

DEPARTMENT OF TECHNICAL EDUCATION

From

The Principal,

Govt. College of Technology,

Coimbatore – 641 013.

To

The District Collector,

The Nilgiris,

Udhagamandalam.

LETTER NO. : PCE/SOIL/Rock & Soil Testing/2022 dated: 06.03.2023

Sir,

Sub: Disaster Management-The Nilgiris District- Rock & Soil Testing in vulnerable zones- Report on Geotechnical and geophysical investigations at New Attuboil and Kuttimani nagar (Nehrukandi)-reg

Ref: 1. Lr.No. : DM/42/2021 dated: 17.05.22
2. Lr No. : DM/42/2021 dated: 22.11.2022
3. Lr.No. : DM/42/2021 dated: 01.12.22

With reference to the above, the report for the testing of rock and soil samples, Borehole soil investigation and Geophysical investigation for the Landslide vulnerable zones at New Attuboil and Kuttimani nagar (Nehrukandi) in Nilgiris district is enclosed herewith. The receipt of the report may please be acknowledged.

Received
DM/42/2021
(CP Rajendran)
9/12/2022
947345384

Encl: i) Report on Geotechnical investigation
ii) Report on Geophysical investigation

o/c
L
06/03/2023

bn at 10/3/23
PRINCIPAL

AT
6/3/23

REPORT ON BOREHOLE SOIL INVESTIGATION FOR THE LANDSLIDE ZONES AT NEW ATTUBOIL AND KUTTIMANI NAGAR IN NILGIRIS DISTRICT

1.0 GENERAL:

The District Collector, Udthagamandalam, Nilgiris district has in his letter no.: DM/42/2021 dated: 22.11.2022, requested for testing of soil samples and preparation of soil investigation report for the landslide zones at New attuboil and Kuttimani nagar (Nehrukandi) in Nilgiris district. The soil investigation was carried out during December 2022 and January 2023 through STRUCTWELL Consultants, under the supervision of the Dept. of Civil Engineering, Coimbatore. The topography of the site is hilly Terrain. After inspection of the site, it was decided to explore the subsurface by drilling 6 boreholes covering the proposed area. The scope of work includes drilling of all the 6 boreholes upto depth ranging between 15.0 m to 25.0m with SPT and DS sampling at every 1.5m. The details required to decide on the depth of foundation, type of foundation and the foundation design parameters are to be obtained from the borehole data.

2.0 METHODOLOGY OF INVESTIGATION

It was decided to make a total of 6 numbers of Boreholes. All the 6 boreholes i.e. BH01-BH06 of diameter 150mm were investigated upto depth ranging from 15 and 25.0m in the entire area proposed for the construction. Boreholes were advanced from the existing ground level using rotary drilling technique supplemented with bentonite mud circulation.

The investigation was planned to obtain the subsurface stratification in the proposed project site and collect soil samples for laboratory testing to determine the engineering properties such as shear strength, along with basic engineering classification of the subsurface stratum to arrive at the foundation design parameters.

2.1 Boreholes

For Geotechnical investigation work, drilling rig was installed at the specified borehole location. Stability of rig was ensured by making level ground. The boreholes were progressed using Rotary Drilling machines and double tube core barrels with diamond bits by Structwell consultants and it is brought to the laboratory for further investigation.

2.2 Standard Penetration Tests (SPT)

Standard Penetration Tests (SPT) was conducted as per IS specifications. SPT split spoon sampler of standard dimensions was driven into the soil from the borehole bottom using 63.5 kg Hammer falling from 75 cm height. The SPT weight was mechanically lifted to the specified height and allowed to fall freely on the anvil with the use of cat-head winch with one to one and half turn of the drum. Blow counts for the penetration of every 15 cm were recorded and the N is reported as the blow counts for 30 cm penetration of the sampler leaving the first 15 cm penetration as seating drive.

When the number of blows exceeded 50 to penetrate the first or second 15 cms length of the sampler, the SPT N is regarded as more than 100. The test is terminated in such case and a record of penetration of the sampler under 50 blows or more is made. SPT refusal is recorded when there is no penetration of the sampler at any stage and also when a rebound of the sounding system is recorded.

SPT 'N' values are correlated with relative density of non-cohesive stratum and with consistency of cohesive stratum.

