Nalgonda (Dt), T.S
in an extent of about 6.5 Acres.
& Submission of Report with
Recommendations on SBC for the
Proposed structures

Per Site 25,000/- L.S 25,000=00

TOTAL : 25,000=00

RUPEES IN WORDS: (TWENTY FIVE THOUSAND ONLY)

E. & O.E.

for **GEOENGINEERING SERVICES**

Cheques may be drawn payable
A/c. Payee to Geo-Engineering Services.

B. Lakshmi
Accountant.

Bank Details:

Name. Geo Engineering Services, Bank. Syndicate Bank, Door No.5-9-57/1, Basheer Bagh,
Hyderabad-500029. Account number 30041210000156 IFSC. SYNB0003004 A/c Type. ODD



GEO – ENGINEERING SERVICES

Geo – Technical Consultants

C- 303, Matrusri Apartments, Hyderguda, Hyderabad – 500 029.

Phone: Off. Hours: 23241852, 66824060, After Off. Hours: 27860371

(Approved by Municipal Corporation of Hyderabad. Vide Lr.No. 2499/TP/TP5/MCH/2000-2, dt.14.3.2000)

Report No: 9455/MYLGD/NLG/TS/17

Date: 07.06.2017

A REPORT ON THE SOIL INVESTIGATIONS CARRIED TO
M/S.MODI PROPERTIES PRIVATE LIMITED, AT THE
SITE PROPOSED FOR CONSTRUCTION OF SIMPLEX & DUPLEX VILLAS,
SITUATED AT SY.NO.786, MIRYALAGUDA,NALGONDA DISTRICT,T.S.

1. INTRODUCTION :

M/s.Modi Properties Private Limited, Head Off: 5-4-187/3&4,M.G.Road, Secunderabad-03, are proposing to construct Residential Simplex & Duplex Villas in Sy.No.786 with the name of " AVR Gulmohar Homes, situated at Miryalaguda,Nalgonda District,T.S, in an extent of 6.5 Acres .

In this connection, Sri.Karna Mehta-Director, M/s. Modi Properties Private Limited has requested M/s. Geo-Engineering Services, Hyderabad to carryout Geo-Technical Investigations at the above site for the proposed structures.

This report furnishes the recommendations of the Safe Bearing Capacity, based on the results obtained out of field & Laboratory tests on the collected soil samples and to find out soil engineering properties.

Fig.1 shows the site plan.

The aim of this report is to evaluate the nature and depth of the soils and strata at the site, and to determine the safe bearing capacity of the foundations,

2. FIELD INVESTIGATIONS:

In total Eight soil samples were collected from the trial pits excavated by using excavator (JCB). The soil samples were collected from the bottom of the pits, packed, labelled and transported to the soil investigation lab at Hyderabad for further investigations. All locations are shown in Fig.1. This is adequate in accordance with IS: 1892-1979 (Code of Practice for Subsurface Investigation of Foundations). Fig.2 gives Logs of Trial Pits.

Generally at TP-1, due Southeast of Villa.No.2, the sub-soil consists of Black Clayey Soil up to 0.2m followed by Red Gravelly Soil with clay up to 1.0m, followed by Hard Disintegrated Rock (HDR) till 1.30m and further underlain by Hard Disintegrated Rock with water till 1.65m below ground level. Water is found at a depth of 1.3m below ground level.

At TP-2, due Northeast of Villa.No.25, the sub-soil consists of Black Clayey Soil up to 0.1m followed by Red Gravelly Soil up to 0.9m, followed by Soft Disintegrated Rock (SDR) till 1.20m followed by Hard Disintegrated Rock till 1.50m and further underlain by weathered Rock with water till 1.7m below ground level. Water is found at a depth of 1.5m below ground level.

At TP-3, due Center of Villa.No.25, the sub-soil consists of Black Clayey Soil up to 0.1m followed by Red Gravelly Soil up to 0.4m, followed by Soft Disintegrated Rock with boulders till 0.9m followed by Hard Disintegrated Rock till 1.20m and

further underlain by Hard Disintegrated Rock with water till 1.6m below ground level. Water is found at a depth of 1.2m below ground level.

At TP- 4, due Southeast of Villa.No.34, the sub-soil consists of Black Clayey Soil up to 0.1m followed by Red Gravelly Soil with clay up to 1.1m, followed by Soft Disintegrated Rock (SDR) with clay and water till 1.9m underlain by Hard Disintegrated Rock with water. Water is found at a depth of 1.1m below ground level.

At TP-5, due North of Villa.No.34, the sub-soil consists of Black Clayey Soil up to 0.1m followed by Red Gravelly Soil with up to 1.0m, followed by Hard Disintegrated Rock (HDR) till 1.5m underlain by weathered Rock with water till 1.8m bgl. Water is found at a depth of 1.5m below ground level.

At TP-6, due Northeast of Villa.No.57, the sub-soil consists of Black Clayey Soil up to 0.7m followed by Red Gravelly Soil with up to 1.5m, followed by Soft Disintegrated Rock (SDR) with water till 1.9mbgl. Water is found at a depth of 1.5m below ground level.

At TP- 7, due North of Club House, the sub-soil consists of Black Clayey Soil up to 0.1m followed by Gravelly clayey Soil up to 1.1m, followed by Soft Disintegrated Rock (SDR) with clay till 2.1m underlain by Hard Disintegrated

Rock with water up to 2.5m bgl. Water is found at a depth of 2.1m below ground level.

At TP- 8, due Southwest of Club House, the sub-soil consists of Black Clayey Soil up to 0.1m followed by Gravelly Soil up to 0.9m, followed by Hard Disintegrated Rock (HDR) 1.2m and further underlain by Hard Disintegrated Rock with water till 1.4mbgl water is found at a depth of 1.2m below ground level.

3. LABORATORY TESTING:

The samples were tested at soil testing laboratory at Hyderabad. The following Engineering tests were conducted.

- * Specific Gravity
- * Grain Size Distribution
- * Direct Shear Test.
- * Bulk Density

(All the tests were conducted in accordance with IS: 2720(Methods of Tests for Soils)

4. RESULTS:

It is seen that the soil at the site, at significant depth, generally consists of soft and hard morum (Soft & Hard Disintegrated Rock) In accordance with IS: 1498 – 1970 (Soil Classification), morum is designated as GM - SM (Silty gravelly, Poorly graded gravel - Sand- Silt mixture/silty sand) .

Table-1 gives the soil properties. Appendix gives the calculations for SBC.

5. CONCLUSIONS & RECOMMENDATIONS:

Based on Field Investigations and Laboratory Testing, the following conclusions are drawn:

- 1) The sub soil consists of Black Clay & Red Gravelly soil followed by Soft / Hard disintegrated rock and weathered Rock with Water.
- 2) Water is found in all the trial pits.
- 3) Open foundations are recommended. Isolated and combined footings are recommended depending upon the requirement of super structure.
- 4) **SBC** is as follows:

TRIAL PIT.NO.	LOCATION	DEPTH OF FOUNDATION IN Mts	SBC T/Sq m (Under Water Logged Conditions)	Formation
1	Southeast of Villa No.2	1.5m below Ground Level	30	Hard Disintegrated Rock (HDR) with Water
2	Northeast of Villa.No.25	1.5m below Ground Level	40	Weathered Rock (WR) with Water
3	Centre of Villa No.25	1.5m below Ground Level	35	Hard Disintegrated Rock (HDR) with Water
4	Southeast of Villa No.34	2.0m below Ground Level	35	Hard Disintegrated Rock (HDR) with Water
5	North of Villa No.34	1.5m below Ground Level	40	Weathered Rock (WR) with Water

TRIAL PIT.NO.	LOCATION	DEPTH OF FOUNDATION IN Mts	SBC T/Sq m (Under Water Logged Conditions)	Formation
6	Northeast of Villa No.57	2.0m below Ground Level	25	Soft Disintegrated Rock (SDR) with Water
7	North of Club House	2.5m below Ground Level	30	Hard Disintegrated Rock (HDR) with Water
8	Southwest of Club House	1.5m below Ground Level	35	Hard Disintegrated Rock (HDR) with Water

5).The **Safe Bearing Capacity** is recommended as **250 kN/Sq m or 25 Tonnes/ Sq.m** for the foundations resting on Soft Disintegrated Rock (SDR) with water, **300 kN/Sq m & 350 kN/Sq or 30 & 35Tonnes/ Sq.m** for the foundations resting on Hard Disintegrated Rock (HDR) with water & **400 kN/Sq m or 40Tonnes/ Sq.m** for the foundations resting on Weathered Rock (WR) with water.