CORRELATION OF SOIL CONSISTENCY WITH SPT VALUE CORRELATION FOR CLAY/PLASTIC SILT		CORRELATION FOR SAND/NON-PLASTIC SILT	
Soil Consistency	SPT Value	Soil Consistency	SPT Value
Very Soft	0 to 2 Blows	Very loose	0 to 4 Blows
Soft	3 to 4 Blows	Loose	5 to 10 Blows
Medium Stiff	5 to 8 Blows	Medium	11 to 30 Blows
Stiff	9 to 16 Blows	Dense	31 to 50 Blows
Very Stiff	17 to 32 Blows	Very Dense	Above 50
Hard	Above 32		

2.3 Disturbed Sampling (Soil) in boreholes

Disturbed soil collected in the SPT sampler was preserved in polythene covers and transported to the laboratory. One more polythene cover was provided to prevent the loss of moisture during the transit period.

2.4 Rock Core Samples

Drilling was advanced by rotary core drilling method using double tube core barrels as per the guidelines of IS: 6926-1996. A core barrel and Nx sized bits are used for drilling and recovering rock cores. Recovered rock cores were numbered serially and preserved in good quality sturdy wooden core boxes as specified in IS: 4078-1980. Rock core recovery and Rock Quality Designation (RQD) were computed for every run length drilled.

Rock classification in terms of weathering and state of fractures and strength is carried out in the following manner. Tabulations given in below explain it briefly.

Scale of Weathering Grades of Rock Mass (As per IS 4464)			
Terms	Description	Grade	Geologists Interpretation
Fresh	No visible sign of rock material weathering; perhaps slight discoloration on major discontinuity surfaces.	I	CR > 90 %
Slightly Weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discoloured by weathering.	II	CR between 70 % to 90 %
Moderately Weathered	Less than half of the rock material is decomposed or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as core stones.	III	CR between 51 % to 70 %
Highly Weathered	More than half of the rock material is decomposed or disintegrated to a soil. Fresh or discolored rock is present either as a discontinuous framework or as corestones.	IV	CR between 11 % to 50 %
Completely Weathered	All rock material is decomposed and / or disintegrated to soil. The original mass structure is still largely intact.	V	CR between zero to 10 %

Residual Soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.	VI	CR = Zero % But N > 50

It should be understood that all grades of weathering may not be seen in a given rock mass and that in some cases a particular grade may be present to a very small extent. Distribution of the various weathering grades of rock material in the rock mass may be related to the porosity of the rock material and the presence of open discontinuities in the rock mass.

2.4.1 Relation between RQD & In-situ Rock Quality

Rock quality is further measured by frequency of natural joints in rock mass. Rock Quality Designation (RQD) is used to define state of fractures or massiveness of rock. Following table defines the quality of rock mass.

RQD CLASSIFICATION OF ROCK MASS	
RQD CLASSIFICATION	RQD (%)
Excellent	91 to 100
Good	76 to 90
Fair	51 to 75

Poor	26 to 50
Very Poor	00 to 25

2.4.2 Classification of Rock based on Compressive Strength

Rock is also classified by strength of intact rock cores collected during drilling. Rock compressive strength (UCS) is used to define strength of rock. Following table summarizes classification of rock based on strength.

Rock Strength Classification	
ROCK STRENGTH	COMPRESSIVE STRENGTH (N/mm²)
Extremely weak	< 2.0
Very Weak	2.0 to 10.0
Weak	10.1 to 25.0
Average (Moderately strong)	25.1 to 50.0
Strong	50.1 to 100.0
Very Strong	100.1 to 250.0
Extremely Strong	> 250.0

3.0 LABORATORY INVESTIGATION:

The soil samples obtained by way of Spoon Samples and core recoveries were analysed in the Geotechnical Engineering laboratory for its classification and the results of 6 boreholes are shown in the borehole logs as given in figures of Bore holes BH01-BH.

4.0 SOIL PROFILE:

BH01:

The soil profile consists of Silty sand at top for a thickness of 12.00m followed by Clayey gravel Upto 15.00m.

BH02:

The soil profile consists of Silty Sand at top for a thickness of 7.50m followed by Silty Gravel for a thickness of 4.50m followed by completely weathered rock (CWR) upto the depth of exploration of 25.00 Core recovery value ranges from 1 to 7%.

BH03:

The soil profile consists of Clayey Gravel at top for a thickness of 9.0m followed by Silty Gravel for a thickness of 6.0m followed by completely weathered rock (CWR) upto the depth of exploration of 21.00m. Core recovery value ranges from 1% to 3%.