6). The above recommendation is based on the isolated square footings, resting on dense hard morum, of size **2.0 x 2.0m** at a depth of **1.5m, 2.0m and 2.5m below Ground level**. The actual size will be based on the loads from the super structure.

7). It is recommended that every foundation base be examined by competent engineer before placement of PCC bed.

8). All Concreting should be done under dry conditions.

9). All foundation pits should be filled back with well-compacted morum/gravel .

10). Avoid resting of foundation in loose soil or isolated rock boulder.

11). Adequate anchors of minimum 25mm should be embedded into the rocky strata, if occurs. The anchor holes shall be filled back by cement grouting.

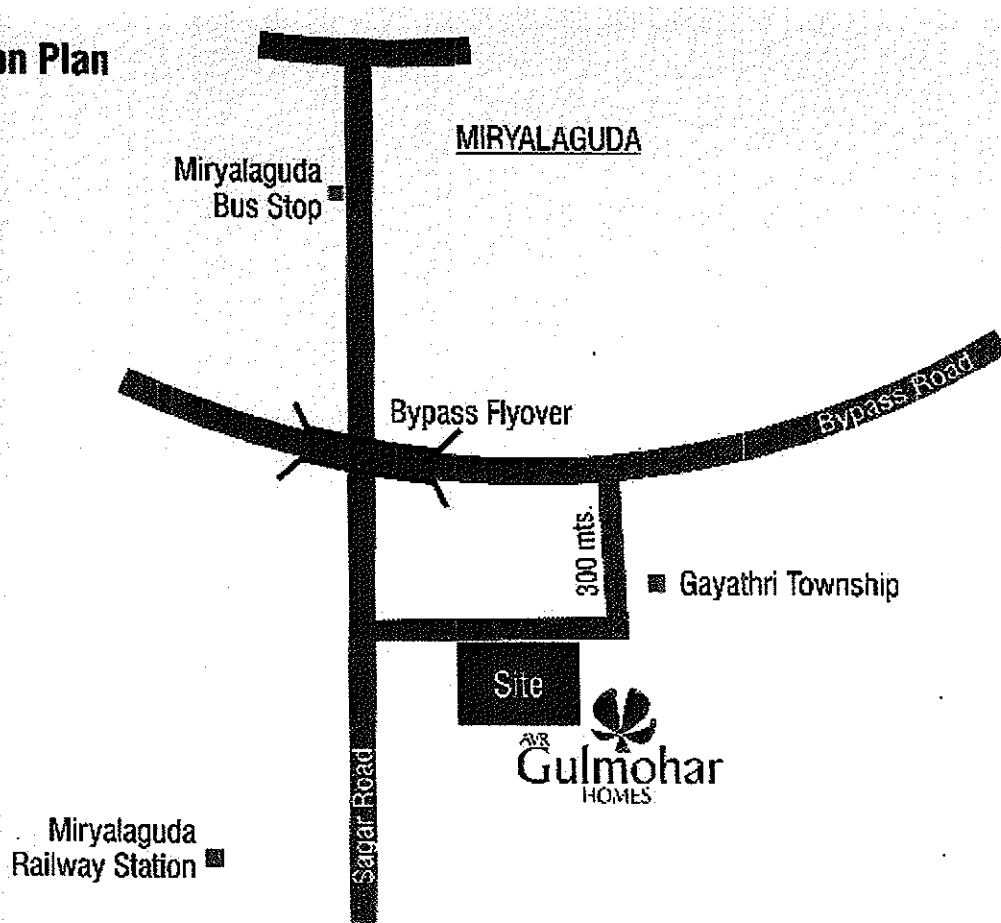
for GEO ENGINEERING SERVICES



(D.PRABHAKAR)
DIRECTOR (TECHNICAL)