BH04:

The soil profile consists of Silty sand at top for a thickness of 7.50m followed by Clayey Gravel for a thickness of 7.50m completely weathered rock (CWR) upto the depth of exploration of 21.00m. Core recovery value ranges from 1% to 2%.

BH05:

The soil profile consists of Clayey Gravel at top for a thickness of 7.50m followed by Silty Gravel for a thickness of 13.50m followed by completely weathered rock (CWR) upto the depth of exploration of 25.00m. Core recovery value ranges from 1% to 6%.

BH06:

The soil profile consists of Clayey Sand at top for a thickness of 7.5m followed by Clayey Gravel for a thickness of 7.50m followed by completely weathered rock (CWR) upto the depth of exploration of 25.00m. Core recovery value ranges from 1% to 9%.

GROUND WATER TABLE:

Ground Water table was met within the depth of investigation. Water table reduction factors are taken into consideration in calculating the allowable bearing capacity of soil as the worst conditions.

5.0 ALLOWABLE BEARING CAPACITY AT THE PROPOSED DEPTH OF FOUNDATION:

The safe bearing capacity of soil can be calculated on shear failure criteria and settlement criteria and any foundation system has to satisfy the following criteria.

5.1. BEARING PRESSURE CORRESPONDING TO SHEAR FAILURE :

The net ultimate bearing capacity, q_{nu} . (in kN/m²) for general shear failure is given by

$$q_{nu} = CN_c S_c d_c i_c + q(N_q - 1) S_q d_q i_q + \frac{1}{2} B \gamma N_\gamma S_\gamma d_\gamma i_\gamma w$$

Where,

- C : Cohesion in KPa
- N_c, N_q, N_γ : Bearing capacity factors based on ϕ value obtained from Fig 1 of IS 6403:1981 (Table 1 of IS 6403:1981)
- S_c, S_q, S_γ : Shape factors (Table 2 of IS 6403:1981)
- D_c, D_q, D_γ : Depth factors (Cl 5.1.2.2 of IS 6403:1981)

- i_c, i_q, i_γ : Inclination factors (Cl 5.1.2.3 of IS 6403:1981)
 w : Water table correction factor
 (Cl 5.1.2.4 of IS 6403:1981)

The net ultimate bearing capacity, q_{nu} . (in kN/m^2) for local shear failure is given by

$$q_{nu} = C'N'_c S_c d_c i_c + q(N'_q - 1)S_q d_q i_q + \frac{1}{2}B\gamma N'_\gamma S_\gamma d_\gamma i_\gamma w$$

Where,

- C' : Cohesion in KPa (2/3 C)
 N'_c, N'_q, N'_γ : Bearing capacity factors based on (2/3 ϕ) value obtained from Fig 1 of IS 6403:1981
 (Table 1 of IS 6403:1981)
 S_c, S_q, S_γ : Shape factors (Table 2 of IS 6403:1981)
 D_c, D_q, D_γ : Depth factors (Cl 5.1.2.2 of IS 6403:1981)
 i_c, i_q, i_γ : Inclination factors (Cl 5.1.2.3 of IS 6403:1981)
 w : Water table correction factor
 (Cl 5.1.2.4 of IS 6403:1981)

A factor of safety of 3 is taken for calculating safe bearing pressure.

5.2. BEARING PRESSURE CORRESPONDING TO SETTLEMENT CONSIDERATION :

The safe bearing pressure (Allowable bearing pressure), q_s (in kN/m^2) is calculated using Fig.9 of IS 8009(Part I):1976 for cohesionless soil. The Fox's correction, water table correction are also applied to obtain the allowable bearing pressure.

6.0 SAFE BEARING CAPACITY:

The recommended safe bearing capacity at various depths based on SPT results are tabulated in the Borehole log sheets.

V. S. [Signature]
 ASST. PROF. IN

CIVIL ENGG.

R. M. [Signature]
 6/3/23
 PROF. OF

CIVIL ENGG. (SOILS)

TEST REPORT

LETTER NO.PCE/Soil & Rock testing /2022 Dated: 31.01.2023

SUMMARY OF RESULTS

The results of test conducted on top soil collected from New attuboil and Kuttimani nagar are given below.