Director (Technical)
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Location Plan



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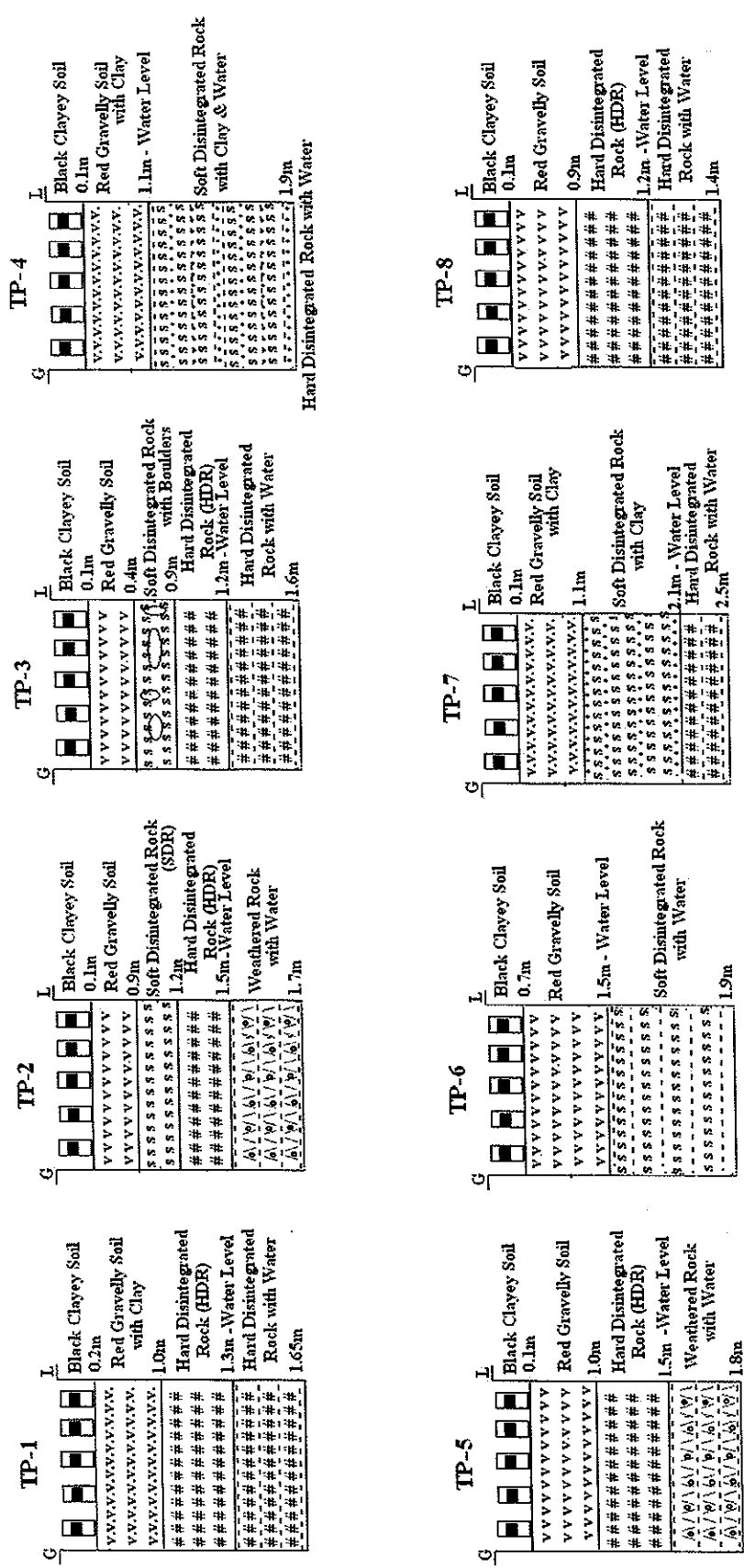


Fig.2: Logs of Trial Pits

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APPENDIX

CALCULATION OF SAFE BEARING CAPACITY

MIRYALAGUDA , NALGONDA DISTRICT, T.S.