S.No	Tests	New attuboil (4 Locations)				Kuttimani nagar- Nehrukandi (2 Locations)	
		Test Sample No-1	Test Sample No-2	Test Sample No-3	Test Sample No-4	Test Sample No-5	Test Sample No-6
1	Moisture Content	14.94 %	12.21 %	12.33%	14.46%	10.84%	12.9 %
2	Bulk Density(g/cc)	1.542	1.611	1.454	1.467	1.667	1.619
3	Dry Density(g/cc)	1.346	1.437	1.298	1.281	1.504	1.434
4	Standard Proctor Compaction Test						
	a) Max. Dry Density (gm/cc)	1.89	1.943	1.93	1.947	1.93	1.8
	b) Optimum Moisture Content %	16%	16%	14%	17%	16%	17%
5	Specific Gravity	2.64	2.61	2.63	2.74	2.65	2.55
6	Unit Weight						
	a) Wet	1.89	1.94	1.93	1.94	1.93	1.80
	b) Dry	1.58	1.62	1.7	1.65	1.83	1.745
7	Grain Size Analysis						
	a)% Gravel	3.8%	0.61%	0.30%	1.10%	12.50%	0.70%
	b)% Sand	57.8%	88.78%	59.60%	66.40%	51.90%	68.20%
	c)% Silt & Clay	38.4%	10.61%	40.10%	32.50	35.60%	31.10%
8	BIS Classification	SC(Clayey sand)	SM(Silty sand)	SC(Clayey sand)	SC(Clayey sand)	SC(Clayey sand)	SC(Clayey sand)
9	Shear Strength Parameters (top soil)						
	a)Cohesion (kPa)	4.9	4.75	3.25	4.91	3.56	3.72
	b)Angle of Internal Friction(°)	18	12	9	12	9	11

10	Coefficient of Permeability (m/s) (Laboratory Permeability)	2.743847 x 10 ⁻⁵	2.230624 x 10 ⁻⁵	2.167485 x 10 ⁻⁵	2.29516 x 10 ⁻⁵	2.03538 x 10 ⁻⁵	2.4552 x 10 ⁻⁵
11	Atterberg's limits						
	a)Liquid limit	41.5 %	Non Plastic	36.5	35.9%	38.8%	43.8%
	b)Plastic limit	23.3%		12.5 %	20 %	22%	25 %
	c)Plasticity Index	8.17%		24%	15.9%	16.8%	18.8%

Ryher 6/3/23

PROFESSOR OF CIVIL ENGINEERING (SOILS)

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2/11/23

CONSULTANCY CHARGES

DEPARTMENT OF CIVIL ENGINEERING (Soils)
GOVERNMENT COLLEGE OF TECHNOLOGY,
COIMBATORE-641013

Letter No.PCE/SOIL/ Rock & Soil testing /2022/

Dated: 27.01.2023

Submitted to the Principal:-

I am submitting herewith the following Demand cheque:

1. *State Bank of India* , Cheque No.198413 dated:23.11.2022 for Rs.15,93,000/-
(Rupees Fifteen Lakhs Ninety Three Thousand only) payable at Coimbatore.

It is requested that the Cheque may please be credited towards *Consultancy Charges* against this department's Bill No. PCE/SOIL/ Rock & Soil testing /2022.The details of the consultancy charges are furnished below.

Consultancy Charges = Rs. **13, 50,000**

Service Tax @ 18% = Rs. **2, 43,000**

Rs. 15, 93,000

It is requested that the following amount may please be credited towards *Drilling of boreholes for Soil investigation and Geophysical investigation* to STRUCTWELL Structural consultants against The district collector's order no.Re.DM/42/2021 dated:23.01.2023 and principal's order No. Principal's permission letter dated: 24.1.2023.The details of the consultancy charges are furnished below.

Consultancy Charges = Rs. **3, 56,250**

Service Tax @ 18% = Rs. **64,125**

Rs. 4, 20,375

The receipt may please be sent to

The District Collector.
The Nilgiris
Udhagamandalam.