Trial Pit.No.1 (Southeast of Villa.No.2)

Assumed depth of foundation 'D' = 1.5m below ground level.

Assumed width of foundation 'B' = 2.0m x 2.0m

Cohesion = 'C' = 0.45 Kg/Sq.Cm (Neglected).

Water Table correction is required.

Under water logged conditions.

Angle of shear resistance = ϕ = 32deg.

Bearing Capacity Factors for ϕ = 32 deg.

$N_c' = 27.2$; $N_q' = 16.2$; $N_y' = 19.0$

Factor of Safety , F.S = 3.0

Bulk Unit Weight of Trial Pit soil = $\gamma = 1.95\text{gm / cc}$

$$q_s = \frac{1}{F} (C N_c' + \gamma D (N_q' - 1) + 0.5 \gamma B N_y') + \gamma D$$

$$= 1/3 (44.46 + 37.05) + 2.92$$

$$= 27.06 + 2.92 = 30.08$$

Net Safe bearing capacity = 30 Tonnes/Sq m

Adopt $q_s = 300 \text{ kN per sq m OR } 30 \text{ T/ sq.m.}$


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Trial Pit.No.2 & 5 (Northeast of Villa.No.25 & North of Villa.No.34)

Assumed value of $N = 30$

Assumed depth of foundation = 1.5m below ground level

Assumed size of footing = 2.0m x 2.0m

a). Shear Criterion:

Allowable bearing capacity with a F.S of 3.0 is:

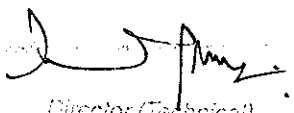
$$q = 1/18 (3N^2 B R_r + 5 (100 + N^2) D R_d)$$
$$= 715.66 \text{ kN per sq. M}$$

b). Settlement Criterion:

For a permissible settlement of 40mm, according to IS: Code,

$$q = 12.25 N (B + 0.3) / B R_r R_d$$
$$= 422.62 \text{ kN per sq.m}$$

Adopt $q_s = 422.62 \text{ kN per sq m OR } 40 \text{ T/ sq.m.}$


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Trial Pit.No.3 & 8 (Center of Villa.No.25 & Southwest of Club House)

Assumed depth of foundation 'D' = 1.5m below ground level.

Assumed width of foundation 'B' = 2.0m x 2.0m

Cohesion = 'C' = Nil (Assuming the hard morum strata as non cohesive in nature)

Water Table correction is required.

Under Waterlogged conditions.

Angle of shear resistance = $\phi = 33$ deg.

Bearing Capacity Factors for $\phi = 33$ deg.

$N_c' = 31.3$; $N_q' = 20.1$; $N_y' = 24.6$

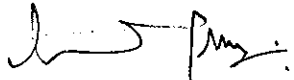
Factor of Safety , F.S = 3.0

Bulk Unit Weight of Trial Pit soil = $\gamma = 2.00$ gm / cc

$$q_s = \frac{1}{F} (C N_c' + \gamma D (N_q' - 1) + 0.5 \gamma B N_y') + \gamma D$$

$$\frac{1}{3.0} (106.5) + 3.0 = 38.50 \text{ or } 35 \text{ Tonnes/Sq.m}$$

Adopt $q_s = 385.0$ kN per sq m OR 35 T/ sq.m.


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Trial pit.No.6 (Northeast of Villa.No.57)

Assumed depth of foundation 'D' = 2.0m below ground level.

Assumed width of foundation 'B' = 2.0m x 2.0m

Cohesion = 'C' = 0.45 Kg/Sq.Cm (Neglected).

Water Table correction is required.

Under water logged conditions.

Angle of shear resistance = ϕ = 31 deg.

Bearing Capacity Factors for ϕ = 31 deg.