PROF. OF CIVIL ENGG (SOILS) and HOD

o/c
27/01/23



भारतीय स्टेट बैंक
State Bank Of India

(00891)-UDHAGAMANDALAM
COMMISSIONER ROAD
UDHAGAMANDALAM, DIST. NILGIRIS, TAMILNADU 643001
Tel : 423 2452390 Fax : IFS Code : SBIN0000891 SWIFT :

23 11 2022

14269 / 100 / BLUE BEAFER / R / 02/Mar/2022
SESHASAI (C) / CTS-2010

To The Principal, Government College of Technology, Coimbatore
₹ 15,93,000/-

1593000/-

10834915483

VALID UPTO ₹ 10 LACS AT NON-HOME BRANCH FOR NON-CASH TRANSACTION ONLY

SB ACCOUNT
PREFIX :
0523600004

10834915483

THE COLLECTOR NILGIRIS DIST

MULTI-CITY CHEQUE Payable at Par at All Branches of SBI

⑈ 198413⑈ 643002002⑈ 012741⑈ 31

HOD/Env. Engg.

6/2/23

To,

The principal,
Government College of Technology,
Coimbatore.

Sub:- Requesting Of Design For 1000 KLD STP.

Namaskaram,

As we are Currently using an aerobic process for Our existing STP. Since the anaerobic process is very economical and less maintenance. We are planning to Switch the System. So we kindly request to design an anaerobic based system of 1000 KLD for our project.

Pranam,

Isha Foundation

To
Dr SM

8/2/23



DEPARTMENT OF TECHNICAL EDUCATION

FROM

The Principal,
Govt. College of Technology
Coimbatore- 641 013.

TO

M/s Isha Foundation,
Isha Yoga Centre,
Velliangiri Foothills,
Ishana Vihar- Po,
Coimbatore -641114.

Letter no. PCE/EE/C-30/2023 dated: 10.02.2023

Sir,

Sub: GCT – Consultancy Work – Design of STP with Bio Gas Plant - 1000KLD -
M/s. Isha Yoga Centre -- Bill sent – reg.

Ref: i) Your Letter No: Nil Dated: Nil

With reference to the letters cited above, the bill for the consultancy charges (with institution GST No.) for the design of STP of capacity 1000 KLD at M/s. Isha Yoga Centre, Coimbatore is enclosed herewith. Please acknowledge the same.

J. J. 10/2/23
PRINCIPAL

Encl: Bill of charge

10/2/23
A. S. P. U. S.

10/2/23

GOVERNMENT COLLEGE OF TECHNOLOGY, COIMBATORE-13

Bill of Charges

FROM

The Principal,
Govt. College of Technology
Coimbatore- 641 013.

TO

M/s Isha Foundation,
Isha Yoga Centre,
Velliangriri Foothills,
Ishana Vihar- Po,
Coimbatore -641114.
GST No:33AAATH1053R1ZK

Letter no. PCE/EE/C-30/2023 dated: 10.02.2023

Name of work	Amount Rs.
Design of STP with biogas plant of capacity 1000KLD	2,50,000
GST @ 18%	45,000

Please send the payment in the form of Two Demand drafts one for Rs.2,50,000/- and another for Rs.45,000/- both in favor of The Principal, Govt College of Technology, Coimbatore-13 quoting the reference number of the bill. (GCT GST No: 33AAALG6830C1ZM)

NOTE: This is to certify that this institution is purely a government organization and its income is unconditionally exempt under section 10 of the Income-tax Act, and who are statutorily not required to file return of income as per section 139 of the Income-tax Act there would be no requirement for tax deduction at source since their income is anyway exempt under the Income-tax Act.

AC
10/2/23
Asst. Prnc

J. J. J.
10/2/23
PRINCIPAL

132

GOVERNMENT COLLEGE OF TECHNOLOGY, COIMBATORE-13

Bill of Charges

FROM

The Principal,
Govt. College of Technology
Coimbatore- 641 013.

TO

M/s Isha Foundation,
Isha Yoga Centre,
Velliangriri Foothills,
Ishana Vihar- Po,
Coimbatore -641114.
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J. J. J.
10/2/23
f PRINCIPAL

DEPARTMENT OF TECHNICAL EDUCATION

FROM

The Principal,
Govt. College of Technology
Coimbatore-641 013.

TO

M/s Isha Foundation,
Isha Yoga Centre,
Velliangriri Foothills,
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Coimbatore -641114.

Letter no. PCE/EE/C-30/2023 dated: 10.02.2023

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M/s. Isha Yoga Centre – Bill sent – reg.

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J. J. J.
10/2/23
f PRINCIPAL

Encl: Bill of charge

A. S. R. V.

J. J. J.
10/2/23
f PRINCIPAL