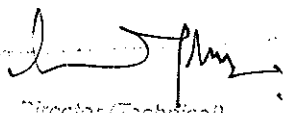
$N_c' = 22.9$; $N_q' = 13.1$; $N_y' = 14.1$

Factor of Safety , F.S = 3.0

Bulk Unit Weight of Trial Pit soil = $\gamma = 1.85$ gm / cc

$$q_s = \frac{1}{F} (C N_c' + \gamma D (N_q' - 1) + 0.5 \gamma B N_y') + \gamma D$$
$$\frac{1}{3.0} (71.65) + 3.7 = 27.58 \text{ or } 25 \text{ Tonnes/Sq.m}$$

Adopt $q_s = 275.8$ kN per sq m OR 25 T/ sq.m.


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Trial pit.No.7 (North of Club House)

Assumed depth of foundation 'D' = 2.5m below ground level.

Assumed width of foundation 'B' = 2.0m x 2.0m

Cohesion = 'C' = Nil (Assuming the hard morum strata as non cohesive in nature)

Water Table correction is required.

Under water logged conditions.

Angle of shear resistance = ϕ = 31 deg.

Bearing Capacity Factors for ϕ = 31 deg.

$N_c' = 22.9$; $N_q' = 13.1$; $N_y' = 14.1$

Factor of Safety , F.S = 3.0

Bulk Unit Weight of Trial Pit soil = $\gamma = 1.95 \text{ gm / cc}$

$$q_s = \frac{1}{F} (C N_c' + \gamma D (N_q' - 1) + 0.5 \gamma B N_y') + \gamma D$$
$$\frac{1}{3.0} (86.47) + 4.87 = 33.67 \text{ or } 30 \text{ Tonnes/Sq.m}$$

Adopt $q_s = 336.7 \text{ kN per sq m OR } 30 \text{ T/ sq.m.}$

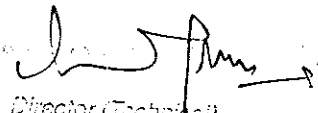

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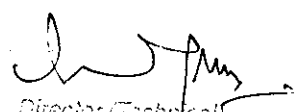
TABLE - 1

SUMMARY OF SOIL PROPERTIES

M/S.MODI PROPERTIES PVT.LTD.

MIRYALAGUDA, NALGONDA DISTRICT, T.S

Property	Trial Pit No.1	Trial Pit No.2	Trial Pit. No.3	Trial Pit No.4	Trial Pit No.5
Soil	GM - SM	GM - WR	GM - SM	GM - SM	GM - WR
Specific gravity	2.25	2.68	2.45	2.71	2.69
Density, gm/cc	1.95	2.15	2.00	2.05	2.20
Gravel >4.75 mm	30	45	31	33	47
Coarse sand 4.75 – 2mm	25	31	26	25	32
Medium sand 2- 0.425mm	18	11	21	23	10
Fine sand, 0.425-0.075mm	15	08	19	15	07
Silt 0.075 – 0.002mm	12	05	03	02	04
Clay < 0.075 mm	10	0	0	02	0
Cohesion, kN/Sq.cm	0.45 (Neglected)	Nil	Nil	0.35 (Neglected)	Nil
Angle of internal friction, Degrees	32	-	33	32	-

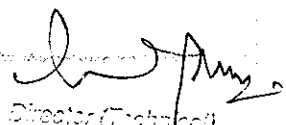

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SUMMARY OF SOIL PROPERTIES

M/S.MODI PROPERTIES PVT.LTD.

MIRYALAGUDA, NALGONDA DISTRICT, T.S

Property	Trial Pit No.6	Trial Pit No.7	Trial Pit. No.8
Soil	GM - SM	GM - SM	GM - SM
Specific gravity	2.20	2.25	2.50
Density, gm/cc	1.85	1.95	2.05
Gravel >4.75 mm	28	32	33
Coarse sand 4.75 – 2mm	24	23	23
Medium sand 2- 0.425mm	15	24	22
Fine sand, 0.425-0.075mm	10	15	19
Silt 0.075 – 0.002mm	12	06	03
Clay < 0.075 mm	11	0	0
Cohesion, kN/Sq.cm	0.45 (Neglected)	Nil	Nil
Angle of internal friction, Degrees	31	31	33


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